AD-A104 352 AIR FORCE SYSTEMS COMMAND WASHINGTON DC F/G 13/2
ENVIRONMENTAL IMPACT STATEMENT MX: BURIED TRENCH CONSTRUCTION A--ETC(U)
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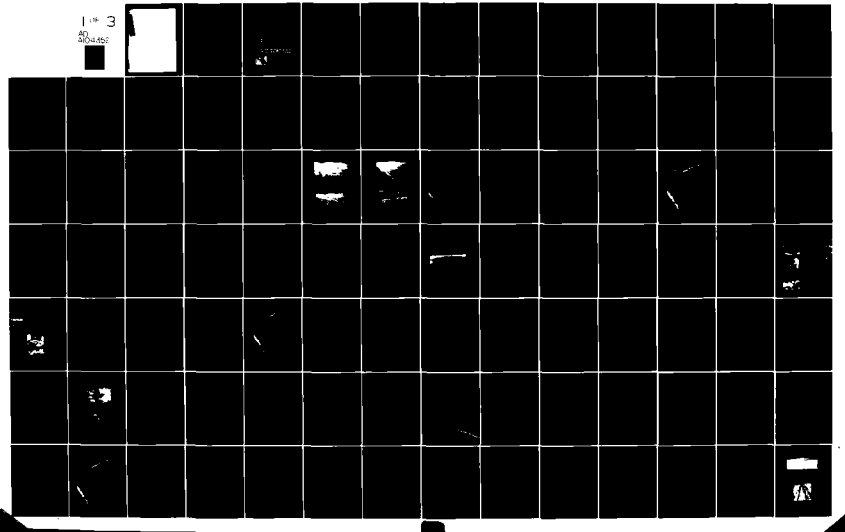

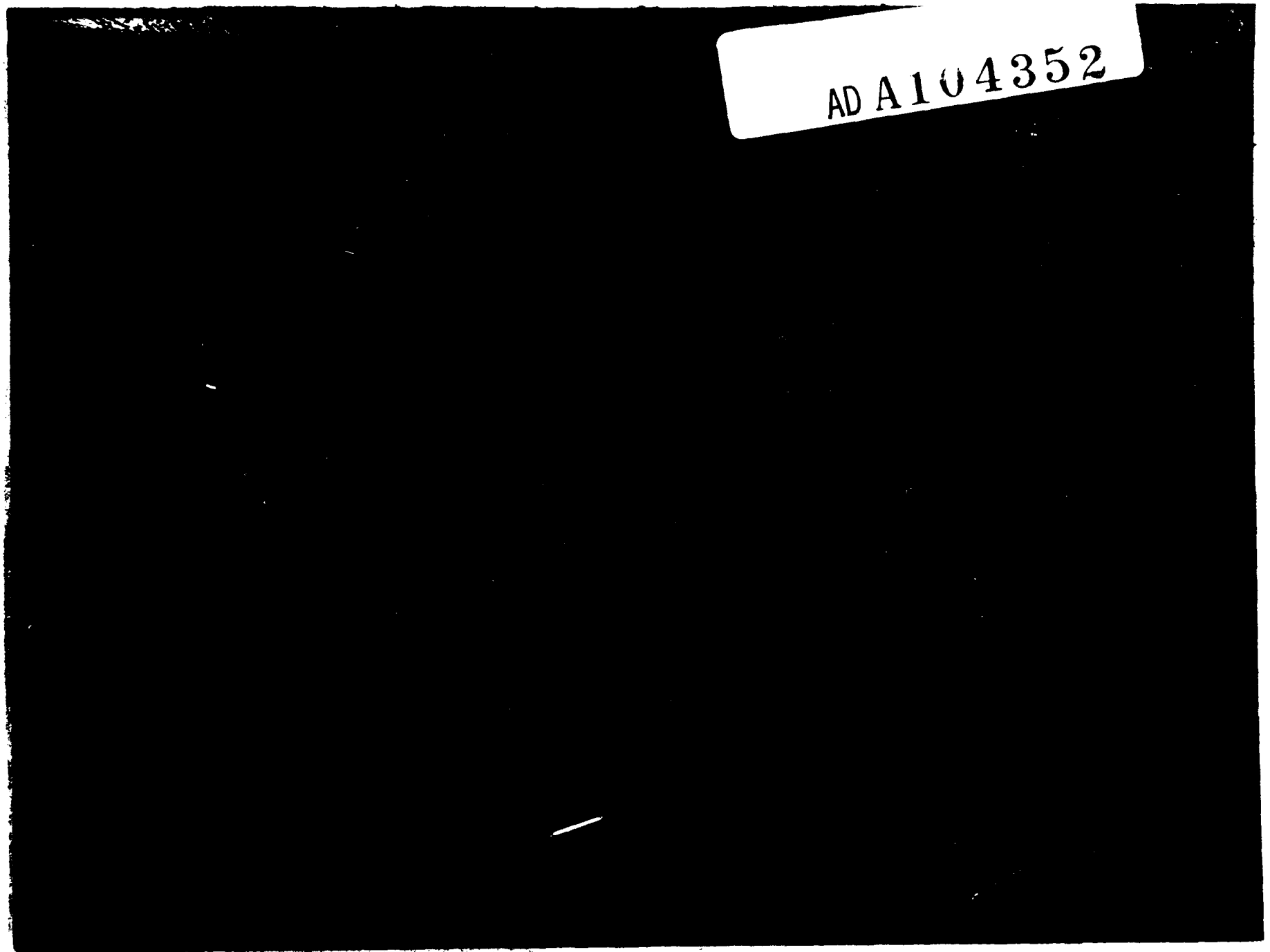

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Environmental Impact Analysis Process

FINAL ENVIRONMENTAL IMPACT STATEMENT

MX: BURIED TRENCH CONSTRUCTION AND TEST PROJECT

DEPARTMENT OF THE AIR FORCE

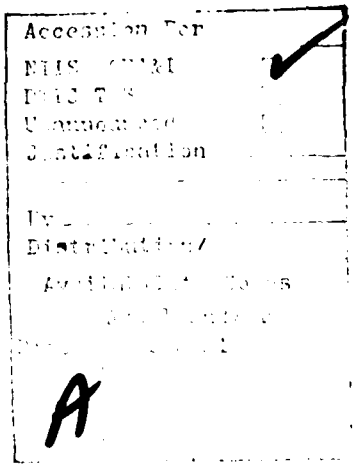
FINAL ENVIRONMENTAL IMPACT STATEMENT

for the

MX: BURIED TRENCH CONSTRUCTION AND TEST PROJECT

DEPARTMENT OF THE AIR FORCE

November, 1977



FINAL
ENVIRONMENTAL IMPACT STATEMENT
FOR
THE MX BURIED TRENCH CONSTRUCTION AND TEST PROJECT
(ADMINISTRATIVE ACTION)

SUMMARY

CONTACT FOR INQUIRIES

This statement was prepared by the United States Air Force. Any inquiries concerning this proposed action should be addressed to the Deputy for Environment and Safety, Office of the Secretary of the Air Force (SAF/MIQ), Washington, D.C., 20330.

SUMMARY OF PROPOSED ACTION

The United States Air Force proposes to construct two sections of underground tunnel in the San Cristobal Valley on the Luke Air Force Range in Yuma County, Arizona. The proposed construction project will provide essential cost and construction data to analyze conceptual protective structures for the mobile, land-based Intercontinental Ballistic Missile (ICBM) System known as MX. The trench will also serve as a test bed for mechanisms designed to punch through the tunnel roof and erect a dummy missile to simulate launch position.

Both tunnels will involve trench excavations approximately 22 ft (6.7 m) deep by 17 ft (5.2 m) wide to allow continuous slip-form placement of two concrete tunnels with dimensions of 13 ft (4 m) and 16.5 ft (5 m) inside and outside diameter, respectively. The two tunnels would total approximately 21,500 ft (6,553 m): a 1,500 ft (457 m) section providing procedure and equipment shakedown and the breakout test bed; and a 20,000 ft (6,096 m) section providing cost and construction data. The construction project, known as MX: Buried Trench Construction and Test Project, would span eight months from February through September 1978.

The MX program was established in 1973 and is an ICBM technology program. The FY78 budget request is for $134.4 million. The results of the MX: Buried Trench Construction Test Project will provide baseline data for future decisions regarding the MX system. Deployment of a force of MX missiles will not be determined until approved by the U.S. Congress.

The major environmental impact of the proposed action will be long-term aesthetic degradation caused by removal of vegetation and disruption of varnished desert pavement for tunnel construction. This impact will occur within the 200 acre test site, less than 0.[illegible] percent of the bajada's total land area. Other temporary impacts during the term of the project could include intermittent disturbance to desert bighorn sheep in the Mohawk Mountains, the loss of some reptiles and burrowing rodents along the trench alignments, and increased wind and water erosion of disturbed soils within the project area. These temporary impacts are, however, not expected to be significant due to scheduling of project events, fugitive dust control measures, and final grading procedures.

Total cost of the construction project is estimated to be $20 million. Most of the construction work force is expected to come from Yuma and Maricopa counties in Arizona. The labor force will peak in April 1978 with approximately 238 employees.

The MX program is being managed by the ICBM System Program Office, Space and Missile Systems Organization (SAMSO), located at Norton Air Force Base, California.

Alternatives to the proposed action are:

- No Action
- Project Postponement
- Construction of the Project at a Different Scale
- Alternative Siting
- Alternative Construction Methods

The Final Environmental Impact Statement was made available to the Council on Environmental Quality and the public in November 1977.

COMMENTS RECEIVED ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

Written comments were received from the following sources. All written comments are reproduced in the appendices.

FEDERAL AGENCIES

United States Department of Agriculture
Soil Conservation Service
3008 Federal Building
Phoenix, Arizona, 85025

United States Department of Defense
Defense Nuclear Agency
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United States Department of the Interior
Office of the Secretary
Washington, D.C. 20240

United States Department of the Interior
Fish and Wildlife Service
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United States Department of Transportation
Federal Aviation Administration
Western Region
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Los Angeles, California 90009

United States Department of Transportation
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United States Environmental Protection Agency
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Arizona Bureau of Geology and Mineral Technology
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Department of Library Archives
Marguerite B. Cooley, Director
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Phoenix, Arizona 85015

State Water Commission
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Phoenix, Arizona 85004

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The Ralph M. Parsons Company
Engineers—Constructors
Pasadena, California 91124

PUBLIC HEARING

A Public Hearing was held at Wellton, Arizona on 19 September 1977, with Col. Allan C. Smith, Fifth Judiciary Circuit, Travis AFB, CA, presiding (Complete transcript in Appendix 3).

LOCATION OF REFERENCE COPIES

Copies of the Final Environmental Impact Statement have been sent to the following libraries for the convenience of the citizens in the local communities who wish to review the document.

Arizona Collection
University Library
Arizona State University
Tempe, Arizona 85281

University Library
Documents Section
University of Arizona
Tucson, Arizona 85721

Arizona Department of Library and Archives
3rd Floor, State Capitol
Phoenix, Arizona 85007

Library
Arizona Western College
Yuma, Arizona 85364

Library
Maricopa County
Community College District
P.O. Box 13349
Phoenix, Arizona

Library
Pima College
2202 West Anklam Road
Tucson, Arizona 85709

Miss Gertrude Thayer, Librarian
Maricopa County Free Library
Regional Headquarters
125 West Washington
Phoenix, Arizona 85003

Mr. Clarence M. Dial, Librarian
Mesa Public Library
Maricopa County System
59 East First Street
Mesa, Arizona 85203

Phoenix Public Library
12 East McDowell
Phoenix, Arizona 85004

Mrs. Frances E. Thomas, Librarian
Yuma City County Library
Regional Headquarters
350 South 3rd Street
Yuma, Arizona 85364

Tempe Public Library
Maricopa County System
3300 South Mill Avenue
Tempe, Arizona 85281

Tucson Public Library
Regional Headquarters
200 South 6th Avenue
Tucson, Arizona 85701

REQUEST FOR COPIES

Persons or organizations who wish to obtain copies of the Final Environmental Impact Statement may do so by writing to the following:

Civil Engineering Division
SAMSO/MNND
Norton AFB, California 92409

STANDARD AIR FORCE ENVIRONMENTAL REFERENCE NUMBER (AFERN) SYSTEM

This "index" is the standard environmental attribute identification system used by the Air Force and adapted for ease in finding information within this test.

AFERN	ENVIRONMENTAL ATTRIBUTE
3.0	NATURAL ENVIRONMENT
3.1	EARTH
3.2	WATER
3.3	AIR
3.3.1	METEOROLOGY
3.3.2	AIR QUALITY
3.4	BIOTIC ENVIRONMENT
4.0	HUMAN ENVIRONMENT
4.1	DEMOGRAPHIC
4.1.1	POPULATION
4.1.2	ETHNIC/RACIAL DISTRIBUTION
4.2	ECONOMIC CHARACTERISTICS
4.2.2	EMPLOYMENT
4.2.3	PUBLIC FINANCE
4.2.4	BASE PROCUREMENT
4.2.5	HOUSING
4.2.5.4	ON-BASE HOUSING
4.3	INSTITUTIONAL CHARACTERISTICS
4.3.1	GOVERNMENT
4.3.3	EDUCATION
4.3.4	MEDICAL
4.3.5	COMMUNITY SERVICES AND FACILITIES
4.4	ACTIVITY SYSTEMS AND PLANS
4.4.1	TRANSPORTATION
4.4.1.2	OFF-BASE TRANSPORTATION
4.4.1.3	ON-BASE TRANSPORTATION
4.4.2	UTILITIES
4.4.2.1	CIVILIAN COMMUNITY UTILITIES
4.4.2.2	ON-BASE UTILITIES
4.4.3	LAND USE
4.5	AIR OPERATIONS CHARACTERISTICS

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SECTION 1
THE PROJECT AND THE EXISTING ENVIRONMENT

1.1 THE PROJECT

1.1.1 Background

In 1973, the Air Force established the Missile X or MX Advanced Development program within the broad framework of the continuing Advanced Intercontinental Ballistic Missile (ICBM) technology program. The MX program had two specific objectives: the first objective was to develop technology for an advanced missile; the second objective was to study ways to assure continued survivability of the land based missile force. These objectives were established to respond to the Soviet Union's large-scale ICBM modernization program which includes the current deployment of four new ICBMs. Forecast increases in the number of Soviet weapons, combined with improved targeting accuracy, could make the U.S. silo based missile force vulnerable to a Soviet first-strike attack which would decrease the credibility of our strategic deterrent forces.

The MX program has concentrated on technology aimed at developing a new missile with increased throw weight and improved accuracy. Various mobile basing concepts were studied as follow-on alternatives to deployment in existing Minuteman silos. In 1976, two mobile basing concepts were selected for further study: the shelter and the buried trench. In-depth studies of these concepts, including results from this project, will be used to validate their technical feasibility and cost. Future decisions regarding the MX system will be affected by these and other key technology questions.

Both trench and shelter concepts are Multiple Aim Point (MAP) configurations. That is, in each concept a missile moves randomly among a number of locations so that the missile's exact position is unknown to an attacker. This makes it necessary for an enemy to attack all possible locations to ensure destruction of any one missile. If many potential missile locations can be constructed relatively inexpensively, then it is possible to present an enemy with more target area than his weapons can cover, making it impossible to destroy the United States ICBM force, with the projected Soviet weapon systems. This will assure force survivability allowing us an ICBM force for retaliation which in turn enhances the credibility of our strategic deterrent.

On a first-cost basis, both the trench and shelter concepts are roughly equal, but the buried trench concept has promise of lower manpower requirements for operation and greater survivability from a variety of possible attack options. A Multiple Aim Point Validation (MAV) program has been initiated to resolve key technical and cost issues related to these two mobile basing concepts.

The MX Buried Trench Construction and Test Project, as a major part of the MAV program, seeks to validate the estimates for cost and construction rate and to prove the basic technical feasibility of large-scale construction of buried trenches. Construction proposed under this project is being preceded by a year of planning and development of special construction equipment. Cost and production estimates would then be verified by construction of the proposed structures. A section of the buried trench is planned for demonstration of prototype breakout and erection hardware developed under another contract. The breakout and erection device is the subsystem contained on the missile transporter-launcher which physically erects the canistered MX missile through the trench headworks and overburden to achieve a launch-ready position. For the test, the device will be fitted with a dummy load to simulate the missile and canister. No actual launch will occur. Breakout and erection tests will be conducted to validate the design of the breakout and erection subsystem.

A second part of the MAV effort is the HAVE HOST test program conducted by the Air Force Weapons Laboratory (AFWL) on a site near the proposed trench construction location (Figure 2). The HAVE HOST test program consists of a series of high explosive tests to evaluate the vulnerability of subscale trench and shelter facilities to induced air blast and ground shock. These tests will provide data for trench and shelter designs and will assist in resolving key technical and cost issues. These tests will be conducted over approximately a two-year period beginning in April 1977. A separate Environmental Assessment on the HAVE HOST test program has been prepared.

A proposed third element of the MAV effort, to be conducted by the Defense Nuclear Agency, is Misers Bluff, which is a series of high explosive tests similar to HAVE HOST tests, but at larger scales. The test series is to be conducted in 2 increments. Phase I is to be conducted in the Queen II area, White Sands Missile Range, NM (WSMR) [illegible], and Phase II is to be conducted on Planet Ranch in West Central Arizona [illegible]. An Environmental Impact Assessment has been prepared (Reference 4) and a determination has been made that the proposed efforts will not have a significant effect of the quality of the human environment.

This [illegible] Statement deals only with the MX trench construction [illegible] of a series of environmental documents that will assess the [illegible] consequences of key decisions on the MX program.

Future environmental analyses will be prepared to analyze major MX program milestones (e.g., Basing Mode Selection; Full-Scale MX System Development; Deployment Site Selection; and Full-Scale Production and Deployment) after the key technology goals are met and the system can be more clearly defined.

1.1.2 MX Buried Trench Concept

Under the Buried Trench Concept, MX missiles would be installed in buried cylindrical reinforced concrete tunnels termed protective structures (PSs). These structures would typically be 13 miles (21 km) long, 13 ft (4.0 m) in inside diameter, and have flat floors. The inside widths of the floors and diameters of the tunnels would be suitable to permit MX missiles, installed in wheeled transporter/launchers (TLs), to move between selected launch points in the PS, so that their exact location at any given time would be denied to a potential aggressor.

Accompanying each missile transporter/launcher would be a pair of blast plugs at either end of the missile train. Within each buried trench, an unmanned train consisting of a transporter/launcher and a pair of blast plugs could be moved from point to point on command. The depth of burial of the tunnel and strength of the protective structure would provide a selected level of protection from nuclear blast overpressures at the surface. The blast plugs would similarly provide protection from shock waves produced within the protective structure should it be breached during an attack.

In some buried trenches, a manned mobile launch control center (MLCC), capable of controlling the launch of several missiles, would also be present between the missile and a blast plug. This configuration is shown in Figure 1. The MLCCs would be moved deceptively among available tunnels in a launch complex, so that the locations of the specific tunnels containing an MLCC (a preferred target) would also be unknown.

Launch from the buried trench would require erection of the missile (protected by a suitable enclosing structure) through the top of the protective structure and its earth cover.

As noted previously, the buried trench concept has promise of several potential advantages; however, it is necessary to resolve specific technical uncertainties before it can be established that the concept is technically feasible and will thus permit these advantages to be achieved in practice.

1.1.3 The Proposed Action in Brief

The proposed action will involve construction of two sections of the buried trench PS at a site on Luke Air Force Range in southwestern Arizona. A short [(1,500 ft) (457 m)] straight section of buried trench, complete with entrance and exit structures, will be constructed first.

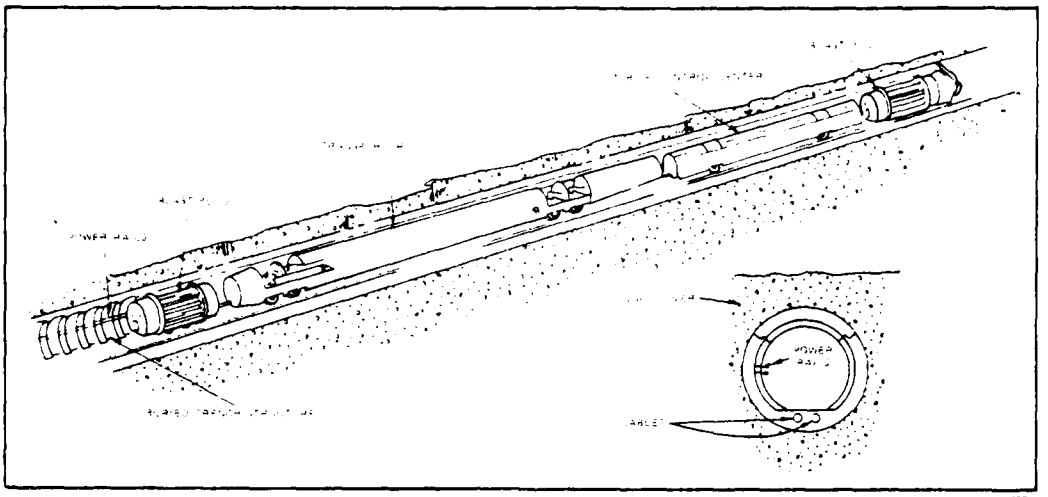


Figure 1. Buried trench concept.

This effort will provide initial validation of construction techniques and experience in construction practices. The resulting buried trench section will provide a suitable test bed for subsequent tests of missile breakout capability so that the tests can proceed without interference with continued validation construction.

Following completion of the short section of buried trench, the construction equipment will be moved to the initial point of the long section [(20,000 ft) (6.1 km)]. This operation will establish the probable rates at which the equipment can be moved between sites, and any potential problems involved.

At the final construction stage, the long section of buried trench will be constructed. This section will traverse areas of varying soil conditions and differing slopes, crossing one major and approximately twenty minor ephemeral streams, and will have straight sections and horizontal and vertical curves. Entrance and exit structures will also be installed at each end of the long buried trench. Construction of this section is to provide data on the achievable construction rate, on the problems encountered in traversing a suitable range of soil and topographic conditions, and in maintaining the desired accuracy of alignment.

Breakout tests will be conducted in the short section of trench, using prototype configurations of the transporter/launcher as described in Section 1.1.10. No missile will be launched from the site.

In addition to engineering, cost, and productivity data, confirmatory information will also be developed on the probable environmental impacts and the efficacy of mitigative measures.

Upon completion of the trench construction and breakout tests, it is planned to seal the trenches and abandon them. Access to roads constructed for the project will be eliminated.

1.1.4 Site Location and General Features

The proposed project site is in southwestern Arizona, in the San Cristobal Valley adjacent to and east of the Mohawk Mountains and south of the right-of-way of the Southern Pacific Railroad and Interstate Highway 8/U.S. Highway 80. Figure 2 shows the general location of the site, and the approximate locations of the two buried trench sections.

The site is approximately equidistant between Yuma, Arizona (1975 population 30,000) to the west, and Gila Bend, Arizona (1975 population 2,100) to the east. Both are approximately 60 miles (111 km) away from the site along Interstate Highway 8. The nearest communities are Dateland, Arizona (estimated population less than 100) and Tacna, Arizona (estimated Population 210). Dateland is approximately 7 miles (13 km) easterly along U.S. Highway 80 from the intersection of San Cristobal Wash and the highway, and lies in the San Cristobal Valley. Tacna is approximately 19 miles (30 km) westerly of this intersection, across the Mohawk Mountains in the Mohawk Valley. The town site known as Monawk, shown on some highway maps as relatively close to the site to the west along Interstate Highway 8/ U.S. Highway 80, is unpopulated.

Current access to the site from improved roads is by jeep trails, with four-wheel-drive vehicles generally required.

Figure 3 is an aerial view of the project area indicating the positions of the trench alignments and the fields of view of Figures 4 through 7, which are oblique aerial photographs of selected areas of the site.

Figure 4 is a view from the east showing the Mohawk Mountains and their accompanying alluvial fan (bajada). The upper end of the alignment of the long trench is superimposed on the photo. In this region the alluvial fan is covered with well varnished desert pavement dissected by watercourses which contain water only after rains. The watercourses range in depth from a few inches to as much as 16 ft (5 m). Throughout this Environmental Statement the larger of these are referred to as arroyos, the smaller ones as washes. Those referred to as arroyos have a depth of at least 7 ft (2 m) at some point along their lengths. The deeper the watercourses are, the greater the volume of water they have transported, and the more dense their vegetation. The largest watercourses are lined with ironwood and yellow palcverde trees reaching heights of 16 ft (5 m), occasional sahauro cacti, and many shrubs. The smaller channels support fewer and smaller trees; the smallest channels have only stunted shrubs (creosote bush and brittle bush predominantly). The interwash areas of desert pavement are barren.

Figure 5 is an oblique aerial view showing the upper third of the alignment of the long trench. It shows the varnished desert pavement giving way in places to unvarnished pavement and sand, indicating geologically recent changes of watercourse position and recent sand and silt deposition. Creosote bush and white bur sage begin to appear in the interwash areas, the sahuaro disappear, and the blue paloverde occur alongside the yellow paloverde in the major arroyos.

Figure 6 is an oblique aerial view showing the lower third of the alignment of the long trench. In this region, the surface watercourses are much less distinct, and appear to confine only minor runoff. In major storms, the runoff spreads over the entire alluvial surface, depositing silt. There is no desert pavement in this part of the alignment. Most of the shrubs are creosote bush, with galleta grass clumps and occasional stunted ironwood trees lining the washes.

