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GROUND-BASED SURVEILLANCE AND TRACKING SYSTEM (GSTS)

AUGUST 1987

STRATEGIC DEFENSE INITIATIVE ORGANIZATION
SYSTEMS ENGINEERING
WASHINGTON D.C. 20301-7100

#387

Cover Sheet

Responsible Agency: Strategic Defense Initiative Organization

Proposed Action: Conduct Demonstration/Validation tests of the Ground-based Surveillance and Tracking System (GSTS) technology.

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Designation: Environmental Assessment

Abstract: The Strategic Defense Initiative Organization (SDIO) and its proponents (the U.S. Army and the U.S. Air Force) plan to conduct Demonstration/Validation tests of the GSTS technology. These tests will demonstrate the ability of the technology to perform required tasks, and to validate production feasibility in support of a future decision on whether to proceed with Full-Scale Development. Demonstration/Validation tests would be conducted at the Nevada Test Site, National Test Facility, Vandenberg Air Force Base/ Western Test Range, U.S. Army Kwajalein Atoll, and contractor facilities. Tests would include analyses, simulations, component/assembly tests, and flight tests. This document addresses the potential environmental consequences of the Demonstration/ Validation testing of the GSTS technology.

Available to the Public: August 1987

EXECUTIVE SUMMARY

INTRODUCTION

The National Environmental Policy Act, the Council on Environmental Quality regulations implementing the Act (40 CFR 1500-1508), and the Department of Defense (DoD) Directive 6050.1 which supplements these regulations, direct that DoD officials take into account environmental consequences when authorizing or approving major Federal actions in the United States. Accordingly, this Environmental Assessment analyzes the potential environmental consequences of a proposed transition from Concept Exploration to Demonstration/Validation of the Ground-based Surveillance and Tracking System (GSTS), one of the technologies being considered in the Strategic Defense Initiative program. The tests and evaluations associated with Demonstration/Validation will be in accordance to the Antiballistic Missile Treaty and are currently structured to conform with the restrictive interpretation of the Treaty. The decision to proceed to Demonstration/Validation for GSTS would not preclude other technologies, nor would it mandate the eventual Full-Scale Development or Production/Deployment of GSTS.

BACKGROUND

The President's announcement of a Strategic Defense Initiative on March 23, 1983, initiated an extensive research program to determine the feasibility of developing an effective ballistic missile defense system to protect the United States and its allies from enemy missile attack. The Strategic Defense Initiative Organization was established to plan, organize, coordinate, direct, and enhance the research and testing of technologies applicable to strategic defense. Future implementation of a Strategic Defense System would be based on the Strategic Defense Initiative research program.

Many technologies currently are being investigated. Among the technologies being considered for Demonstration/Validation are space-based technologies:

- Boost Surveillance and Tracking System (BSTS)
- Space-based Surveillance and Tracking System (SSTS)
- Space-Based Interceptor (SBI)

and ground-based technologies:

- Exoatmospheric Reentry Vehicle Interception System (ERIS)
- Ground-based Surveillance and Tracking System (GSTS)
- Battle Management/Command and Control, and Communications (BM/C^3).

DoD Directive 5000.1 calls for a staged approach to the DoD acquisition process. In keeping with that mandate, DoD's major system acquisition process consists of four distinct stages: Concept Exploration, Demonstration/Validation, Full-Scale Development, and Production/Deployment. These four stages are separated by three major decision points (Milestones I, II, and

III). Prior to Milestone I, the Defense Acquistion Board will review the results of Concept Exploration and decide whether the subject technology will be carried forward into Demonstration/Validation or remain in the Concept Exploration stage. The GSTS Strategic Defense Initiative technology is approaching the end of Concept Exploration and is preparing for Demonstration/Validation.

PURPOSE AND NEED

The purpose of the Demonstration/Validation program for GSTS is to determine the ability of technology to perform its intended function, and to provide the information necessary to make an informed decision whether to proceed with Full-Scale Development. These activities are the first steps needed to support a decision to develop, produce, and deploy the GSTS technology, which is integral to an effective strategic defense.

The function of GSTS would be to provide search, acquisition, tracking, discrimination, and transfer of sensor data concerning potentially hostile ballistic missile targets to the Battle Management/Command and Control, and Communications (BM/C^3) network for further processing. The GSTS would provide a necessary element of one alternative architecture of the proposed Strategic Defense System.

PROPOSED ACTION

The proposed action is the Demonstration/Validation program for the GSTS technology. This program would demonstrate whether the system can meet its specific performance requirements and would provide the information necessary for the Defense Acquisition Board to recommend a Milestone II decision to proceed into Full-Scale Development.

Demonstration/Validation of GSTS would require fabrication and ground testing of the sensor, general processor, guidance and control subsystem, and communication subsystem components and assemblies. It would also include launching sensor-equipped boosters into a ballistic trajectory to test the search, acquisition, tracking, and discrimination performance against a target missile. The fabrication and ground testing of the components of the weapon would take place in existing or planned contractor and government facilities. Flight testing would require modification of existing launch facilities at two DoD installations.

Demonstration/Validation of GSTS would address the following technological issues:

- Computer Hardware and Software: Verify that hardware and software can operate after exposure to radiation, accept information from the sensors, and operate in a space environment.

- Sensors and Detectors: Verify that sensors can be produced in sufficient quantities and can operate with an acceptable degree of reliability in the different types of environments that may be

encountered after deployment; verify the ability to detect, identify, and track targets.

- Spacecraft Platform: Verify that the platform can be controlled in space and that all components can be integrated on the platform.

The Demonstration/Validation testing activities for the GSTS program fall into four categories: analyses, simulations, component/assembly tests, and flight tests. The tests and their proposed locations are provided in Table S-1.

NO-ACTION ALTERNATIVE

The no-action alternative is to continue with Concept Exploration activities without progressing to the Demonstration/Validation stage at this time.

ENVIRONMENTAL SETTING

The test activities of the GSTS Demonstration/Validation program would be carried out in contractor and government facilities that have not yet been identified and at four government facilities that have been selected: Nevada Test Site, National Test Facility, Vandenberg Air Force Base/Western Test Range, and U.S. Army Kwajalein Atoll. The attributes of each of these facilities as they relate to the proposed testing activities are as follows:

The **Nevada Test Site** is located approximately 65 miles northwest of Las Vegas, Nevada. The main function of the site is underground testing of nuclear devices.

The **National Test Facility** will be constructed at Falcon Air Force Station in Colorado. An interim facility will be operated out of the Consolidated Space Operations Center, also located at Falcon Air Force Station, until construction is complete.

Vandenberg Air Force Base/Western Test Range, located on the coast of California, is the site the United States uses to test launch operational land-based intercontinental ballistic missiles. Vandenberg Air Force Base launches between 14 and 20 Minuteman missiles per year. Preparation for launching takes 6 to 8 weeks, although the actual launch takes place during a 4-hour "launch window." Between 200 and 300 people are involved during the launch, including the launch agency and Western Test Range personnel.

The Western Test Range includes a broad area of the Pacific Ocean which functions as a test area for space and missile operations. The range is activated by launches 60 to 70 times each year. Only that portion of the range affected by a launch is actually activated; activation consists of instructing ships and airplanes to stay out of the affected area and either sheltering or evacuating any people living in the activated area.

The **U.S. Army Kwajalein Atoll** is located on Kwajalein Atoll within the Ralik Chain in the Marshall Islands, east-southeast of Guam. The U.S. Army Kwajalein Atoll has facilities on 11 of the approximately 100 islands in the atoll.

TABLE S-1.
DEMONSTRATION/VALIDATION TESTING FOR THE GROUND-BASED SURVEILLANCE AND TRACKING SYSTEM

TEST ACTIVITIES	TEST TECHNIQUES				LOCATIONS[1]
	Analyses	Simulation	Component/ Assembly	Flight	
Develop and test software that interprets sensor data to detect the presence of threat objects; discriminate between objects with the purpose of distinguishing warheads from decoys; track a number of threat objects; correlate data from a pair of GSTS sensors	X	X	Scene Generator		Contractor/government facility[2]
Develop architecture of onboard signal processor for large volume of data processing	X	X	HWIL[5]		Contractor/government facility[2]
Develop and test hardened circuitry, focal plane array and optical glass with ability to withstand nuclear and space environment	X	X	Radiation and Space Chambers		Contractor/government facility[2]
			Broad Spectrum Radiation		Nevada Test Site

[1] Adequate facilities exist unless otherwise noted.

[2] Contractor or government facility has not been selected; when selection occurs the need for supplemental environmental evaluation of these additions to the Demonstration/Validation program will be determined in conformance with Council on Environmental Quality and DoD regulations.

[3] Use of the U.S. Army Kwajalein Atoll for flight testing also requires launching of both dedicated targets and targets of opportunity from Vandenberg Air Force Base and use of the Western Test Range.

[4] Facility construction or modification required (excluding minor modification).

[5] Hardware-in-the-loop. Refers to tests in which some portion of GSTS hardware is used in computer simulation.

TABLE S-1 (Continued).
DEMONSTRATION/VALIDATION TESTING FOR THE
GROUND-BASED SURVEILLANCE AND TRACKING SYSTEM

TEST ACTIVITIES	TEST TECHNIQUES				LOCATIONS[1]
	Analyses	Simulation	Component/ Assembly	Flight	
Develop and test sensor with ability to resolve closely spaced objects	X	X	Optical Chamber	X	Contractor/government facility[2]
				X	U.S. Army Kwajalein Atoll[4]
				X	Vandenberg Air Force Base/Western Test Range[3]
Determine the minimum level of long-wave infrared radiation the detectors can discern against background levels of radiation	X		Scene Generator		Contractor/government facility[2]
Determine effectiveness of cryogenic cooling system through operational period	X		Space Chamber		Contractor/government facility[2]

(1) Adequate facilities exist unless otherwise noted.

(2) Contractor or government facility has not been selected; when selection occurs the need for supplemental environmental evaluation of these additions to the Demonstration/Validation program will be determined in conformance with Council on Environmental Quality and DoD regulations.

(3) Use of the U.S. Army Kwajalein Atoll for flight testing also requires launching of both dedicated targets and targets of opportunity from Vandenberg Air Force Base and use of the Western Test Range.

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TABLE S-1 (Continued).
DEMONSTRATION/VALIDATION TESTING FOR THE
GROUND-BASED SURVEILLANCE AND TRACKING SYSTEM

TEST ACTIVITIES	TEST TECHNIQUES				LOCATIONS[1]
	Analyses	Simulation	Component/ Assembly	Flight	
Determine ability of hardware and software to detect and track targets				X	Contractor/government facility[2]
				X	U.S. Army Kwajalein Atoll[4]
				X	Vandenberg Air Force Base/Western Test Range[3]
Analyze and store flight test data	X	X			National Test Facility[4]

[1] Adequate facilities exist unless otherwise noted.

[2] Contractor or government facility has not been selected; when selection occurs the need for supplemental environmental evaluation of these additions to the Demonstration/Validation program will be determined in conformance with Council on Environmental Quality and DoD regulations.

[3] Use of the U.S. Army Kwajalein Atoll for flight testing also requires launching of both dedicated targets and targets of opportunity from Vandenberg Air Force Base and use of the Western Test Range.

[4] Facility construction or modification required (excluding minor modification).

[5] Hardware-in-the-loop; refers to tests in which some portion of GSTS hardware is used in computer simulation.

ENVIRONMENTAL CONSEQUENCES

Many of the tests for the GSTS Demonstration/Validation program would be conducted at contractor facilities. These contractors would be selected through the DoD procurement process. The contractors would be required to meet all Federal, State, and local environmental laws and regulations necessary for facility operations. If the procurement process required the contractor to use Federal funds to conduct an activity with a potential for significant environmental consequences, an environmental analysis of the consequences of such activities would also be required of the contractor. This analysis would be utilized by DoD in completing an environmental assessment or environmental impact statement, as appropriate.

To assess the potential for and the magnitude of impacts from Demonstration/Validation at each government facility, a two-step methodology was utilized. The first step was the application of assessment criteria to identify activities with no potential for significant environmental consequences. Activities were deemed to present no potential for significant environmental consequences if they met all of the following criteria (i.e., all "yes" answers):

1. Are the facility and its infrastructure adequate for the proposed activity (i.e., can the tests be conducted without new construction, excluding minor modifications?)

2. Is current staffing at the facility adequate to conduct the test, excluding minor staff level adjustments?

3. Does the facility comply with existing environmental standards?

4. Are the resources of the surrounding community adequate to accommodate the proposed testing?

If a proposed test was determined to present a potential for impact (i.e., a "no" answer to any of the above questions), the second step was to evaluate the activity in the context of the following environmental considerations: air quality, water quality, biological resources, infrastructure, hazardous waste, land use, visual resources, cultural resources, noise, and socioeconomics. As a result of that evaluation, consequences were assigned to one of three categories: insignificant, mitigable, or potentially significant.

Environmental consequences were determined to be **insignificant** if, in the judgment of the analysts or as concluded in existing environmental documentation, no potential for significant environmental impacts exists. Consequences were deemed **mitigable** if concerns exist but it was determined that all potential consequences could be readily mitigated through standard procedures, or by measures recommended in existing environmental documentation. If serious consequences exist that could not be readily mitigated, the activity was determined to represent **potentially significant** environmental impacts.

The environmental consequences of GSTS activities at the **Nevada Test Site** would be **insignificant**. The tests would include exposure of circuitry to broad-spectrum radiation resulting from an underground nuclear test scheduled for other programs. No facility/infrastructure modification or additional

staff would be required as a consequence of GSTS testing and the facility is in compliance with environmental standards.

The environmental consequences of constructing and operating the **National Test Facility** at Falcon Air Force Station are deemed to be **mitigable**. The consequences have been analyzed in "National Test Facility Environmental Assessment," which also identifies the necessary mitigation measures. The National Test Facility would employ 2,300 workers in a new facility. Until the facility is constructed, workers would be located in existing facilities at Falcon Air Force Station. Air quality, infrastructure, and land use impacts from construction and operation will be mitigable through the use of standard control and conservation practices. No significant impacts are expected on water quality, biological resources, hazardous waste, visual and cultural resources, noise, or socioeconomics.

Environmental consequences of launching targets for GSTS from **Vandenberg Air Force Base/Western Test Range** are expected to be **insignificant**. The launching of Minuteman missiles is a continuing acceptable use and represents no significant impacts to air, biological or other environmental resources. However, overall operations at Vandenberg Air Force Base are contributing to regional overdrawing of the aquifers used for water supply. Continued regional consumption at current rates could cause depletion of the aquifers.

The use of the Western Test Range for GSTS activities will be in connection with launches from Vandenberg Air Force Base. The impacts on Western Test Range operation from GSTS activities are deemed **insignificant**.

Environmental consequences at the **U.S. Army Kwajalein Atoll** may be **significant**. Although the launch vehicle is unknown, it is anticipated that launch facilities on Meck Island could be either constructed or modified from existing facilities. This construction is addressed in a record of environmental consideration and the resulting Categorical Exclusion #7. Additional support personnel would be required, which in turn would necessitate new infrastructure and housing. New housing requirements have been identified for Kwajalein Island. The "Environmental Assessment for Family Housing Dwellings, FY 1987-1989 Phases, Kwajalein Island, Kwajalein Missile Range, Kwajalein Atoll, Marshall Islands" addresses the impacts of housing construction on Kwajalein Island. Those impacts were deemed mitigable and not significant. Increased infrastructure requirements would be met with the following planned construction: expansion of the power plant and a new desalinization facility on Kwajalein Island; a sewage treatment plant and a water storage tank on Roi-Namur Island. An environmental assessment has been prepared for the construction and operation of the expanded power plant. The environmental assessment concluded that all potential impacts are mitigable and that the action does not constitute a major Federal action with potential for significant impacts on the environment.

Activities associated with GSTS Demonstration/Validation at U.S. Army Kwajalein Atoll are expected to result in an increase of 3.5 percent over the most recent available population figure (2,432 persons on 30 June 1986) in staff and their dependents residing at the facility. The total population would be below the highest population figure of nearly 6,000 people in 1972. Such an increase may result in environmental impacts. Specific areas of consideration are:

- Air Quality: The 1979 estimates of emissions from the Kwajalein Island power plant showed emissions reaching the limits of Environmental Protection Agency standards for nitrogen oxide. The planned power plant expansion would be required to meet emission limitations. The environmental assessment for the expanded power plant concluded that with the implementation of mitigation measures, emissions standards would be met.

- Water Quality: Available data from 1976 indicated that water quality was being degraded as a result of toxic metal leaching from a waste disposal site on Kwajalein Island used by the U.S. Army Kwajalein Atoll. Subsequently, a wall was constructed. Although the wall was installed on the ocean side of the landfill, visual inspection indicated direct seepage to the ocean was occurring (5). The source of the leachate was considered to be waste oil or sewage tank pumpage. The landfill is currently used only for disposal of construction materials and GSTS activities are expected to continue the use of this landfill. The potential change in rate of seepage as a result of disposal of construction wastes is unknown. Water quality in the lagoon may be degraded by the dumping of untreated sewage in the lagoon of Roi-Namur Island. A planned sewage treatment plant on Roi-Namur Island or operational mitigation initiated by the U.S. Army Kwajalein Atoll Commander are expected to mitigate all anticipated impacts. Indirect water quality impacts have not been evaluated in previous documents.

- Biological Resources: Beaches on Roi-Namur Island have been judged suitable for nesting of the endangered Hawksbill Turtle and the threatened Green Sea Turtle. Launching activities, if they utilize Roi-Namur, should consider possible impacts to the potential nesting beaches. If coral is dredged for use in construction, degradation of the marine environment could result. However, the harvesting can be accomplished in a manner that will ensure that critical habitats of marine biota are not degraded. Indirect impacts on biological resources have not been evaluated in previous documents.

- Infrastructure:

  -- Electricity demands associated with facility population staff increases may require increased power plant generating capacity. A concern is the nitrogen oxide emission which is considered mitigable.

  -- Solid waste demands associated with the increase in facility population would be accomodated by the existing waste disposal system.

  -- Sewage treatment demands from increased facility population may result in a slight increase in sewage treatment requirements but are not expected to exceed capacity. Sewage treatment demands on Roi-Namur Island are anticipated to be met if

the planned sewage treatment facility is constructed or if operational mitigation measures are intiated by the U.S. Army Kwajalein Atoll Commander.

-- Water supply demands would be increased and mitigation measures, such as the planned desalinization facility on Kwajalein Island and the water storage facility on Roi-Namur, are anticipated to be sufficient to prevent degradation of groundwater resources.

-- Transportation demands may require additional ferry service to Kwajalein Island from Ebeye for increased Marshallese staff.

o Hazardous Waste: Hazardous waste produced is not expected to significantly impact the treatment, storage, or disposal provisions provided in the Hazardous Waste Management Plan.

o Socioeconomics: The economy of Ebeye Island relies heavily on the people residing at the U.S. Army Kwajalein Atoll. Because of this dependence, virtually any change in facility population could potentially have beneficial and adverse socioeconomic consequences at Ebeye Island. An increase of approximately 87 persons (3.5 percent) associated with GSTS Demonstration/Validation activities is expected, for a period of 2 years. Such an increase is expected to have a positive direct effect on the Marshallese economy in terms of new jobs, which should be complemented by the Job Corps Program recently implemented by the U.S. Army Kwajalein Atoll. In addition, the U.S. Army Kwajalein Atoll currently has a policy limiting the number of Marshallese employed which may minimize the influx of people to Ebeye Island. Due to the small size and duration of the population increase, this growth in employment is not expected to be significant. However, there may be indirect socioeconomic consequences of increases in U.S. Army Kwajalein Atoll population, as a result of Marshallese migrating from other islands to Ebeye Island in response to reported availabilty of relatively high-paying jobs. The consequences of increased migration could be significant.

No significant impacts at U.S. Army Kwajalein Atoll are anticipated upon land use, visual resources, cultural resources, or noise because the proposed tests are similar to current activities that have no significant impacts on these resource areas.

In recognition of the need to avoid, minimize, and mitigate any potential adverse impacts on the environment of the Kwajalein Atoll, the U.S. Army will prepare a comprehensive environmental impact statement addressing the continuing operations at the U.S. Army Kwajalein Atoll, which include the proposed Demonstration/Validation activities. The environmental impact statement will address the environmental concerns recognized in this Environmental Assessment and will identify appropriate mitigations.

If the no-action alternative is selected, no significant environmental impacts are anticipated as current Concept Exploration activities would continue with utilization of current staffing and facilities.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Development of the GSTS through the Demonstration/Validation stage would result in irreversible and irretrievable commitment of resources such as electronic components, various metallic and nonmetallic structural materials, fuel, and labor. This commitment of resources is not different from those necessary for many other aerospace research and development programs; it is similar to the activities that have been carried out in previous aerospace programs over the past several years.

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1. DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

The National Environmental Policy Act, the Council on Environmental Quality regulations implementing the Act (40 CFR 1500-1508), and the Department of Defense (DoD) Directive 6050.1 which supplements these regulations, direct that DoD officials take into account environmental consequences when authorizing or approving major Federal actions in the United States. Accordingly, this Environmental Assessment analyzes the potential environmental consequences of a proposed transition from Concept Exploration to Demonstration/Validation of the Ground-based Surveillance and Tracking System (GSTS), one of the technologies being considered in the Strategic Defense Initiative program. The tests and evaluations associated with Demonstration/Validation will be in accordance with the Antiballistic Missile Treaty and are currently structured to conform to the restrictive interpretation of the Treaty. The decision to proceed to Demonstration/Validation for GSTS would not preclude other technologies, nor would it mandate the eventual Full-Scale Development or Production/Deployment of GSTS.

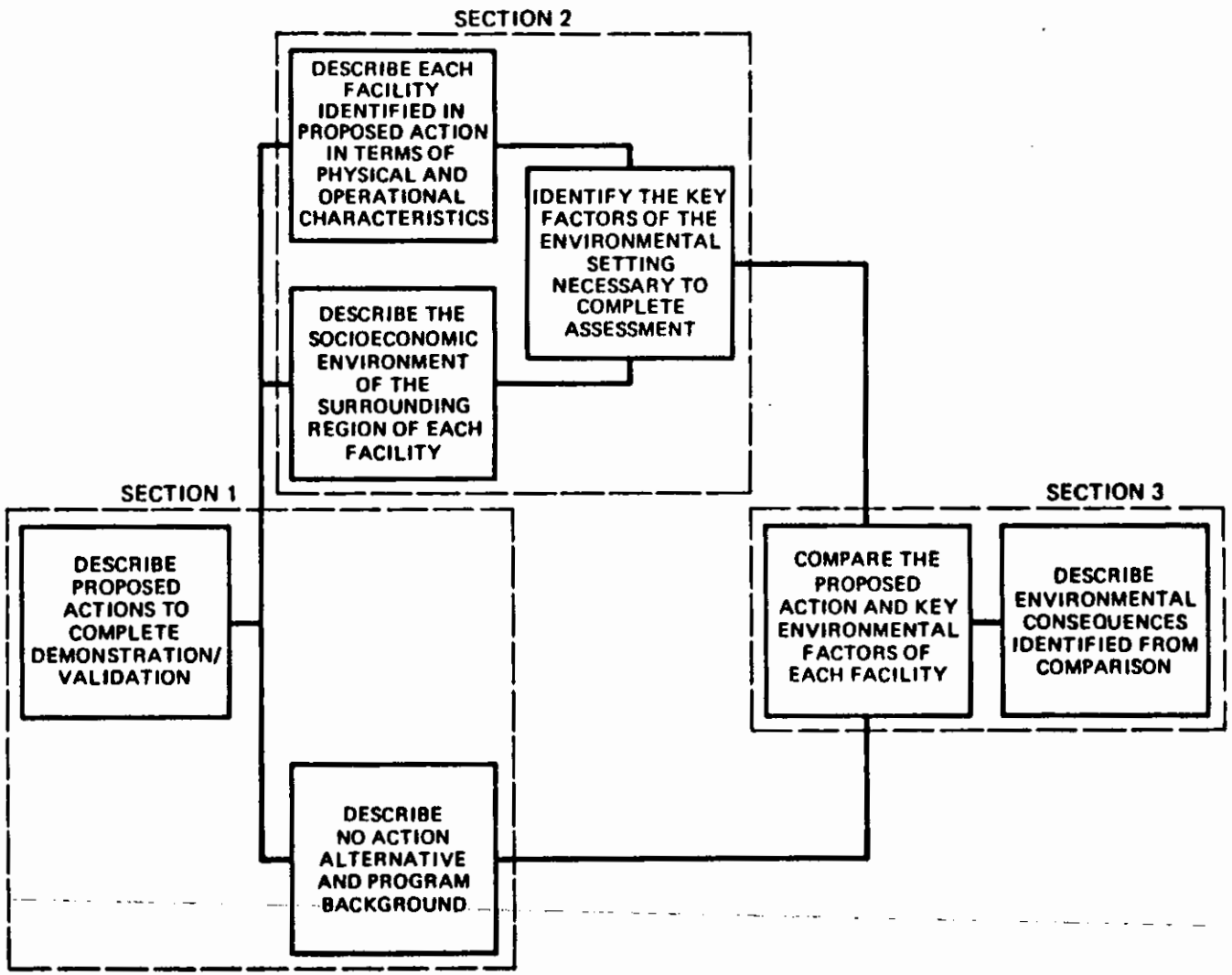
The approach followed to complete this assessment is presented in Figure 1-1. This section describes the test and evaluation activities that would be completed for GSTS and identifies the contractor and government facilities where the activities would be carried out. Section 2 characterizes those facilities and the surrounding communities and Section 3 assesses the potential environmental consequences of the activities.

Demonstration/Validation of the GSTS technology would consist of a number of tests. Descriptions of these tests were developed from documentation describing the GSTS Demonstration/Validation program and interviews with program personnel who developed the documentation. Section 1.3 describes the types of tests and their locations. Also, where possible, other factors related to the test such as work force or hazardous materials requirements, have been described.

The remainder of this section briefly describes the background of the Strategic Defense Initiative program, the purpose of and need for the GSTS technology, the proposed action, and the no-action alternative.

1.1 BACKGROUND

The President's announcement of a Strategic Defense Initiative on March 23, 1983, initiated an extensive research program to determine the feasibility of developing an effective ballistic missile defense system to protect the United States and its allies from enemy missile attack. The Strategic Defense Initiative Organization was established to plan, organize, coordinate, direct, and enhance the research and testing of technologies applicable to strategic defense. Future implementation of a Strategic Defense System would be based on the Strategic Defense Initiative research program.



GENERAL APPROACH TO COMPLETE ENVIRONMENTAL ASSESSMENT

FIGURE 1-1

1. Analyses: Examining and evaluating data to define or refine the current knowledge of a technology

2. Simulations: The use of software models representing both the test article and the environment to determine performance abilities

3. Component/Assembly Tests: Demonstrating performance of components and assemblies under simulated conditions such as space or battle environments

4. Flight Tests: The use of flight-qualified devices and assemblies in real flight environments to verify performance.

Some GSTS Demonstration/Validation activities may require modifications or additions to existing government facilities. Should this occur, the need for supplemental environmental evaluation would be determined in conformance with Council on Environmental Quality and DoD regulations.

1.2 PURPOSE AND NEED

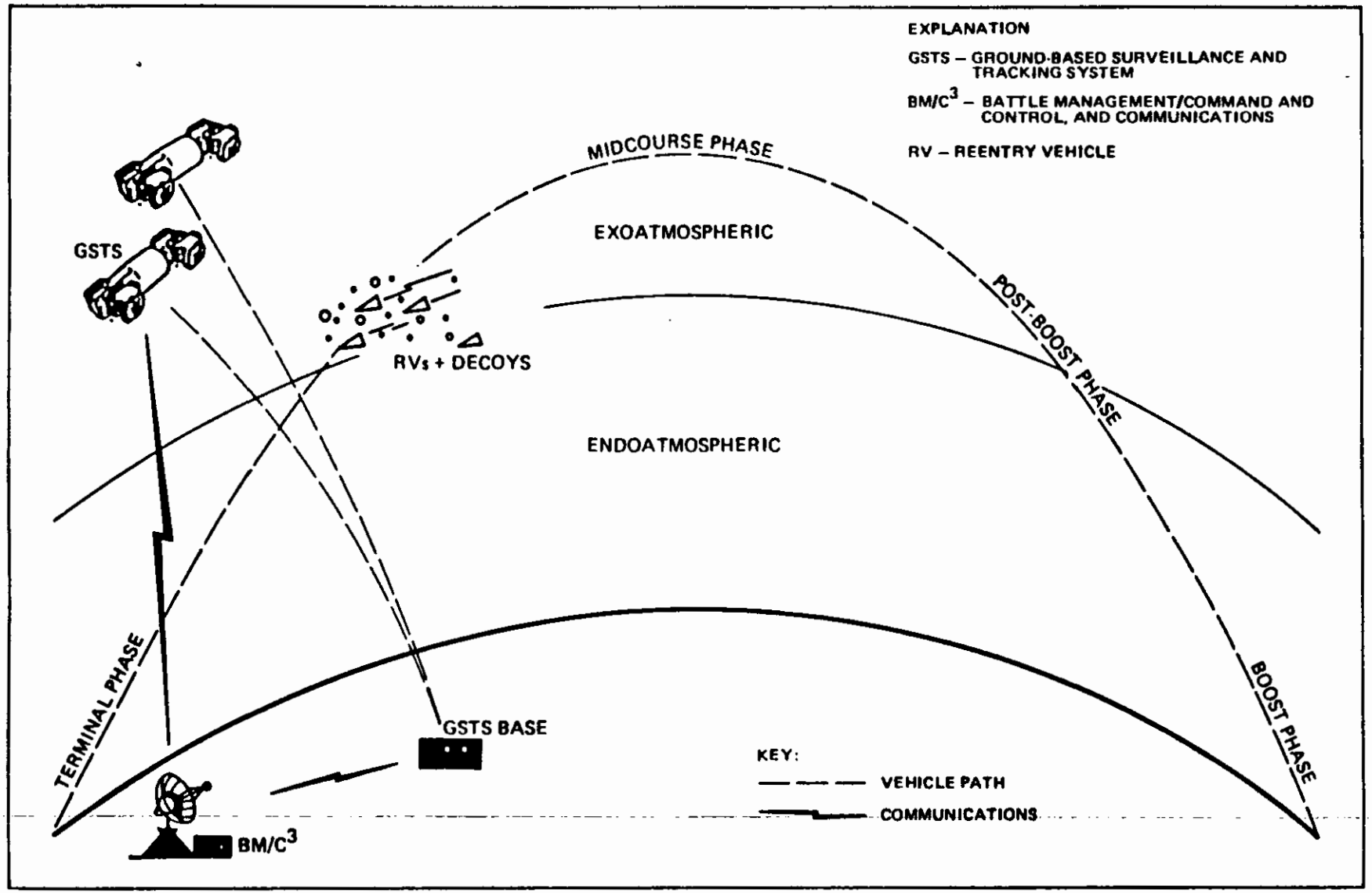
The purpose of the Demonstration/Validation program for GSTS is to determine the ability of the technology to perform its intended function, and to provide the information necessary to make an informed decision whether to proceed with Full-Scale Development. These activities are the first steps needed to support a decision to develop, produce, and deploy the GSTS technology, which is integral to an effective strategic defense.

The function of GSTS would be to provide search, acquisition, tracking, discrimination, and transfer of sensor data concerning potentially hostile ballistic missile targets to BM/C^3 (Figure 1-2). GSTS sensor data would be processed by a combination of onboard signal and data processors and ground-based data processors. Data from the GSTS ground equipment would be transmitted to the BM/C^3 network for dissemination to other Strategic Defense System elements. The GSTS would provide a necessary element of one alternative architecture of the proposed Strategic Defense System.

1.3 PROPOSED ACTION

The proposed action is the Demonstration/Validation program for the GSTS technology. This program would demonstrate whether the system can meet its specific performance requirements and would provide the information necessary for the Defense Acquisition Board to recommend a Milestone II decision to proceed into Full-Scale Development.

Demonstration/Validation of GSTS would require fabrication and ground testing of the sensor, general processor, guidance and control subsystem, and communication subsystem components and assemblies. It would also include launching two sensor-equipped boosters into a ballistic trajectory to test the search, acquisition, tracking, and discrimination performance against a target.



FUNCTIONAL CONCEPT OF
GROUND-BASED SURVEILLANCE AND TRACKING SYSTEM

FIGURE 1-2

To date, Concept Exploration activities for the GSTS technology have included significant efforts in software development for discrimination between objects and in developing components and subassemblies of the sensor. Demonstration/Validation testing is needed to resolve the following technical issues:

- Sensor: Determine resolution limits and accuracy of angle measurement; verify that off-axis sources can be rejected by baffle assembly.
- Detector: Increase the production yields in the manufacture of detectors.
- Focal Plane Assembly: Develop manufacturing techniques to accurately produce focal plane assembly.
- Signal Processor: Increase speed of data processing and communication; design for survivability in a nuclear environment.
- Temperature Controller: Verify cooling capabilities during the anticipated operational lifetime and environment.

The Demonstration/Validation testing activities for the GSTS program are divided into analyses, simulations, component/assembly tests, and flight tests. Each of these categories and the subcategories specific to GSTS are described in greater detail in Appendix A. The GSTS test activities and their locations are summarized in Table 1-1. The following paragraphs provide additional descriptions of the test activities where such descriptions are appropriate. Figure 1-3 presents the locations of the test facilities.

1.3.1 Analyses

Analyses would be performed for 12 test activities within the GSTS program as described in Table 1-1. All analyses would take place at a contractor facility or facilities that have not yet been identified. The analyses and storage of flight test data at the completion of flight testing would include storing the data and analysis results for further refinement of GSTS.

1.3.2 Simulations

Simulations create a digital representation of the physical world using specially developed computer software. Each simulation assigns a specific value to all physical parameters in the simulated system; these values are changed in subsequent simulations to determine: (1) how each parameter affects the simulated system, and (2) the optimal value for each parameter for maximum system efficiency. All exercises using computer models would be conducted at contractor or government facilities that have not been selected. GSTS flight test data would be used for simulations at the National Test Facility to analyze the results of one flight test and to initiate improvements in the succeeding tests.