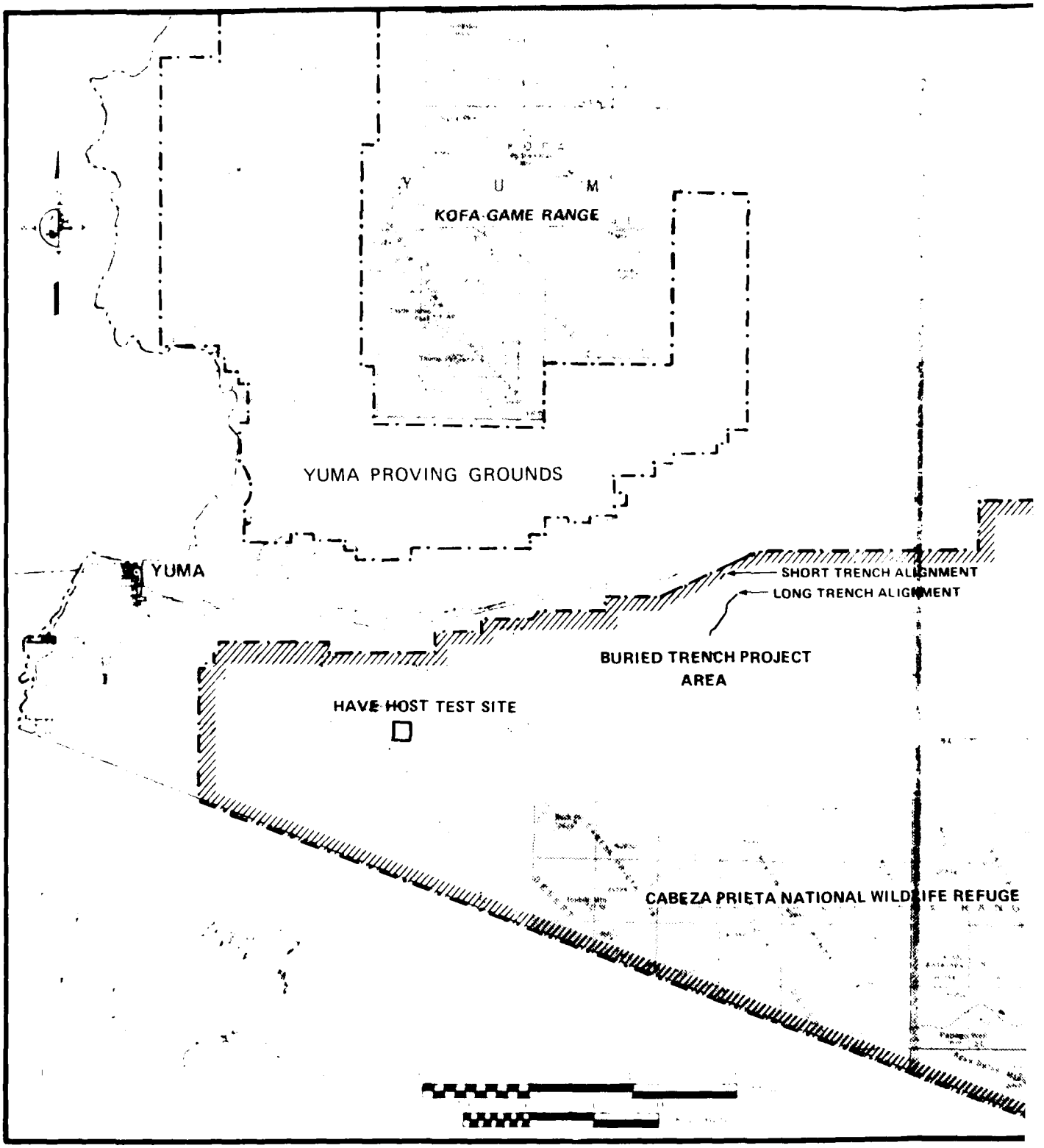
Figure 7 is an oblique aerial view looking northward toward Texas Hill from a point above Stoval Airfield in the middle of the San Cristobal Wash. The substrate is a playa with little vegetation except in slightly raised areas where saltbush, creosote bush, and mesquite occur. The downhill end of the short trench is located to the left of field of view of the photograph. The equipment lay-down areas and batch plant will be located on the runway shown in the photograph.

1.1.5 Facilities to be Constructed

The facilities to be constructed consist of two sections of buried trench, with terminal ramps. Figure 8 shows the locations of the two sections of buried trench, with their associated ramps. Two different ramp types are to be used: the "X" configuration with a terminal level pad (Figure 9), and the "Y" configuration without a pad (Figure 10). The X configuration is associated only with the short section of buried trench, which is to be used for breakout tests.

The shorter section of buried trench is straight in plan view, and nominally 1,500 ft (457 m) long. The ground surface at the northeastern end of this section is at approximately 360 ft (110 m) above mean sea level (MSL), and at the upper end, it is approximately 370 ft (113 m). The vertical profile of the buried trench is to be recommended by the construction contractor, and may include vertical curves of 2,000 ft (610 m) radius to avoid the presence of angular discontinuities between the ramp surfaces and the running surfaces of the buried trench. This trench section will have an X configuration ramp at its northeastern end, and a Y configuration ramp at its southern end, increasing the nominal overall length to 2,960 ft (902 m).

The northeast terminus of the short tunnel section will be approximately 4,950 ft (91.5 km) and the initial point of the associated ramp will be approximately 4,550 ft (1.4 km) from the centerline of the railroad right-of-way.


KOFA GAME RANGE
YUMA PROVING GROUNDS
YUMA
SHORT TRENCH ALIGNMENT
LONG TRENCH ALIGNMENT
BURIED TRENCH PROJECT AREA
HAVE HOST TEST SITE
CABEZA PRIETA NATIONAL WILDLIFE REFUGE

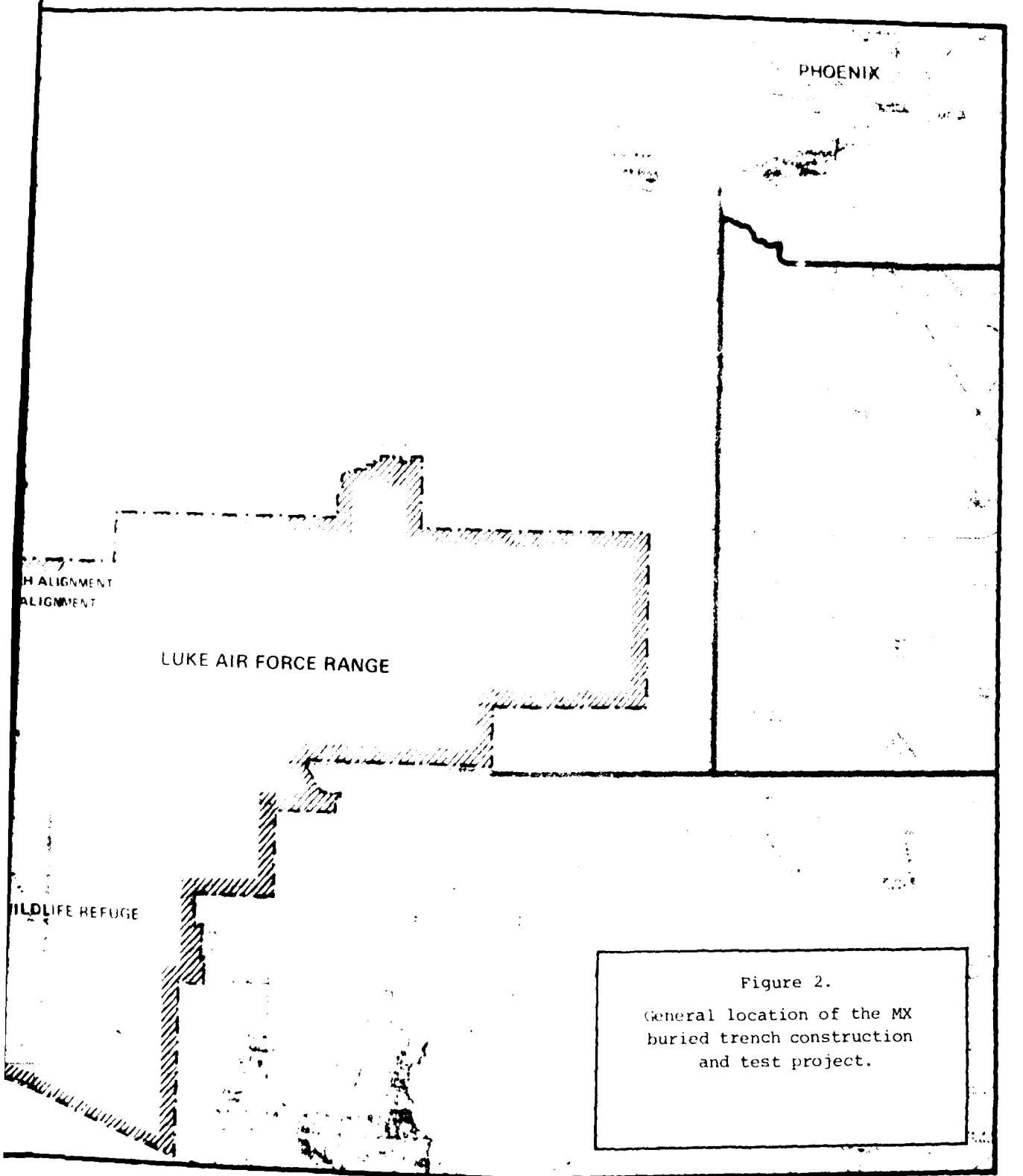
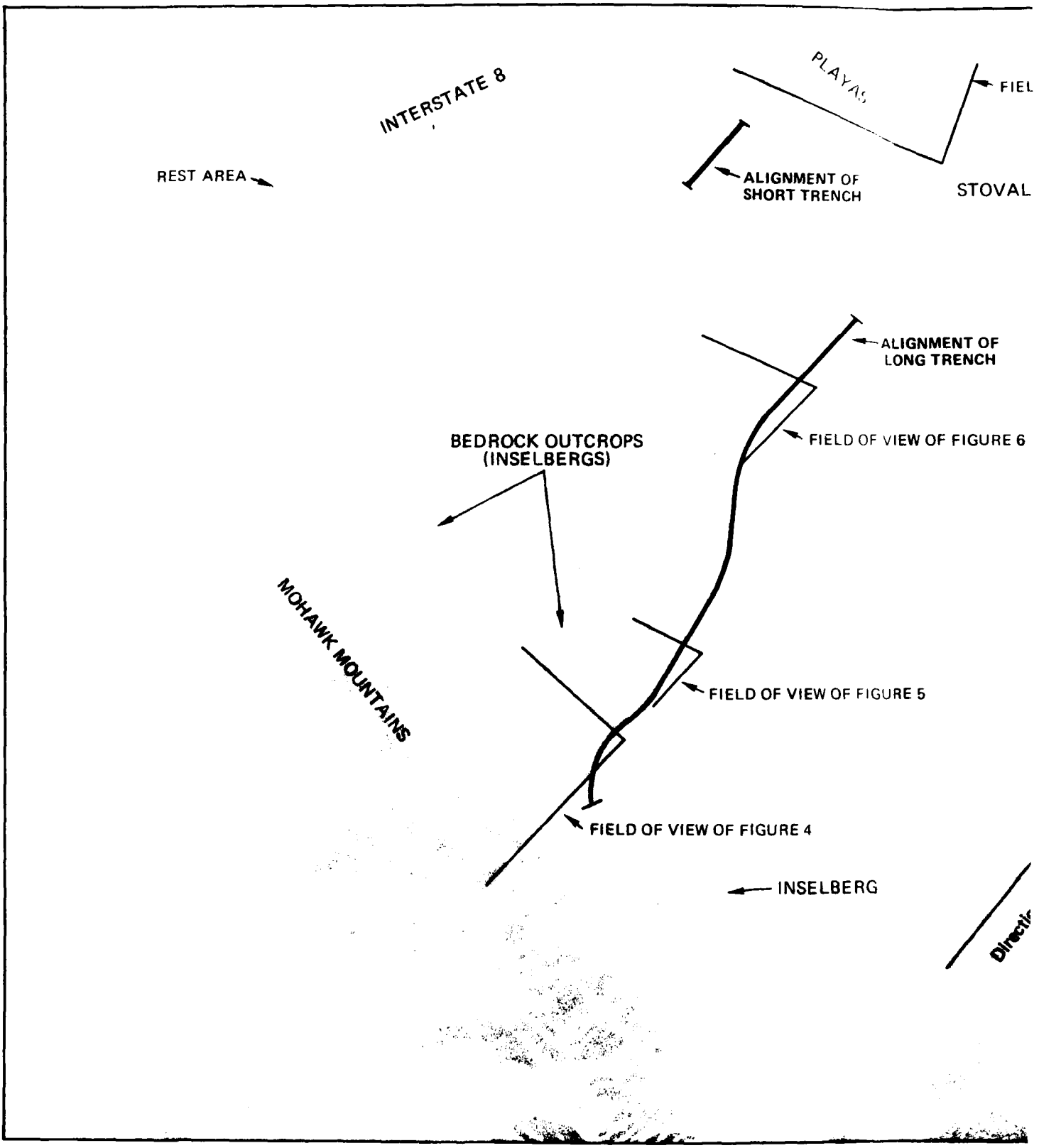


Figure 2.

General location of the MX buried trench construction and test project.


INTERSTATE 8
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REST AREA
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SHORT TRENCH
STOVAL
ALIGNMENT OF
LONG TRENCH
FIELD OF VIEW OF FIGURE 6
BEDROCK OUTCROPS
(INSELBERGS)
MOHAWK MOUNTAINS
FIELD OF VIEW OF FIGURE 5
FIELD OF VIEW OF FIGURE 4
INSELBERG

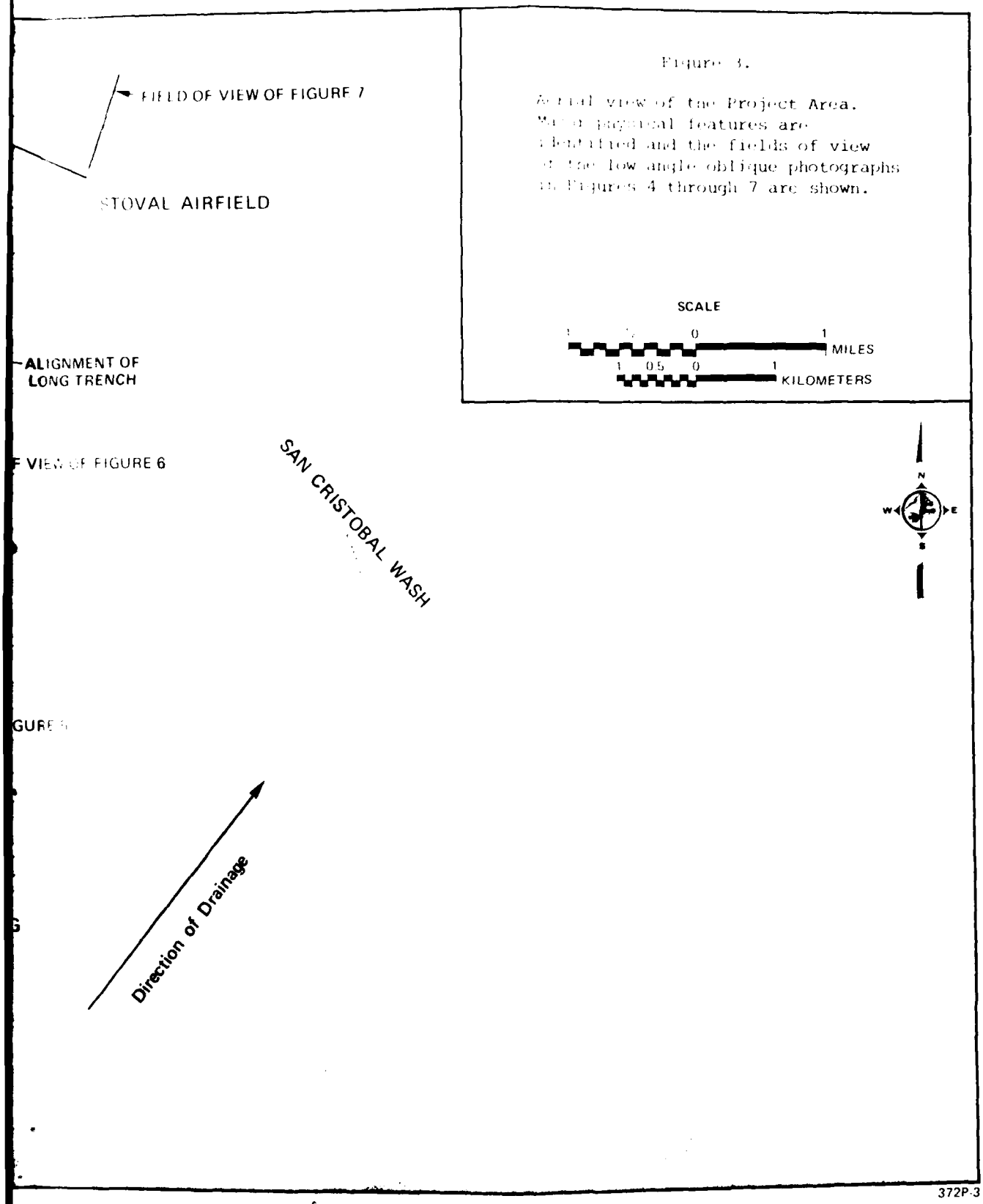

Figure 3.

Aerial view of the Project Area. Major topographical features are identified and the fields of view of the low angle oblique photographs in Figures 4 through 7 are shown.

372P-3

372P-4

Figure 4. An oblique aerial view of the southwestern end of the proposed alignment of the long trench. The trench terminates approximately 800 ft (240 m) to the left of the photo, at a position within 1,600 ft (480 m) of the base of the Mohawk Mountains, and extends 19,200 ft (6 km) to the right, to its lower terminus in San Cristobal Valley.

372P-5

Figure 5. An oblique aerial view of the upper third of the proposed alignment of the long trench, as viewed from the east.

372P-6

Figure 6. An oblique aerial view of the (northeast) third of the proposed alignment of the long trench, as viewed from the east.

372P-7

Figure 7. An oblique aerial view looking northward toward Texas Hill and Interstate 8 from a point above Stoval Airfield (abandoned). The lower end of the proposed alignment of the short trench is to the left of the left center of the figure. The northeast-southwest runway of Stoval Airfield is in the foreground. North of the airfield is part of the playa area of San Cristobal Wash.

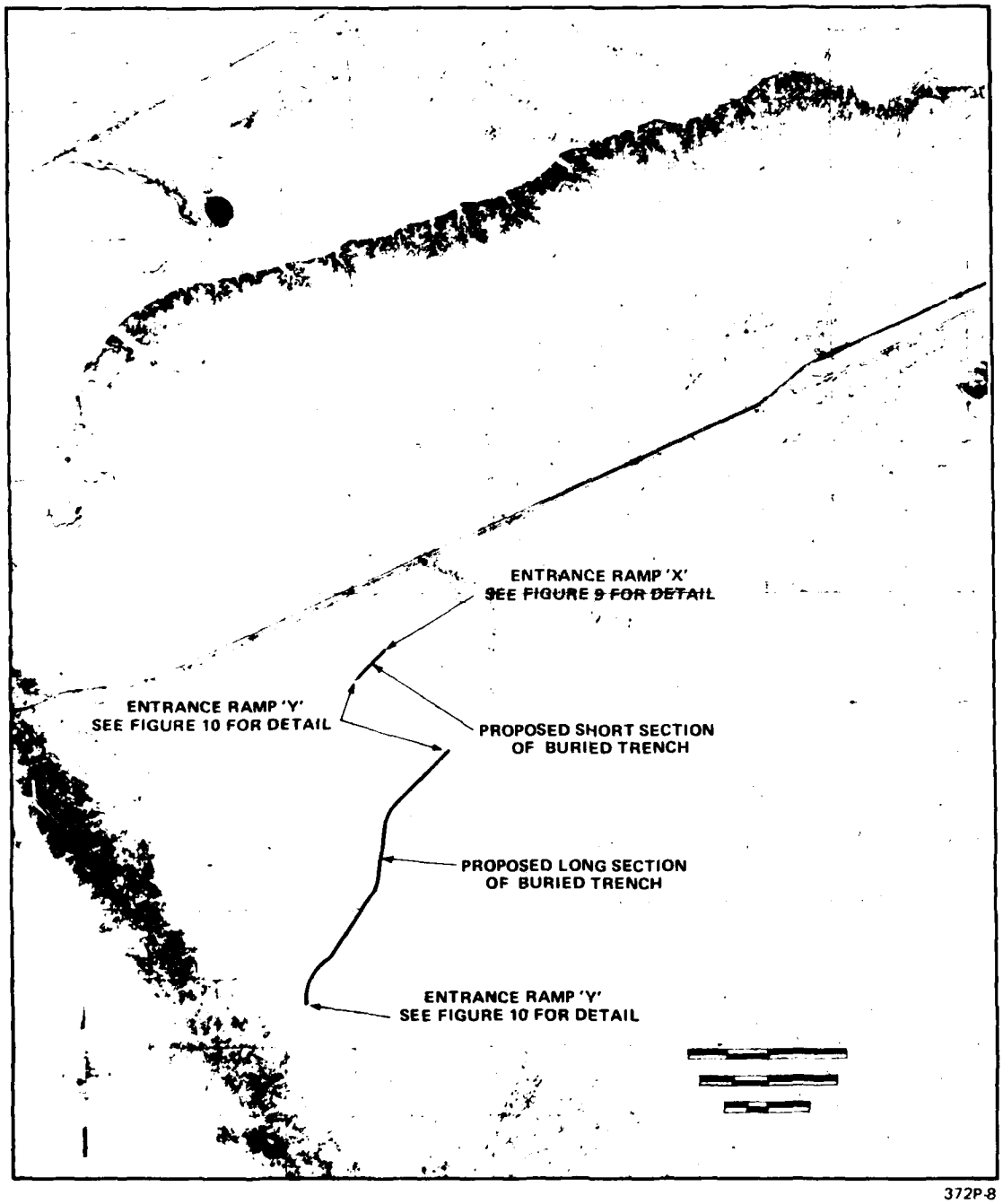

Figure 8. Trench alignments and locations of entrance ramps.

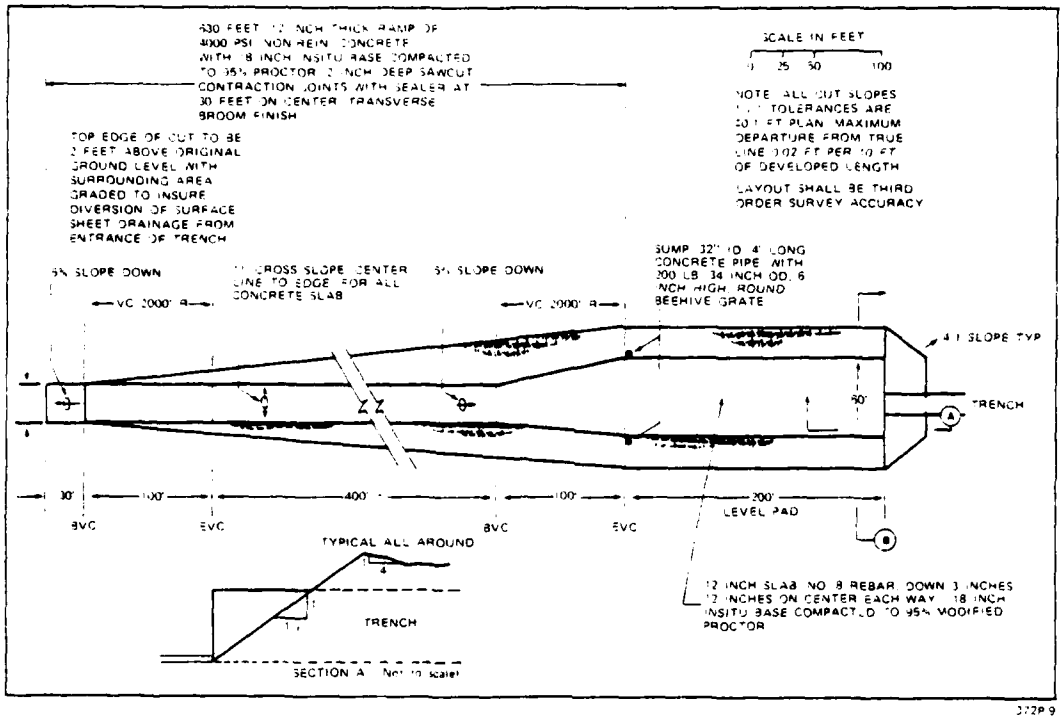

Figure 9. Configuration of entrance ramp "X".

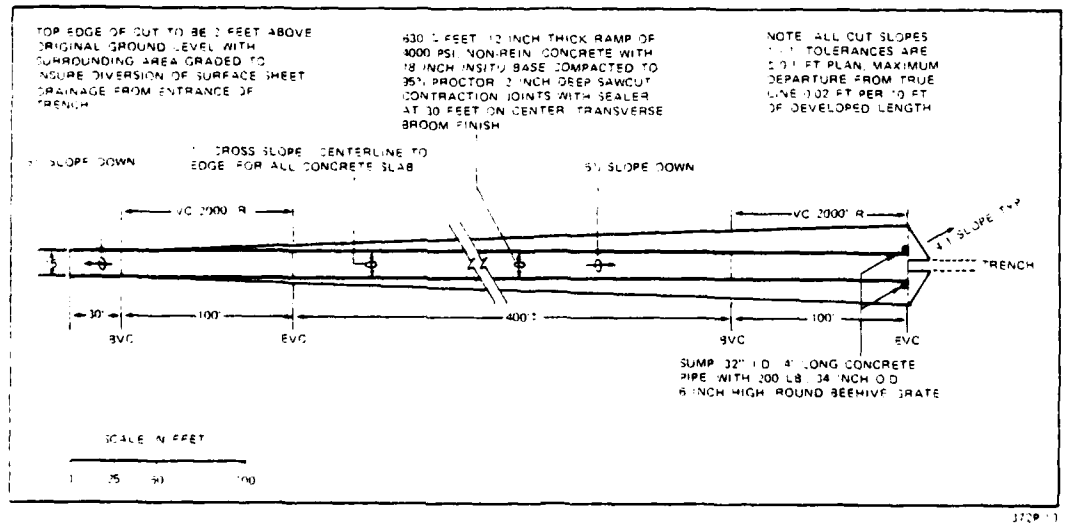

Figure 10. Configuration of entrance ramp "Y".

The lower terminus of the long trench is approximately 9,000 ft (2.74 km) southeast of the eastern terminus of the shorter section. This buried trench section is 20,000 ft (6.1 km) long in plan view, and includes both straight sections and five 2,000-foot-radius (610 m) horizontal curves. Entrance ramps of the Y configuration will be provided at both ends, increasing the nominal length of the complete structure by 1,260 ft (384 m) for a nominal overall length of 21,260 ft (6.48 km).

The vertical profile of the long buried trench will include some sections of compound horizontal/vertical curves in addition to straight (sloping) sections. The vertical profile of the buried trench will be such that arroyos will not be blocked except as an incident of construction; i.e., the buried trench will be carried under all arroyos so that the existing drainage pattern will not be permanently disrupted.

The configuration of the protective structure is shown in Figure 11. The structure is 16.5 ft (5.03 m) in outside diameter, and is to be covered with 5 ft (1.52 m) of compacted fill. Wall thickness, rib thickness, and rib spacing are selected to provide the desired degree of resistance from external overpressures; however, external longitudinal and transverse cuts in the structure reduce its resistance to upward-thrusting forces, permitting missile breakout from the structure.

The protective structure is to be constructed from steel-fiber-reinforced concrete, to facilitate its fabrication by a "slipforming" process to be described later. Conventional reinforced-concrete construction will be used for the ramps.

1.1.6 Construction Support Facilities and Delivery Routes

This site is currently accessible only by unimproved roads, preferably using four-wheel-drive vehicles, and except for the abandoned Stoval Airfield, is essentially undeveloped. It will thus be necessary to provide access roads for men, materials, and equipment, and support facilities such as a concrete batch plant for construction of the tunnel.

The proposed locations of these supporting facilities are shown in Figure 12.

1.1.6.1 ACCESS

As shown on Figure 12, traffic to and from the west will utilize a temporary turnoff to be constructed at the eastbound ramp of the Mohawk Interchange on Interstate 8. This turnout will be a two-way road, and will provide good visibility in both directions. The ingress and egress will not interfere with interstate traffic and the ramp has only a small amount of traffic per day (10 to 15 vehicles). A temporary road will be constructed between the railroad track and the highway right-of-way from this turnoff to the proposed railroad crossing at milepost 61, opposite

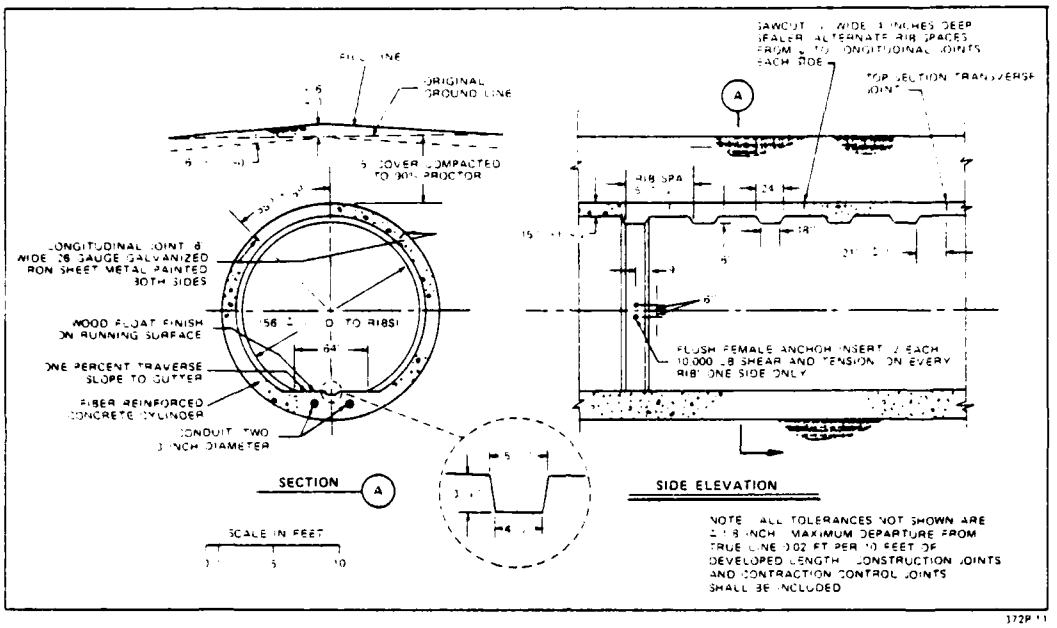

Figure 11. Configuration of the Protective Structure (PS).

Stoval Airfield. Eastbound traffic will exit the freeway at Tacna Interchange and travel east on old U.S. Highway 80 to the proposed turnoff. Westbound traffic will follow the same route entering the freeway at the Tacna Interchange. Trucks hauling gravel from the Tacna area would not travel on I-8 through traffic lanes. The freeway offramp will be signed with truck crossing ahead. These signs will start halfway down the ramp but there will be no signs placed on the Interstate. The dusty surface of the portion of the haul road located opposite the Interstate Highway 8 rest stop, will be oiled at the rest stop and for 500 ft (152 m) on either side of it. Negotiations are currently under way with the Arizona Department of Transportation District I, concerning design details and Highway Use Permit. Oral approval has been obtained from the Southern Pacific Transportation Company to construct the temporary road from the Mohawk offramp to milepost 61.

Traffic to and from the east will utilize the I-8 Interchange at Dateland, and will gain access to the site through an extension of the existing road, running part way between Dateland and milepost 61, between the railroad track and I-8. A permit has been obtained from the Southern Pacific Transportation Company, to extend this road on their right-of-way, and to install a signalized grade crossing opposite Stoval Airfield.

A semi-improved road will be constructed between the railroad crossing and Stoval Airfield.

On site, semi-improved roads will also be constructed from Stoval Airfield to the near ends of the two buried trench sections, as shown on Figure 12. Temporary roads (not shown) will also be constructed along the buried trench alignments as construction progresses.

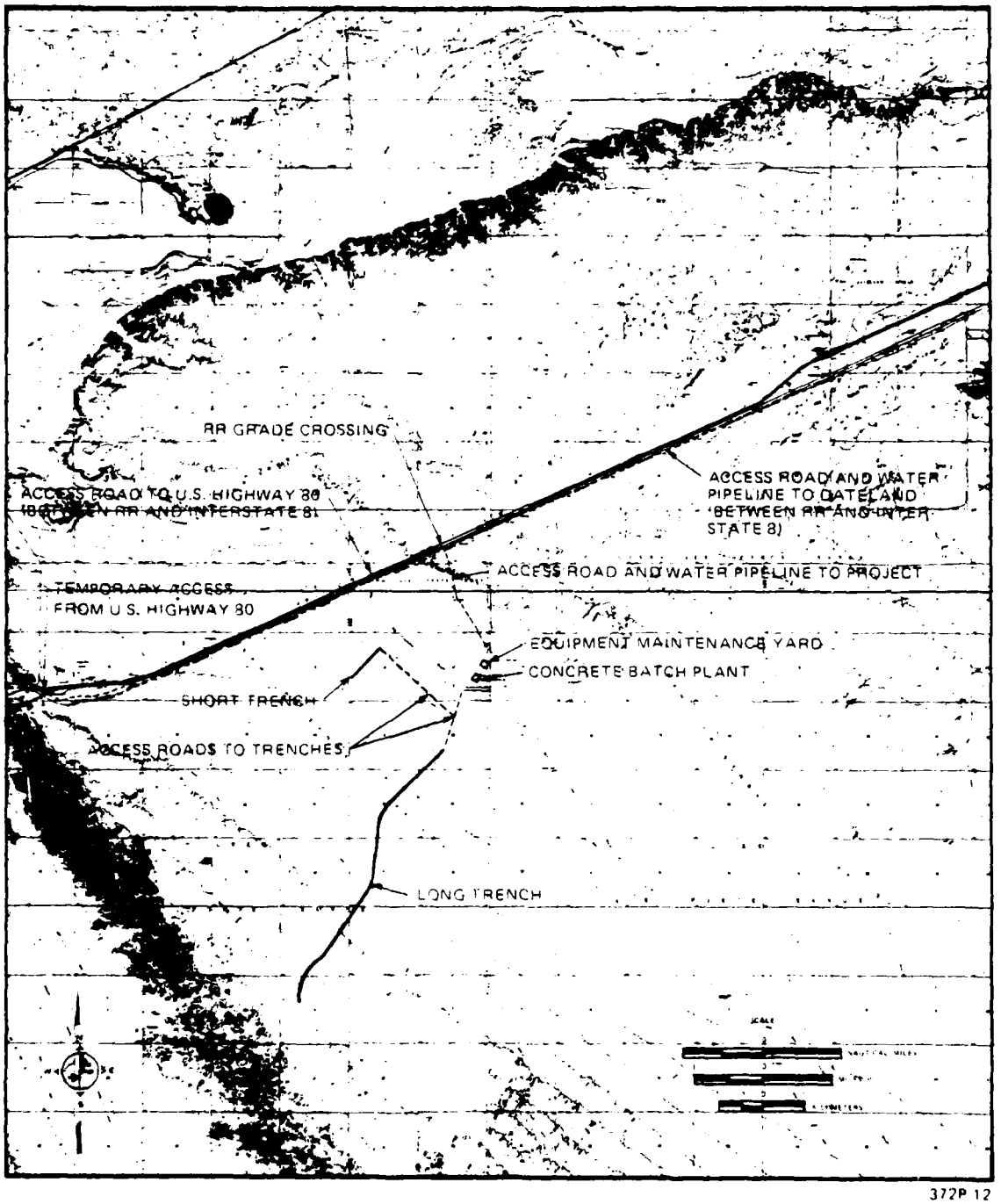

Figure 12. Support facility locations for project construction.

1.1.6.2 SUPPORT FACILITIES

The principal support facilities for the project will be a concrete batch plant (150 yd^3/hr; 114.5 m^3/hr) and a fenced equipment storage and maintenance yard, both of which will be installed at the abandoned Stoval Airfield either on the existing runways or toward the interior of the airfield. The total area will be approximately 10 acres (4.05 ha). It is planned to construct a pipeline adjacent to the access road from Dateland and pipe it to the site. A 20,000 gallon (76 m^3) water storage tank and a lined storage pond that could be as large as 125 ft^2 x 12 ft deep (37.5 m^2 x 3.6 m deep) will be constructed at the terminus of the pipeline to store water pumped during nonconstruction hours. If water is not available from this source, wells may be drilled on site on the upper bajada (see Section 1.2.1.5.2).

Approximately 2 MW of electricity will be produced on site with diesel-powered generators. No new electrical transmission lines will be required.

1.1.6.3 DELIVERY ROUTES

The following delivery routes are expected for the major items of construction materials and equipment required for the project:

1) Sand and gravel for concrete aggregate will be derived either from an existing commercial source approximately 5 miles north of Tacna or from existing abandoned pits north of Dateland redeveloped specifically for this project. If this material comes from Tacna, it will be trucked to the site via Highway 8 and the highway offramp near Mohawk. If the Dateland source is used, all access will be via Dateland.

2) Cement will be obtained from local commercial sources and trucked to the site via the access roads.

3) Reinforcement will be trucked to the site.

4) Heavy construction equipment will arrive by truck.

1.1.7 Construction Methods

The following general procedures are anticipated for construction of the buried trenches, and have been used for environmental analysis:

1) A 100 ft (30 m) wide path, 50 ft (15 m) to either side of the centerline of the horizontal alignment will be graded to provide a smooth working surface. Cuts are expected to be in the range of 3 to 5 ft (1 to 1.5 m) deep. Excess materials will be stored adjacent to the 100 ft (30 m) wide path on both sides of the alignment.

The width of the disturbed zones along the trench alignments will vary with the topography and soil conditions encountered. A width of up to 328 ft (100 m) is anticipated and has been used for this assessment.

2) Combinations of conventional and specialized equipment will excavate a trench to the approximate final depth of the springline (half vertical dimension) of the Protective Structure. The trench may have either vertical sides or as much as a 45° side slope. The width of the base of the excavation will be between 17 and 20 ft (5 and 6 m). If vertical slopes are used, temporary shoring will be installed where soil strengths are not adequate to maintain them (it is estimated that approximately 90 to 95 percent of the trench can be excavated without support). Excavated material will be stockpiled at a distance sufficient not to interfere with the progress of subsequent pieces of equipment, but within the 328 ft (100 m) zone of disturbance. Water will be applied as necessary for dust suppression.

   This equipment will move sufficiently far ahead of the subsequent pieces that delays encountered as a result of nonoptimum excavation conditions (e.g., shoring requirements for loosely consolidated deposits, or the need to rip or blast hard deposits) would not impede progress of the overall operation. However, it would not be so far ahead that the probability of slumping of unsupported vertical sections would be large.

3) Another piece of equipment may be used to excavate the trench to its final depth and precise horizontal and vertical alignment, shaping its bottom to the external configuration of the Protective Structure. The additional excavated materials will be stockpiled with the materials previously excavated.

4) Another piece of equipment will emplace slip forms defining the upper external and internal surfaces of the Protective Structure to the required degree of dimensional and alignment tolerance. Steel-fiber-reinforced concrete will then be emplaced in the forms, with appropriate measures (e.g., vibration) taken to eliminate voids, and allowed to set. The slip forms and the equipment will be moved forward continuously.

   Concrete will be trucked to the slip-forming site along semi-improved roads parallel to the trench alignment within the cleared zone.

5) When the protective structure has achieved adequate strength, the trench will be backfilled (using conventional or specialized equipment), using the adjacent excavated materials to the extent that they are suitable for compaction (usually with added water to provide the optimum moisture content). This material would be compacted to 90 percent Proctor density to at least the top of the Protective Structure.

6) The remaining (excess) excavated materials will be spread over the disturbed zone in such a way as to provide drainage away from the centerline of the alignment, and all arroyos disrupted by construction will be restored to their original drainage pattern. The volume of spoil may vary depending on the final configuration of the excavated trench, the tunnel structure and the degree of compaction for backfill. Assuming near-vertical trench walls with nominal space for the tunnel structure and the access ramp configurations proposed, it is estimated that the net surplus volume of soil remaining after completion of all trench and ramp backfill and compaction will equal a spoil volume of about 180,000 yd^3 (137,000 m^3) for the project.

The spoil will be spread over the 328 ft (100 m) wide trench construction zone while maintaining a maximum of 5 ft (1.5 m) of fill over the top of the trench structure. The resultant spoil pile heights will be approximately 0.7 ft (0.2 m) above the original ground surface.

In areas where varnished desert pavement occurs, the top layer of rocks will be stockpiled during excavation and will be spread evenly over the final graded compacted surface.

The entrance ramps will be constructed after the corresponding terminal sections of Protective Structure, and the terminal sections of the ramps will match the PS floor exactly in elevation and angle.

1.1.8 Materials Consumption

The following quantities of materials are expected to be used on construction of the project.

1.1.8.1 WATER

Total water consumption is estimated as 68.6 million gallons (Mgal) budgeted as follows:

Concrete Preparation	2.0 Mgal	(7.57 Ml)*
Soil Compaction	35.5 Mgal	(134.47 Ml)
Dust Control	20.0 Mgal	(75.76 Ml)
Domestic Uses	1.0 Mgal	(3.79 Ml)
Equipment Washing	1.5 Mgal	(5.68 Ml)
Sand Washing	8.6 Mgal	(32.58 Ml)
TOTAL	68.6 Mgal	(259.85 Ml)

*Ml = Million liters

If sand is procured from the commercial source at Tacna, the 8.6 Mgal (32.58 Ml) budgeted for sand washing would not be required to be produced on site.

1.1.8.2 CONCRETE CONSTITUENTS

Concrete constituents have been estimated to be required in the following quantities to produce the required 46,000 cu yds (35,167 m^3).

Material	Quantity	Probable Sources
Cement	675 truckloads	Phoenix
Fly Ash	90 truckloads	Phoenix
Sand	1200 truckloads	Tacna
Aggregate	1900 truckloads	Tacna
Steel Fibers	50 rail carloads	Eastern Seaboard

1.1.9 Construction Costs and Schedule

Construction costs have been estimated as follows:

Engineering	2.0 million dollars
Construction materials	10.5 million dollars
Construction labor	3.5 million dollars
Special equipment	4.0 million dollars
TOTAL	20.0 million dollars

Detailed project schedules by activity phase are in a late state of evaluation, but subject to minor changes that are not expected to have a substantial influence on impacts. The project is scheduled to start February, 1978, with peak activities in April and May, with completion scheduled for the end of September. The intensity of activity is shown by the following table of estimated total labor force applied (contractor, craftsman, and government).

Month (1978)	Estimated Labor Force
February	112
March	171
April	238
May	199
June	58
July	33
August	24
September	17

A standard 40-hour work week consisting of five 8-hour work days will be followed throughout the project. Some aspects of construction, notably cement pouring, may have to be done at night because of the high daytime temperatures. Some personnel will probably put in as much as 3 hours overtime daily to accomplish routine maintenance on construction equipment.

1.1.10 Buried Trench Breakout, Erection, and Demonstration Test

Following completion of the short tunnel section, a simulated launch canister and simulated load will be positioned within the tunnel, and one or two breakout demonstration tests will be performed. The demonstration will consist of actuating the breakout and erection subsystem which consists of a series of gas generator-driven ballistic actuators. One actuator will provide lift for the initial breakout. Following initial breakout, two smaller five-stage telescoping pistons will effect erection of the simulated missile.

The breakout demonstration will take place near 15 August 1978. Preparation will begin approximately 15 April. Personnel are expected to commute from Yuma, Arizona to the test site daily. There will be approximately 20 personnel (in addition to those listed in Section 1.1.9) on site throughout this period, with some visitors expected prior to and during the breakout demonstration.

1.2 THE EXISTING ENVIRONMENT (AFERN 3.0)

1.2.1 Physical Environment

1.2.1.1 GENERAL SETTING AND GEOLOGY (AFERN 3.1)

The project site is located northeast of the Mohawk Mountains on a northeasterly sloping, nearly planar, alluvial surface which forms the southwestern flank of San Cristobal Valley. The alluvial surface reaches elevations of 860 ft (262 m) at the base of the Mohawk Mountains and gently slopes downward to the northeast at an average rate of 83 ft/mile (15 m/km) to an elevation of about 355 ft (108 m) in San Cristobal Wash. The slopes of the rugged Mohawk Mountains rise steeply from the alluvial surface to elevations greater than 2,000 ft (610 m). Scattered remnant bedrock knobs (inselbergs) situated not more than 1 mile (1.6 km) from the mountain front, remain unburied by the alluvial deposits and form small resistant outlying hills.

The proposed trench alignments roughly parallel the slope of the alluvial surface. The slope of the trench reaches a maximum of 3 percent grade at the southwestern end of the proposed long alignment (elevation 600 ft [183 m]) and gradually flattens to the northeast as it approaches the flat central portion of San Cristobal Wash.

The general geologic setting of the San Cristobal Valley area consists of a broad structural basin, bordered by the Mohawk Mountains and the Aztec Hills. The Mohawk Mountains consist of a complex assemblage of metamorphic and granitic rocks. Detritus from these rocks, ranging in grain size from boulders to clay, have been deposited over the bedrock terrain

and have filled the San Cristobal Valley basin. These sediments have a thickness of approximately 3,700 ft (1,121 m) in the vicinity of Stoval Airfield (1). The depth to bedrock, and thus the thickness of the overlying sediments, decreases toward the Monawk Mountains. Drillhole and seismic refraction data indicate that bedrock material (compressional wave velocity 7,000 ft/s,(2.1 km/s)) along the proposed trench alignments is not likely to be encountered within 100 ft (30 m) of the surface along most of the alignment and within 70 ft (21 m) of the surface along the southwestern portion of the alignment of the long trench.

The near surface alluvial sediments of the site have been divided into several geologic units based on their geomorphic, geophysical and soil engineering characteristics (Figure 13). The majority of the trench alignments cross the "Alluvial Fan Deposits." This geologic unit has been further divided into three subunits: the intermediate, young and recent fan deposits. These subunits consist of various proportions of loose to well consolidated admixtures of silt, sand, gravel, pebbles and cobbles. The coarser intermediate fan deposits are located in the southwestern portion of the long alignment while the finer grained recent fan deposits are restricted to the northeast portion of the long alignment and underlie the majority of the short alignment. The "Stream Channel and Flood Plain Deposits" represent the youngest geologic unit in the siting area and are reported to consist of loosely consolidated silt, fine to coarse sand, gravel and cobbles. Along the trench alignment, these deposits are generally restricted to the arroyos and washes. The very fine grained portion also makes up the flat floor of San Cristobal Valley. The "Undifferentiated Surficial Deposits" are restricted to local areas at the northeastern end of the proposed trench alignments and consist predominately of loose silt and fine sand with scattered residual coarse sand and fine gravel. Isolated stabilized sand dunes are also associated with these deposits.

1.2.1.2 GEOMORPHOLOGY (AFERN 3.1)

The overall geomorphic character of the alluvial surface consists of a series of coalescing fans (bajada) derived from detritus eroded from the Monawk Mountains. The bajada gradually grades into the flat playa (epnemeral lake) of San Cristobal Valley. Three generations of alluvial fans, in addition to other associated geomorphic features, have been recognized on the bajada at the site.

The oldest fans are generally restricted to the southwest portion of the long alignment, (see Figure 13, geologic unit A5). These old fans have well-developed dark desert-varnished, desert pavement surfaces (visible on Figures 3 and 4). With progressively younger age and increasing distance down the alluvial surface toward the playa, the surfaces of the fans have less well-developed pavements and totally lack the desert varnish. The surfaces of the fans in the lower (youngest) portions of the

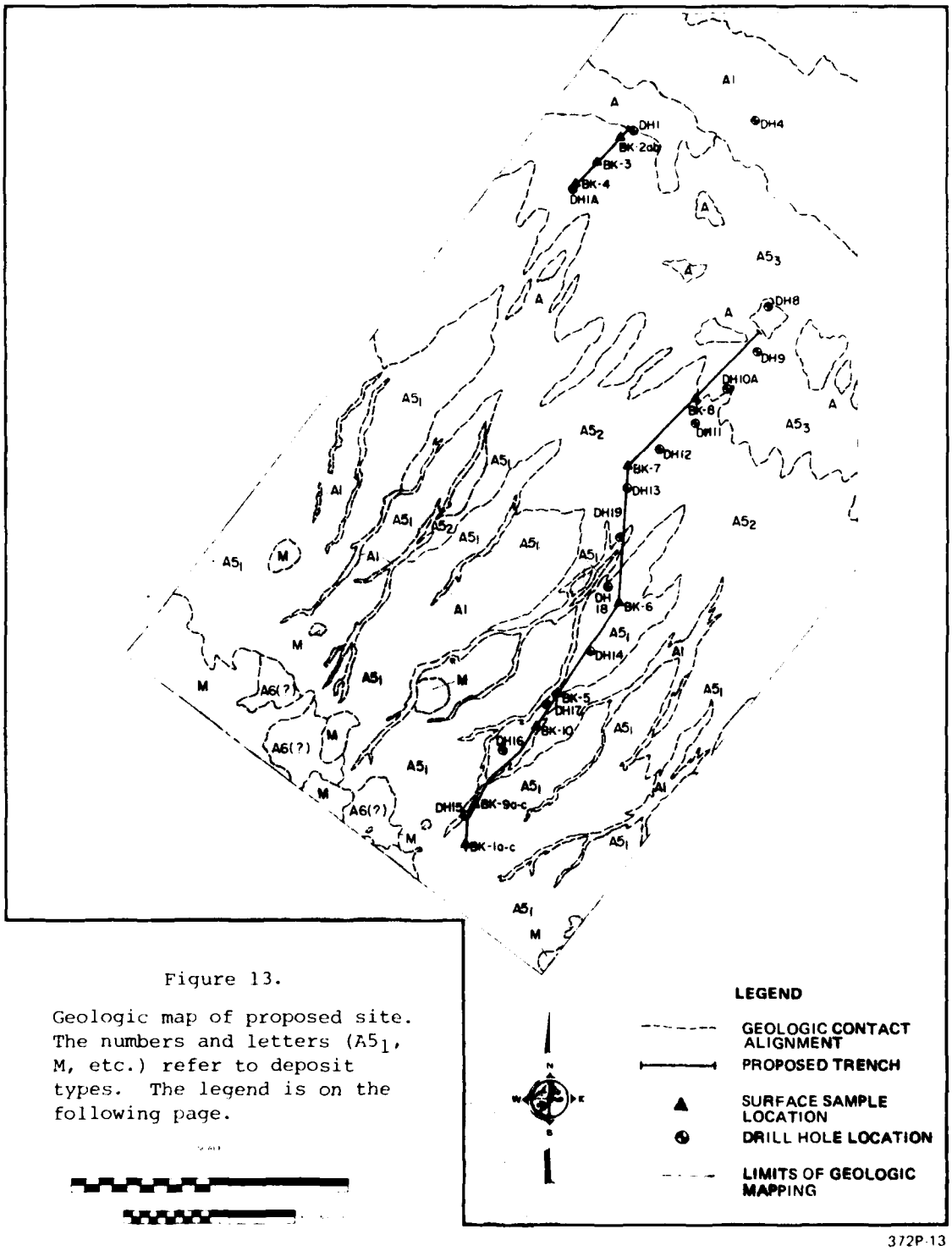

Figure 13.

Geologic map of proposed site. The numbers and letters ($A5_1$, M, etc.) refer to deposit types. The legend is on the following page.

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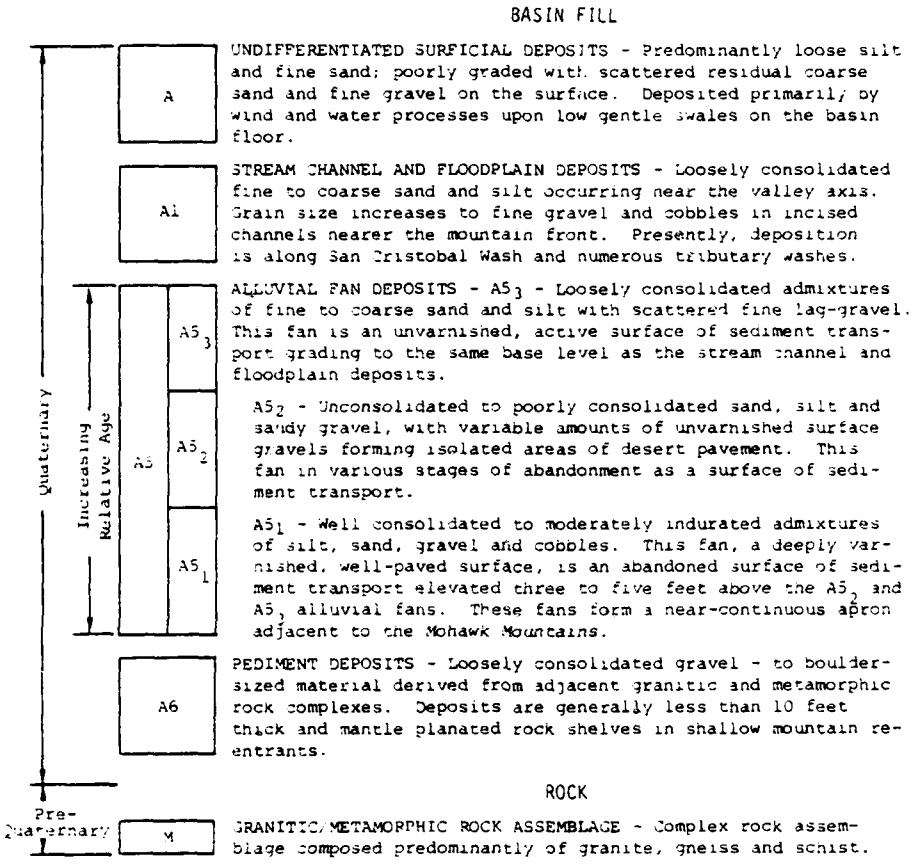
Figure 13. (cont.) Legend for map on preceding page.



bajada (the northeast portion of the long alignment and all of the short alignment) are soft and fine-grained with little to negligible pavement development. The most recent deposits occur in the active ephemeral stream channels and on the playa surface.