TABLE 1-1.
DEMONSTRATION/VALIDATION TESTING FOR THE
GROUND-BASED SURVEILLANCE AND TRACKING SYSTEM

TEST ACTIVITIES	TEST TECHNIQUES				LOCATIONS[1]
	Analyses	Simulation	Component/ Assembly	Flight	
Develop and test software that interpret sensor data to detect the presence of threat objects; discriminate between objects with the purpose of distinguishing warheads from decoys; track a number of threat objects; correlate data from a pair of GSTS sensors	X	X	Scene Generator		Contractor/government facility[2]
Develop architecture of onboard signal processor for large volume of data processing	X	X	HWIL[5]		Contractor/government facility[2]
Develop and test hardened circuitry, focal plane array and optical glass with ability to withstand nuclear and space environment	X	X	Radiation and Space Chambers		Contractor/government facility[2]
			Broad Spectrum Radiation		Nevada Test Site

(1) Adequate facilities exist unless otherwise noted.

(2) Contractor or government facility has not been selected; when selection occurs the need for supplemental environmental evaluation of these additions to the Demonstration/Validation program will be determined in conformance with Council on Environmental Quality and DoD regulations.

(3) Use of the U.S. Army Kwajalein Atoll for flight testing also requires launching of both dedicated targets and targets of opportunity from Vandenberg Air Force Base and use of the Western Test Range.

(4) Facility construction or modification required (excluding minor modification).

(5) Hardware-in-the-loop. Refers to tests in which some portion of GSTS hardware is used in computer simulation.

TABLE 1-1 (Continued).
DEMONSTRATION/VALIDATION TESTING FOR THE
GROUND-BASED SURVEILLANCE AND TRACKING SYSTEM

TEST ACTIVITIES	TEST TECHNIQUES				LOCATIONS[1]
	Analyses	Simulation	Component/ Assembly	Flight	
Develop and test sensor with ability to resolve closely spaced objects	X	X	Optical Chamber	X	Contractor/government facility[2]
				X	U.S. Army Kwajalein Atoll[4]
				X	Vandenberg Air Force Base/Western Test Range[3]
Determine the minimum level of long-wave infrared radiation the detectors can discern against background levels of radiation	X		Scene Generator		Contractor/government facility[2]
Determine effectiveness of cryogenic cooling system through operational period	X		Space Chamber		Contractor/government facility[2]

(1) Adequate facilities exist unless otherwise noted.

(2) Contractor or government facility has not been selected; when selection occurs the need for supplemental environmental evaluation of these additions to the Demonstration/Validation program will be determined in conformance with Council on Environmental Quality and DoD regulations.

(3) Use of the U.S. Army Kwajalein Atoll for flight testing also requires launching of both dedicated targets and targets of opportunity from Vandenberg Air Force Base and use of the Western Test Range.

(4) Facility construction or modification required (excluding minor modification).

(5) Hardware-in-the-loop; refers to tests in which some portion of GSTS hardware is used in computer simulation.

TABLE 1-1 (Continued).
DEMONSTRATION/VALIDATION TESTING FOR THE
GROUND-BASED SURVEILLANCE AND TRACKING SYSTEM

TEST ACTIVITIES	TEST TECHNIQUES				LOCATIONS[1]
	Analyses	Simulation	Component/ Assembly	Flight	
Determine ability of hardware and software to detect and track targets				X	Contractor/government facility[2]
				X	U.S. Army Kwajalein Atoll[4]
				X	Vandenberg Air Force Base/Western Test Range[3]
Analyze and store flight test data	X	X			National Test Facility[4]

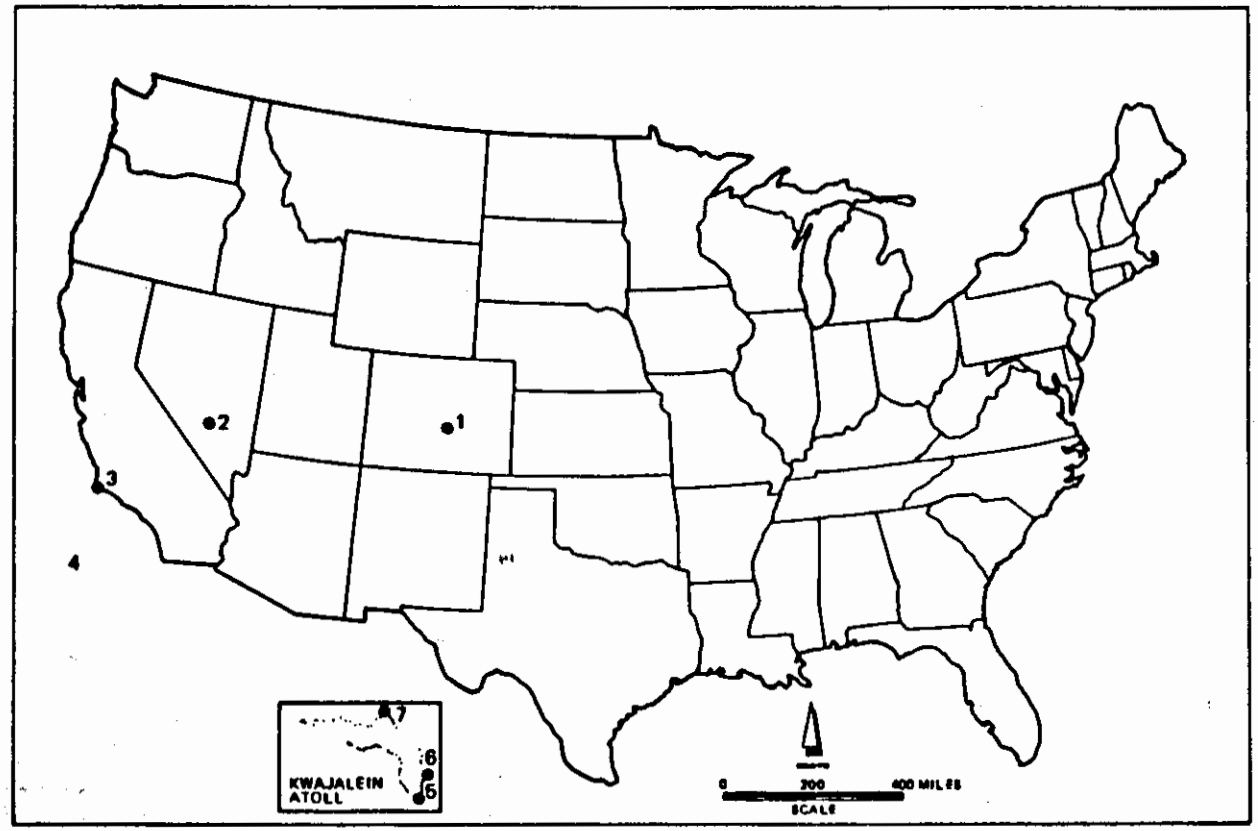
[1] Adequate facilities exist unless otherwise noted.

[2] Contractor or government facility has not been selected; when selection occurs the need for supplemental environmental evaluation of these additions to the Demonstration/Validation program will be determined in conformance with Council on Environmental Quality and DoD regulations.

[3] Use of the U.S. Army Kwajalein Atoll for flight testing also requires launching of both dedicated targets and targets of opportunity from Vandenberg Air Force Base and use of the Western Test Range.

[4] Facility construction or modification required (excluding minor modification).

[5] Hardware-in-the-loop; refers to tests in which some portion of GSTS hardware is used in computer simulation.



FACILITY

1. NATIONAL TEST FACILITY
2. NEVADA TEST SITE
3. VANDENBERG AFB
4. WESTERN TEST RANGE

U.S. ARMY KWAJALEIN ATOLL

5. KWAJALEIN ISLAND
6. MECK ISLAND
7. ROI-NAMUR ISLAND

GROUND-BASED SURVEILLANCE AND TRACKING SYSTEM DEMONSTRATION/VALIDATION FACILITIES

FIGURE 1-3

1.3.3 Component/Assembly Tests

The objective of component/assembly testing is to control some particular aspect of the physical environment surrounding a hardware component being developed. During the test, data are collected on the environment and the performance of the hardware component being tested. A chamber generally represents the environment; the hardware component is subjected to the environment and the response of the hardware is recorded and analyzed for future modifications.

An optical chamber would be used to develop a sensor with the ability to resolve closely spaced objects. Once the sensor has been developed, several subsequent tests that involve the sensor would use a scene generator with versatility to provide high-fidelity radiometric targets, realistic object motion, and a large number of objects and simulated environments. These tests would take place at a government-provided sensor test chamber that has not yet been identified.

A method of hardening (designing an assembly to function in a nuclear environment) would most likely be developed in a contractor facility. To determine the success of the hardening design, the circuitry, focal plane assembly, and glass material of the objects would be exposed to the broad-spectrum radiation effects during an underground test of a nuclear device scheduled for other programs at the Nevada Test Site.

The circuitry, focal plane assembly, glass material of the optics, and cryogenic cooling system would be tested in a space chamber at a contractor or government facility that has not yet been identified.

1.3.4 Flight Tests

Flight tests are conducted within a missile range that generally consists of a launch area with launch pads or silos, associated control and support facilities, a safety area around the launch area, and a controlled land/sea/air area for flight and impact.

Flight testing for the GSTS Demonstration/Validation includes two options. The first option would involve a total of three launches: two launches of single GSTS vehicles and one test of two GSTS vehicles launched simultaneously. The second option would involve up to six additional launches (65). Paired launches of the GSTS vehicle would occur from the U.S. Army Kwajalein Atoll. Test targets would include targets of opportunity and dedicated targets launched from Vandenberg Air Force Base aimed for the vicinity of U.S. Army Kwajalein Atoll. The targets would consist of single and multiple reentry vehicles, some with penetration aids including balloons or warhead replicas.

Western Test Range personnel would be requested to recover the GSTS sensor at the end of the test. Shipborne trackers, recovery units, and chase planes would be required.

1.4 NO-ACTION ALTERNATIVE

The no-action alternative is to continue with Concept Exploration activities without progressing to the Demonstration/Validation stage at this time.

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2. ENVIRONMENTAL SETTING

The test activities of the GSTS Demonstration/Validation program and the facilities where they would be conducted are identified in Table 1-1. The tests would be conducted at contractor and government facilities that have not yet been identified. Tests would also be conducted at government facilities at the Nevada Test Site, National Test Facility, Vandenberg Air Force Base/Western Test Range, and U.S. Army Kwajalein Atoll. This section describes the environmental setting of each government facility in terms of physical and operational characteristics, permit status, and previous environmental documentation. Specific physical characteristics include facility size, base and test facilities, and environmental conditions. Operational characteristics include the socioeconomic parameters of staffing, payroll, and housing, and the infrastructure characteristics of electricity, solid waste, sewage treatment, transportation, and water supply.

Permits described are those that relate to air quality, water quality, and hazardous waste. Previous environmental documentation includes environmental compliance plans, base master plans, environmental assessments, and environmental impact statements. The socioeconomic characteristics of the counties and communities surrounding the facility are also presented.

The data for each planned test facility are presented in tables and figures. The level of detail in these tables reflects the availability of pertinent program and facility information.

Many of the tests for the GSTS Demonstration/Validation program would be completed at contractor facilities that have not been identified. The contractors would be selected through the DoD procurement process, and would be required to meet all Federal, State, and local environmental laws and regulations necessary for facility operations.

Some of the tests would be conducted at government facilities that have not yet been selected. When selection occurs, the need for supplemental environmental evaluation of these additions to the Demonstration/Validation program would be determined in conformance with the Council on Environmental Quality and DoD regulations.

The methodology used in developing the descriptions of the government facilities that would be used in the program involved identifying and acquiring available literature, such as environmental assessments, environmental impact statements, and base master plans. The literature was reviewed and data gaps (i.e., questions that could not be answered from the literature) were identified. To fill the data gaps, facility personnel were interviewed by telephone. Where this report utilizes information collected through telephone interviews, appropriate references are presented in the List of References, Section 6; primary contacts for each facility are listed in Section 5. The following subsections describe the environmental setting of each of the government facilities where Demonstration/Validation activities are planned.

Ten areas of environmental consideration are addressed: (1) air quality; (2) water quality; (3) biological resources; (4) infrastructure: electricity, solid waste, sewage treatment, water supply, transportation; (5) hazardous waste; (6) land use; (7) visual resources; (8) cultural resources; (9) noise; and (10) socioeconomics.

Several of the resource areas, specifically air and water quality, are regulated by federally mandated standards. the treatment, storage, and disposal of hazardous wastes are also regulated by Federal standards. Where federally mandated standards do not exist, qualitative evaluations were made. a discussion of each resource area is provided below.

Air Quality

Air quality concerns at each facility were evaluated in terms of the National Ambient Air Quality Standards and the location of the facility in an attainment or nonattainment area. For existing air emissions sources, the facility was evaluated for the emissions standards contained in the associated State Implementation Plan. Possible air emissions sources, such as expansion of facilities and new construction, were evaluated using the New Source Review requirements.

Water Quality

Water quality concerns at each location were identified and the facility's record of compliance with permits is presented.

Biological Resources

The Endangered Species Act protects plants and animals threatened with extinction. A review of the environmental documentation of the geographic area surrounding the facility was conducted to determine the documented presence of threatened and endangered species.

Infrastructure

Electricity, solid waste, sewage treatment, water supply, and transportation, are infrastructure requirements that ultimately limit the capacity for growth. Capacity and current demand are described for each facility.

Hazardous Waste

The Resource Conservation Recovery Act regulates how a facility can dispose of its hazardous waste. The record of compliance was reviewed to determine the facility's capability to handle any additional wastes and to determine any potential disposal problems.

Land Use

Base master plans, environmental management plans, and other documentation were reviewed to determine any current conflicts between the facility and local standards, and to evaluate the probability of conflict resulting from any planned expansions.

Visual Resources

Existing environmental documentation was reviewed to determine if aesthetic concerns were an issue at any of the facilities.

Cultural Resources

Existing environmental documentation was reviewed to determine if any significant cultural resources in proximity to the facilities would be affected by test activities.

Noise

Existing environmental documentation was reviewed to determine if noise concerns were an issue at any of the facilities.

Socioeconomics

Key socioeconomic indicators (population, housing, employment, and income data) for the supporting region of each facility were examined to evaluate the potential consequences of increased population, expenditures, and employment.

2.1 NEVADA TEST SITE

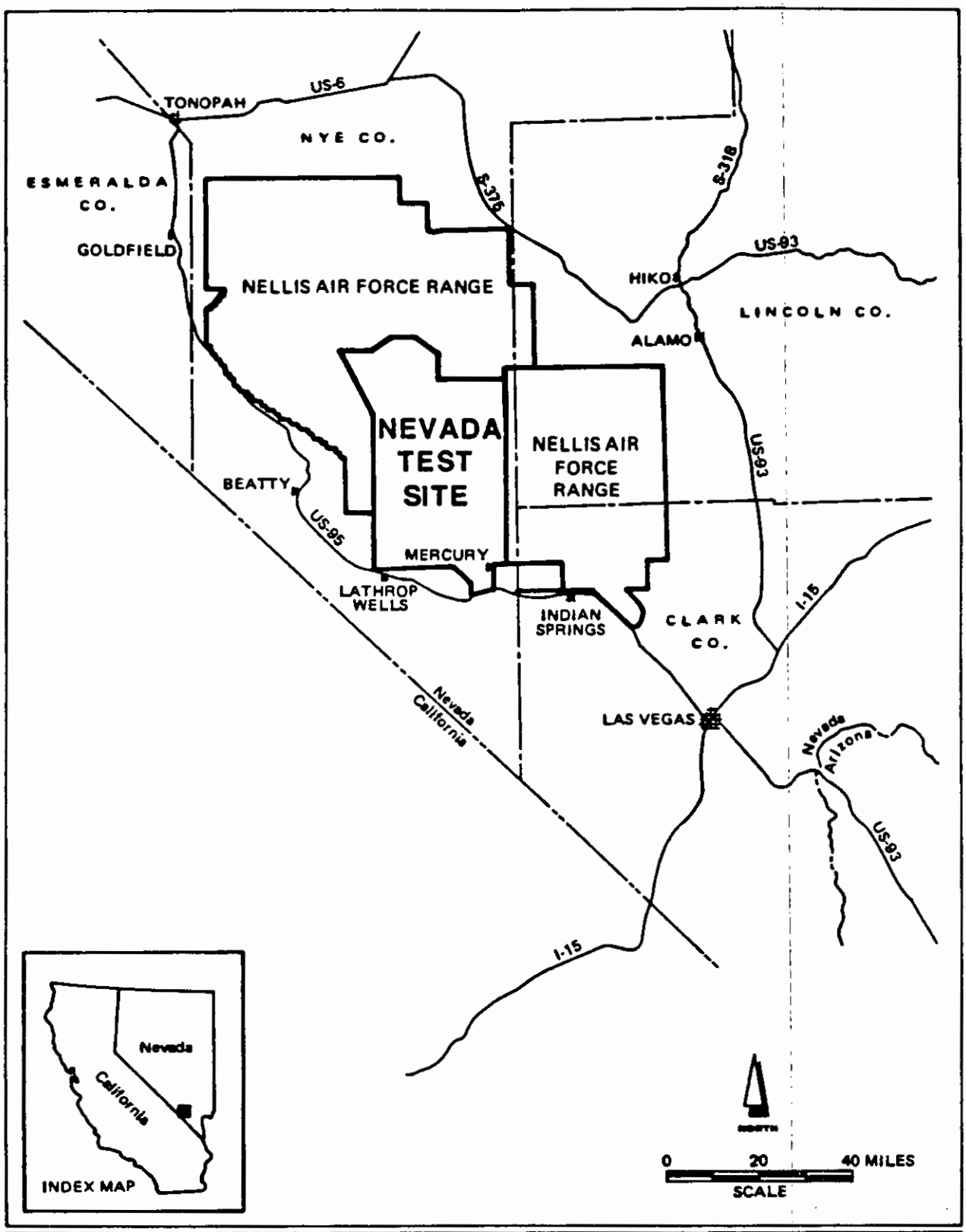
The Nevada Test Site is located adjacent to the Nellis Air Force Range approximately 65 miles northwest of Las Vegas in southeastern Nye County, Nevada (62) (Figure 2-1). The Nevada Test Site, 864,000 acres in size, operates facilities for underground testing of nuclear devices and weapons testing. Exposure of materials and components to nuclear radiation is often an integral part of a nuclear test. A description of the facility and its environment is presented in Table 2-1.

For purposes of socioeconomic assessment, the supporting region for the Nevada Test Site is defined as Nye County, where the facility itself is located, as well as Clark County and its main population center, Las Vegas, located to the southeast. Selected socioeconomic data for these areas are presented in Table 2-2.

Based on available data, the Nevada Test Site is in compliance with Federal standards for air quality, water quality, and hazardous waste (40, 63). Environmental documentation has been prepared for the Nevada Test Site (Final Environmental Impact Statement, ERDA-155, September 1977) (9).

2.2 NATIONAL TEST FACILITY

The National Test Facility will be constructed at Falcon Air Force Station (45). An interim facility will be operated out of the existing Consolidated Space Operations Center, also located at Falcon Air Force Station. This facility is in El Paso County, Colorado, about 12 miles east of Colorado Springs (Figure 2-2). The present mission of the Consolidated Space Operations Center is to provide support for military space operations through



LOCATION MAP OF NEVADA TEST SITE, NEVADA

FIGURE 2-1

TABLE 2-1
SELECTED ENVIRONMENTAL CHARACTERISTICS
NEVADA TEST SITE

				REFERENCE NO.
PHYSICAL CHARACTERISTICS	FACILITIES	SIZE	864,000 acres	62
		BASE FACILITIES	Dedicated to underground nuclear testing, development and testing of nuclear explosives for peaceful applications, and testing of weapons effects	14, 41
		TEST FACILITIES	Facilities for underground testing of nuclear devices and exposure of components to nuclear radiation	41, 62
	ENVIRONMENTAL CONDITIONS	NATURAL RESOURCES	Low-grade uranium and geothermal resources are found in general area, but are not currently considered economical.	41
		VISUAL RESOURCES	Located in a desert area with gently rolling topography dissected by ephemeral streams; landscape has been affected by underground blasting.	41
		SPECIAL STATUS	No federally listed threatened or endangered species listed; however, there are several candidate species. Archaeological and historical sites have been identified, but none are listed on the National Register of Historical Places.	9, 40, 41
		NOISE	Uninhabited desert, intermittent short duration noise from onsite tests	9
OPERATIONAL CHARACTERISTICS	SOCIOECONOMICS	STAFFING	Approximately 8,000, mostly civilians	62
		PAYROLL	Data not available	
		HOUSING	Limited housing onsite	62

TABLE 2-1 (Continued)
SELECTED ENVIRONMENTAL CHARACTERISTICS
NEVADA TEST SITE

				REFERENCE NO.
OPERATIONAL CHARACTERISTICS (Continued)	INFRASTRUCTURES	ELECTRICITY	Peak daily load = 37 MW; will need to upgrade capacity in the next 4-5 years	63
		SOLID WASTE	Permitted disposal onsite	63
		SEWAGE TREATMENT	Currently three ponds in use	63
		TRANS-PORTATION	700 miles of road onsite, 300 miles are paved. Funding for upgrading is available. Network is within capacity.	63
		WATER SUPPLY	Demand = 1.2 million gallons/day; capacity = 2.4 million gallons/day; supplied by 17 onsite wells.	40
PERMIT STATUS		AIR	Within attainment of all National Ambient Air Quality Standards	40
		WASTE WATER	No release of effluent to streams; no permits	40, 62
		HAZARDOUS WASTE	TSD facility with RCRA Part B permit to handle new wastes	40
ADDITIONAL ENVIRONMENTAL INFORMATION	Final Environmental Impact Statement, Nuclear Test Site, ERDA-155, September 1977			9
COMMENTS	Underground testing is conducted in the Pahute Mesa, Ranier Mesa, Yucca Flat, and Frenchman Flat areas of Nevada Test Site.			9

TABLE 2-2.
SELECTED SOCIOECONOMIC INDICATORS FOR THE SUPPORTING REGION
NEVADA TEST SITE

Area/Indicator	1970	1980	1984	Annual Change 1970-1980 (%)	Annual Change 1980-1984 (%)
Nye County					
Population	5,599	9,048	14,434	4.92	12.39
Year-Round Housing	2,093	4,202	N/A	7.22	N/A
Vacancy Rate (%)	13.4	18.3	N/A	--	--
Civilian Labor Force	2,465	4,330	3,659	5.80	-4.12
Unemployment (%)	2.8	4.7	6.3	--	--
Per Capita Income ($)[1]	3,844	7,169	8,889	--	--
Median Family Income ($)[1]	10,218	19,914	N/A	--	--
Clark County					
Population	273,288	463,087	536,473	5.42	3.75
Year-Round Housing	92,815	189,860	N/A	7.42	N/A
Vacancy Rate (%)	5.5	8.4	N/A	--	--
Civilian Labor Force	113,669	240,320	279,180	7.77	3.82
Unemployment (%)	5.2	6.4	8.6	--	--
Per Capita Income ($)[1]	3,538	8,259	9,930	--	--
Median Family Income ($)[1]	10,865	21,029	N/A	--	--
Las Vegas					
Population	125,787	164,674	183,227	2.73	2.70
Year-Round Housing	43,028	67,041	N/A	4.53	N/A
Vacancy Rate (%)	5.0	7.3	N/A	--	--
Civilian Labor Force	54,500	86,114	100,136	4.68	3.84
Unemployment (%)	5.6	6.7	9.0	--	--
Per Capita Income ($)[1]	3,614	8,135	9,795	--	--
Median Family Income ($)[1]	11,338	21,028	N/A	--	--

References: 32, 33, 34, 36, 39

[1] Income figures refer to preceding year

communications centralization and data link operations. The facility and its environmental characteristics are described in Table 2-3.

The Consolidated Space Operations Center was built to house two mission elements: the Satellite Operations Center and the Space Shuttle Operations Center (46). The former performs command, control, and communications service functions for orbiting spacecraft. The latter was to conduct DoD Shuttle flight planning, readiness, and control functions. The interim National Test Facility could be located at the Consolidated Space Operations Center because adequate support facilities are available (51).

For the purpose of socioeconomic assessment, the supporting region for this facility is defined as the surrounding El Paso County and the nearby community of Colorado Springs. Selected socioeconomic data for these areas are contained in Table 2-4.

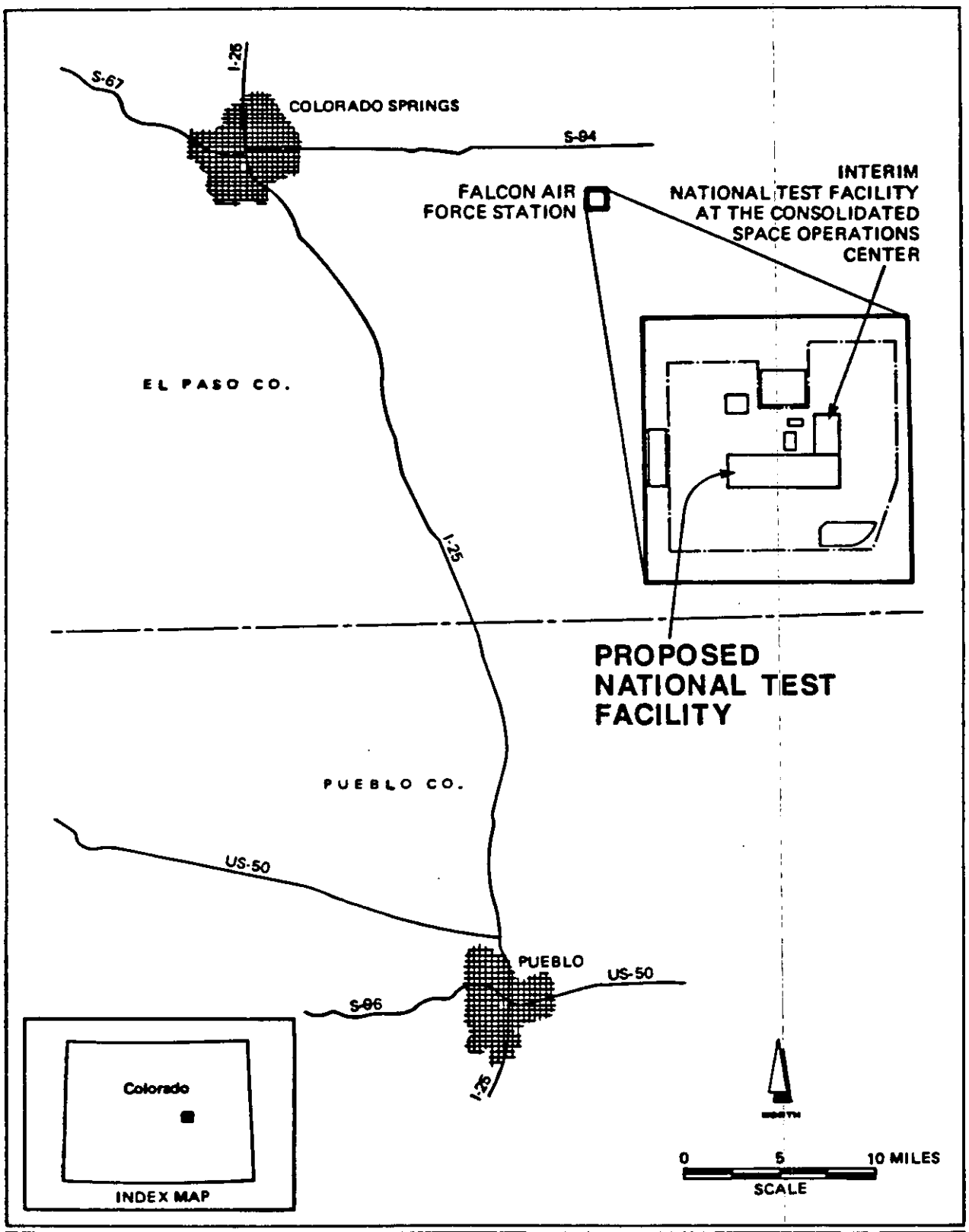
Based on available data, the Falcon Air Force Station, including the Consolidated Space Operations Center and the proposed location of the National Test Facility, is in compliance with Federal standards for air quality, water quality, and hazardous waste. Environmental documentation has been prepared for both the National Test Facility (National Test Facility Environmental Assessment) (45) and for the interim National Test Facility at the Consolidated Space Operations Center (Categorical Exclusion, control number AFSPC 86-1) (51).

2.3 VANDENBERG AIR FORCE BASE/WESTERN TEST RANGE

Vandenberg Air Force Base is located on the coast of California 55 miles north of Santa Barbara (Figure 2-3). Vandenberg Air Force Base is the third-largest air base in the United States and occupies 98,400 acres along 35 miles of Pacific coastline within Santa Barbara County. It is the Strategic Air Command's pioneer missile base and the headquarters of the 1st Strategic Aerospace Division and the Space Missile Test Organization (50). Facilities house DoD, government, and civilian contractors, and provide the necessary support for missile test launches. A description of the facility and its environment is presented in Table 2-5.

Existing launch facilities are scheduled to test launch intercontinental ballistic missiles, including the Minuteman, Peacekeeper, Atlas, and Scout (26). Launch facilities for the Space Shuttle are not operational, but are maintained. Current plans are to refurbish Titan Complex 4E for launches of Titan IV or construct a new facility (5). The refurbished facility is due to be operational around 1990 (5).

The Western Test Range includes a broad area of the Pacific Ocean which extends offshore from Vandenberg Air Force Base on the coast of California (Figure 2-4) to the Indian Ocean. The range functions as the test area for space and missile operations. It includes a network of tracking and data gathering facilities throughout California, Hawaii, and the South Pacific which are supplemented by instrumentation on aircraft (30). Launch and spacecraft operations are monitored and supported by the Air Force Satellite Control Facility, the Consolidated Space Operations Center, and the MILSTAR Satellite Communication system.



LOCATION MAP OF NATIONAL TEST FACILITY AT FALCON AFS, COLORADO

FIGURE 2-2

TABLE 2-3
SELECTED ENVIRONMENTAL CHARACTERISTICS
NATIONAL TEST FACILITY

				REFERENCE NO.
PHYSICAL CHARACTERISTICS	FACILITIES	SIZE	640 acres	1
		BASE FACILITIES	Administrative offices, communications network	45
		TEST FACILITIES	Advanced communications network capabilities	45
	ENVIRONMENTAL CONDITIONS	NATURAL RESOURCES	None on facility	7
		VISUAL RESOURCES	Region consists of gently rolling plains characterized by semiarid grasslands used for agricultural grazing; Falcon Air Force Station is considered developed, as high-technology buildings and support facilities dominate the landscape.	45
		SPECIAL STATUS	None on facility	7
		NOISE	Current ambient noise level is 40 L_{dn}, which is below acceptable limits.	6
OPERATIONAL CHARACTERISTICS	SOCIOECONOMICS	STAFFING	Military = 895, Active Duty; Civilian = 2,088 (1987, at Falcon Air Force Station)	13
		PAYROLL	$0.9 Million (1987; Civilian payroll, at Falcon Air Force Station)	13, 58
		HOUSING	Officer = 106; NCO = 384; Transient = 130; (1987; at Peterson Air Force Base, no known housing at Falcon Air Force Station)	13

TABLE 2-3 (Continued)
SELECTED ENVIRONMENTAL CHARACTERISTICS
NATIONAL TEST FACILITY

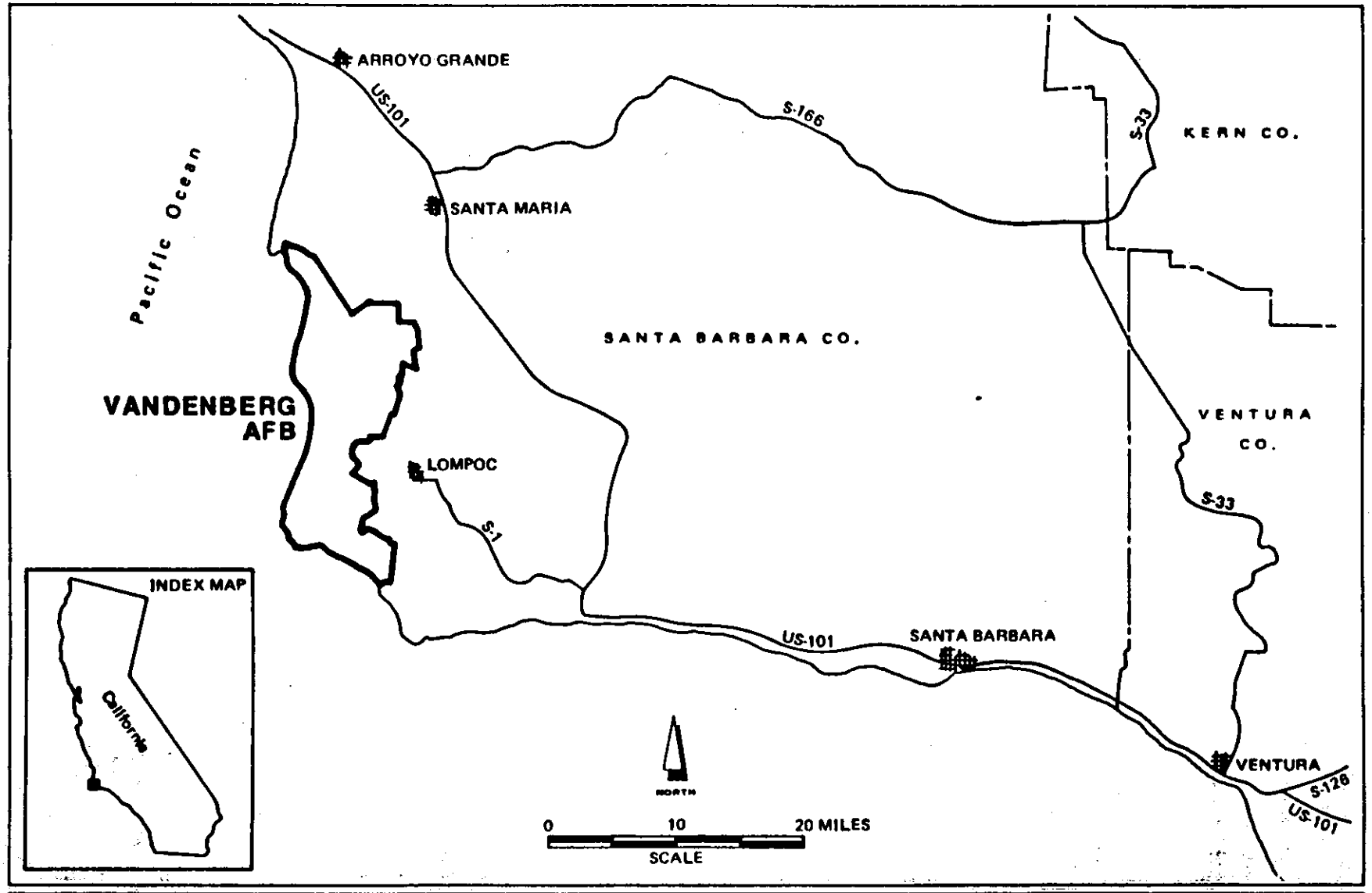
				REFERENCE NO.
OPERATIONAL CHARACTERISTICS (Continued)	INFRASTRUCTURES	ELECTRICITY	Peak daily demand = 6,100 kWh for Consolidated Space Operations Center; Capacity = 15,000 kW; can be expanded to 25,000 kW	45
		SOLID WASTE	Disposed offsite at licensed landfill by private contractor	6
		SEWAGE TREATMENT	Design capacity = 0.069 million gallons/day; designed to support 2,300 Base personnel	45
		TRANS-PORTATION	Access to Falcon AFS provided by State Highway 94 and Enoch Road. Current traffic at Enoch Road = 1,550 vehicles/day, capacity 11,300 vehicles/day. Current traffic at SH 94 = 3,500 vehicles/day, capacity 16,000 vehicles/day.	45
		WATER SUPPLY	The Cherokee Water District contract with Falcon Air Force Station limits delivery of water to 0.479 million gallons per day. Existing peak water demands at the installation are estimated at 0.409 million gallons per day.	45
PERMIT STATUS		AIR	Attainment by Colorado standards (Falcon AFS is located outside the Colorado Springs non-attainment areas for carbon monoxide and total suspended particulates)	6
		WASTE WATER	NPDES Permit is in place for wastewater that is discharged offbase into lagoons.	6
		HAZARDOUS WASTE	Potential Hazardous Wastes: electrolytes, sodium hydroxide, sodium sulphide, dichlorodiflouromethane, sulfur dioxide, SSP-55 all in very small amounts; offsite disposal by Defense Reutilization Management Office	6, 8
ADDITIONAL ENVIRONMENTAL INFORMATION	No environmental compliance plan available. The Base Master Plan is being developed and is expected to be completed in June 1988; there are no land use or zoning conflict issues. Current EA: National Test Bed Program, 1987; Final Environmental Impact Statement, Consolidated Space Operations Center, January, 1981			7, 45
COMMENTS	National Test Facility has categorical exclusion as stated in document 813 (control # AFSPC 86-1) dated 8-12-86. Data is for Falcon Air Force Station, unless otherwise noted.			51, 64