The southwestern portion of the bajada has been dissected by a dendritic pattern of recent ephemeral stream channels (Figure 14). In the northeast portion of the bajada the channels are less well-defined and generally produce a braided stream pattern.

The flat-floored playa has extensive areas of barren, smooth, sun-baked silty to clayey mud-cracked ground. The surface is hard when dry; however, during and after storms the playa surface can be inundated with shallow waters making it very soft.

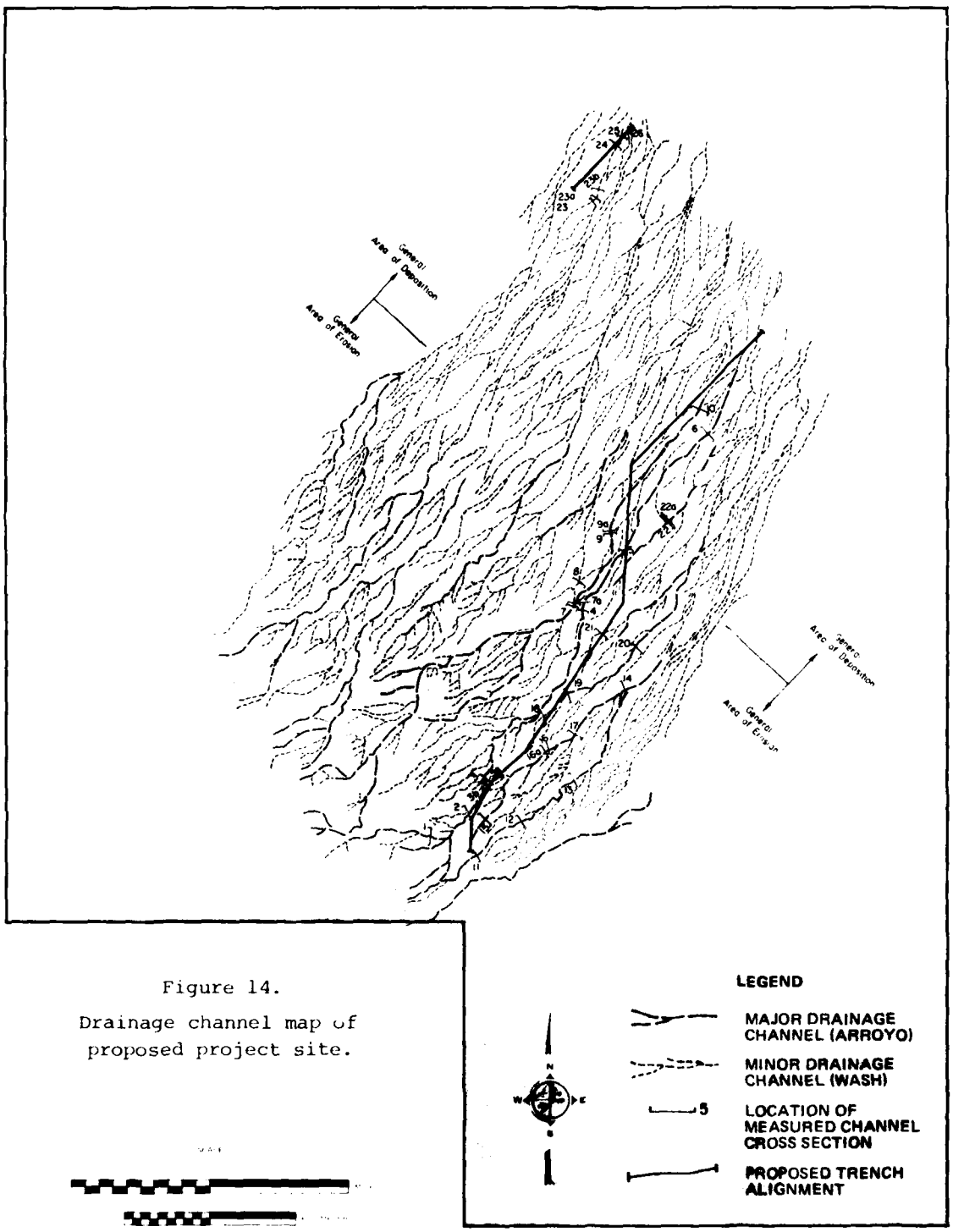


Figure 14.

Drainage channel map of proposed project site.

The smaller scale geomorphic features on the surface of the bajada, such as desert pavements, are expressions of a natural state of equilibrium between erosional and depositional processes. In their natural state these features prevent any unbalanced erosion or deposition from occurring.

The desert pavements of the southwestern portion of the long alignment are composed of a tightly-packed mosaic of angular, coarse clasts, one stone thick, overlying a thin layer of loose silt (Figure 15). These pavements are formed by wind and water erosional forces which remove the fine-grained surface materials and leave the coarse clasts. When mature, the pavements tend to retard the eroding forces that formed them (2).

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Figure 15. Smooth, barren desert pavement between washes on the upper bajada near the long trench alignment. No perennial vegetation occurs in these areas.

The bajada surfaces at the short alignment and the northeastern portion of the long alignment are protected from wind and water erosion primarily by scattered vegetation and a thin (3 to 5 mm) silt and clay surface crust (carapace). The carapace crust coats the underlying loose sediments and is formed by the settling of silt and clay on the surface after raindrop impact or a sheet flow of water. The vegetation traps small volumes of windblown sand in the form of coppice sand dunes. This tends to retard further movement of the sand by the wind.

1.2.1.3 SOIL PROPERTIES (AFERN 3.1)

The near-surface soils along the proposed trench alignments are principally silty sands with varying amounts of boulders (as large as 30 in [76 cm] in diameter), cobbles, gravels, silt, and clay. Generally the silt content of the soil increases with increasing distance down the bajada toward the playa.

Based on the results of laboratory tests, an overall volumetric soil shrinkage of 10 to 15 percent is expected from the inplace density of the native soils to the compacted density of the backfill material (compaction will be carried out to a nominal 90 percent of the maximum density, as determined by the ASTM D1557-70 test method). Further, a comparison of average *in situ* moisture contents and the optimum moisture contents indicates that less than 5 percent additional moisture by weight will be required for compaction, assuming some drying out of materials.

The soil materials of the bajada, because of their natural protective coverings, are moderately erodible, but once this covering is disrupted or removed, they are expected to become highly erodible to actions of wind and water. The permeability of the soil of the upper fans is very high, decreasing with decrease in grain size toward the playa. It is expected that disruption of the surface should increase permeability, particularly in the coarsest soil materials of the fans ($A5_{1,2,3}$). Soil materials with expansive properties are found only in the lower reaches of the long trench where it approaches the playa and at the site of the short trench.

Natural cementation of the bajada in the form of clay, silt and caliche in the finer-grained soils and of caliche in the gravelly soils provides a good measure of strength to the subsoils for surface use of heavy vehicles and equipment. At or near the surface on the higher fan deposits ($A5_1$) a two to three inch thick duricrust has accumulated locally. The lower fan deposits ($A5_2$ and $A5_3$) of the bajada are surfaced with a thin carapace crust and the playa with a thin, sun-dried mud cake. These surfaces can generally withstand limited, light vehicle use in dry weather. Moisture conditioning and recompaction of access road materials may be required to provide reliable access for heavy equipment and prevent serious washout and rutting during times of heavy rainfall.

1.2.1.4 MINERAL RESOURCES

Silver and barite form veins of minor economic importance, and minor mineralization of gold, copper, lead, and molybdenum have been found in the Mohawk Mountains. The more dominant barite and silver-bearing veins appear to be of epithermal character. There is presently no active mining in the area; however, since the turn of the century, there have been about

a half dozen mines and prospects consisting mainly of shallow shafts extending to depths up to 70 ft (21 m) below the ground surface, surface cuts to 25 to 30 ft (8 to 9 m) deep, and a tunnel about 300 ft (91 m) long.

1.2.1.5 HYDROLOGY (AFERN 3.2.1)

1.2.1.5.1 Surface Hydrology

The drainage channels that affect the project site are delineated on the drainage channel map (Figure 14).

Surface runoff from precipitation on the eastern slopes of the Mohawk Mountains collects in the canyons and flows down into well-defined drainage channels that have become incised up to 10 ft (3.05 m) into the upper portion of the bajada over the last several thousand years. Rain falling directly on the bajada collects in a dendritic pattern of small channels that formed initially as shallow rills generally a few feet wide and only a few inches deep. These small rills converge into larger channels that either join the large channels from the mountains, or flow on down the alluvial surface to form additional drainage channels. Fluvial processes are predominantly in a state of erosion in the area of dendritic channel patterns characteristic of the higher southwest portions of the bajada.

In an area located approximately midway between the mountains and San Cristobal Wash, the drainage channels take on a braided pattern that continues on to the valley floor. The fluvial processes in this braided channel portion of the bajada are generally in a state of deposition. In this area the main channels become shallower and progressively less well defined toward the valley floor, continually dividing into smaller distributary channels.

At some localities within this area, especially in areas near San Cristobal Wash, runoff has been in the form of sheet flow.

The arroyo shown in cross sections 1 through 6 on Figure 16 typifies the large arroyos that originate in the mountains and are deeply incised in the southwest or upper portion of the bajada. The locations of cross sections 1 through 6 are shown on Figure 14. This arroyo becomes progressively smaller down the bajada surface toward the playa. The arroyo ranges from 7 to 9 ft (2.1 to 2.7 m) deep and has a gradient of from 1.7 percent to more than 3.3 percent in the southwestern portions of the bajada. The arroyo is sinuous with an irregular bottom formed by silt, gravel and boulders. Downstream from measured Section 3, the arroyo maintains similar characteristics for another mile (1.6 km) or so, and then changes character, becoming narrower, shallower, and less sinuous. About 2 miles (3.2 km) downstream from measured Section 3, the channel is

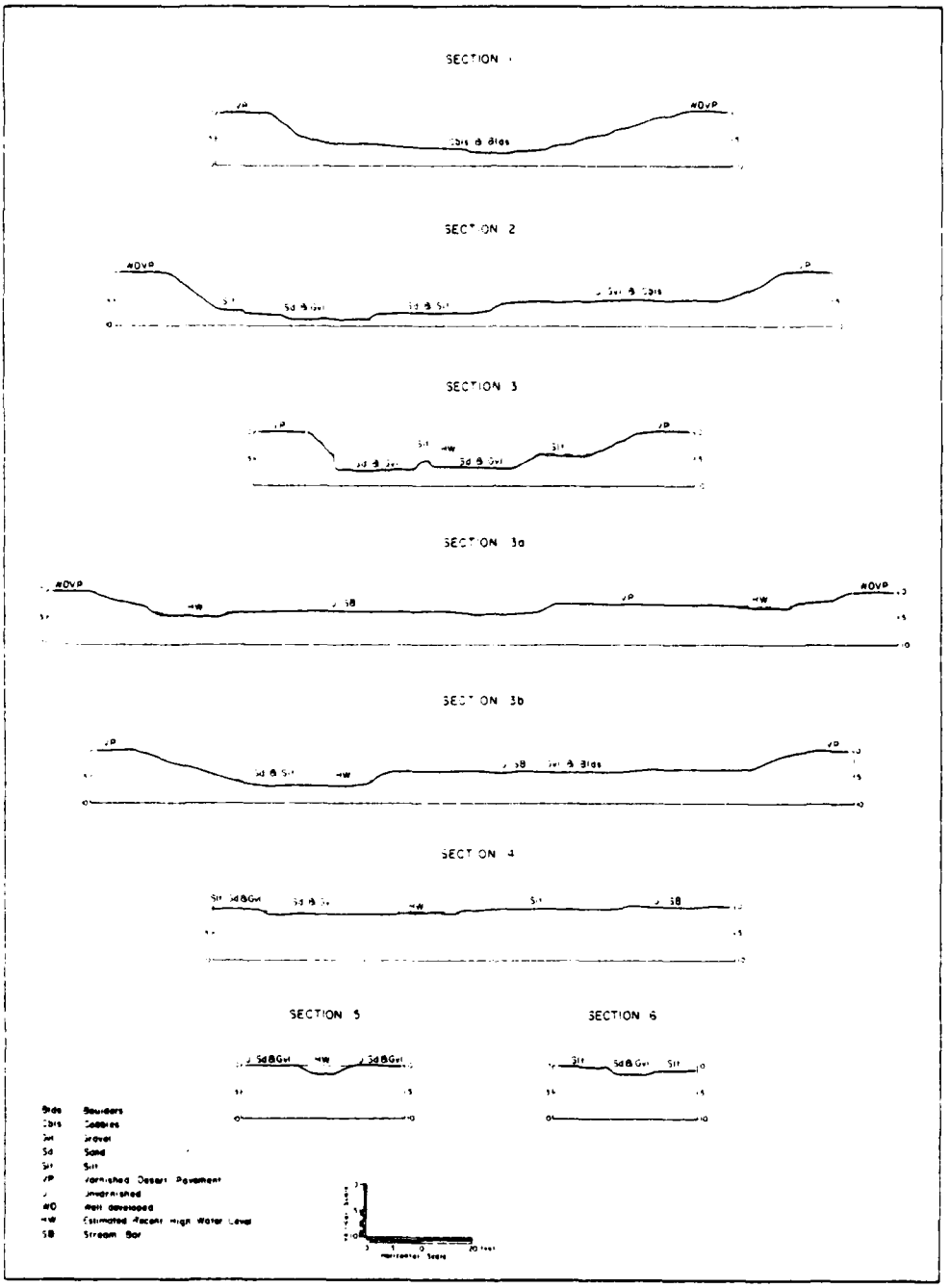

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Figure 16. Measured channel cross sections 1 through 6, San Cristobal Valley, Arizona. The locations of these sections are shown on Figure 14. They demonstrate the size reduction in an arroyo from the mountains (Section 1) to the lower bajada (Section 6).

greatly reduced in size (Section 5), averaging only 10 ft (3 m) wide and 1.8 ft (0.5 m) deep. At this point, the channel bottom is covered by sand, fine gravel, and silt, and its course is nearly straight.

The change in channel shape and size, as shown in Figure 16, reflects the dramatic loss of storm waters through infiltration into the sands underlying the wash during periods of storm runoff. Infiltration rates of more than 3.80 inches/hr (9.4 cm/hr) have been measured adjacent to the site, (3). As a storm wave passes down the alluvial fan, this marked reduction in volume reduces the erosive power of the stream and thus limits the size of channel excavation by flowing water, resulting in the noted changes in size and character of the channels.

Two major arroyos which originate in the mountains, and therefore have the largest potential flow volumes, cross the long trench alignment. The first of these arroyo crossings is located at cross section No. 5, (located on Figure 14 and 17). The second of these arroyo crossings is located about 0.3 miles (0.5 km) downstream of cross section No. 9a (Figure 14). As seen in Figure 16, the cross-sectional area of these arroyos in this portion of the bajada is relatively small.

The largest arroyo crossed by the alignment (shown in Figure 17) carries water only when water levels in the adjacent arroyo (cross Sections 1 through 6, Figures 14 and 17) exceed 1 ft (0.3 m). Cross section 2 of Figures 16 and 17 shows the size of this adjacent main arroyo where it passes within 42 ft (14 m) of the southwestern portion of the long alignment. Many smaller tributary and distributary washes cross the trench alignments.

1.2.1.5.2 Groundwater Availability and Quality (AFERN 3.2.2)

The San Cristobal Valley constitutes a groundwater basin which is part of the larger Gila River groundwater basin. The alluvial deposits, which comprise a major portion of the basin, generally consist of clay, silt, and some gravel. Shallow groundwater tends to move approximately northerly in the immediate vicinity of the site, and approximately northwesterly in the vicinity of Dateland.

A special study (92) was conducted in support of this FEIS to determine the existence and characteristics of potential aquifers in the general vicinity of the site, to evaluate alternate near-site sources of water, and to assess potential impacts. Details are given in that report

The San Cristobal Valley constitutes a groundwater basin which is part of the larger Gila River Groundwater Basin. The alluvial deposits, which comprise a major portion of the basin, generally consist of clay, silt, sand, and some gravel. These materials are inferred to extend to depths in excess of 1,000 feet in the center of San Cristobal Valley near Stoval Field, based on data from existing wells and test borings.

Three distinct aquifers have been inferred from the limited data available in the immediate areas:

1. A "sandy gravel aquifer," which occurs in an apparently narrow strip from the base of the Mohawk Mountains to an inferred discontinuity paralleling the mountain front and approximately halfway from the alluvial contact with the mountains to the center of the valley. This aquifer increases in both depth and thickness with distance from the Mohawk Mountains, reaching a maximum depth from surface of approximately 200 feet (61 m) and thickness of approximately 300 feet (91 m) near the inferred discontinuity in the vicinity of the site. It apparently terminates near the discontinuity, and is underlain by the impermeable metamorphic bedrock of the Mohawk Mountains.

2. A "fine sand aquifer," which underlies a relatively large area in the northern portion of San Cristobal Valley and Dateland at comparatively shallow depth. This aquifer does not appear to extend over the area underlain by the sandy gravel aquifer near the Mohawk Mountains. In the San Cristobal Valley, it is underlain by a silty and sandy clay aquitard. To the northwest of the site it is underlain by a clay and sandy clay aquitard, which may be discontinuous or absent north of Dateland.

   This aquifer is approximately 100 feet (30 m) thick. It is encountered at a depth of a few tens of feet in the center of the San Cristobal Valley, and at approximately 50 feet (15 m) in the vicinity of Dateland.

3. A "sand and gravel aquifer," which is inferred to have a relatively large areal extent beneath the Gila River Terrace in the Dateland area, and to extend toward but not underlie the site. In its southeastern reaches near the site, it is overlain by a clay and sandy clay aquitard, and underlain by a clay and silty clay aquitard. The aquitard that caps this aquifer may be discontinuous or absent in the vicinity of the Gila River to the northeast of Dateland.

   The aquifer is approximately 150 feet (46 m) thick in the Dateland vicinity, and is encountered at depths of approximately 500 feet (150 m).

Groundwater is not currently being used extensively in the vicinity of the site. A well at the Mohawk Rest Station, on Interstate 8 northwest of the site, is currently producing approximately 10,000 gallons per day for domes-

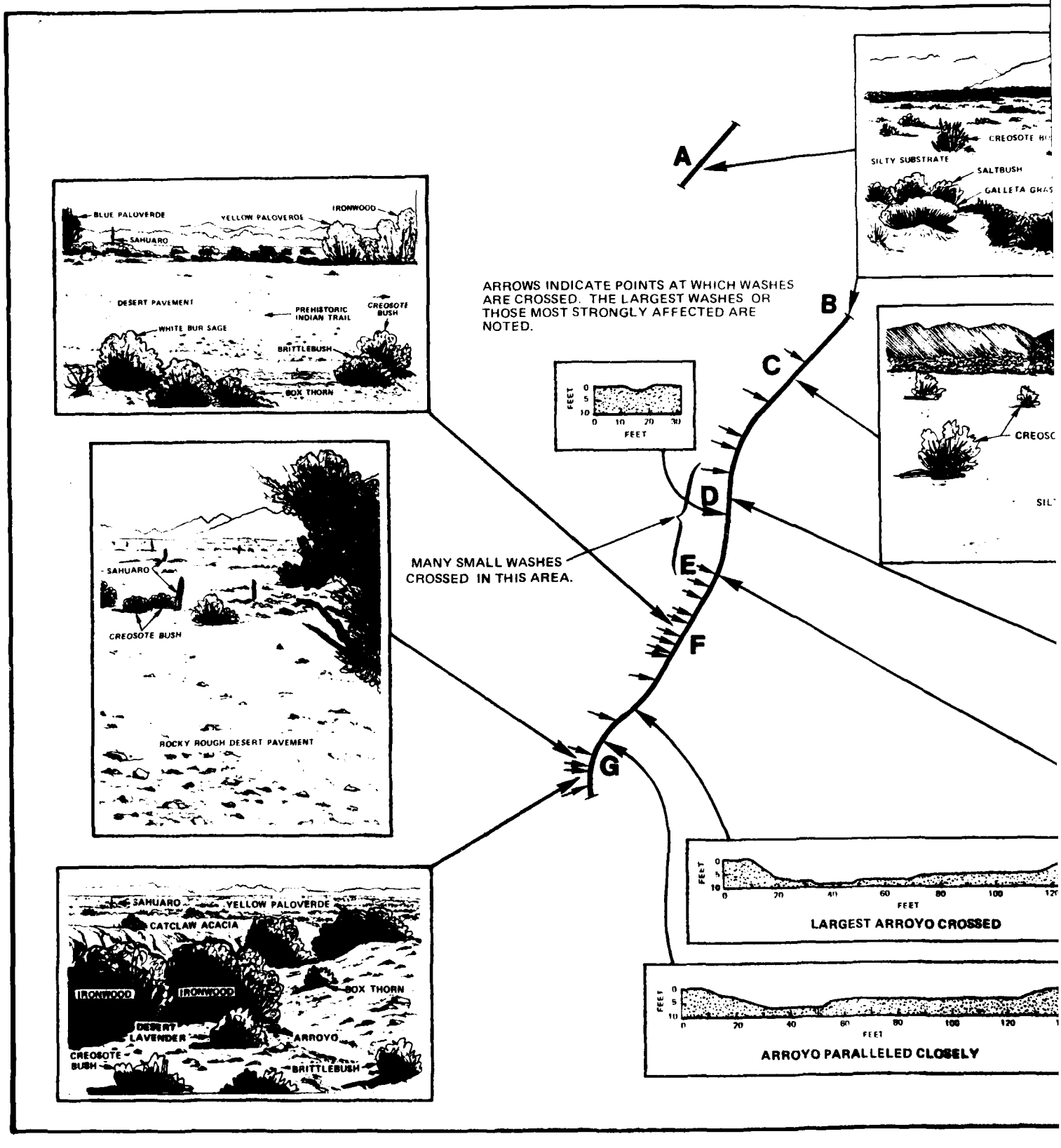
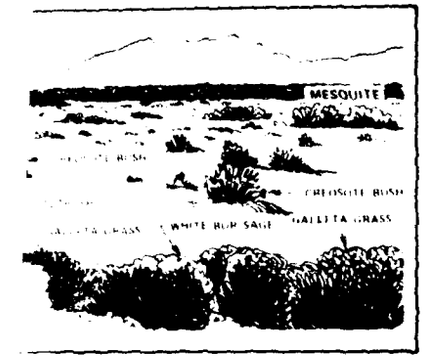
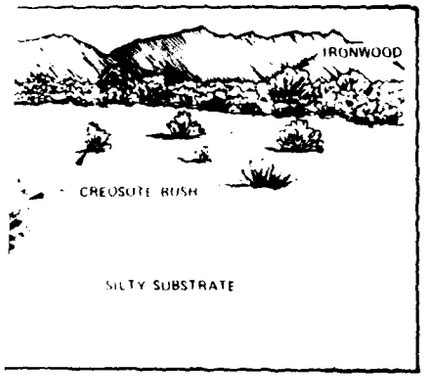
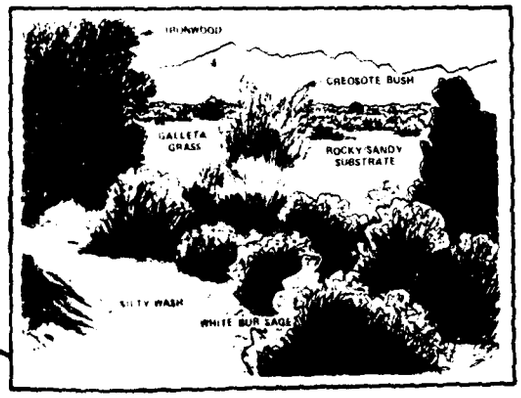

A
B
C
D
E
F
G
BLUE PALOVERDE
YELLOW PALOVERDE
IRONWOOD
SAHUARO
DESERT PAVEMENT
PREHISTORIC INDIAN TRAIL
CREOSOTE BUSH
WHITE BUR SAGE
BRITTLEBUSH
BOX THORN
SILTY SUBSTRATE
SALTBUSH
ARROWS INDICATE POINTS AT WHICH WASHES ARE CROSSED. THE LARGEST WASHES OR THOSE MOST STRONGLY AFFECTED ARE NOTED.
FEET
0
5
10
0
10
20
30
FEET
MANY SMALL WASHES CROSSED IN THIS AREA.
SAHUARO
CREOSOTE BUSH
ROCKY ROUGH DESERT PAVEMENT
SAHUARO
YELLOW PALOVERDE
CATCLAW ACACIA
IRONWOOD
IRONWOOD
BOX THORN
DESERT LAVENDER
ARROYO
CREOSOTE BUSH
BRITTLEBUSH
FEET
0
5
10
0
20
40
60
80
100
FEET
LARGEST ARROYO CROSSED
FEET
0
5
10
0
20
40
60
80
100
120
FEET
ARROYO PARALLELED CLOSELY

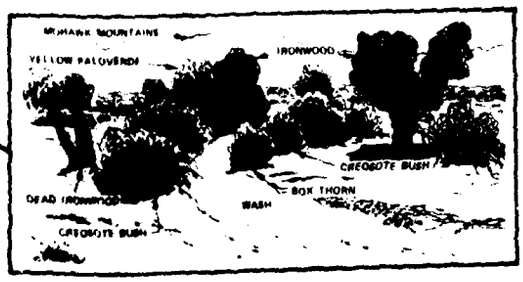
Figure 17.

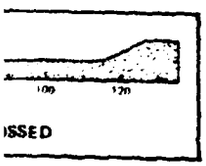
[illegible] drawings and
[illegible] to the general character
[illegible] alignments.

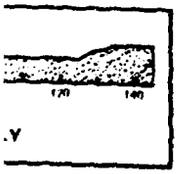












SCALE

1 ½ 0 1 MILES

1 0.5 0 1 KILOMETERS

372P-17

tic use and landscape irrigation. (This well produces from the "sandy gravel" aquifer.) A well at Dateland owned by the Harris Cattle Company is presently being operated for approximately one-half hour each day to supply water for domestic, commercial, and irrigation purposes. This well has reportedly been tested at more than 1,600 gallons/minute, and penetrates both the fine sand and sand and gravel aquifers.