TABLE 2-4.
SELECTED SOCIOECONOMIC INDICATORS FOR THE SUPPORTING REGION
NATIONAL TEST FACILITY

Area/Indicator	1970	1980	1984	Annual Change 1970-1980 (%)	Annual Change 1980-1984 (%)
El Paso County					
Population	235,972	309,424	349,066	2.75	3.06
Year-Round Housing	72,913	116,770	N/A	4.82	N/A
Vacancy Rate (%)	7.3	7.7	N/A	--	--
Civilian Labor Force	71,085	130,297	163,883	6.25	5.90
Unemployment (%)	5.5	7.6	5.4	--	--
Per Capita Income($)[1]	2,920	7,027	9,812	--	--
Median Family Income ($)[1]	8,974	18,729	N/A	--	--
Colorado Springs					
Population	140,512	215,105	247,739	4.35	3.59
Year-Round Housing	46,502	88,189	N/A	6.61	N/A
Vacancy Rate (%)	7.7	7.9	N/A	--	--
Civilian Labor Force	46,414	98,140	123,504	7.78	5.92
Unemployment (%)	5.7	7.4	5.3	--	--
Per Capita Income ($)[1]	3,001	7,404	10,292	--	--
Median Family Income ($)[1]	9,089	18,987	N/A	--	--

References: 32, 33, 34, 36, 39

[1] Income figures refer to preceding year



LOCATION MAP OF VANDENBERG AFB, CALIFORNIA

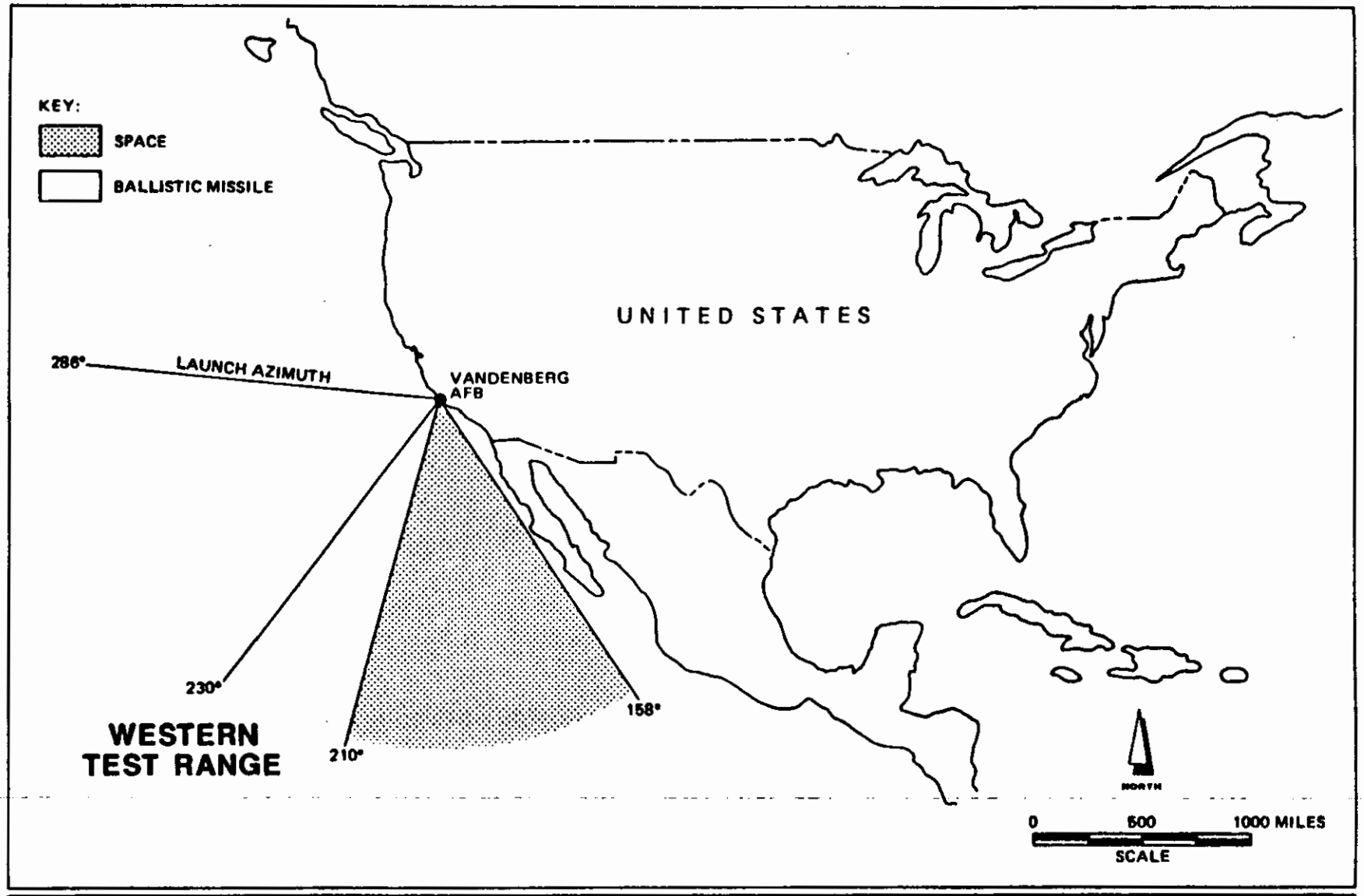
FIGURE 2-3

TABLE 2-5
SELECTED ENVIRONMENTAL CHARACTERISTICS
VANDENBERG AIR FORCE BASE

				REFERENCE NO.
PHYSICAL CHARACTERISTICS	FACILITIES	SIZE	98,400 acres	1
		BASE FACILITIES	45-bed hospital, 6 onbase electrical power plants, 6,000-acre cantonment area, 35 missile launch sites, 15,000-foot runway	1, 44
		TEST FACILITIES	Missile assembly buildings, missile launch pads, missile control building, tracking stations	44
	ENVIRONMENTAL CONDITIONS	NATURAL RESOURCES	Proven onbase oil and gas reserves	44
		VISUAL RESOURCES	North Vandenberg is characterized by natural landforms consisting of rolling hills interrupted by canyons and valleys. The central cantonment area consists of residential, administrative, and industrial structures. The inland portion of south Vandenberg landscape varies from gently rolling hills to steep, sloping terrain. The coastal portion of north and south Vandenberg includes steep bluffs and canyons, rocky shorelines and promontories, beaches, river outlets, and sand dunes.	44
		SPECIAL STATUS	Over 600 known cultural resources exist on base, most of which are archaeological sites. Two sites listed on National Register of Historical Places. Federally listed endangered species include: California Brown Pelican, California Least Tern, Least Bell's Vireo, American Peregrine Falcon, and Unarmored Threespine Stickleback. Threatened species include the Southern Sea Otter and the Guadalupe Fur Seal. There are no federally listed endangered or threatened plants. 5,125 acres are designated by the U.S. Fish and Wildlife Service as wetlands. The Base also contains 35 miles of coastline, 166 miles of streams, 9,000 acres of dune habitat, and 4,200 acres of woodland.	44
		NOISE	North Vandenberg area affected by missile launches, maintenance activities, and traffic. Noise levels in cantonment area typical of residential area. South Vandenberg affected by launch facilities, traffic, and the Southern Pacific Railroad. Noise monitoring network onbase. Measured noise levels in vicinity of launch facilities range from L_{dn} 44 to L_{dn} 69, with maximum L_{dn} 120.	44
OPERATIONAL CHARACTERISTICS	SOCIOECONOMICS	STAFFING	Military = 3,971 Civilian = 1,487 Contractor = 7,913 (1987)	13
		PAYROLL	Military and civilian $157 million; contractors $244 million (1987)	13
		HOUSING	Officers = 511; NCO = 1,567; Transient = 400; 172 mobile trailer spaces, (1987)	13

TABLE 2-5 (Continued)
SELECTED ENVIRONMENTAL CHARACTERISTICS
VANDENBERG AIR FORCE BASE

				REFERENCE NO.
OPERATIONAL CHARACTERISTICS (Continued)	INFRASTRUCTURES	ELECTRICITY	Peak daily demand = 558,900 kWh; peak daily capacity = 580,000 kWh; supplied by PG&E power grid.	11, 29
		SOLID WASTE	Volume = 25,000 tons/year, capacity = 95,000 tons/year; disposed at five offsite facilities by private contractor. Three of five facilities expected to have adequate space to year 2000.	10, 44
		SEWAGE TREATMENT	Design capacity of offsite facility (serving the city of Lompoc, unincorporated areas surrounding Lompoc, and Vandenberg) is 5 million gallons/day. Onsite system treats waste from cantonment area with a capacity of 3 million gallons/day. Total sewage produced in 1986 by Vandenberg AFB was approximately 1 million gallons/day.	10, 44, 47
		TRANS-PORTATION	Road network on base has considerable excess capacity. Road network leading to base near or at capacity. Access to launch sites restricted several hours prior to launch.	28, 44
		WATER SUPPLY	10 potable wells on base supply all Vandenberg's water needs. 1,497 million gallons produced in 1986. Potable water wells and an additional 24 monitoring wells are regularly sampled. All have acceptable water quality, except for two wells in the Santa Ynez field which show excessive chromium and pesticide levels.	10, 44
PERMIT STATUS		AIR	Permits in place authorize onbase construction and operations from the Air Pollution Control District. North county portion of Santa Barbara County, which contains Vandenberg, is currently in attainment of air quality standards. Three PSD monitoring stations onbase.	22, 29, 31
		WASTE WATER	NPDES permits in place for 15 onbase sewage discharge locations	27
		HAZARDOUS WASTE	Approximately 500 tons generated per year; disposed at offsite facility by private contractor. Vandenberg has a short-term hazardous waste storage permit.	22
ADDITIONAL ENVIRONMENTAL INFORMATION	Recent (1987) Draft EIS on oil and gas exploration at Vandenberg. Existing EIS documents (1983, 1978) for MX missile and space shuttle launches from Vandenberg. EIS in progress for Titan IV launch facilities and operations.			4, 44, 47, 48, 53
COMMENTS	Missile launches have relatively little impact on air quality. Many base operations and programs were resticted in anticipation of Space Shuttle launches. Since the program has been suspended, the large amounts of offset allow for more potential emissions.			31



LOCATION MAP OF WESTERN TEST RANGE

FIGURE 2-4

For socioeconomic purposes, the supporting region for Vandenberg Air Force Base is defined as the surrounding Santa Barbara County, and the nearby communities of Lompoc and Santa Maria. Selected socioeconomic data for these areas are presented in Table 2-6.

Based on available data, Vandenberg Air Force Base is in compliance with all Federal standards for air quality, water quality, and hazardous waste. However, water is supplied by onbase wells from two aquifers which are currently overdrawn (44).

Recent environmental documents include: "Draft Environmental Impact Statement, Potential Exploration, Development, and Production of Oil and Gas Resources," April 1987 (44), and "Environmental Assessment for Repair and Restoration of Space Launch Complex 4," June 1987 (52). "The Space Shuttle Environmental Impact Statement," 1978 (48), addresses Shuttle launches from Vandenberg Air Force Base. Impacts from MX launches are addressed in the "MX Milestone II Final Environmental Impact Statement," 1978 (28, 47). An environmental impact statement is in progress for the refurbished facility for Titan IV launches (29).

2.4 U.S. ARMY KWAJALEIN ATOLL

Kwajalein Atoll is a northern atoll within the Ralik Chain of the Republic of the Marshall Islands, located east-southeast of Guam (Figure 2-5). The Marshall Islands were previously administered by the United States under a strategic trust established by the United Nations (23). The Compact of Free Association prepared by the government of the United States, the Marshall Islands, the Federated States of Micronesia, and Palua in 1980 established a sovereign Marshall Islands government (23). The Compact was approved by the United Nations in 1986.

Kwajalein Atoll consists of a very large interior lagoon (839 square miles) surrounded by approximately 100 component islets (23, 54). The U.S. Army Kwajalein Atoll encompasses the Kwajalein Atoll and includes facilities on the islands of Kwajalein, Roi-Namur, Ennylabegan, Meck, Ennugarret, Gagan, Gellinam, Omeleck, Eniwetak, Legan, and Illeginni (38). United States resident populations are located on Kwajalein and Roi-Namur. A description of the facility and its environment is presented in Table 2-7.

Technical facilities present on the U.S. Army Kwajalein Atoll include multiple launch facilities, and numerous supporting elements such as tracking radars, optical instrumentation, and telemetry stations (38). Support services include airports, warehouses, and maintenance buildings (38). During the last decade U.S. Army Kwajalein Atoll has served an important role in research related to exoatmospheric ballistic missile defense, development of the MX missile system, and support of other advanced DoD research (38). Radars, optical instrumentation, and telemetry facilities were installed on Meck Island during this time (38). Also, major facilities have been established on Roi-Namur by the Defense Advanced Research Projects Agency. Since 1976, ballistic missile defense activities have been limited to research and technology demonstration programs (38).

TABLE 2-6.
SELECTED SOCIOECONOMIC INDICATORS FOR THE SUPPORTING REGION
VANDENBERG AIR FORCE BASE

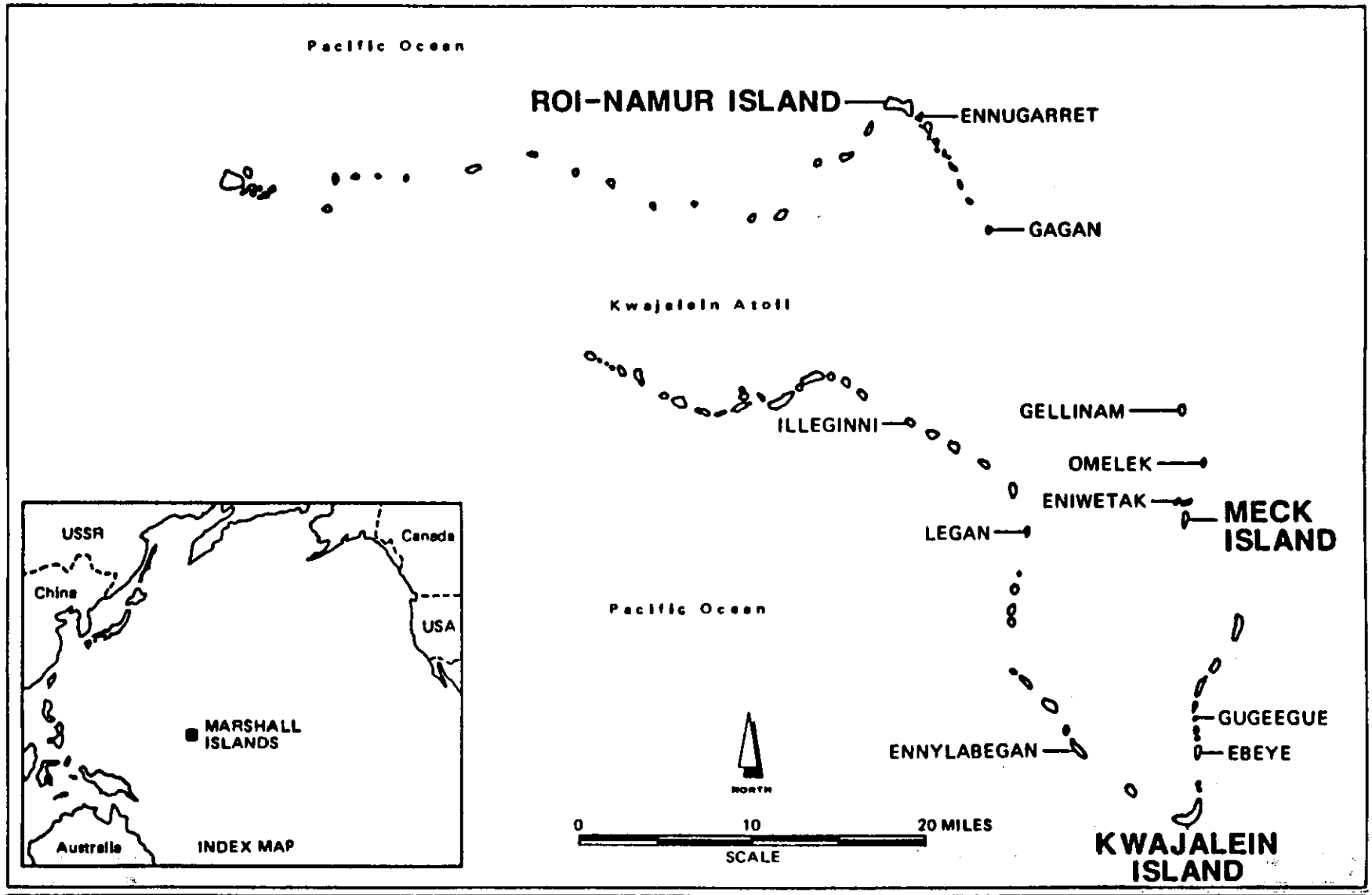
Area/Indicator	1970	1980	1984	Annual Change 1970-1980 (%)	Annual Change 1980-1984 (%)
Santa Barbara County					
Population	264,324	298,694	322,781	1.23	1.96
Year-Round Housing	88,777	114,720	123,476 (2)	2.60	1.48 (3)
Vacancy Rate (%)	5.5	4.7	3.64 (2)	--	--
Civilian Labor Force	101,425	145,949	167,921	3.71	3.57
Unemployment (%)	6.4	5.8	5.9	--	--
Per Capita Income (1)	3,357	8,406	11,125	--	--
Median Family Income (1)	10,451	21,630	N/A	--	--
Lompoc					
Population	25,280	26,267	29,342	0.38	2.81
Year-Round Housing	7,991	9,870	N/A	2.13	N/A
Vacancy Rate (%)	5.5	5.0	N/A	--	--
Civilian Labor Force	8,727	11,366	13,083	2.68	3.58
Unemployment (%)	9.6	9.3	9.4	--	--
Per Capita Income (1)	2,839	6,828	9,492	--	--
Median Family Income (1)	9,636	19,272	N/A	--	--
Santa Maria					
Population	32,749	39,685	46,494	1.94	4.04
Year-Round Housing	10,803	15,007	N/A	3.34	N/A
Vacancy Rate (%)	5.5	6.4	N/A	--	--
Civilian Labor Force	13,269	18,678	21,500	3.48	3.58
Unemployment (%)	8.1	9.4	9.5	--	--
Per Capita Income (1)	3,116	6,507	8,682	--	--
Median Family Income (1)	9,902	18,526	N/A	--	--

References: 33, 34, 35, 37, 42

(1) Income figures refer to preceding year

(2) 1985 data

(3) 1980-1985 annual % change



LOCATION MAP OF U.S. ARMY KWAJALEIN ATOLL
REPUBLIC OF MARSHALL ISLANDS, MICRONESIA

FIGURE 2-5

TABLE 2-7
SELECTED ENVIRONMENTAL CHARACTERISTICS
U.S. ARMY KWAJALEIN ATOLL

				REFERENCE NO.
PHYSICAL CHARACTERISTICS	FACILITIES	SIZE	Approximately 100 component islands in Kwajalein Atoll, total land area = 3,584 acres; Kwajalein Island = 768 acres, Roi-Namur = 419 acres, Meck Island = 55 acres; lagoon = 75 x 15 miles	23, 54, 37
		BASE FACILITIES	Marine terminal facilities, storage warehouses, power plants, underground power distribution system, 6,800 x 250 foot runway, air terminal, deepwater fuel pier, fuel farm, mechanical and electrical repair shops, administrative office space, barracks and dormitory, hospital, schools	38
		TEST FACILITIES	Tracking radar, optical instrumentation, telemetry facilities, multiple launch facilities	38
	ENVIRONMENTAL CONDITIONS	NATURAL RESOURCES	Coconut harvest and operation of fisheries. Mineral deposits of limited quantity within the Marshall Islands, but non-existent on Kwajalein Atoll.	23, 25
		VISUAL RESOURCES	Most of the islands are elongated in shape, flat, and rise no more than 15 feet above sea level. Original surface features of Meck Island have been completely altered.	54, 56
		SPECIAL STATUS	One endangered species, the Hawksbill Turtle and one threatened species, the Green Sea Turtle, may nest on the following islands under U.S. Army control or partial control: Roi-Namur, Legoa, Ningi, Ennylabegan, Ennugarret, and Omelek. Turtles have been observed at southwestern end of Kwajalein Island, feeding off food-wastes dumped daily into oceans. No forest preserves established; existing parks and sanctuaries either privately owned or operated by the local state authorities. The entire islands of Kwajalein and Roi-Namur are listed as historical battlefields on the National Register. All actions (i.e., construction) must conform to Army Regulation 420-40, which considers the National Historical Preservation Act.	17, 23, 38, 54, 56
		NOISE	No data available on noise levels for U.S. Army Kwajalein Atoll activities	
OPERATIONAL CHARACTERISTICS	SOCIOECONOMICS	STAFFING	There are approximately 2,600 total non-indigenous persons residing at U.S. Army Kwajalein Atoll facilities (2,350 on Kwajalein Island and 250 on Roi-Namur).	55, 57, 60
		PAYROLL	Data not available	
		HOUSING	519 Family Housing Units (Permanent & Trailer); 1,202 Barracks & Dormitory Beds; 150 Transient (1984; note that additional housing construction is currently underway)	55, 57

TABLE 2-7 (Continued)
SELECTED ENVIRONMENTAL CHARACTERISTICS
U.S. ARMY KWAJALEIN ATOLL

				REFERENCE NO.
OPERATIONAL CHARACTERISTICS (Continued)	INFRASTRUCTURE	ELECTRICITY	Electricity on Kwajalein supplied by diesel generators; Peak load: Kwajalein = 9960 kW; Ennylabegan = 350 kW; Roi-Namur = 5300 kW. Capacity: Kwajalein = 5.2 million kWh; Ennylabegan = 217,000 kWh; Roi-Namur = 2.7 million kWh; Meck 795 kW.	54, 55
		SOLID WASTE	Metal wastes transported by barge to authorized dumping site 21 miles west of the Kwajalein Atoll. Other wastes incinerated within EPA standards or placed in sanitary landfills. Wet waste dumped into ocean off Kwajalein Island. Past problem with seepage from landfill into the shorewaters.	16, 18, 54, 59
		SEWAGE TREATMENT	Sewage treatment plant on Kwajalein Island is designed to treat an average design flow of 0.45 mg/liter and remove 85% to 90% of suspended solid and 75% to 85% biochemical oxygen demand. After 90% of solids are removed, the total effluent is 450,000 gallons/day. Roi Namur has five pumping stations served by a septic tank and a leach field on the island's east side. No sewage treatment facilities exist on the west side of Roi-Namur. Untreated sewage is currently collected from the bachelor's quarters and dining facilities and pumped via a 12-inch main directly into the Kwajalein Atoll Lagoon. Residents are restricted from using these areas for health concerns and there is a potential for contamination of the island's freshwater supply.	54, 55, 60
		TRANSPORTATION	Sea transportation network provides inter-island movement of cargo and passengers, and logistical support from the major governmental centers to all inhabited outer islands. On Kwajalein Island, there are 13 miles of paved road, 300 vehicles; no vehicular congestion. Workers from Ebeye are brought over by ferry. Air transportation available on Kwajalein Island.	19, 23, 38, 55
PERMIT STATUS		WATER SUPPLY	Inhabited islands have rainwater catchment systems, none of which supplies enough potable water for the area's needs. Salt water is used in sewers and for fire fighting. Underground lenses of fresh water can provide in excess of 50 million gallons per year on Kwajalein Island, and 8 million gallons per year on Roi-Namur. Groundwater resources on other islands unknown. Water consumption from all sources on Kwajalein Island = 272,580 gallons/day, Roi-Namur = 25,309 gallons/day, Ennylabegan = 2,629 gallons/day. Portable desalination units are being brought to the U.S. Army Kwajalein Atoll to cover needs until desalination plant is built on Kwajalein in FY 1991. Droughts in recent years have resulted in inadequate water supply for the existing populations on Kwajalein and Roi Namur Islands. In emergency situations, water from Kwajalein Island is barged to Roi-Namur.	19, 54, 55, 60
		AIR	Air pollution currently not a problem due to the constant tradewinds, the island's low profile, and lack of constraining factors. Air pollutants are generated from transportation, range operations, power plant generators, dust, and waste incineration. Power plant generators are the major source for particulates, sulphur, oxides, and nitrogen oxides. 1979 estimates of power plant emissions showed emissions approaching the limits of EPA standards for nitrogen oxide.	18, 23, 54

TABLE 2-7 (Continued)
SELECTED ENVIRONMENTAL CHARACTERISTICS
U.S. ARMY KWAJALEIN ATOLL

			REFERENCE NO.
PERMIT STATUS (Continued)	WASTE WATER	Water quality standards may be violated as a result of toxic metal leaching from a solid waste disposal site used by U.S. Army Kwajalein Atoll operations.	16, 17, 54
	HAZARDOUS WASTE	Known hazardous wastes on Kwajalein: PCBs, solvents, asbestos, hydrazine fuel. When hydrazine fuel is used, someone is brought in specifically to handle the associated problems; no known violations; has a hazardous waste management plan implemented to comply with Army Regulation 420-47. All toxic metals are returned to the United States for disposal.	17, 18, 60
ADDITIONAL ENVIRONMENTAL INFORMATION	EIA, Internal Operations, 1974; EIA, Kwajalein Missile Range Operations, 1980; EA, Family Housing Dwellings, 1986; EA, Missile Impacts, Illegini Island, 1977 Environmental Consideration, ERIS, Meck Island, 1986; Environmental Consideration, HEDI, Meck Island, 1986; Environmental Consideration, AOA, 1985; Environmental 124 Consideration, TIR, 1987; EA Power Plant upgrade, Kwajalein Island, 1987		3, 12, 20, 21, 54, 56, 57
COMMENTS	- U.S. operations on the Kwajalein Atoll must comply with all NEPA standards. However, there is no formal permitting procedure or monitoring. It is the responsibility of the user agency to make sure standards are met.		17, 18
	- Any reentry debris from Western Test Range activities that land in the Kwajalein Lagoon are required to be removed in compliance with the "clean bottom" policy.		2

For socioeconomic purposes, the supporting region for the U.S. Army Kwajalein Atoll is defined as the islet of Ebeye. This is the main concentration of Marshallese at Kwajalein Atoll; although no missile range staff or dependents reside on Ebeye, the economy of this community relies almost exclusively on the range facility (54). Selected information on staffing and housing for the facility itself is contained in Table 2-7. Additional data on the socio-economic background of Ebeye, including information on population, housing, and employment, are provided in Table 2-8.

Based on available data, it has been determined that U.S. Army Kwajalein Atoll facilities are in compliance with all applicable environmental permitting requirements except water quality (17, 18, 54). One endangered species, the Hawksbill Turtle, and one threatened species, the Green Sea Turtle, may nest on several islands under U.S. Army Kwajalein Atoll control: Roi-Namur, Lagos, Ningi, Ennylabegan, Ennugarret, and Omeleck. Both species have been observed off the southwestern end of Kwajalein Island (18, 23, 38, 54).

Operations at the U.S. Army Kwajalein Atoll were evaluated by the U.S. Army in "Environmental Impact Assessment of Kwajalein Missile Range Operations, Kwajalein Atoll, Marshall Islands, Revision No. 1," dated August 1980 (54). That document concluded that range operations:

- Had not resulted in significant adverse, direct effects on the physical or human environment at that time
- Had created significant direct, short-term social and economic benefits
- Had resulted in long-term cumulative constraints to future uses of the islands by the native Marshallese
- Had resulted in controversial, long-term, indirect effects on Marshallese society.

Construction of new housing units for the families of personnel working on Strategic Defense Initiative programs has been addressed in a 1986 U.S. Army study, "Environmental Assessment for Family Housing Dwellings, FY 1987-1989 Phases, Kwajalein Island" (57). Construction of launch facilities on Meck Island has been addressed in two record of environmental consideration documents prepared by the U.S. Army in December 1986 (3). Construction and operation of a power plant expansion on Kwajalein Island has been addressed in "Environmental Assessment for Upgrade of Power Plant No. 1, Kwajalein Island, Marshall Islands, May, 1986" (12).

3. ENVIRONMENTAL CONSEQUENCES

This section assesses the potential environmental consequences of the proposed GSTS tests. It is based on a comparison of the tests described in Section 1 with the facilities to be utilized at proposed test locations, as described in Section 2. Any identified environmental documentation that addresses the types of activities proposed for the facilities is incorporated by reference.

Many of the tests for the GSTS Demonstration/Validation program would be conducted at contractor facilities which have not been identified. The contractors would be selected through the DoD procurement process and would be required to meet all Federal, State, and local environmental laws and regulations necessary for facility operations.

The approach used to complete the Environmental Assessment of the GSTS Demonstration/Validation program was described in Section 1. To assess the potential for and the magnitude of impacts from Demonstration/Validation at each government facility, a two-step methodology was utilized (Figure 3-1). The first step was the application of assessment criteria to identify activities with no potential for significant environmental consequences. Activities were deemed to present no potential for significant environmental consequences if they met all of the following criteria (i.e., all "yes" answers):

1. Are the facility and its infrastructure adequate for the proposed activity (i.e., can the tests be conducted without new construction, excluding minor modifications)?

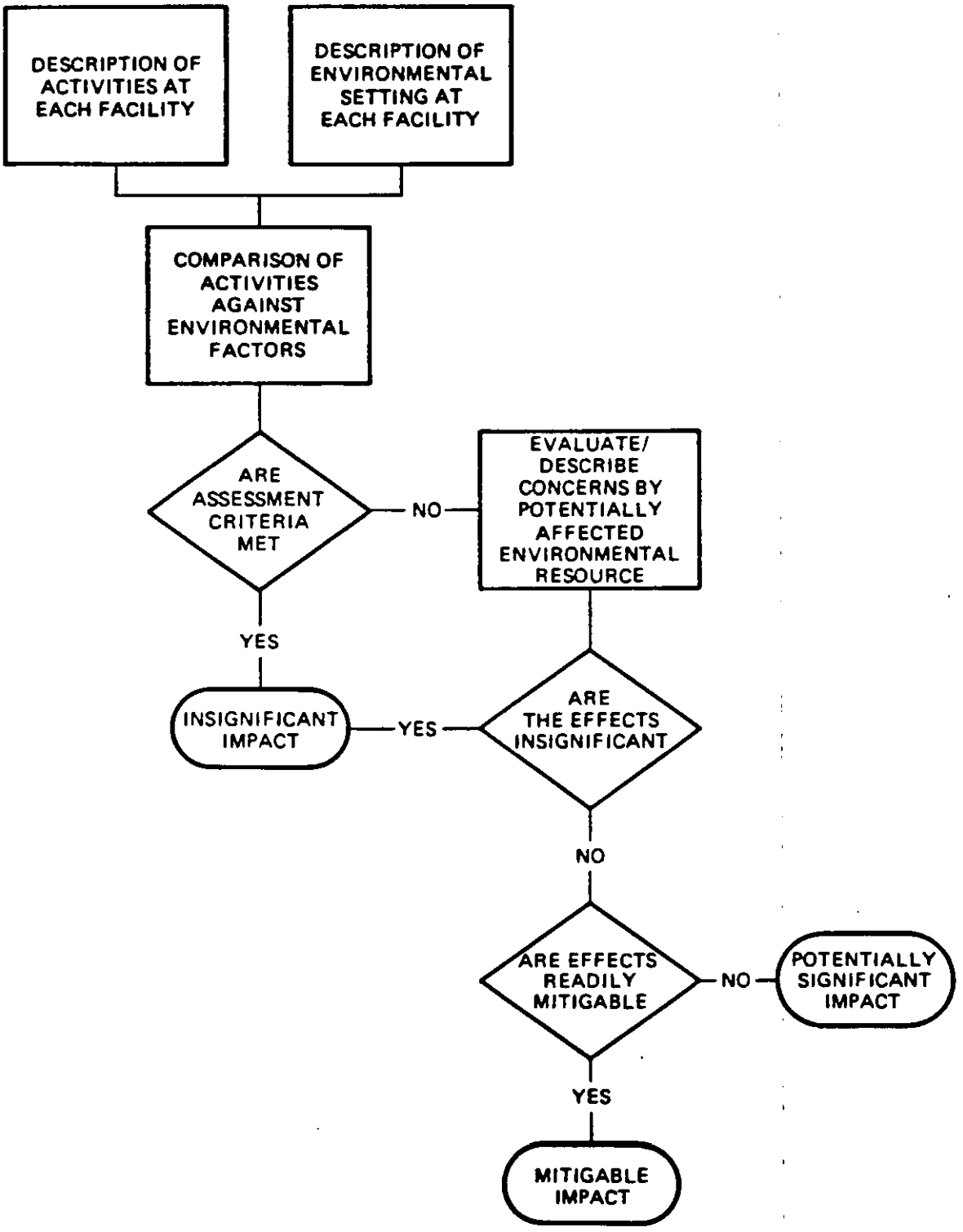
2. Is current staffing at the facility adequate to conduct the test, excluding minor staff level adjustments?