Data on groundwater quality in the vicinity of the site are very sparse, and much of the data are not current. Some new measurements (including measurements on the quality of water in special exploration wells) were derived in the referenced study (92). The following generalizations can be drawn from the available data:

1. The best quality groundwater in the vicinity of the site is found at Dateland. The water from the Harris Cattle Company well, for example, has levels of total dissolved solids (TDS) of less than 1,000 parts per million (ppm), and is suitable for most domestic and agricultural uses.

2. Water in the "Sandy gravel aquifer" along the westerly side of San Cristobal Valley is of marginal quality, but could potentially be used for most purposes with some level of treatment or dilution with other water. Data are available both from the well at the Mohawk Rest Station, and from a special on-site test boring, with selected results as follows in parts per million (ppm):

SOURCE	TDS	CHLORIDE
Rest Station	2,260	1,038
Test Boring	2,420	960

The TDS values slightly exceed the 2,000 ppm limit assumed for sand washing and concrete preparation, and the chloride concentrations exceed the 600 ppm limit assumed for industrial uses in the special study (92).

3. Groundwater from the "fine sand aquifer," derived from a special test boring in the vicinity of Stoval Field, gave the following selected measurements in ppm:

TDS	16,308
Sulphates	3,509
Chlorides	7,090

These three critical concentrations are much higher than the assumed acceptable values. (A maximum TDS of 4,000 ppm was assumed for soil compaction, equipment washing, dust control, and domestic sanitary purposes.) (92).

4. Fluoride concentrations from all tested sources ranged from a minimum of 2.3 to a maximum of 6.8 ppm.

The annual average of the maximum daily temperature at Gila Bend, Arizona, which is reasonably typical of the site, is 86.0°F (30.0°C). For this temperature, the EPA National Primary Drinking Water Regulations (40 CFR 141)* specify that fluoride concentrations not exceed 1.4 ppm. All local groundwaters exceed this value. Nitrate (as N) cannot exceed 10 ppm. No local groundwaters exceed this value. Data are not available for the other controlled constitutents.

Proposed National Secondary Drinking Water Regulations (42 FR 17143) call for limits on various substances, based on esthetic qualities. Groundwater from the Dateland wells most nearly meets the secondary goals, as shown below in ppm for those constitutents for which measurements are available:

CONSTITUTENT	GOAL	DATELAND WELL	REST STATION
Chloride	250	282	1,038
Sulfate	250	212	405
TDS	500	917	2,260

With respect to groundwater, adequate supplies can be obtained from the Dateland area, or could be developed on site, derived from wells in the "sandy gravel aquifer," although some level of treatment or dilution would be required. Use of an onsite well or wells near Stoval Field is not feasible and is not likely for unused wells immediately north of the site owing to the low quality of the water. All of the groundwater sources considered have fluoride levels sufficiently high that treatment should be considered if they are to be used for long-term human consumption.

In addition to the data in Reference 92, further information on local groundwater conditions is given in References 4, 5, and 6.

*These standards are related to health.

2.2.1.6 METEOROLOGY (AFERN 3.3.1)

Wind

There are no preexisting wind data available for the site area. For this reason, two isolated measurements were made, one in the month of October 1976 and one in the month of April 1977. Typical hourly transport winds at selected hours computed from these measurements are presented in Figure 18.

These two field measurements do not conclusively characterize wind fields on site because of the short durations; however, they depict the characteristic diurnal wind direction cycle. This diurnal direction cycle is controlled by the local uneven surface heating. In the early part of the day, the east-facing slopes of the Mohawk Mountains are heated and cause air to rise from the San Cristobal Valley. Consequently, the prevailing wind direction is from the northeast of the site. In the late afternoon and early evening hours the east-facing slopes cool off at a faster rate than in the Valley. Subsequently, the air flows from the slopes to the valley and causes westerly and southerly winds in the site area.

The diurnal valley/slope wind patterns dominate the wind pattern in the site area with synoptic systems occasionally superseding this mesoscale diurnal variation.

Table 1 indicates the present frequency of occurrence of wind of various speeds at Yuma and Gila Bend over a period of record extending from 1948 to 1975.

Table 1. Percent frequency of occurrence of winds of various speeds (from Reference 17).

LOCATION	WIND SPEEDS (mph)						
	0-1.2	1.3-4.6	4.7-6.9	7.0-11.5	11.6-18.4	18.5-24.2	24.3-31.1
Yuma[1]	9.6%	10.8%	33.8%	29.6%	13.8%	2.1%	0.3%
Gila Bend[2]	29.2%	7.0%	29.2%	16.8%	6.2%	1.2%	0.3%

[1]Period of Record 1948-1971.

[2]Period of Record 1948-1960, 1971-1975.

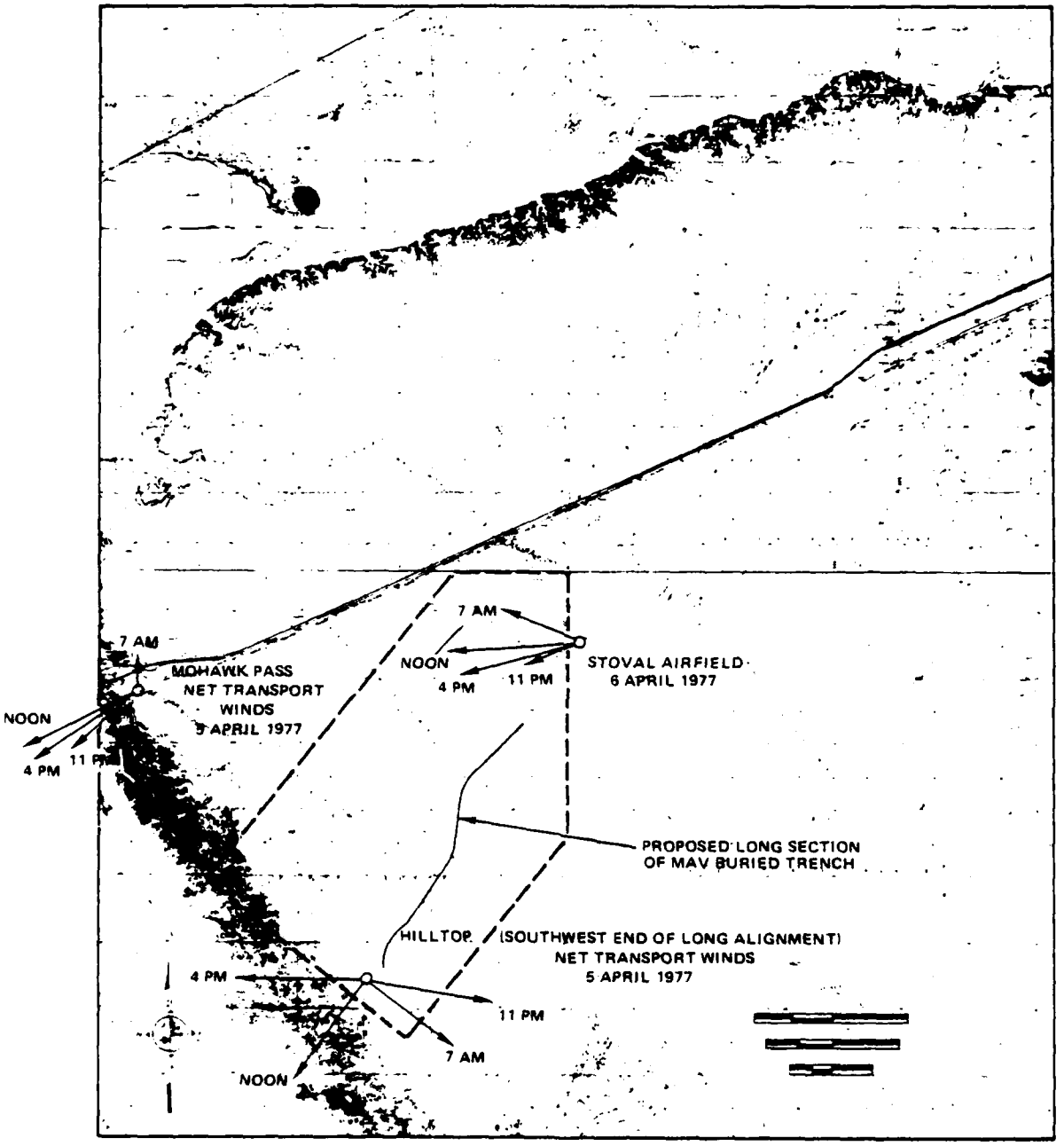


Figure 18. Hourly average net transport winds for specified hours at three locations on the project site on 5 and 6 April 1977. The lengths of the arrows are drawn to scale in miles and represent miles per hour. The dotted outline is the part of the area mapped geologically (see Figure 13) from which the soil types are used in calculation of impacts to air quality.

Climate

The project site climate is given below:

The climate is emphatically that of the desert. While the period from October to mid-May is quite pleasant, the remainder of the year is almost unbearably hot. Temperatures of 120 degrees or higher have been recorded in July, August, and September.

During the cooler seven and one-half months of the year, the area has very mild weather. Below freezing temperatures are rare, occurring, on the average, only occasionally during January and the last two-thirds of December. The lowest temperature on record, 16 degrees, was recorded in January 1937. During the daylight hours in winter, temperatures normally rise into the high sixties or low seventies.

Rainfall amounts at Mohawk Station (8) are normally very small. Only in August and December is the normal rainfall more than one-half of an inch. A large fraction of the total precipitation falls in a very short period of time. The heaviest warm season rains are associated with tropical storms originating in the Pacific Ocean off the coast of Mexico. Such a storm dumped 3.55 inches of rain on Mohawk on 10 August 1941. The winter rains are usually gentler and longer lasting than those of summer.

Table 2 shows the frequency of occurrence of storms of various intensities at Yuma and Gila Bend, the two closest sites for which such data are available.

Table 2. Estimated maximum precipitation from short duration storms at Yuma and Gila Bend (9). Frequency of occurrence shown.

DURATION OF STORM	LOCATION	(AMOUNT OF PRECIPITATION (INCHES)		
		1 YEAR	10 YEARS	100 YEARS
3 Hours	Gila Bend	0.75	1.92	3.08
	Yuma	0.40	1.54	2.61
1 Hour	Gila Bend	0.64	1.74	2.78
	Yuma	0.36	1.35	2.25
0.5 Hour	Gila Bend	0.55	1.37	2.20
	Yuma	0.28	1.07	1.78

The seasonal distribution of rainfall, in general, follows the same pattern in the southwestern region of Arizona as it does in the more rugged northern and eastern sections. The precipitation from showers is greatest in July, August, and September and least in April, May, and June. The southwestern region of Arizona receives 48 percent of its rainfall between May and October while the much wetter (about twice as much rainfall) central and plateau regions of the state receive 48 and 55 percent of their annual totals in the same period. On a daily basis most of the rain in the desert areas occurs in the evening coincident with the peak in thunderstorm activity, rather than in mid to late afternoon as occurs farther north and east over the plateau.

1.2.1.7 AIR QUALITY (AFERN 3.3.3)

Except for the presence of suspended dust, air pollution in the desert regions of Arizona is considered to be well below the National Ambient Air Quality Standards (10) and the standards set by the Arizona State Department of Health (11).

Ambient airborne dust levels that exceed the national primary standard for particulates do occur at the project site. In a study of diurnal dust variation in the United States (12), the normally reported visibility of 7 mi (11.3 km) used by the National Weather Service to indicate the first presence of significant blowing dust, results from an estimated dust concentration of about 2,700 $\mu g/m^3$ or just over 10 times the air quality standard. A day with 50 mi (80 km) visibility would have 715 $\mu g/m^3$ dust in the air on the average, about three times the national standard of 260 $\mu g/m^3$. Figure 19 shows that 7 mi (11.3 km) visibility at the site is exceeded approximately 99.5 percent of the time.

Relationships have been developed relating wind speed, particulate concentration, and visibility at lower wind speeds than those reducing visibility to 7 mi (11.3 km). Table 3 derived from references (12) and (82) indicates the wind speeds and related dust loads to reduce visibility over soils similar in grain size distribution to those at the project site. At wind speeds of 12 to 18 miles per hour, the primary federal ambient air quality standard for particulates (260 $\mu g/m^3$) can be exceeded by windborne dust from an undisturbed surface. Visibility reduction to less than 50 mi (80 km) from windborne particulates will occur from winds more than approximately 30 mi (48 km) per hour. For winds up to 11 mph the visibility will be unaffected. Intermediate winds (11 to 18 mph) will cause some restriction.

Thunderstorms also generate dust and cause what have been called "American Haboobs" or dust storms (13, 14). Frequently, individual storms form lines or systems that move north or northwest across Arizona under the influence of upper level winds. Since the formation of these systems occurs most frequently in the area south and west of Tucson, the western desert areas are subjected to more frequent dust storms than other parts of Arizona. Visibility in the most severe of these storms would be reduced to less than 0.25 mi (0.4 km).

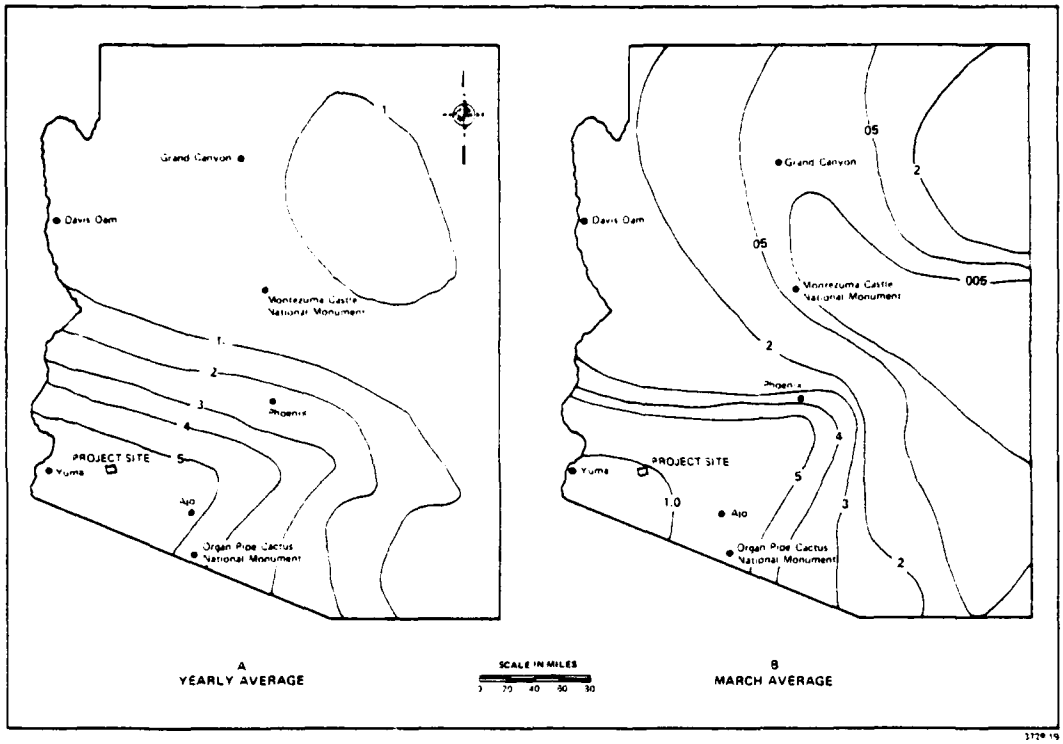


Figure 19. Locations of Arizona Particulates Monitoring Network Stations; and the percentage frequency (based on hourly observations from military stations not shown on this map) when prevailing visibility was less than 7 mi (11.3 km). Period of record 1940 to 1970 (12).

Table 3. Expected wind speed, dust, and visibility relationship for the undisturbed site (derived from references 12 and 82).

WIND SPEED		DUST LOAD	VISIBILITY	
ms	mph	$\mu g/m^3$	km	mi
0.7- 1.8	1.5- 4	0.4 - 5.	UNAFFECTED	
1.9- 3.4	4.1- 7.5	5.- 22.	UNAFFECTED	
3.5- 5.2	7.6-11.5	25 - 80	UNAFFECTED	
5.3- 8.4	11.6-18.4	90 - 330	SOME RESTRICTION	
8.5-11.0	18.5-24.2	350 - 600	140 to 95	90 to 60
11.1-14.1	24.3-31.1	650 - 1200	82 to 44	50 to 27

Sulfur dioxide, carbon monoxide, and oxidants in varying amounts have been recorded at the scattered desert locations of Ajo, Davis Dam, and Yuma. Carbon monoxide, hydrocarbons, and nitrogen oxides have been measured in some residential areas and near vehicular traffic.

Selected data from stations representative of southwestern Arizona are given in Table 4. In most instances, national and state standards are not exceeded. The exceptions are particulate levels (including dust) at Yuma and Ajo and oxidant levels at Yuma.

The implications of these measured values as well as the Davis Dam observations farther north are that background ambient dust levels at the project site may frequently exceed air quality standards, but not nearly as much as those in disturbed areas such as Ajo and Yuma. In addition, along and in the vicinity of Interstate 8, it is possible that high oxidant and carbon monoxide levels could occur under the light wind conditions that often prevail through the San Cristobal Valley.

1.2.1.8 NOISE

Ambient noise levels on the project site are low (measured at approximately 30 dBA). Background levels were measured in April 1977 at the Gateland Post Office and school and at the Interstate 8 reststop. They were between 45 and 50 dBA at both locations when no traffic was passing. Traffic raised these levels to between 65 and 70 dBA and a train passing the Interstate 8 reststop raised sound pressure levels to 79 dBA.

1.2.2 Biological Environment (AFERN 3.4)

1.2.2.1 GENERAL

The proposed site lies in the Sonoran Desert within the lower Colorado desert subdivision, and is the hottest and driest area of all North American deserts (18). Because of its remoteness, extremes of temperature, and inaccessibility, much of the area within LAFR remains the least disturbed part of the Sonoran Desert within the United States. Grazing by domestic livestock, mostly cattle and sheep, which has had a detrimental effect on plant species composition and abundance in most of Arizona, appears to have not affected the project site. The studies conducted for this Environmental Statement indicate that the proposed site lies in an area structurally and biologically characteristic of many alluvial areas of the Sonoran Desert in southwestern Arizona, particularly portions of the Cabeza Prieta National Wildlife Refuge to the south (19) and the bajadas of the Kofa National Wildlife to the north.

Table 4. Existing air quality data for the southwestern Arizona monitoring stations nearest the project site. Circled numbers exceed both federal* and state** air quality standards (15, 16, 17, 10, 11).

PARTICULATES ANNUAL GEOMETRIC MEAN, $\mu g/m^3$	1969	1970	1971	1972	1973	1974	1975
DESERT BACKGROUND SITES:							
Davis Dam	29	31	33	36	32	30	17
Montezuma Castle National Monument	-	-	21	26	28	27	27
Organ Pipe Cactus National Monument	26	37	34	29	34	23	28
Grand Canyon	15	21	30	12	18	17	14
SMELTER/MINE							
Ajo	(97)	(83)	(75)	(73)	(71)	59	(83)
URBAN:							
Yuma	-	(98)	(94)	(97)	(110)	(111)	(147)
FEDERAL STANDARDS:	Annual Geometric Mean				24 Hour Average		
Primary[1]	75				260		
Secondary[2]	60				150		
STATE STANDARDS:	60				150		
SULFUR DIOXIDE Annual Average (mg/m^3)							
Ajo	(98)	(189)	50	47	37	55	39
Davis Dam	-	-	-	1	2	7	10
FEDERAL STANDARDS:	Annual Geometric Mean				One Hour Average		
Primary	80 (0.03 ppm)				365(0.14 ppm)		
Secondary	-				-		
STATE STANDARDS:	50 (0.2 ppm)				260(0.1 ppm)		
CARBON MONOXIDE Max. 8 hr ave. (mg/m^3)							
Yuma	-	-	-	-	-	3	7
FEDERAL STANDARDS:	8 Hour Average				24 Hhour Average		
Primary	10 (9 ppm)				40(35 ppm)		
Secondary	10				40		
STATE STANDARDS:	10				40		
OXIDANTS Max. 1 hr avg. ($\mu g/m^3$)							
Yuma	-	-	-	-	-	(330)	(245)
FEDERAL STANDARDS					One Hour Average		
Primary	-				160(0.08 ppm)		
Secondary	-				160		
STATE STANDARDS	-				160		

* Primary standards are those necessary to protect human health.

** Secondary standards are those necessary to protect public welfare and the environment from known or anticipated adverse impact.

The site area (except at the extreme upper end of the long alignment) is somewhat unusual for the Sonoran Desert as a whole because of the marked paucity of cacti and ocotillo. Sahuaro cactus (*Carnegeia gigantea*) is conspicuous by virtue of its size and form along drainageways in the upper and midbajada but does not reach the density it has over much of its range. Here it is almost invariably associated with large shrub or tree "nurse plants" under which it becomes established.

At the upper end of the alignment the most conspicuous topographic feature is the presence of barren, flattish areas of darkly varnished desert pavement dissected by shallow washes to deep arroyos. The deeper arroyos originate in the mountains while the washes originate upon the pavement fans themselves. These pavement areas, which represent old alluvial fan surfaces, are devoid of perennial vegetation except in the arroyos.

1.2.2.2 VEGETATION (AFERN 3.4.1)

The bajada on which the proposed site is located extends a distance of 6 miles (10 km) from the base of the Mohawk Mountains to the playa of the San Cristobal Wash with an elevational drop of 500 ft (15 m). Along this elevational gradient there are substantial changes in drainage patterns and surface that substantially influence the species composition and distribution of vegetation. The characteristics of the vegetation in turn influence the distribution of animals.

Perennial Vegetation

The plant associations encountered by the project include the paloverde-sahuaro associations in the upper bajada with the addition of ocotillo at the mountains, grading into creosote bush-scrub associations with white bur sage in the middle bajada. Mesquite hummocks and patches of saltbush are common near San Cristobal Wash. Along the major arroyos the blue paloverde-yellow paloverde-ironwood complexes form a desert riparian community. As the small washes grade into the playa, mesquite and saltbush become common.

Vegetation of the site falls within the lower Colorado Valley subdivision of the Sonoran Desert (20). It also retains some elements of the Arizona Upland region to the east. Along the elevational gradient traversed by the long alignment there occur interrelated changes in the topography, drainage pattern, and substratum (soil) characteristics. These changes have a pronounced effect on the aspect and species composition of the vegetation. Figure 17, as well as showing watercourse crossings, gives a visual characterization of vegetation encountered at different elevations of the bajada.

In the smallest washes on the fans, vegetation consists of *Encelia farinosa* (brittlebush), *Larrea divaricata* (creosote bush), and *Ambrosia dumosa* (white bur sage), with occasional *Krameria grayi* (ratany), and *Hibiscus denudatus*. The latter is characteristic of the lower rock-slopes above the alignment and occurs in washes only in the uppermost part of the bajada. As these washes deepen slightly, stunted *Olneya tesota* (ironwood) and *Cercidium microphyllum* (yellow paloverde) also occur. These latter species form trees characteristic of washes virtually throughout the Sonoran Desert. Occasional sahuaro cactus (*Carnegiea gigantea*) complete the perennial flora of the minor washes. Most large sahuaros on the site have several nest holes formed originally by Gila woodpeckers and common flickers but utilized by other bird species including elf owl. A number of the older sahuaros have galleries spiraling up the trunk, evidently gnawed by wood rats (*Neotoma*). Characteristic *Neotoma* stick nests were observed adjacent to several of the large washes and arroyos.

The barrel cactus (*Ferocactus wislizeni*) is the only other conspicuous cactus along the alignments. It occurs as scattered individuals on sandy *Larrea* flats on the lower bajada and flood plain at the lower end of the alignments.

Opuntia acanthocarpa (buckhorn cholla) exists as a few scattered individuals at the lower end of the alignment, and it and *O. bigelovii* (Teddybear cholla) are common at the extreme upper end of the alignment. *Mammillaria tetrancistra* (pincushion cactus) is uncommon in rocky places in the upper and mid-bajada and on rockslopes, and two individuals of *Cereus greggii* (night blooming cereus) were observed, one at the upper end of the long alignment and another near Interstate 8 midway down the bajada. The latter species is often inconspicuous (when not in flower it resembles dead sticks where it grows under large trees along washes), and it may be more common than site observations suggest. The ocotillo (*Fouquieria splendens*) occurs as a few scattered individuals near the uppermost end of the alignment. It and many of the cacti become more common on the rockslopes of the Mohawk Mountains immediately above the upper end of the alignment.

The arroyos of the upper bajada support the most diverse perennial flora of the alignment area. All the above species occur here (*Olneya* and *Cercidium* as well-developed trees, as well as the tree *Cercidium floridum* (blue paloverde), which reaches its maximum numbers in arroyos about one-third of the way down the alignment. Characteristic shrubs include *Hyptis emoryi* (desert lavender), *Acacia greggii* (catclaw acacia), *Ambrosia ilicifolia* (holly-leaf bur sage - restricted to this part of Arizona), *Trixis californica* (California trixis), *Bebbia juncea* (tortoise's delight), *Lycium andersonii* (box thorn), *Condalia lycioides* var. *canescens* (gray thorn), *Teucrium glandulosum* (glandular germander, uncommon in Arizona), *Sphaeralcea ambigua* (desert mallow), *Fagonia californica* subsp. *laevis* (California fagonia), and *Ditaxis lanceolata* (narrow-leaved ditaxis). Two perennial vines grow on the larger shrubs and trees: *Sarcostemma cynanchoides* var. *hartwegii* (climbing milkweed) and

Brandega bigelovii (brandega). Perennial herbs include two spurges or sand-mats, *Euphorbia polycarpa* and *E. glyptosperma*, and the four o'clock, *Mirabilis bigelovii*. The epiparasite *Phoradendron californicum* (desert mistletoe), grows on *Olneya, Cercidium,* and *Acacia,* and the root parasite *Orobanche ludoviciana* (broom rape) - in this area parasitic on the roots of *Ambrosia, Encelia,* and occasionally *Opuntia* - sends its spikes of flowers up in good years.

At about the midpoint of the long trench alignment (Areas D and E), well-developed desert pavement areas cease to exist, and the arroyos and washes become shallower. During storms, sheet flooding and deposition occur, preventing the development of desert pavement and allowing the development of vegetation in the interfluvial areas. Between drainageways, *Larrea* occurs in the sandy-silty to sandy-gravelly soils with occasional *Ambrosia dumosa* as an associate. Scattered small ironwoods and yellow paloverde occur in washes and in the arroyos: many of the same species as those in arroyos higher on the bajada occur with the addition of occasional *Hymenoclea salsola* (cheese bush) in sandy wash soils. *Cercidium floridum* (blue paloverde) reaches its greatest development in arroyos here but several of the uppermost bajada shrub species including *Trixis, Teucrium, Condalia, Fagonia,* and *Sphaeralcea* have either dropped out or become quite uncommon.

A gradual transition occurs between this region (which has many tree-lined shallow washes winding their way through *Larrea* flats) and the area of the base of the alignment (which has a less rocky, sandy-silty soil with a more or less uniform stand of *Larrea)*. Vegetation of washes less than a foot deep is distinguished from the surrounding *Larrea* flats only by a greater frequency and size of the characteristic shrubs of the area (*Larrea, Ambrosia dumosa, Atriplex canescens* [four wing saltbush], *A. confertifolia* [cattle-spinach]) and by the addition of the conspicuous shrubby Galleta grass *(Hilaria rigida)*, which is confined to drainageways on the lower part of the bajada and adjacent flood plain. Scattered colonies of the tall herbaceous *Argemone intermedia* (prickly poppy) are also characteristic of this area.

In spring, the diminutive annual *Plantago insularis* (Indian wheat) carpets the area with densities up to 400 individuals/m^2, ranging in height from 2 cm or less to 20 cm or more depending upon the favorableness of the situation. Maximum size is attained in small depressions. Table 5 compares size and reproductive output of a *Plantago* population growing adjacent to 6 inch deep tire ruts and a population less than 3 ft (1 m) away on an undisturbed soil surface.

Table 5. Comparison of size and reproductive characteristics of the annual, *Plantago insularis*, growing adjacent to 6-inch deep tire ruts near base of long alignment and on undisturbed soil 1 meter away. Data are expressed as mean ± standard error; p indicates the probability that the difference between means is not significant (Student's t test). Seventeen plants were measured for each sample. April 9, 1977.

	TALLEST STEM (cm)	LONGEST LEAF (cm)	# INFLORESCENCES PER PLANT	# CAPSULES PER INFLORESCENCE*
Tire Rut	14.1 ± 2.5	6.4 ± 1.2	45 ± 14	30.4 ± 7.0
Undisturbed Soil	4.7 ± 1.6	3.6 ± 1.2	22 ± 10	14.4 ± 3.8
Student's t	12.51	6.49	5.41	8.04
p	< 0.001	< 0.001	< 0.001	< 0.001

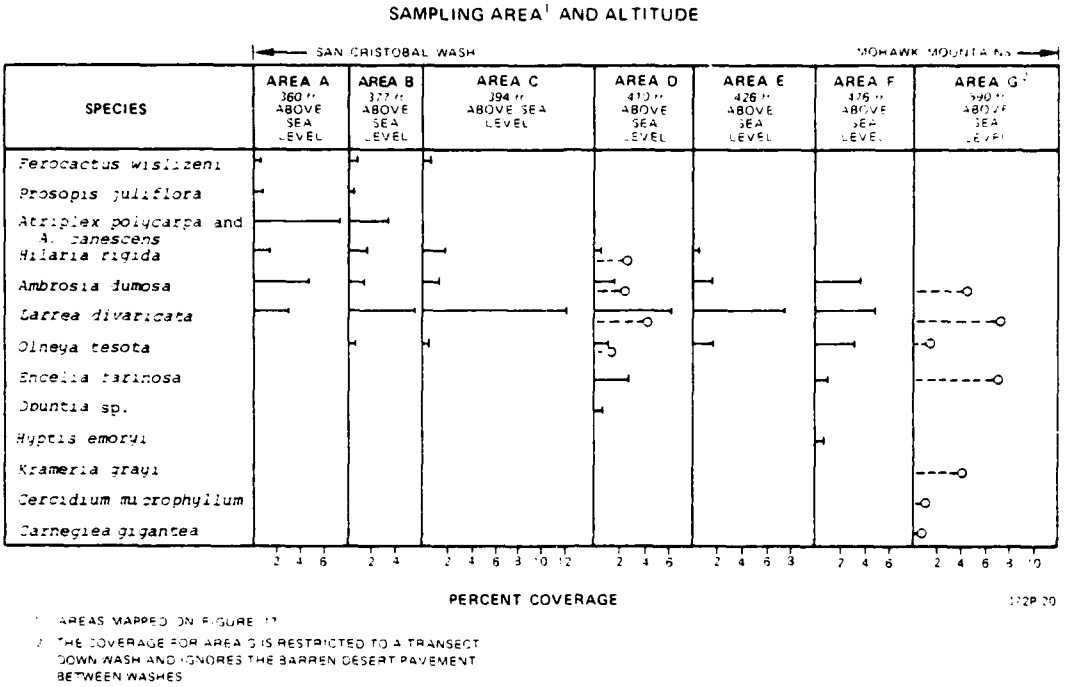
*Each capsule contains two seeds.

On the lower bajada and flood plain the shrubs are usually less than 3 ft (1 m) tall and there are occasional small trees (*Olneya* and both species of *Cercidium*) as tall as 6 ft (2 m) growing along the larger washes. There are also individuals of the barrel cactus (*Ferocactus wislizeni*), a characteristic species of sandy flats, here occurring at the western limit of its distribution.

Below the lower end of the alignments there are small sand hummocks held in place by mesquite (*Prosopis juliflora* var. *torreyana*), which also grows in small washes here, and by *Larrea* and *Hilaria*. The transition to the playa is marked by an increase in frequency of the somewhat salt-tolerant saltbushes (*Atriplex canescens* and *A. polycarpa*) and by the succulent-leaved halophytic subshrub *Suaeda torreyana* var. *torreyana* (Torrey's Sea-blite). Mesquite also occurs on the playa fringe.

The clear altitudinal zonation of tree and shrub species composition is shown in Figure 20, which includes data from San Cristobal Wash to the base of the Mohawk Mountains. Data from interwash transects and from small washes are included in this figure. Figures 21 and 22 are photographs of the characteristic vegetation.

In some areas of all elevations on the bajada, in addition to perennial flowering plants, there are extensive growth of soil lichens, which appear to add considerable stability to the soil.



[1] AREAS MAPPED ON FIGURE 17

[2] THE COVERAGE FOR AREA G IS RESTRICTED TO A TRANSECT DOWN WASH AND IGNORES THE BARREN DESERT PAVEMENT BETWEEN WASHES

Figure 20. Percent vegetation coverage on interwash transects (solid lines; bare ground had a value of greater than 80 percent and is not included), or the number of plants per 15 m length of small wash (dotted lines) on an altitudinal gradient from San Cristobal Wash (Area A) to the base of the Mohawk Mountains (Area G) parallel to the proposed trench alignment. There is a clear altitudinal zonation of species composition but creosote bush (*Larrea divaricata*), white bur sage (*Ambrosia dumosa*), and ironwood (*Olneya tesota*) are present at all elevations.

Ephemeral Annual Plant Species

Ephemeral annual species vary greatly from year to year in distribution and abundance owing to the great temporal and spatial variability of rainfall, and to specific germination-regulation mechanisms which restrict germination of a species to times when sufficient soil moisture [usually the equivalent of 1 in (2.5 cm) or more precipitation] coincides with temperatures favorable to that species' germination (22). Both winter and summer annuals occur on the site.

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Figure 21. A Sahuaro Cactus and Paloverde Tree in minor watercourses on the Upper Bajada near the longer trench alignment.

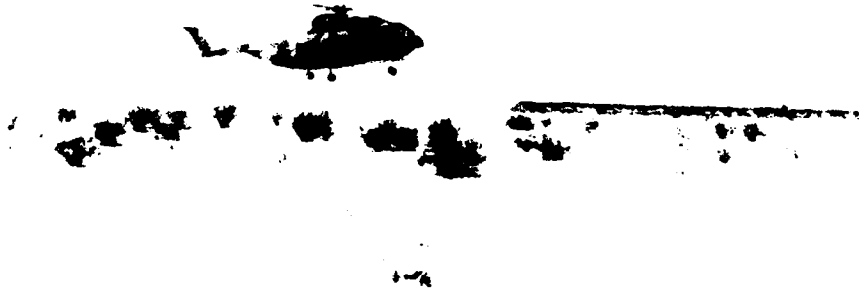

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Figure 22. The sparse Creosote Bush community of the Lower Bajada.

Annual species occurring on the site fall into two generally recognized groups: summer and winter annuals (20, 23). These groups differ not only in germination-regulation mechanism but also in the photosynthetic pathway employed (24). From the total winter annual flora of a site, different selections of species may appear on the site from year to year depending upon local temperature and rainfall conditions for that particular year. For these reasons, annual plants are not considered in the quantitative vegetation descriptions. A serious attempt was made, however, to collect all annual species occurring on the site in summer 1976 and spring 1977, and these species are included in the plant species list in Reference 88. In addition, comprehensive plant collections were made in nearby areas having more favorable local conditions, and three species from these collections likely to occur on the site under favorable conditions are included in that species list. Due to the yearly and seasonal fluctuations in species composition and abundance of annuals on the site, they were not considered in detail in the quantitative vegetation description prepared for this statement. Annual species collected in late summer of 1976 and spring 1977 are included in the plant species list in Reference 88.

Plant Species Protected by Federal Law

An examination was made of the Department of the Interior Fish and Wildlife Service lists of endangered and threatened plant species occurring in Arizona and recently extinct or possibly extinct species in the Continental United States (25). All species reported to occur in the Sonoran Desert, or possibly occurring there as stragglers, and species reported to occur in and near Yuma County (19, 26, 27, 28, 29, 30) were noted and information on their appearance, habitat, and recorded distribution was evaluated. A careful search was made for these species during the field investigations on the project site and in the vicinity. No endangered or threatened species were found on the project site or in nearby similar habitats. There is some possibility that one or more of the endangered and threatened species occurs in the adjacent Mohawk Mountains out of range of potential disturbance from the project.

Plant Species Protected by Arizona Law

Arizona State law (31) designates certain plant groups identified by botanical names as protected. Species that occur on the site that are protected by these laws are listed in Table 6.

These taxa and other protected or endangered ones considered to have a remote possibility of occurrence on the site (*Atriplex hymenelytra*,

Table 6. Species occurring on the proposed project site protected by Arizona state law. Nomenclature follows Kearney and Peebles (27). Habitat information is contained in the annotated plant checklist for the project site (Baseline Studies).

CACTACEAE:

Carnegiea gigantea - sahuaro
Ferocactus wislizeni - barrel cactus
Mammillaria tetrancistra - pincushion cactus
Opuntia acanthocarpa - buckhorn cholla
O. bigelovii - teddy bear cholla
Peniocereus greggii var. *transmontanus* - night-blooming cereus

FOUQUIERIACEAE:

Fouquieria splendens - ocotillo

LEGUMINOSAE:

Cercidium floridum - blue paloverde
C. microphyllum - yellow paloverde
Olneya tesota - ironwood
Prosopis juliflora - mesquite

Dalea spinosa, Rhus kearneyi, Crassulaceae - *Dudleya arizonica = Echeveria pulverulenta)* were carefully searched for during the field investigations. It is considered highly unlikely that protected taxa (other than bulb-forming Liliaceae) not included in the species list occur here. The bulb-forming Liliaceae *(Hesperocallis, Allium, Triteleiopsis, Dichelostemma, Calochortus)* present a problem because, like desert annuals mentioned earlier, plants existing underground as perennial bulbs or corms may not appear above the surface except in "good" years. "Good" years for a given species at a given locality may occur infrequently. Thus, although no Liliaceae were observed at the project site during 1976-1977 - a relatively good year - the possibility that one or more species occurs here can be deemed rather unlikely but cannot be ruled out.

1.2.2.3 WILDLIFE (AFERN 3.4.2)

Wildlife of LAFR and its vicinity is generally more abundant and diversified in the paloverde-sahuaro association than in the creosote bush-scrub community. Lists of the vertebrate species expected in desert habitats occurring in the vicinity of the project site are included in Reference 88.

The only large mammals whose presence was verified during the field studies on the site were coyote, kit fox and a wild horse. Badgers and striped skunks may also occur in the vicinity but no observations or definite identification of sign were made of these species. The status of the two large mammal species in the area that are of greatest public interest (the Sonoran pronghorn antelope and the desert bighorn sheep) is discussed in detail below under "Animal Species Protected by Federal and State Law."

Six species of rodents were trapped during the two site surveys (conducted during September 1976 and April 1977). These included five species of pocket mice and the Merriam kangaroo rat. The only other species of small mammals observed were two species of ground squirrel, the desert cottontail and the blacktail jack rabbit. Trapping data, and relative abundances of species are contained in Reference 88.

Thirty-five species of birds were observed on the site. Breeding behavior was observed in 13 of these species during the April 1977 study. Most of the bird species found on the site utilize the trees and denser vegetation of the arroyos for their breeding activities although some species such as the sage sparrow and Brewer's sparrow nest in the open, flat areas. A bird species list is included in Reference 88.

Animal Species Protected by Federal Law

The most recent United States Fish and Wildlife Service List of Endangered and Threatened Wildlife (32) includes only one species of animal, the Sonoran pronghorn (*Antilocapra americana sonoriensis*) that would be likely to occur on the site. Sonoran pronghorns at one time occupied "desert plains of central western Sonora and north to southern Arizona" but in 1973 were reported to be "found in the United States only in a limited portion of the Cabeza Prieta Game Range [20 miles south of the site] and the Organ Pipe Cactus National Monument, Arizona" (33). More recent continuing observations conducted by personnel of the Cabeza Prieta National Game Range, the United States Border Patrol, the U.S. Customs Service, and the Arizona Game and Fish Department, and collected in annual Completion Reports by the Arizona Game and Fish Department (34) have recorded some 160 observations of a total of 700 pronghorns (some probably multiple observations of the same individuals) on or near LAFR (LAFR, Cabeza Prieta National Game Range, and Organ Pipe National Monument) since 1968. These are mapped on Figure 23. There have been no recorded sightings or other evidence of pronghorns in the San Cristobal Valley within 12-15 miles of the project site. The habitat is similar to that of the Mohawk Valley to the west of the Mohawk Mountains where, since 1968, ten sightings including 36 animals have been made (34). It is not known why pronghorn should occupy one and not both of these valleys, and the lack of observations does not rule out the possibility that pronghorn may occasionally be present in the San Cristobal Valley and on the project site itself.

Because the Sonoran pronghorn is an endangered species, the United States Fish and Wildlife Service (FWS) Regional Director (Albuquerque) established a "recovery team" to study the species and determine its "critical habitat" in accordance with Section 7 of the Endangered Species Act. The "critical habitat" recommended by the recovery team is shown in Figure 23 and includes the project site. The FWS Regional Director determined that there was insufficient justification accompanying the recommendation to support the designation and returned the recommendation to the recovery team for further study. The Air Force is currently in consultation with the U.S. Fish and Wildlife Service on this issue, and a letter from the FWS Regional Director indicating that the project as described herein "...will not adversely affect the pronghorn or its essential habitat..." is included in Appendix 2.

Animal Species Protected by State Law

Desert bighorn sheep are the only large game mammals occurring in the vicinity of the site aside from occasional visits of mule deer, and are of particular interest to the Arizona Game and Fish Department. Their population size in the Mohawk Mountains is stable and estimated to be approximately 25 individuals (37). Bighorns in this area are not particularly sensitive to nearby human activity (34) but may temporarily leave an area of noisy human activity, such as construction and blasting (37). The long trench alignment terminates at the base of the major seasonal use area for bighorns in the Mohawk Mountains. During the wetter, cooler months of January through April, bighorns frequently occupy the inselbergs (rock outcrops) protruding from the bajada to the northwest and southeast of the upper terminus of the long trench alignment, and also may be found on the bajada near the base of the mountains (37). There are no documented tanks (water catchments) on the eastern flank of Mohawk Mountains to attract sheep, but one has been reported adjacent to the abandoned mine a mile to the northwest of the terminus of the long alignment, and another putative small one was located during the archaeological survey (for this EIS) at the base of the mountains directly in line with the long alignment. Neither has been located by the Arizona Department of Game and Fish.

All vertebrates and some invertebrates are protected in Arizona to the extent that a hunting license with the appropriate stamps is required for collecting them. A few species known to occur on the project site are protected individually but for reasons unrelated to potential disturbance from construction activities. The possession of two genera of lizards for example, chuckwalla (*Sauromalus* sp.) and the horned lizard (*Phrynosoma* sp.), is restricted to prevent their collection and sale as pets.

1.2.3 Socioeconomic Environment (AFERN 4.0)

1.2.3.1 ECONOMY AND SERVICES (AFERN 4.2)

The project site is located in a very sparsely populated portion of south central Yuma County in Southwestern Arizona. The closest major urban centers are Phoenix, Arizona; Tucson, Arizona, and San Diego, California. The only medium-sized city within 100 miles of the site is the City of Yuma, Arizona (about 54 air miles [87 km] and 64 road miles [103 km]* west). Several small agricultural and tourist service communities exist along Interstate 8 within 50 miles of the site. Dateland, Arizona is about 6 air miles (11 km) and 7 road miles (13 km) east of the site, but consists of only a lunch counter, gas station, post office and gift shop. Dateland will be the access point for traffic leaving the site. Tacna, Arizona is approximately 16 air miles (30 km) or 19 road miles (30 km) west of the site and contains the nearest motel and some other services. The closest doctor is in Wellton, Arizona, about 25 air miles (46 km) and 37 road miles (69 km) west of the site. Each of these communities has only a few hundred people. Gila Bend, Arizona has about 2,000 people and is about 46 air miles (85 km) or 48 road miles (89 km) east of the site. Yuma is about 49 air miles (91 km) and 65 road miles (100 km) west of Dateland and the closest community providing a full range of services as well as a sufficient labor force to support the project. Over 70 percent of the population of Yuma County lives in the vicinity of Yuma City. Yuma County and City are considered in some detail here because it is thought that most of the construction force will come from or relocate in Yuma.

The City of Yuma offers a socioeconomic infrastructure not unlike most communities in the population range of 25,000 to 100,000 people: schools, police, hospitals, libraries, developed recreation opportunities, shopping, housing, and water and sewerage facilities are all available in Yuma. Elementary school enrollment growth is occurring in the Crane Elementary School District while declines are being experienced in the Yuma Elementary School District No. 1. The two schools operated by Yuma Union High School District are currently over capacity. The Police Department has a staff of 78 people to serve Yuma and the adjacent area. Fire protection in the city is provided by 59 firefighters operating from 3 stations and the Insurance Underwriters have assigned Yuma a rating of 4B**. The 26 firemen of the Yuma Rural/Metro Fire Department, Inc. provide subscription

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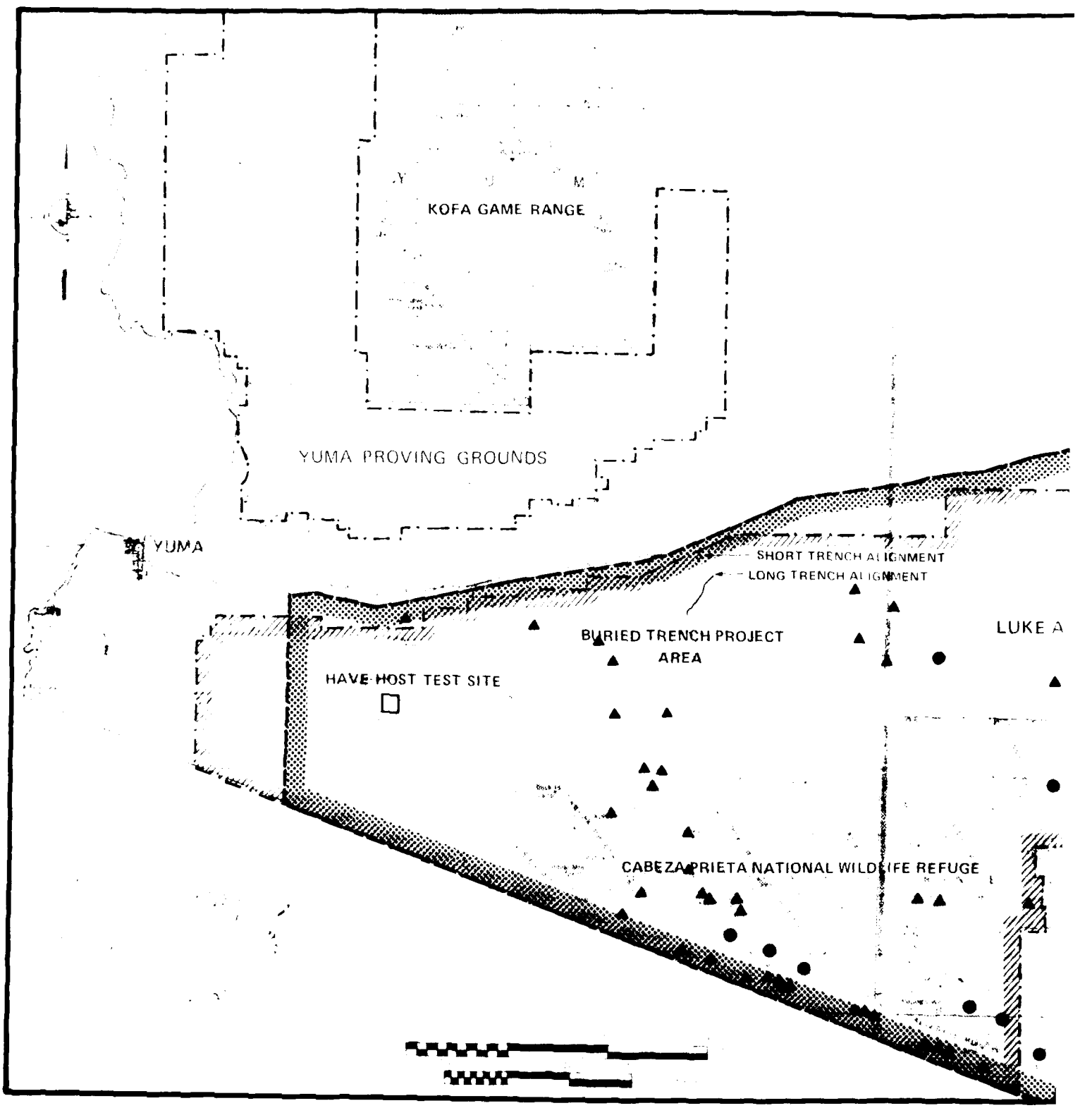
*Air miles are straight-line distance from Stoval Airfield; road miles are from Stoval Airfield to Dateland and then along Interstate 8.

**The National Fire Underwriters and the Insurance Services Office evaluate a community's overall fire defense and rate it according to an insurance protection class. The grades range from 1, the best, to 10.


KOFA GAME RANGE
YUMA PROVING GROUNDS
YUMA
SHORT TRENCH ALIGNMENT
LONG TRENCH ALIGNMENT
BURIED TRENCH PROJECT AREA
HAVE HOST TEST SITE
LUKE A
CABEZA PRIETA NATIONAL WILDLIFE REFUGE

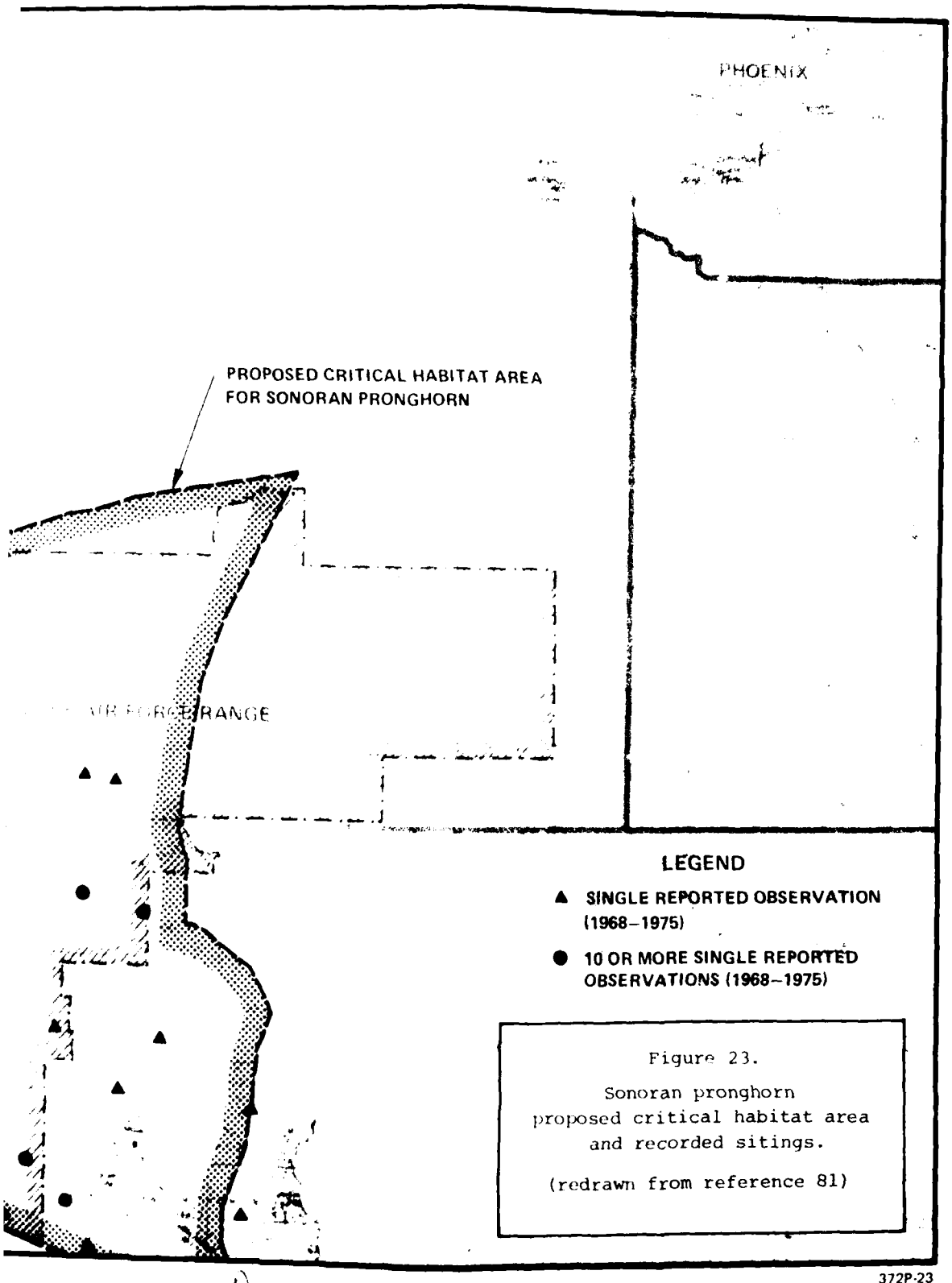


Figure 23.

Sonoran pronghorn proposed critical habitat area and recorded sitings.