3. Does the facility comply with existing environmental standards?

4. Are the resources of the surrounding community adequate to accommodate the proposed testing?

If a proposed test was determined to present a potential for impact (i.e., a "no" answer to any of the above questions), the second step was to evaluate the activity in the context of the following environmental considerations: air quality, water quality, biological resources, infrastructure, hazardous waste, land use, visual resources, cultural resources, noise, and socioeconomics. As a result of that evaluation, consequences were assigned to one of three categories: insignificant, mitigable, or potentially significant.

Environmental consequences were determined to be **insignificant** if, in the judgment of the analysts or as concluded in existing environmental documentation, no potential for significant environmental impacts exists. Consequences were deemed **mitigable** if concerns exist but it was determined that all potential consequences could be readily mitigated through standard procedures, or by measures recommended in existing environmental documentation. If



METHOD FOR ASSESSING
POTENTIAL ENVIRONMENTAL CONSEQUENCES

FIGURE 3-1

serious consequences exist that could not be readily mitigated, the activity was determined to represent potentially significant environmental impacts.

The remainder of this section provides discussions of the potential environmental consequences for each location proposed for the GSTS Demonstration/Validation program. The impacts of the no-action alternative and irreversible and irretrievable commitments of resources that would accompany GSTS Demonstration/Validation are described at the end of this section.

3.1 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION

3.1.1 Nevada Test Site

Demonstration/Validation activities for GSTS at the Nevada Test Site would include the exposure of components and assemblies to a nuclear environment. The dedicated use of the Nevada Test Site includes such activities (9) and GSTS testing would take advantage of underground nuclear tests scheduled for other programs. No facility modifications are anticipated and no additional staff or infrastructure services would be necessary as a consequence of GSTS activities. Also, the Nevada Test Site meets all applicable environmental standards (62, 63). Therefore, the environmental consequences of the GSTS-related activities at the Nevada Test Site are be expected to be insignificant.

3.1.2 National Test Facility

The National Test Facility would be used for analysis and application of data from flight tests of the GSTS in simulation exercises. The functions of the National Test Facility in the GSTS tests are within the scope of its design. Environmental effects of construction and operation of the National Test Facility are presented in the "National Test Facility Environmental Assessment" (45). This environmental assessment estimated that minor erosion during construction and minor impacts on air quality, ecology, groundwater supply, and vehicular traffic during operation would occur. It concluded that with the implementation of proposed mitigation measures, no significant impacts are anticipated. Copies of this environmental assessment may be obtained from the Public Affairs Office at Falcon Air Force Station.

Until the National Test Facility is constructed, the staff necessary to complete the GSTS tests would be located at existing facilities at Falcon Air Force Station. The environmental consequences of the proposed use of these existing facilities were addressed in a "Request for Environmental Impact Analysis," control number AFSPC 86-1 (51). The result of this request was an assessment that the interim National Test Facility qualified as a categorical exclusion in accordance with U.S. Air Force Categorical Exclusion 2x. This categorical exclusion states, "This is an administrative action utilizing interior space for personnel and computer equipment." Thus, no further environmental documentation is necessary. The categorical exclusion refers to the environmental impact statement for the Consolidated Space Operations Center (46). Copies of this document may be obtained from the Public Affairs Office at Falcon Air Force Station.

Operation of the National Test Facility would require a significant increase in the staff at Falcon Air Force Station. The previously completed "National Test Facility Environmental Assessment" (45) of this operation predicted the

creation of approximately 2,300 permanent onsite jobs, as well as a daily average of 400 visitors (because each visit is likely to last several days, visitors were counted as equivalent to employees). Including the visitors, the total maximum daily population would thus be increased by 2,700. On the assumption that only 10 percent of the daily population would be drawn from the local area, it was predicted that more than 2,400 families would relocate to the area. No estimates of the portion of the staffing specific to GSTS have been made. While it can be assumed that only a portion of the total staffing is relevant to GSTS, the consequences of complete staffing are included as a worst-case analysis.

Applying the four assessment criteria against the test activities and the facility construction they would require shows the potential for environmental effects related to the construction and operation of the National Test Facility, the proposed staffing requirements of the facility, and the resulting socioeconomic presence in surrounding communities. The assessment criteria for compliance with permits is met by the existing facilities. The results of the environmental assessment conducted for the National Test Facility are summarized below.

Air Quality

Current operations at Falcon Air Force Station are in attainment by Colorado standards. Once the National Test Facility is constructed, operations are predicted to add to an existing violation of the 1-hour and 8-hour carbon monoxide Federal standard from automobiles at the intersection of Petersen Boulevard and Highway 94 outside the base (45). This addition can be mitigated through the use of van pools and other conservation measures.

Water Quality

All discharges are in compliance with current permits (6). The environmental assessment for the National Test Facility predicts no significant impact on groundwater or surface water quality (45).

Biological Resources

No threatened or endangered species are identified in the vicinity of the National Test Facility (45). Impacts to biological resources were predicted to be insignificant (45).

Infrastructure

Evaluation of the effects on each of the infrastructure components is as follows:

- The electrical substation can be expanded to 25,000 kW with additional cooling equipment. The National Test Facility will require the addition of 13,000 kW, which could be accommodated by expansion of the substation (45).

- Solid waste is disposed of offsite in a licensed landfill. The amount of solid waste that would be generated by the National Test Facility has not been estimated, but it is anticipated to be a relatively small volume (6).

- Sewage treatment capacity is currently adequate but the construction of the National Test Facility requires an expansion of the capacity of the sewage treatment plant by 0.124 million gallons/day (45). The expansion could encroach on a flood plain. All impacts are anticipated to be mitigable (45).

- Construction and operation of the National Test Facility are projected to increase water requirements from 0.37 million gallons/day to 1.0 million gallons/day (45). Mitigation measures such as conservation, reuse, and drought-tolerant landscaping would reduce the projected water requirements to 0.5 million gallons/day (45). Additional mitigation measures would have to be implemented to prevent exceeding water supply.

- Transportation system capacity exceeds current traffic demands. The addition of the National Test Facility would create significant increases in vehicular traffic, but would be below design capacity; however, increased delays would occur at some intersections (45).

Hazardous Waste

Any hazardous waste would be disposed of in accordance with current applicable regulations (6, 8).

Land Use

There are no current land use or zoning conflicts (7). No conflicts are anticipated for the development and operation of the National Test Facility (45). Expansion of the sewage treatment plant could encroach on a flood plain. This impact can be mitigated through the use of standard flood control measures.

Visual Resources

The current visual landscape is a rolling agricultural grassland (45). The National Test Facility will have an insignificant additional impact on the visual resources because it will be adjacent to an existing building (45).

Cultural Resources

No cultural resources have been identified on the facility (45); therefore, impacts are anticipated to be insignificant.

Noise

Due to the administrative and industrial nature of the existing facilities on Falcon Air Force Station, impacts from construction and operation are anticipated to be insignificant (45).

Socioeconomics

Unemployment in El Paso County of 5.4 percent (8,800 persons) in 1984, and an adequate availability of housing indicate that the socioeconomic impacts of the growth resulting from construction and operation of the National Test Facility would be insignificant.

The environmental consequences associated with the construction and operation of the National Test Facility are mitigable by the measures described in the "National Test Facility Environmental Assessment" (45). No significant environmental consequences have been identified associated with the operation of the Interim National Test Facility based on the "Request for Environmental Impact Analysis" (control number AFSPC 86-1) (51).

3.1.3 Vandenberg Air Force Base/Western Test Range

The GSTS flight test program would involve launches of targets from Vandenberg Air Force Base. The targets would be either targets of opportunity or dedicated targets. The total possible number of GSTS missions is nine, therefore a maximum number of nine dedicated targets could be required; up to six targets of opportunity could be used, decreasing the number of dedicated targets to three. Minuteman tests and operations are similar to those conducted for MX Missile Development (29). A final environmental impact statement was prepared for the MX Missile Milestone II Decision (47). Copies of this documentation are available from the Public Affairs Office at Vandenberg Air Force Base.

GSTS would involve launches of targets from Vandenberg Air Force Base, which in turn would require activating the Western Test Range for each launch. The Western Test Range is activated 60 to 70 times per year. GSTS launches would not significantly affect range operations since they represent a relatively small increase in the number of times the range would be activated.

The results of applying the four assessment criteria against the test activities indicate a potential for environmental effects related to the adequacy of facility infrastructure, specifically water supply. The Western Test Range meets all four assessment criteria; therefore, environmental consequences are considered insignificant. A more detailed assessment addressing each of the environmental considerations at Vandenberg Air Force Base was completed and is presented below.

Air Quality

Vandenberg Air Force Base is currently in attainment for all National Ambient Air Quality Standards. Air quality is monitored at three stations onbase (31). Minuteman missile launches are clean-burning with no acid deposition. Any emissions are dispersed immediately over the ocean, and therefore do not contribute to onbase air quality degradation (29). Any degradation of air quality can be attributed to transporting vehicles, but these effects are not significant for the current Minuteman launch schedule (29).

Water Quality

National Pollution Discharge Elimination System permits are in place for 15 onbase sewage discharge locations (27). Water used in launch washdown operations is either collected, stored, and disposed as hazardous waste, or treated by the onbase sewage facilities (27). Continued Minuteman launch operations within the current schedule are not expected to affect water quality.

Biological Resources

Seven federally listed threatened and endangered species are present on Vandenberg Air Force Base (44). A critical habitat for one of the endangered species is located near the Peacekeeper launch area, but launches of Minuteman missiles would not affect this area (44). The threatened and endangered species are subjected to vibration from launches and could be affected by catastrophic explosions (29). Vibration impacts are not considered significant and possible catastrophic explosions are unlikely; thus, Minuteman launch operations within the current schedule are not expected to increase the impacts.

Infrastructure

Evaluation of the effects on each of the infrastructure components is as follows:

- Electricity is currently supplied by the Pacific Gas and Electric Company power grid (29). Demand is below capacity, and continued Minuteman launches within the current schedule will not increase electrical demand (11).

- Solid waste is disposed of offbase at five facilities with adequate capacity. Continued Minuteman launches within the current schedule will not increase solid waste volume (10, 44).

- Sewage treatment by onbase and offbase facilities is within capacity. Continued Minuteman launches within the current schedule will not increase sewage volumes.

- Water is supplied by 10 onbase wells (44). Currently, water use in the region is overdrawing the two aquifers used for water supply. Although the continued Minuteman launches within the current schedule will not increase water consumption, overall operations of Vandenberg Air Force Base are contributing to overdrawing the aquifers, and at current usage rates the aquifers could be depleted (44). The "Draft Environmental Impact Statement, Mineral Resource Management Plan" states that concerted efforts to plan and enforce water management programs can prevent serious impacts to water supply (44).

- Transportation routes to the base are at or near capacity (44). Routes onbase have excess capacity (44). Additionally, access routes to launch sites are restricted several hours before a launch (29). Continued Minuteman launches within the current schedule will not affect the transportation network.

Hazardous Waste

Vandenberg Air Force Base has a short-term hazardous waste storage permit. Disposal is offbase by a licensed contractor (22). Continued Minuteman launches within the current schedule would not contribute increased volume or new types of hazardous waste.

Land Use

Launch facilities for Minuteman missiles are adequate for the current schedule, and are consistent with land use guidelines outlined in the "Base Development Pattern" (49).

Visual Resources

Continued launching of Minuteman missiles from existing facilities would not affect present visual resources.

Cultural Resources

There are 600 known cultural resources, mostly archaeological sites, on Vandenberg Air Force Base (44). Two sites are on the National Register of Historical Places, but are not in areas adjacent to existing Minuteman launch facilities (44). The continued use of existing facilities would not affect the cultural resources.

Noise

There are no specific standards for noise levels, but noise generated by Minuteman launches is of short duration and high intensity within a remote area (29). Continued Minuteman launches will not contribute excessive noise.

Socioeconomics

No new staff will be required for continued Minuteman launches within the current schedule, and therefore no socioeconomic impacts are expected (30).

As a result of the analysis of each of the environmental considerations, no potential significant impacts have been identified that are related to Minuteman launches. Thus, GSTS impacts at Vandenberg Air Force Base are anticipated to be insignificant.

3.1.4 U.S. Army Kwajalein Atoll

Flight testing of GSTS would be performed at U.S. Army Kwajalein Atoll. This use of U.S. Army Kwajalein Atoll facilities is consistent with the current missions and operations of those facilities. However, upgrading existing facilities and constructing new facilities may be necessary at Meck, Roi-Namur, and Kwajalein Islands.

GSTS launch requirements have not been determined; the launch facilities would be selected after the GSTS Demonstration/Validation program has been further defined. However, on Meck Island, a general refurbishment of infrastructure would be completed (3), and an existing missile assembly building, silo, and

launch equipment rooms would be upgraded to accommodate another Strategic Defense Initiative program (ERIS Demonstration/Validation flight test). A new missile assembly building, launch pad, and launch equipment rooms would be used by yet another Strategic Defense Initiative program (SBI Demonstration/ Validation flight test) (3). It is anticipated that GSTS could use the upgraded or new facilities. If launching facilities on other islands in the U.S. Army Kwajalein Atoll are used for GSTS flight tests, the potential environmental consequences would be addressed in the comprehensive environmental impact statement that will be prepared by the U.S. Army.

The potential environmental consequences of refurbishment and construction of launch facilities on Meck Island have been addressed in separate environmental analyses. The U.S. Army Corps of Engineers, Pacific Ocean Division, has prepared a record of environmental consideration for the upgrade of the existing missile assembly building, silo, launch equipment room, and infrastructure (3). A second record of environmental consideration was prepared for constructing a new missile assembly building, a launch pad, and launch equipment rooms on Meck Island (3). The result of both of the records of environmental consideration was Categorical Exclusion #7, as defined in Appendix A to Army Regulation 200-2 (3). This exclusion applies to "construction that does not significantly alter land use, provided the operation of the project when completed would not of itself have a significant environmental impact." Projects that fall into this category do not require additional environmental documentation. Copies of the records of environmental consideration are available from the Public Affairs Office, U.S. Army Strategic Defense Command, Huntsville, Alabama.

Existing facilities on Roi-Namur Island could be utilized for GSTS launches. The launch complex and missile assembly building currently at the proposed site may be suitable for supporting such a mission. It is anticipated that no significant modifications of the Roi-Namur launching facilities would be necessary to support GSTS test activities. Construction of additional housing, a sewage treatment plant and a water storage facility are planned by the U.S. Army to support continuing operations at the island (60). This construction is needed to upgrade existing deficiencies, and will occur regardless of the Strategic Defense Initiative Demonstration/Validation decision. Environmental consequences of these proposed construction activities on Roi-Namur Island have not been evaluated in previous documents.

Additional support personnel would be housed primarily at Kwajalein Island, which in turn will require support services and new housing. Current estimates call for an increase in facility population of approximately 3.5 percent beyond the most recent available population figures for the U.S. Army Kwajalein Atoll (2,432 persons on 30 June 1986) (15, 57). The total population would be below the highest population figure of nearly 6,000 people in 1972 (38).

Housing requirements for GSTS have not been determined at this time. The environmental consequences of housing construction on the island of Kwajalein to support Strategic Defense Initiative programs have been analyzed in "Environmental Assessment for Family Housing Dwellings, FY 1987-1989 Phases" prepared by the U.S. Army Strategic Defense Command in 1986 (57). That study, which included evaluations of housing to support all Strategic Defense

Initiative programs planned or proposed for U.S. Army Kwajalein Atoll, concluded that the proposed construction does not constitute a major Federal action having a significant effect on the quality of the human environment. Copies of the aforementioned Environmental Assessment for Family Housing may be obtained from the Public Affairs Office at the U.S. Army Strategic Defense Command in Huntsville, Alabama.

In addition to new housing, the following new construction on Kwajalein Island is planned: expansion of an existing power plant and a new desalinization facility. An Environmental Assessment was prepared on the construction and operation of the proposed power plant expansion, "Environmental Assessment for Upgrade of Power Plant No. 1, Kwajalein Island, Marshall Islands, May, 1986" (12). That environmental assessment concluded that the proposed action will not constitute a major Federal action with potential for significant impact on the environment. Copies of this documentation are available from the Public Affairs Office listed above.

Approximately 4 miles north of Kwajalein Island lies Ebeye Island, the main concentration of Marshallese in Kwajalein Atoll, and for assessment purposes it is defined as the "surrounding community" for the military facility. Ebeye Island has the second-highest population of any island in the Republic of the Marshall Islands, approximately 8,000 people (a density of 66,316 people per square mile), many having migrated there from other islands in search of jobs at the U.S. Army Kwajalein Atoll installation. As a means of reducing population density, a causeway connecting Ebeye Island with adjacent habitable islands is planned (25). Until this anticipated redistribution of population occurs, the dense population of Ebeye Island will continue to place heavy demands upon both manmade and natural resources of the island.

The application of the assessment criteria indicates a potential for environmental impacts related to GSTS activities at the U.S. Army Kwajalein Atoll. There are expected to be facility modifications and additional staff requirements, and there is a lack of resources in the surrounding community. Thus, a more detailed assessment addressing each of the environmental considerations was completed. The results of the assessment of each of the environmental considerations are presented below.

Air Quality

Currently, the U.S. Army Kwajalein Atoll has good ambient air quality attributable to strong tradewinds (54). However, 1979 estimates of emissions, especially from the power plant on Kwajalein Island, showed emissions approaching the limits of EPA standards for nitrogen oxide (NOx) (17). Increased staff would require increases in power generating capacity. The expanded power plant would have to meet major stationary source performance standards or obtain a waiver from the Marshall Islands government (17). The Environmental Assessment prepared for the power plant expansion concluded that mitigation measures would be required (12). Possible mitigation measures include raising the stack height, increasing the velocity of the emissions to increase dispersion, using low-NOx engine design, combustion air cooling, fuel injection recharge, or engines designed to meet the Environmental Protection Agency's proposed New Source Performance Requirements (12). The proposed plant expansion "can meet all National Ambient Air Quality Standards as well

as nitrogen oxide if low NOx combustion and/or enhanced dispersion techniques are employed to reduce ambient impact by 28 percent" (12). Thus, this air quality concern is considered mitigable.

Water Quality

Available data from 1976 indicated that water quality was being degraded as a result of toxic metals leaching from a solid waste disposal site on Kwajalein Island used by U.S. Army Kwajalein Atoll operations (54). Subsequently, a wall was constructed. The 1980 "Environmental Impact Assessment of U.S. Army Kwajalein Atoll Operations" noted that although the wall was installed on the ocean side of the Kwajalein Island landfill, a visual inspection in 1978 indicated direct leachate seepage to the ocean was occurring (54). The source of the leachate was considered to be waste oil or sewage tank pumpage that was dumped on the landfill. The landfill is presently used only for disposal of construction waste, and Demonstration/Validation activities associated with GSTS are expected to continue this use. The composition of the leachate and the potential change in rate of seepage from the landfill as a result of the disposal of construction waste from activities in support of Demonstration/Validation are unknown.

Currently, sewage collected from facilities on the west side of Roi-Namur Island is pumped untreated through a pipe into Kwajalein Atoll Lagoon (54, 60). The discharge of raw sewage into the lagoon has the potential to significantly impact water quality and is in violation of Clean Water Act standards (54). Unless mitigated by avoidance actions by the U.S. Army Kwajalein Atoll Commander and the range users the increase in activities on Roi-Namur Island because of Strategic Defense Initiative activities, which could include GSTS testing, would contribute additional untreated sewage to the lagoon. A wastewater treatment facility to provide secondary treatment before discharge is planned (60). Until this treatment facility is operational, impacts to water quality in the lagoon will continue and would be increased by any unmitigated Strategic Defense Initiative activities, which could include GSTS tests, that begin prior to the operation of the treatment plant. In addition, consequences on water quality from potential increased population on Ebeye Island have not been evaluated in previous documents.

Without mitigating actions, impacts to water quality caused by GSTS activities are potentially significant. Continued presence of leachate seepage from the Kwajalein Island landfill and potential mitigations, if any, are not documented. Water quality impacts from sewage discharges on Roi-Namur Island are mitigable if the planned sewage treatment plant is constructed or if the U.S. Army Kwajalein Atoll Commander initates operational mitigation. These and other potential impacts will be addressed in an environmental impact statement to be prepared by the U.S. Army for all continuing operations at Kwajalein Atoll prior to initiation of GSTS Demonstration/Validation flight test activities.

Biological Resources

Concrete used in housing and other facility construction may employ coral dredged from surrounding reefs. The construction needed to support activities associated with GSTS testing may constitute an increase in the harvesting of coral, if coral from surrounding reefs is used as a construction material as

in the past. Extensive reef harvesting could result in degradation of the marine habitat (54). Coral harvesting can be accomplished in a manner that will ensure that critical habitats of marine biota are not degraded. Additional data collection and analysis will be required to identify positive and negative impacts of this activity at U.S. Army Kwajalein Atoll through the environmental impact statement investigation.

Several islands of the U.S. Army Kwajalein Atoll, including Roi-Namur Island, have beaches suitable for nesting sites of the endangered Hawksbill Turtle and the threatened Green Sea Turtle. No beaches suitable for turtle nesting have been identified on Kwajalein or Meck Islands (54). Construction and operation activities that take place on Roi-Namur Island should consider possible impacts to these potential nesting beaches. Degradation of marine water quality as discussed in the previous section could adversely impact marine biota. Consequences on biological resources from potential increased population on Ebeye Island have not been addressed in previous documents. Those potential impacts on biological resources will be addressed in the aforementioned environmental impact statement.

Infrastructure

The increased staffing and project activities associated with GSTS Demonstration/Validation are expected to increase the demands on infrastructure on Kwajalein Island and possibly on Roi-Namur Island, if Roi-Namur is selected as a launch site. Specific areas of consideration include electricity, solid waste, sewage treatment, water supply, and transportation. The aforementioned environmental impact statement will address appropriate mitigations for impacts from increased infrastructure requirements.

- Electricity demands associated with the GSTS-related population increase on Kwajalein Island may require increased generating capacity. A concern is the control of nitrogen oxide emissions from the power plant, which is mitigable as discussed earlier. The planned expansion of the power plant (60) should meet any increased electricity demands.

- Solid waste is currently disposed of by (1) burning combustible material, (2) dumping wet (biodegradable) waste and metal waste in the ocean, and (3) landfilling (18, 54). Additional staff required for GSTS activities would increase the volume of solid waste, but this waste would be disposed of in onbase facilities with adequate capacity.

- Sewage treatment demands at the U.S. Army Kwajalein Atoll are expected to increase as a result of the 3.5 percent increase in inhabitants that would accompany GSTS testing. Such an increase in sewage treatment demands at Kwajalein Island is not expected to exceed the plant's existing capacity. However, untreated sewage on the west side of Roi-Namur Island is currently pumped directly into the lagoon (54, 60). If Roi-Namur is selected as the launch site, additional staff associated with GSTS would increase the volume of untreated sewage. A new sewage treatment facility is planned at Roi-Namur Island (60) which would be designed to provide secondary treatment and have adequate capacity to meet all anticipated needs.

The aforementioned environmental impact statement will identify interim mitigation options until a planned facility is constructed.

- Potable water is a limited resource on the islands of the Kwajalein Atoll (57). Water supplies on Kwajalein Island come from rainwater catchment and storage systems and groundwater lenses, although much of the groundwater is brackish. It is possible that increased demand resulting from GSTS activities could increase withdrawal of groundwater. Overdraft of groundwater could potentially result in saltwater intrusion and long-term degradation of the available groundwater resources. Kwajalein is unique in that the command has total control over all lens wells and monitors the groundwater level. This complete control with feedback minimizes the possibility of overdrawing the groundwater. Before groundwater depletion were allowed to occur, water rationing would be implemented or alternate sources of water would be utilized, such as importation. The increased demands for potable water that would result from GSTS activities would be accommodated through the planned construction of a desalinization system on Kwajalein Island, and construction of a holding tank on Roi-Namur Island. These planned mitigation measures are projected to be adequate to ensure sufficient potable water without degrading groundwater resources.

- Transportation on Kwajalein Island is predominantly by means other than automobiles. In 1986 there were only 300 cars for 13 miles of paved road (55). Transportation of employees to Kwajalein and Meck Islands from Ebeye Island is by ferry (19). Increases in the number of Marshallese employees may necessitate increases in ferry capacity.

Hazardous Waste

The U.S. Army Kwajalein Atoll is preparing a Hazardous Waste Management Plan to comply with Army Regulation 420-47 (18). An increase in U.S. Army Kwajalein Atoll operations for GSTS program may increase the volume of hazardous waste produced. The treatment, storage and disposal of additional hazardous waste must be in compliance with the Hazardous Waste Management Plan.

Land Use

The islands that make up the U.S. Army Kwajalein Atoll are dedicated for use as a military installation. The use of this facility for launching missiles and monitoring flight tests is a continuation of an established land use. The long term impacts on land use from continuing operations at U.S. Army Kwajalein Atoll will be addressed in the aforementioned environmental impact statement.

Visual Resources

The presence of the U.S. Army Kwajalein Atoll has significantly altered the visual resources of the islands by extensive development. The current visual resources would continue to be altered by the facility upgrades that may be utilized for GSTS activities. Those alterations are anticipated to have insignificant impacts.

Cultural Resources

Both Kwajalein Island and Roi-Namur Island are considered historically significant sites due to the activities which took place on the atoll during World War II. In addition, potential prehistoric sites have been discovered very recently on Kwajalein Island, some possibly as old as 2,000 years (18). As any excavation during construction activities has the potential for permanently destroying such cultural resources, those activities could have a potential impact. An archeological survey would be conducted and appropriate mitigations developed during the preparation of the aforementioned environmental impact statement.

Noise

No data are available on noise levels associated with U.S. Army Kwajalein Atoll operations. Based on the distance between launching facilities on Meck Island and the nearest community (more than 10 miles), no significant noise impacts are anticipated from launches at Meck Island. Similarly, the launching of missiles from Roi-Namur Island would not be expected to have significant noise impacts.

Socioeconomics

The economy of Ebeye Island relies heavily upon the people residing at the U.S. Army Kwajalein Atoll. Because of this dependence, changes in facility population associated with GSTS Demonstration/Validation activities could potentially have significant beneficial and adverse socioeconomic consequences at Ebeye Island. An increase of approximately 87 staff and dependents (3.5 percent) living at the U.S. Army Kwajalein Atoll is expected, lasting for a period of 2 years (15). Such an increase is expected to have a noticeable direct positive effect on the Marshallese economy at Ebeye Island in terms of new jobs, which should be complemented by the Job Corps Program recently implemented by the U.S. Army Kwajalein Atoll (60). Due to the relative size and duration of the population increase this growth in employment is not expected to be significant. There may be indirect socioeconomic consequences of such an increase in U.S. Army Kwajalein Atoll population as well. These indirect effects would take the form of Marshallese migrating from other islands to Ebeye Island as they have before in search of relatively high paying (guaranteed U.S. minimum wage) jobs associated with the increases in facility population and activities (38, 54). The consequences of such renewed migration could be serious, adding people to the already dense population of Ebeye Island and leading to: increased pressure on inadequate housing and public infrastructure; a further decline in public health, below currently unsatisfactory levels; an increase in Marshallese unemployment; further disruption of the economic and sociocultural mechanisms underlying Marshallese society, on both Ebeye Island and the islands from which the migrants originated; increased reliance of the Marshallese economy on Department of Defense expenditures. At present it is impossible to predict with certainty how many Marshallese would migrate to the area in response to the anticipated increase in GSTS-related population and activities at the U.S. Army Kwajalein Atoll. The U.S. Army Kwajalein Atoll currently has a policy limiting the number of Marshallese they employ which may minimize the amount of influx of people to Ebeye Island.

As a result of the analysis of each environmental consideration, potentially significant impacts were identified at the U.S. Army Kwajalein Atoll. In recognition of the need to avoid, minimize, and mitigate any potential adverse impacts on the environment of the Kwajalein Atoll, the U.S. Army will prepare a comprehensive environmental impact statement addressing the continuing operations at the U.S. Army Kwajalein Atoll, which include the proposed Demonstration/Validation activities (61). The environmental impact statement will address the environmental concerns recognized in this Environmental Assessment and will identify appropriate mitigations.

3.2 ENVIRONMENTAL CONSEQUENCES OF NO ACTION

If the no-action alternative is selected, no additional environmental consequences are anticipated. Concept Exploration would continue at currently staffed facilities with no changes in operations.

3.3 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Development of the GSTS candidate vehicle through the Demonstration/Validation stage would result in irreversible and irretrievable commitment of resources such as electronic components, various metallic and nonmetallic structural materials, fuel, and labor. This commitment of resources is not different from those necessary for many other aerospace research and development programs; it is similar to the activities that have been carried out in previous aerospace programs over the past several years.

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APPENDIX A
TEST ACTIVITY DESCRIPTIONS

The Demonstration/Validation test activities have been divided into four categories: analyses, simulations, component/assembly tests, and flight tests. This Appendix describes in greater detail the simulations, component/assembly tests, and flight tests identified in Section 1.3.

SIMULATION TESTING

Simulation testing of a physical entity (machine, system component, etc.) is accomplished by developing a computer model of that entity. The model then interacts with data representing physical stimuli to assess the entity's capabilities in real-world conditions. A simulation involves writing and running computer programs, with possible interfaces to other systems or system elements. No impacts on the physical environment are involved other than the commitment of manpower and electrical energy involved in computer operations.

COMPONENT/ASSEMBLY TESTING

The basic concept of component/assembly testing is to control the physical conditions in which the hardware item is tested. Tests are typically conducted in specialized environments, and data are collected regarding the performance of the hardware item in that environment. The scope of the tests may range from single microchip components up to major subassemblies. This section describes those special environments and the tests to be performed.

Space Environment Chamber

A space environment chamber simulates some or all of the characteristics of space (thermal, vacuum, radiation, etc.) in order to closely emulate the space environment in which the test object is designed to operate.

Nuclear Radiation Chambers

The object of a radiation chamber is to determine the detrimental effects of various types of radiation. Radiation testing (other than that involving nuclear explosions) can be accomplished by exposing materials to:

- Radiation from a research or test nuclear reactor
- A beta/gamma radioactive source, such as cobalt-60 or cesium-137, in an exposure chamber or pool
- Nuclear particles in an accelerator (Van de Graff, cyclotron, etc.) in a target room (requires very large power source)
- X rays from an x-ray machine (requires large power source).

The specific device used will depend on the type of radiation, energy, and intensity desired, the size of the object, and the availability of the facility.

Infrared Radiation Chambers

The purpose of an infrared chamber is to isolate the infrared sensor(s) from environmental infrared radiation in order to conduct performance evaluations measuring low-level infrared signals. The performance evaluations include detector sensitivity tests, array phasing, and linearity tests. For critical tests, the sensor would be placed in a low-temperature (cryogenic) chamber. For linearity tests, a cold room or even an air-conditioned laboratory could be used. The target (or source) that would be used would be an electrically heated resistance wire with the proper infrared characteristic. Power consumption of these chambers is usually low to moderate.

Scene Generator

A scene generator is an optical environment simulator. It is used to drive optical processing equipment (e.g., surveillance systems) in test environments. A sequence of images is produced on an image display device (e.g., television screen). These sequences correspond to scenarios that are commonly encountered in the operational environment or are idealizations designed for testing specific performance aspects. The optical sensor element "views" the images by focusing the images on a detector component. The detected image is then passed to an interpreter which interprets the image and responds according to the interpretation. The responses are recorded for subsequent analysis. Power requires are generally modest.

Nuclear Testing

Underground nuclear explosion testing is performed by drilling a vertical shaft and establishing a detonation chamber at the bottom. Test objects are placed in horizontal tunnels leading away from the detonation chamber, and exposed to the high-intensity radiation pulse from the detonation. Usually one detonation serves many experiments and tests. Impacts on the physical environment include the commitment of an underground volume to radioactive contamination, the disposal of drilling spoils, and the fracturing of geological structures from the detonation. No fission products are emitted to the atmosphere.

FLIGHT TESTING

The government normally establishes flight ranges to test specific type systems from a dedicated facility. For the purpose of the Strategic Defense Initiative, flight testing can include missiles in ballistic flight trajectories or tests with objects in orbit.

Missile Range

Missile ranges consist of a launch area with launch pads and associated control and support facilities, a safety area around the launch area, and a controlled land/sea/air/space area for flight and impact. A missile range comprises large areas of the earth's surface and include tracking, communications and recovery facilities.

TABLE 2-8.
SELECTED SOCIOECONOMIC INDICATORS FOR THE SUPPORTING REGION
U.S. ARMY KWAJALEIN ATOLL (EBEYE)

POPULATION

Total Persons		Density per sq. mi. (Area = 76 acres)
1967:	3,540	29,810
1973:	5,469	46,055
1980:	6,169	51,949
1985:	7,875	66,316

(For comparison, population density in Washington D.C. is about 12,000 persons per sq. mi.)

Percent of Marshallese residents on Ebeye born on Ebeye, 1973 = 48%

Median Age

1967: 16 years
1973: 15 years
1980: 14 years

HOUSING

Total Units		Median Persons Per Household	
1967:	308	1967:	7
1980:	602	1980:	9

Vacancy Rate

1980: 1.6%

EMPLOYMENT

1982: 996 employed full time
62% USAKA
28% RMI public service
10% Local economy
(sales of goods to population)

References: (24, 32, 36, 38, 43)

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