(redrawn from reference 81)

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fire protection to property outside the city. The closest comprehensive health care services to the site are in Yuma. Facilities include a hospital, convalescent center, outpatient clinic, psychological counseling center, and the County Health Department. The hospital, Yuma Regional Medical Center, an acute care facility with 60 physicians and surgeons on staff, is currently expanding from 167 beds to 220 beds. The city maintains 14 parks and recreation areas including a 240-acre recreation complex. Electricity is provided through the investor-owned Arizona Public Service Company, mainly from the Four Corners generating station. Water is provided from the Colorado River with a maximum supply of 50,000 acre feet, depending on the river level. Wastewater is treated at the city's 6.5 mgd plant. Effluent meeting Arizona State Department of Health water quality standards is discharged to the Colorado River. All of the above listed facilities, except the high schools, are considered adequate for current requirements, and will accommodate any temporary growth (unexpected) induced by the MX buried trench project.

The ethnic composition of Yuma County's population includes a large proportion of Spanish heritage people (27 percent); smaller concentrations of blacks (3 percent), native Americans (4 percent), and Orientals (1 percent); and 65 percent white. Indian populations are concentrated in reservations near the western border of the county. Blacks tend to concentrate in Yuma City, and other groups are randomly distributed throughout the population centers (38, 39).

Tourism is an important component of Yuma City's economy and has resulted in a large number of temporary housing units. These facilities are summarized in Table 7. The tourist season generally peaks in January, but extends from October to March. In the off-season, a large number of units are available; even during the season, some units are typically available. Gila Bend also provides tourist facilities including nine motels with 284 rooms (40). Tacna's one motel has 22 units, while Wellton's one motel has 14 units.

The economic region most likely to be influenced by project expenditures includes both Yuma and Maricopa (Phoenix) counties which differ widely in terms of total income. In 1972, income in Yuma County was about $241 million and in Maricopa County almost $4 billion. Earnings in the two counties in 1972 are presented, by Industrial Division, in Table 8. Yuma County's private sector is dominated by agriculture as the prime earnings generator with the combination of trade and services holding a strong position, reflecting, in part, the importance of tourism to Yuma. The government sector is about the same size as agriculture as a source of earnings, and the presence of substantial military activities in the county accounts for much of this sector's earnings. Maricopa County, on the other hand, exhibits some of the character of what has come to be termed a postindustrial economy, where a large manufacturing capacity has been overshadowed by the more rapid growth of trade services and local government, elements more oriented toward local needs.

Table 7. Temporary accommodations in the City Yuma, 1976 (39).

TYPE	NUMBER OF UNITS/SPACES	OCCUPANCY RATES	
		WINTER SEASON PERCENT	REST OF YEAR PERCENT
Mobile Home Park	7,036[1]	98	39
Apartment	2,087	100	92
Motel-Hotel	1,332	93	62

[1]An additional 262 spaces are under construction.

Table 8. Personal income in 1972 in Yuma and Maricopa counties (41).

INDUSTRIAL DIVISION	YUMA COUNTY INCOME		MARICOPA COUNTY INCOME	
	MILLIONS OF DOLLARS	PERCENT	MILLIONS OF DOLLARS	PERCENT
Farm	$ 74.8	30.9	$ 140.7	3.5
Mining	0.1	--	4.3	0.1
Construction	12.2	5.1	422.0	10.6
Manufacturing	9.5	3.9	803.2	20.3
Transportation, Communication, Public Utilities	11.5	4.8	251.6	6.3
Trade	31.3	12.9	717.4	18.1
Finance, Insurance, and Real Estate	(D)[1]	--	(D)[1]	--
Services	22.8	9.4	653.3	16.5
Other	(D)[1]	--	(D)[1]	--
Federal Govt-Civilian	22.8	9.4	114.4	2.9
Federal Govt-Military	27.4	11.3	106.1	2.7
State & Local Govt.	22.6	9.4	453.1	11.4
TOTAL Earnings by Place of Work	$241.7	100.0	$3,965.0	100.0

[1]Data not provided because of disclosure rules.

Table 9 places the labor force of the two counties in the context of conventional economic structure as defined by the Standard Industrial Classification System. Yuma County is dominated equally by agriculture, trade, and government, with services in a lesser though still significant role. Maricopa County's leading source of employment is trade (wholesale and retail combined). Services and government are a strong and equal source of jobs, second only to trade, while manufacturing also occupies a strong position.

Table 9. Employment in Yuma and Maricopa counties in 1975 and July 1976 by SIC (in 1,000s of people) (42, 43).

STANDARD INDUSTRIAL CLASSIFICATION	1975 ANNUAL AVERAGE				JULY 1976			
	YUMA COUNTY		MARICOPA COUNTY		YUMA COUNTY		MARICOPA COUNTY	
	AMOUNT	PERCENT	AMOUNT	PERCENT	AMOUNT	PERCENT	AMOUNT	PERCENT
Agriculture	5.5	23.1	10.1	2.3	5.1	21.9	10.3	2.3
Mining and Quarrying	0.0	0.1	0.4	0.1	0.0	0.1	.4	0.1
Construction	1.1	4.6	23.3	5.3	1.1	4.7	21.8	4.9
Manufacturing	1.2	5.1	71.3	16.2	1.2	5.3	72.4	16.3
Transportation, Communication and Public Utilities	0.8	3.5	23.0	5.2	0.8	3.3	23.3	5.2
Trade	5.5	23.3	113.0	25.7	5.6	24.0	115.0	25.9
Finance, Insurance & Real Estate	.6	2.5	32.2	7.3	0.6	2.6	33.1	7.4
Services	3.5	14.8	83.2	18.9	3.6	15.4	84.3	19.0
Government	5.5	23.2	83.0	18.9	5.3	22.7	83.9	18.9
TOTAL	23.7	100.0	439.5	100.0	23.3	100.0	444.5	100.0

The construction labor force of Yuma is about 1,100 people and three local projects are known to be placing demands on this supply. The Colorado River crossing of Interstate 8 is employing about 75 people. Iowa Beef is planning a processing plant in Yuma that will require about 185 construction workers. These two projects should be completed in early or mid 1978. The Bureau of Reclamation's salinity control project now employs about 180 construction workers and this labor force is expected to continue expanding through mid to late 1979.

The rapid growth that has historically characterized Yuma is expected to continue. Economic growth to support the population growth is largely manifest in the Iowa Beef Processing Plant that may employ up to 1,600 people by the early 1980s.

1.2.3.2 TRANSPORTATION (AFERN 4.4.1)

The primary form of transportation to LAFR is by highway. Construction workers will commute to the site via highways, and much of the equipment and material will be delivered by highway. Some material will be transported by rail.

Highways

The major highway in the Yuma to Phoenix transportation corridor is Interstate 8 (U.S. 80), a four-lane divided highway with limited access. Off-ramps are located at: Wellton, Roll, Tacna, Mohawk, Dateland, Aztec, and Sentinel in the vicinity of the construction site. Table 10 summarizes the traffic characteristics on Interstate 8.

Table 10. Traffic volumes on Interstate 8 between Yuma and Gila Bend (44).

TRAFFIC CHARACTERISTICS	MEASURE
ADT[1] on Highway Segment	
Yuma to Wellton	5,700 ADT
Wellton to Maricopa County Line	5,200 ADT
Maricopa County Line to Sentinel	5,600 ADT
Sentinel to Gila Bend	5,400 ADT
Traffic Composition	
Peak Hour (percentage of daily traffic occurring during the hour of most heavy usage)	12 percent
Peak Hour, Trucks (percentage of trucks during the peak hour)	10 percent
Overall Trucks (total percentage of trucks)	17 percent
Travel in heaviest direction during peak hour (percentage of traffic going in a single direction during the peak hour)	55 percent
Average Vehicle Occupancy	
Overall	1.8 persons/vehicle
Out of State	2+ persons/vehicle

[1]ADT = Average daily trips by vehicles using the highway.

Traffic characteristics are expressed in terms of average daily number of trips (ADT) occurring on different segments of Interstate 8. The traffic composition figures from Table 10 show that there is no heavy peak hourly traffic flow, nor is there a strong unidirectional flow.

No paved roads exist inside the range in the vicinity of the project site. There are a few jeep trails crossing the range but these are rarely used. The general public is not allowed to travel within the boundaries of LAFR without express permission.

Rail Transportation

Rail service is provided in southwestern Arizona by the Southern Pacific Transportation Company. One line connects Yuma, Wellton, and Phoenix and another connects Wellton, Gila Bend, and Tucson. An operational passing siding and an old spur exist opposite Stoval Airfield (abandoned). Table 11 summarizes present traffic on these two lines.

Table 11. Train traffic in the vicinity of the site (45, 46).

BETWEEN	FREIGHTS (Per Week)	PASSENGERS (Per Week)	TOTAL (Per Week)
Wellton & Tucson	140	0	140
Wellton & Phoenix	21	6	27

Air Transportation

Three airports with Federal Aviation Administration control towers exist in the vicinity of the site. They are Yuma International, Gila Bend and Pheonix Sky Harbor International. There are numerous abandoned airfields on LAFR, one of which is Stoval Airfield. Restricted flight operation areas exist around the base and the low level (under 18,000 feet [5,486 m]) flight paths. General aviation aircraft are prohibited from flying above the bombing range and typically follow low level flight paths in times of low visibility. Yuma International is used jointly by civilians and the United States Marine Corps; civilian traffic accounts for about one-sixth of the total operations (47, 48, 49).

1.2.3.3 ARCHAEOLOGICAL SITES

Three archaeological field surveys of the area likely to be affected by the project construction were conducted during the periods 28 to 30 September

1976; 6 to 10 April 1977, and 20 to 22 July 1977. A total of 42 sites were recorded during the field surveys. These can be grouped into five categories: trails (8 sites); temporary campsites (5 sites); rock features (10 sites); isolated artifacts (9 sites); and historic artifacts (9 sites). In addition, one natural feature that could be mistaken for a site was recorded as MAV-24. In accordance with federal guidelines, a map of all sites has been prepared and provided to the Arizona State Historic Preservation Office (along with a copy of this EIS) and is on file at the Arizona State Museum. A determination of National Register eligibility is being pursued at this time. The map is not included in this EIS in order to minimize disturbance of sites or unauthorized removal of artifacts. However, the approximate study area is mapped in Figure 24.

The method employed on the first survey in September 1976 was to zig-zag back and forth along a corridor which extended at least 70 ft (20 m) along each side of the project centerline. Vegetation was very sparse along the line, thus visibility was good. A second intensive field survey was carried out along a 2,000 ft (614 m) wide corridor along the southeast side of the proposed long trench alignment and along a similar corridor to the southeast of the short alignment during the period 6 through 10 April 1977. Each of three archaeologists covered a transect approximately 330 ft (100 m) wide by walking in a zig-zag pattern. In this way it was possible to examine the entire 2,000 ft (614 m) corridor by walking the 1,000 ft (307 m) closest to the staked line for a given distance, and then reversing direction to cover the outer 1,000 ft (307 m). The third phase investigation concentrated in the area 1,000 ft (307 m) northwest of the proposed alignments, with techniques similar to those used on the southeast side. The third survey period was 20 to 22 July 1977.

As archaeological features were encountered they were assigned sequential field numbers (e.g., MAV-17). Then, descriptive information about the feature and its setting was recorded, the feature was mapped and photographed, and in most cases where artifacts were present they were collected. All artifacts and field notes are on file at the Arizona State Museum in Tucson, Arizona. When sites were encountered they were recorded on the Arizona State Museum site survey form. The policy followed in making artifact collections was as follows:

1. Where artifacts were found within the project right-of-way, a detailed map was made and all artifacts were collected.
2. When artifacts were found outside the project right-of-way, they were mapped and only a minimal collection for identification purposes was made.

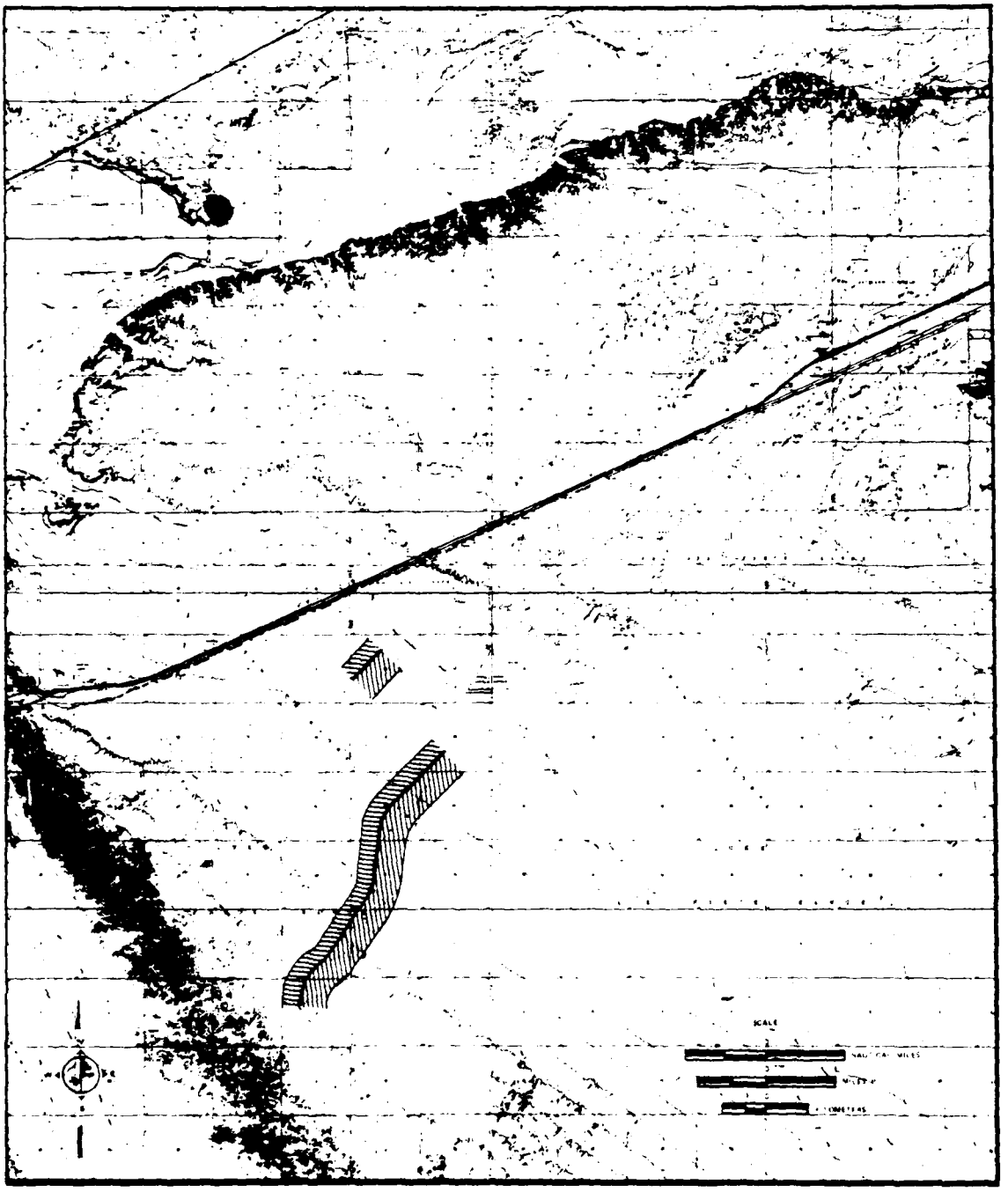


Figure 14. Approximate areas in which detailed archaeological field surveys were made in October 1976 and April 1977.

1.2.3.3.1 Trails

Field Numbers: MAV-1, MAV-2, MAV-13, MAV-19, MAV-21, MAV-29, MAV-31, MAV-35

Eight trails were discovered during the archaeological survey of the project area. Seven of the trails run roughly parallel to one another and to the Mohawk Mountains. They occur on the lower portion of the upper bajada and they are visible only where they cross desert pavement. While it is possible that prehistoric travellers walked along the lower bajada as well, and that these trails simply were not preserved, it seems more likely that most travel was restricted to the lower portion of the upper bajada. Several reasons can be suggested in support of this contention. First, the soft soils of the lower bajada make walking more difficult in comparison to walking on the hard desert pavement. Second, by walking on the upper bajada long distance travellers would be closer to the mountains, the most likely source of water during most of the year. A third factor which may have encouraged travel on the lower portion of the upper bajada is the distribution of three species of economic plants. The ironwood, blue paloverde, and yellow paloverde all reach their highest densities in this area today.

The seven trails parallel to the Mohawk Mountains can be divided into two different types. The first type, trails with associated ceramic artifacts, includes MAV-1 and MAV-31. The other five trails (MAV-2, MAV-13, MAV-19, MAV-29, and MAV-35) had no pottery associated with them along the areas walked to date. Several interpretations of this situation are possible. First, there may be a temporal difference between the trails: those trails without ceramics may be earlier in time. Second, trails where pot breaks were relatively common, may have been used much more often than the other trails and that the high frequency of artifacts reflects this high frequency of use. A third possibility is that the trails had a different function, for example, the trails without artifacts may have been used for running, since competitive running was an important activity among many of the ethnographically known groups in southwestern North America.

The ceramics along MAV-1 provide some evidence for estimating the time period when this trail was utilized. Since the earliest reported dates for the manufacture of Lower Colorado Buff Wares are between A.D. 700-800 (50, 51), it is clear that at least some of the use of the trail postdates this time. Pottery from seven vessels was collected from along this trail, but only one of these vessels is temporally diagnostic. One large stuccoed bowl was recovered (Component 4), and according to Harner (51) the application of stucco to the outside of vessels was practiced during the period A.D. 1300-1700. Since present knowledge of the chronology of Lower Colorado Buff Wares derives largely from a single stratified site, these dates must be accepted with caution. It cannot be assumed that all use of this trail dates within this 400 year time period, for the majority of the pottery recovered from the trail cannot yet be temporally placed.

Two trails (MAV-21 and MAV-31) were encountered which run perpendicular to the mountains. MAV-21 is outside of the direct impact zone of the project, and it heads directly toward the small rock tank (natural water catchment) in the Mohawk Mountains. Several pot breaks occur along this trail. Due to the fact that this trail lies outside the direct impact zone, it was not recorded in detail. MAV-31 roughly parallels the large wash in the Mohawk Mountains and may join MAV-20, MAV-30, or MAV-37. Or it may northward along the base of the mountains and become part of MAV-35. Most sherds at MAV-31 were only 2 to 3 cm and scattered over an area about 10 m in diameter. Four sherds were collected.

1.2.3.3.2 Temporary Camp Sites

Field Numbers: MAV-3, MAV-4, MAV-20, MAV-30, MAV-31

A temporary campsite is a place where everyday activities such as food preparation, eating, and sleeping take place on a short-term or seasonal basis. Specialized activities, such as hunting or plant processing, may occur at or near such a location as well, but archaeological remains of everyday activities need to be identified before a site can be classified as a temporary camp. However, the shorter the occupation of a camp the less likely it is that such material evidence will have entered the archaeological record. At MAV-3, for example, pottery, grinding tools, and a possible hearth were found in close association which strongly suggest that food preparation and consumption were occurring here. At MAV-4, MAV-30 and MAV-31, several grinding tools suggest that food processing took place, and the amount of use wear on these tools, while slight, probably required more than a single day to develop. Thus we can infer that these sites served as a campsite, though probably a briefly occupied one. At MAV-20 the evidence is much less direct. Only nonlocal cobbles occur at this site, and most of them show evidence of intentional modification through hard hammer percussion. Our limited understanding of this site makes its classification as a campsite rather tentative.

An especially interesting aspect of these three camp sites is the diversity they suggest. MAV-4, MAV-32 and MAV-31 are in the upper bajada, close to the mountains and a possible water source. The large number of grinding tools present suggests that local plant resources were being exploited - possibly seeds from the leguminous trees that line the washes. MAV-20 is located on the lower bajada, and its function remains unclear for the present. MAV-3 is located within the playa. While it is difficult to understand why a camp would be set up in a location subject to flooding, two factors might account for this. First, the drainage pattern may have been different in the past, and as a result water may not have stood in the same areas as it does today. Second, the playa may have been only partially full when this camp was established. While a number of possible resources may occur in the playa area it has not been possible to determine what specific resources may have been exploited by the occupants of MAV-3.

Another interesting point about the temporary camps is that their small areal extent and the small numbers of artifacts discarded suggest that

they were occupied by small groups for rather short periods of time. Ability and willingness to live in small, mobile groups seems to have been the key to survival in this harsh environment. The large number of trails encountered within the study area is consistent with this need for mobility as well.

1.2.3.3.3 Rock Features

Field Numbers: MAV-6, MAV-7, MAV-8, MAV-9, MAV-10, MAV-11, MAV-28, MAV-34, MAV-36

While all occur on the desert pavement of the upper bajada, there is a great deal of variability in what have been designated here as rock features. All consist of clusters of rock which clearly are not in their natural context. In some cases the rocks are not of the same type as those which make up the surrounding desert pavement. In several cases large and medium-sized rocks have been placed in artifical clusters, two of which are roughly oval or circular in shape. In no cases were artifacts associated with these features, a fact which makes interpretation of these rock clusters especially difficult. Along the lower Colorado River roughly comparable rock features have been reported (52, 53), but they are usually in immediate association with trails and have been called "trail shrines." "Trail shrines" often have pottery "offerings" on and around them. None of the rock features from the project area is directly associated with any of the trails, however.

Since no definite conclusions can be reached as to the function of these features, a number of hypotheses is suggested.

1. These features may be shrines.
2. The rocks may be the remains of temporary shelters. For example, they may have held down brush which functioned as a windbreak.
3. The rocks may be markers. They may indicate the locations of especially productive ironwood groves, or that water and/or food are cached nearby, for example.

Aside from the trails these rock features were the only evidence of human activity on the desert pavement. All other evidence was restricted to the areas along the washes.

1.2.3.3.4 Isolated Artifacts

Prehistoric Artifacts - Field Numbers: MAV-5, MAV-12, MAV-25, MAV-26, MAV-27, MAV-33, MAV-38, MAV-41, MAV-42

Both prehistoric isolated artifacts were cores and both were found in close proximity to washes. The cores recovered from MAV-5, MAV-12 and MAV-26 show only unifacial retouch, and the edge thus created is backed

with cortex. The steep edge angles of 60 degrees and 65 degrees, respectively, on these two cores are similar to the mean edge angle of about 70 degrees that Goodyear (54) reports for his sample of 127 core tools. Thus the two prehistoric isolated artifacts recovered from the project area morphologically meet the definition of a core tool. Because the primary use of such tools may be wood procurement (54) close association of the cores with drainage systems (and therefore trees) suggests wood procurement as a possibility here as well.

The small sample of cores recovered from the project area does not allow us to rule out the possibility that these cores were used only for deriving flakes. In fact, the occurrence of a flake derived from the core at MAV-12, MAV-25, MAV-27 and MAV-38 tends to support this latter hypothesis. A much larger sample of isolated cores would be necessary so that their morphology and spatial distribution could be studied in order to derive meaningful patterns.

A flake core and associated flakes were found near the trail, MAV-2, as it crossed a wash. While it still seems probable that the association of this core with the trail is a valid one, the apparent association of cores with wash systems noted above suggests that the association of the flake core with MAV-2 may be due to chance.

MAV-38 contains both sherds and a flake while MAV-33 is a projectile point possibly used in hunting. It is also possible that this projectile point was a spear flint contemporaneous with MAV-37.

Historic Artifacts - Field Numbers: MAV-14, MAV-15, MAV-16, MAV-17, MAV-18, MAV-22, MAV-23, MAV-32, MAV-40

Within the direct impact zone historic artifacts were encountered only on the lower bajada. There was no indication that there had ever been an actual historic occupation of this area, rather it appears that the historic artifacts were carried to this area from elsewhere - possibly from now abandoned Stoval - to be discarded. Only one of the historic artifacts, a wine bottle that probably dates from the period 1890-1920 (MAV-22), appears to be over 50 years old. This bottle was collected and is in the collections of the Arizona State Museum.

An alternative source for the historic artifacts may have been from miners, although if this were the case it seems likely that the artifacts would have occurred on the upper bajada and at the base of the mountains where mining and prospecting activities would have taken place. A single small cluster of hole-in-cap cans was discovered very near the mountains to the southwest of the main alignment (outside the impact zone). A second cluster of cans, both hole-in-cap and tin can top, was located at MAV-32 while MAV-40 contained a can with lapped and crimped seams. The association of these cans with a small cleared area suggest that this was a campsite. The hole-in-cap cans suggest a date in the mid-1920s or earlier while other cans postdate 1920.

SECTION 2

RELATIONSHIP OF PROPOSED ACTION TO LAND USE PLANS, POLICIES, AND CONTROLS FOR THE AFFECTED AREA

2.1 LAND OWNERSHIP (AFERN 4.4.3)

The proposed site is in Yuma County, Arizona, where only 8 percent of the total area of 10,020 square miles of land is privately owned. That remaining is owned by either the federal government or by the state; some of this is leased for private and public ventures. This type of non-local, nonprivate ownership results in large areas of land outside the normal local land use and zoning controls, and as such, the impact of local land use policies on the project is minimal.

Only two local agencies, the City and County of Yuma, are known to have prepared land use plans for the general area. The City of Yuma's Planning Area is at least 50 miles (80 km) from the site and will not directly affect or be affected by activities at the site. County zoning does not include land on the Luke Air Force Range, but offsite alternative uses could be affected by onsite projects. This is not anticipated as a result of construction since no hazardous activities, beyond normal construction risks, are planned onsite and no long term operation phase is included in the project. The project is short term and involves few construction workers or professional and supervisory personnel.

Potentially affected privately owned land is concentrated on a strip that is adjacent to both sides of Interstate Highway 8, between the eastern county line and the City of Yuma. This strip varies in width from less than a mile to 20 miles (32 km). With the exception of the immediate area on LAFR no direct effects on land use and management are anticipated as a result of construction of the trenches on the Range. Some indirect effects will occur in the small towns located on Interstate 8 between Gila Bend and Yuma.

The closest of these to the site is Dateland. There is room for residential expansion and development in the subdivisions near this town that were planned and later abandoned. Some plots and utility connections have been laid out. However, the cost of relocating a work force of any

size would be prohibitive since neither sewerage systems nor housing structures exist. Because the town is basically a way-station for travelers on Interstate 8, there is neither sufficient housing in the town nor the social amenities to encourage relocation of a work force to the area. No changes in land use are anticipated.

The same pattern emerges in each of the small towns between Dateland and Yuma; no or little acceptable vacant housing, few social attractions, and only the minimum numbers and types of retail commerce. It is, therefore, unlikely that this project will spur the development or expansion of residential areas between the project site and the closest, large urban areas. The more probable alternative is that the required work force would live in Yuma and commute the 60 miles (96 km) to the site.

The lands within the site boundary are owned by several agencies including the Bureau of Land Management (BLM), Air Force, and the State of Arizona (Figure 25). Non-Air Force lands would revert to control of these agencies and to jurisdiction of the Public Land Laws should the Department of Defense relinquish control.

State Trust Lands are parcels of land owned and administered by the Arizona State Land Department. They were deeded to the State of Arizona by the federal government through the enabling legislation that brought Arizona into the Union. The purpose was to leave the state with suitable land it could lease out for purposes such as grazing and prospecting. The revenues from these leases pay for public institutions like schools and hospitals. The State Trust Lands on the Luke Air Force Range have been withdrawn from leasing to the public and are now paid for by the Department of Defense.

2.2 LAND USE ON LAFR

The Luke Air Force Range, originally activated in 1941, is currently controlled and administered by the 58th Tactical Fighter Training Wing (TFTW), Tactical Air Command (TAC), Luke AFB, near Phoenix, Arizona. Although the physical real estate of the Range is under the control of the 58th TFTW, a use agreement exists between TAC and the U.S. Marine Corps, Yuma Marine Corps Air Station. In this agreement, Yuma MCAS is responsible for administration of the airspace over the western sector of the Range which extends westward from a buffer zone, located over the Mohawk Mountains. The western sector of the range includes two air-to-air and two air-to-ground ranges plus an air combat maneuvering instrumentation range. The use of the western sector is currently confined to radio controlled air-to-air gunnery due to the HAVE HOST project. This restriction is expected to continue throughout the proposed project duration. The eastern and central sectors are used as tactical air-to-ground bombing and gunnery ranges and air-to-air gunnery, respectively, by the 58th TFTW. The range is also routinely used by the 355 Tactical Fighter Wing (TFW) at

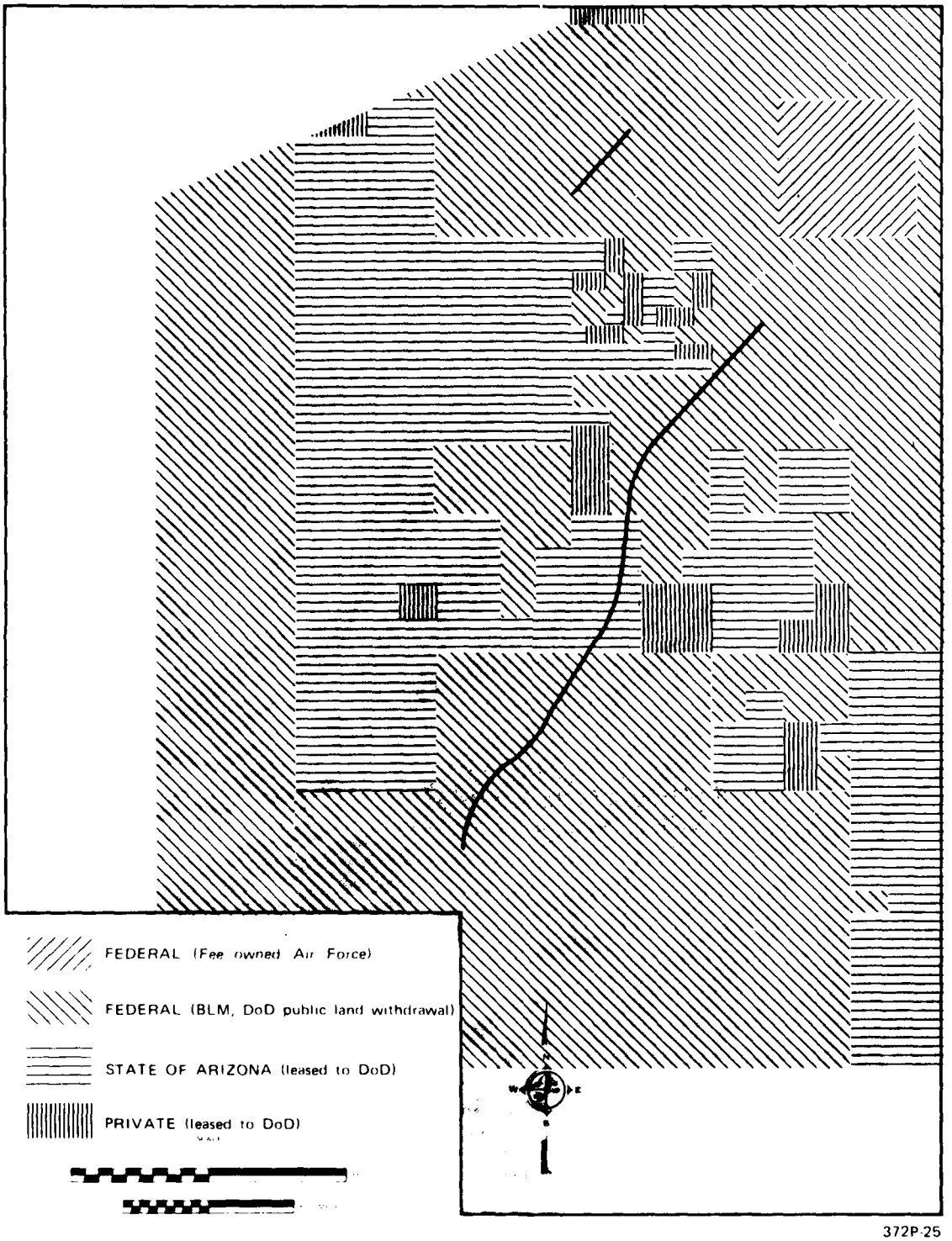


Figure 25. Land ownership in the project area.

Davis-Monthan AFB and the Air National Guard unit at Tucson. Live firings are made routinely on the eastern and central sectors, whereas the use of live ordnance occurs only one to two times yearly in the western sector (55). The proposed project site is located east of the Mohawk Mountains.

Long-range plans for LAFR include a variety of improvements in scoring, monitoring, and targets on the range compatible with the current mission. An Air Combat Maneuvering Instrumentation (ACMI) is planned for fiscal year 1979. This installation will result in an increase in the frequency of sonic overpressures in an area nominally 30 miles (48 km) diameter, and southeast of the proposed site. The earliest possible operational date is October 1978, or after trench construction, so no incompatibility of the two projects is anticipated (81). Short-range plans are to continue LAFR in its current usage, although both short- and long-range plans may be affected by future congressional action on the Cabeza Prieta Wilderness Area proposal (below).

The Mohawk Mountains and sand dunes to the west of the site currently have the status of a proposed natural area under the jurisdiction of the Arizona State Parks Board (73). Wachter et al. (74) have identified the section of the mountain range from Interstate 8 to the wind gap approximately 18.6 miles (30 km) south (including a part of the proposed site near the mountains) and all of the sand dunes as an area of highest national significance as a potential regional natural area. The reasons for this designation are the pristine character of the dunes which have not been traversed by dune buggies, the youth and striking topography of the Mohawk Mountains, the peculiar locations of the dunes on the windward side of the mountains and the interesting biology of both the dunes and the mountains. The proposed project site is separated from the dunes by the mountains.

The only designated special use area within the Range is the Cabeza Prieta National Wildlife Refuge which is administered by the U.S. Fish and Wildlife Refuge. The Cabeza Prieta National Wildlife Refuge was established in 1939 as the Cabeza Prieta Game Range and existed as such until March 1975, when its designation was changed by Secretarial order (55). The refuge encompasses over 940,000 acres of the southeastern portion of the Range. To date, major portions of the Cabeza Prieta National Wildlife Refuge have been proposed for inclusion under the Federal Wilderness Act of 3 September 1964 (56). The proposal and draft environmental statement were submitted in 1971 by the U.S. Fish and Wildlife Service with a request that Congressional action await completion of both aerial and ground surveys of the area by the U.S. Geological Survey to assess the mineral and geothermal power potential of the refuge. As of January 1977, the mineral assessment had not begun. There is reason to believe that Congressional action may take place within the next 5 to 10 years to designate the refuge as a Wilderness Area because of its significant ecological value for scientific and recreational uses (55).

SECTION 3

IMPACTS OF THE PROJECT ON THE ENVIRONMENT

3.1 IMPACTS ON THE PHYSICAL ENVIRONMENT

To provide a basis for comparing the amount of land and land-associated biological and archaeological resources to be disturbed by the project, the overall area of the eastern bajada of the Mohawk Mountains (bounded on the north by Interstate 8; on the west by the base of the mountains; on the east by San Cristobal Wash; and on the south by the wind gap located approximately at the border between Township 10 South and 11 South) was measured from a satellite (LANDSAT) image. The areas of varnished desert pavements that are clearly visible on the image were also measured. The overall area of the bajada is approximately 100 sq. miles (25,900 ha) and the area of varnished desert pavement is approximately 53 percent of the total area (53 sq. miles or 13,700 ha). The total area to be disrupted by construction of the trenches and ramps is approximately 183 acres (74 ha) of which approximately 36 acres (15 ha) is covered by varnished desert pavement. Additional roads and equipment yards will increase the disrupted area of the site to approximately 200 acres (81 ha).

The total area of disturbance will be approximately 0.3 percent of the total bajada. The amount of desert pavement which will be disrupted is approximately 0.1 percent of the total amount of desert pavement on the bajada. The trench alignments will disrupt a relatively small percentage (estimated to be between 0.003 and 0.03 percent) of the water courses on the bajada because they trend nearly parallel to most water courses.

3.1.1 Effects on Geomorphology

The major potential adverse impacts on the geomorphic physical environment will result mainly from: 1) the placement of the spoil material over the natural surface and; 2) the disruption of existing surface features such as desert varnish, desert pavement, thin carapace surfaces, coppice dunes, drainages and the playa by construction activities and off-road vehicle traffic. The natural surface features on the bajada are directly related to the physical processes that maintain an equilibrium between erosion and deposition by wind and water movements. Virtually all physical features of the desert environment are closely interrelated. Disruption of these variables modifies the equilibrium; this in turn accelerates erosion and deposition until a new equilibrium is established. In addition, the disruption of the physical features may produce long-lasting changes that can modify the aesthetics of the area.

The surface character of the natural bajada and its drainages will be altered in the siting area by the excavation and backfill of the trenches and the spreading of spoil material. The physical appearance of the trench alignment after completion of construction activities will be a mounded berm reaching a height of less than 1 ft (.3 m) at its center and tapered toward the edges of the 328 ft (100 m) wide disturbance. The exact height and width of this berm will depend on the amount of backfill used in the trenches and the amount of unsuitable backfill material. The disposal of unsuitable backfill material, such as clasts larger than 6 in., will also add to the surface relief or character of the spoil berm surface.

If there is insufficient backfill material to bring the trench excavations back to finished grade, excess material will be imported from other sections of the alignments, thus reducing the amount of spoil in those sections. However, measures will be taken in using imported material to ensure that the uppermost few feet of the backfill are of a grain-size distribution similar to the natural near-surface material. This will aid in reducing the change in character of the surface and facilitate restoration of the surface toward its original state.

In order to minimize the disruption of the natural drainages and to prevent blockage of the downstream flow, the grade of the trench alignment will be lowered at stream crossings such that the tops of the finished backfill will be flush with the bottoms of the water course. Erosion of the backfill material over the trench alignment is possible at these locations. Erosion may also occur to a lesser extent on the other portions of the spoil berms, until a stable surface is re-established. The total character of the original surface along spoil berms and disturbed areas will probably never be completely restored; however, the change in surface form caused by the height of the spoil berm will be a minor impact.

Soil losses (or soil transfer) due to increased susceptibility to water erosion in the 328 ft-wide (100 m) trench construction zone will occur only during periods of rainfall. The rate and duration of any rainfall, in relation to the schedule of construction activities, are primary variables controlling any estimation of soil losses (transfer). The variable nature of rainfall in the desert area makes rate and duration predictions difficult to quantify. Therefore, the evaluation of soil losses (transfer) has relied on the observable, physical factors of the desert site and a knowledge of the geomorphic processes that have occurred in San Cristobal Valley.

Water erosion and deposition of sediment are the dominant natural geomorphic processes that operate on the bajada. Figure 14 shows the location of drainage channels. The drainage pattern in the southwest part of the mapped area along the longer trench alignment is principally dendritic-tributary, indicating that erosion and transportation are dominant. In the northeast part, the drainage pattern is principally braided-distributary, indicating that deposition of sediment is the

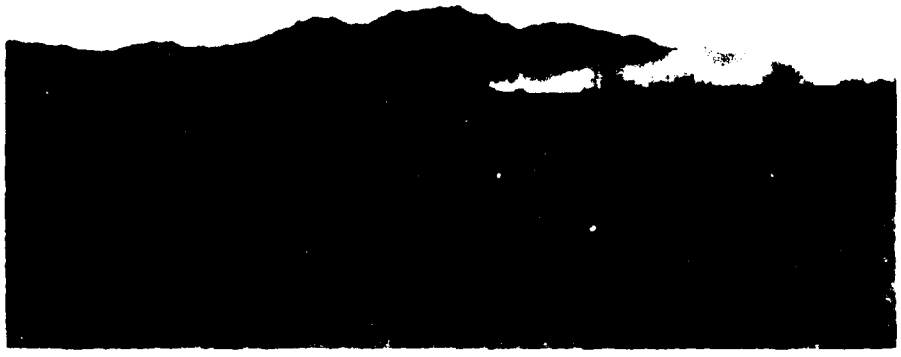
dominant geomorphic process. Finer-grained materials predominate in the lower elevations of the site, toward the northeast along the trench alignment. The gradient along the longer trench alignment decreases from a maximum of 3 percent at the southwest and to 0.5 percent at the northeast end.

Drainage profiles displayed in Figure 16 indicate high infiltration rates, reduced flow and velocities downstream, and concomitant deposition of suspended load in the lower bajada, as shown by 1) the reduction in cross-sectional area of the drainage channels and 2) the existance of natural levees in profiles in the area of deposition. Slope wash deposits in the area of deposition are additional indicators of the natural erosion/deposition geomorphic process taking place on the bajada.

The natural geomorphic process of sediment transfer due to erosion in higher, steeper slopes, and deposition in lower, flatter slopes will not be changed by trench construction. Some increase in water erosion in the upper reaches of the trench alignment may occur if heavy rainfall should occur at a time when open trenching reaches the area of steeper gradient. There should be no lowering of the base level controlling the gradient. Fill cover over the tunnel is to be compacted to essentially the same density as the natural material, and the alignment is essentially parallel to the drainage direction, crossing only two "major" drainages. The drainage cross-sections are to be returned to the pre-existing profiles at these two crossings which should minimize accelerated erosion in these area.

The most noticeable effect of the activities is likely to occur in the southwestern portion of the alignment where it crosses the darkly varnished desert pavements. Disruption of the fragile desert pavements will result in accelerated water erosion and fugitive dust generation both during and after construction activities. Dislodging, removing or burying the pavement particles, especially the darkly varnished particles, and compaction of the surface by vehicle traffic is likely to cause significant aesthetic impacts. The time required for natural processes to rejuvenate the desert pavements depends on a number of variables and the degree of damage. If the pavement particles are stripped or dislodged, many years are required before the pavement will show signs of rejuvenation (2) and at least 2,000 years are required for the desert varnish to show signs of forming.

Figure 26 shows an example of the disruption to a desert pavement surface by active off-road rubber-tired vehicle usage. Figure 27 shows the same road several years after abandonment. It can be noted that as long as the pavement particles are not stripped or dislodged, the pavement partially recovered. However, the tire ruts shown in Figure 27 will be visible for a long period of time. Figure 28 shows a road over a desert pavement; the road has been continually used and occasionally regraded as a result



372P-26

Figure 26. Example of a non-graded road over desert pavement. Surface disruption and dust have resulted from active rubber-tired vehicle traffic. The same road, partially recovered after several years without traffic is shown in Figure 27. Photo taken near Vidal, California in an area with desert pavement similar to that at the project site.

372P-27

Figure 27. A portion of the ungraded road over desert pavement shown in Figure 26 after several years without traffic and with normal wind and water erosion.

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of the compaction of the surface and the long time required for desert varnish formation, aesthetic impacts to the desert pavement surface will probably remain indefinitely.

In the lower northeastern portion of the site, where desert pavements are lacking, construction activities and off-road vehicular activity will disrupt the fragile carapace crust and other protective surface features. This will result in accelerated fugitive dust generation and water erosion both during and after construction until the protective surfaces can be reestablished. Compaction of the surface (e.g., by vehicle traffic) will result in ruts that could remain indefinitely as permanent scars. The spoil pile berm in this area, even though its relief is low, may result in: some development of erosion washes, concentration of stream flow on the upstream side, and a source of fugitive dust until a protective crust and vegetation are reestablished.

Observations of tire ruts in the lower bajada following a single rainy winter show stabilization resulting from formation of a thin clayey crust (carapace) interspersed with sand and from invasion by annual plants (Indian Wheat, see Figure 29). However, the compacted road ruts still remain as permanent scars and could concentrate surface runoff and result in local erosion. Smooth finish grading and water spraying will aid in reducing the depth of these road ruts and in accelerating the formation of the surface crust.

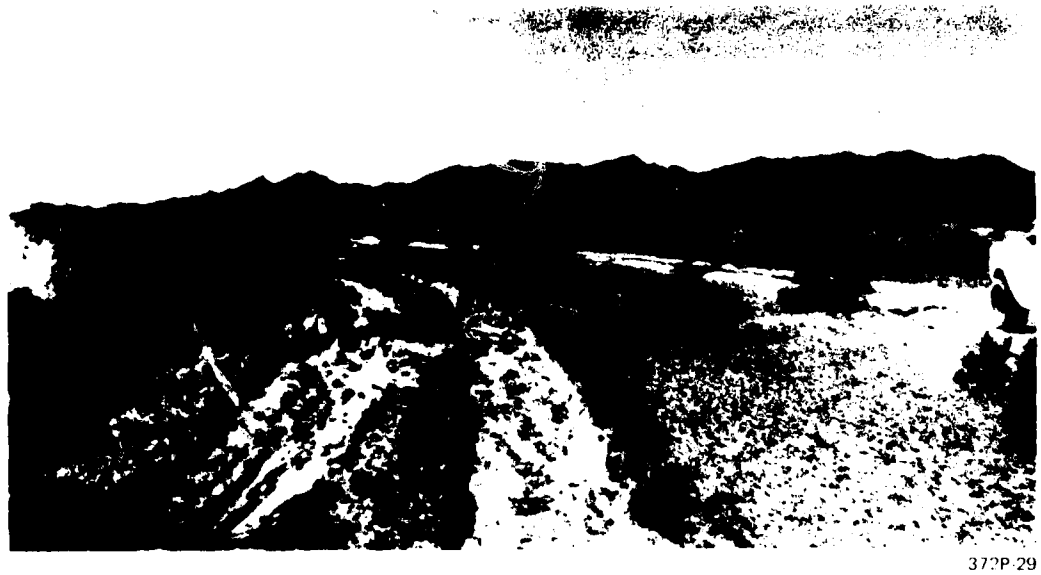
Improved access roads across the playa surface will remain as permanent impacts to the aesthetics of the playa.

3.1.2 Effects on Hydrology

The main impacts of the construction on the hydrology of the area will result from locally accelerated erosion and consequent sediment deposition downstream in channels that have been disturbed, blocked, or diverted. During construction, several drainages will have to be diverted away from the excavation into adjacent drainages which do not intersect the alignment downstream. Such diversion could result in a significant increase in downstream erosion and siltation if precipitation occurs during the construction period. Following construction, accelerated erosion and possible siltation might occur in sections of channels which have been rechannelized but not returned to their natural state. In addition, any significant cuts made in the channel banks to maintain the required 5 ft of cover as the alignment passes under channels will be potential areas of erosion.

372P-28

Figure 28. Graded road over varnished desert pavement. Photograph taken near Vidal, California.



372P-29

Figure 29. An example of soil stabilization and revegetation in tire ruts (left center foreground) on the project site following a single winter season. The ruts may remain indefinitely. Active tracks are shown on the right. Photo taken April 1977.

3.1.3 Groundwater and Water Quality

Self-contained portable chemical toilets at the construction sites will prevent sanitary waste impacts on groundwater. Liquid emissions from construction activities include equipment washdown water and spilled petroleum products. These emissions will have only localized surface effects because the low relative humidity in the environment tends to evaporate any washdown water and consolidate some petroleum product spill. Hence the amount of petroleum product spill that reaches the groundwater will be insignificant.

Surface silt transport in natural drainage channels following storms is usually substantial. Any additional turbidity in surface waters and subsequent siltation resulting from construction is unlikely to be detected except in specific watercourses directly influenced by construction or adjacent to spoils.

Infiltration of surface water and shallow groundwater might concentrate in the backfill material causing either (a) a perched groundwater zone adjacent to the buried structure or (b) accelerated groundwater flow and possible underground erosion adjacent to the structure. The completed structure might also act as a barrier to natural shallow groundwater conduits.

Effects of deriving project water from available groundwater sources were considered in terms of a "worst case" condition in which a 500 gallon per minute (gpm) flow would be required over a 4-month construction period. This value is the peak flow estimated to be required by the construction contractor if the project is to be completed in a 4-month period, and represents a total withdrawal over that period of 87.6 million gallons of water, as compared with the estimated 68.6 million gallons actually required.

Pumping at this rate from a deep well at Dateland is calculated to produce a lowering of the water table of as much as 2 feet at a distance of 2 miles during pumping. The Harris Cattle Company well at Dateland is the only producing well within this radius. If this well is not selected for use, it could potentially be influenced to a degree determined by the specific Dateland-vicinity site selected for withdrawal.

At the completion of pumping, water levels could be lowered 1 to 2 feet at a 1-mile radius from the well. This decline represents about 0.2 percent of the saturated zone penetrated by local wells and a 20 percent increase in the annual decline occuring under present drought conditions. This impact would be temporary and would not, detectably, affect local well yields (92).

A test boring approximately 2.6 miles southeasterly of the Wellton Rest Station well produced 140 to 180 gpm during air-lift testing. A two-well field in this vicinity would potentially produce 300 gpm from the "sandy gravel aquifer."

The sandy gravel aquifer is confined below by impermeable rocks and above by an aquitard, so that the water level may be expected to rise above the water-bearing strata when a well is drilled. This level is termed the "piezometric surface." Calculations indicate that the piezometric surface will drop approximately 1 to 3 feet at a distance of 2 miles after 4 months of continuous pumping from the vicinity of the test boring. There is, therefore, some potential impact at the Mohawk Rest Station well if this source is adopted.

The Rest Station well was drilled to a depth of 300 feet, and is producing from a depth of 110 feet, which has not changed measurably from October, 1968 through July, 1977. A serious impact on this source is not anticipated from minor changes in water level, depending on the depth setting of the pump.

Water could potentially be developed at a 500-gpm rate from a 3-well field near Stoval Field, producing from the "fine sand aquifer." Such production would produce a calculated drawdown of 1/3 foot at a distance of 1 mile from the field. This amount of drawdown would have negligible effect on unused wells two or more miles distant to the north on the opposite side of the highway. Use of this source is considered extremely unlikely owing to the poor quality of the water.

3.1.4 Impacts on Air Quality

The proposed action will result in a minor degradation of air quality in the vicinity of the project site as a result of:

1. combustion emissions associated with increased traffic to the site and operation of the construction and power generation equipment on site; and
2. fugitive dust generation associated with the cement batch plant, construction of access roads and from sand and gravel blowing off trucks, from the spoils piles, from vehicular movement, from trenching activities, and from breakout mechanism generator tests.

Due to the sparse population distribution in the project area, the only areas at which air quality impacts are expected to have a measurable effect are: the Interstate 8 rest stop near the Mohawk Pass and in the town of Dateland. These areas are of primary consideration because of their proximity to the site, approximately 3 miles (4.8 km) and 7 miles (11.3 km) respectively.

Normal vehicular emissions and calculated ambient pollutant levels at the Mohawk rest stop on Interstate 8 (see reference 88 for calculations) are listed in Table 12. To these are added the onsite and offsite emissions due to the construction project. Emission factors are from EPA

Table 12. Combustion emissions within San Cristobal Valley associated with transportation of construction crews and materials. Concentrations estimated at the I-8 rest stop are shown in parentheses.

ORIGIN AND DESTINATION	MILES	TRIPS/DAY	VMT	TOTAL LBS/DAY (ppm)			
				CO	HC	NO_X	PART.
Normal Interstate 8 Traffic[1]	13[2]	5,700	74,100	2,437 (0.16)	622 (0.04)	622 (0.02)	88 9 $\mu g/m^3$
Construction Equipment & Materials[3]	13	601	7,813	257 (0.02)	66 (0.004)	66 (0.002)	9.3 1 $\mu g/m^3$
Onsite Traffic and Construction[4]	5	31	155	5 (.0006)	1.3 (.002)	1.3 (.016)	0.18 .22 $\mu g/m^3$

[1]Determined to be 5700 vehicles/day travelling at an average speed of 50 mph.

[2]Thirteen miles is the highway distance across San Cristobal Valley, approximately from the Interstate 8 rest stop to Dateland.

[3]Includes commuting to and from the project.

[4]SO_2 combustion concentrations = 0.2 $\mu g/m^3$ calculated from estimated electrical generator fuel consumption and EPA emission factors.

publication AP-42, Supplement 5 (80). Commuting vehicles are assumed to be light duty automobiles or pickups with an average speed of 45 mph (72 km/hr). Construction equipment is assumed to be heavy duty diesels with an average speed of about 20 mph (32 km/hr). The emissions associated with the diesel-powered electric generators are listed in Table 13. The emission factors listed in Reference (80) are used to compute the combustion products.

The combined project-related internal combustion emissions will result in an approximate 24 percent increase in air pollutants currently being released into the San Cristobal Valley. Diffusion and dispersion of the CO pollutant was modeled using the line source HIWAY model (59). Although this model applies strictly to the nonreactive pollutants (e.g., particulates and carbon monoxide), it may be used as a guide to assess the expected levels of all pollutants at the highway's edge. Existing traffic generates an average CO level of approximately 11 ppm. This will be increased by as much as 5.0 ppm from construction traffic at peak hours. The nominal level of 16 ppm is well below the federal standard of 35 ppm for a 24-hour day (Table 4).

The impact from combustion products associated with the proposed action is thus considered minor with respect to the existing highway background air pollution levels.

Table 13. Combustion emissions associated with diesel-powered electric generators for an 11-hour day.

APPLICATION	POWER RATING	KWH
Office, Shop	335 kW , 2 ea	7,370
Job Water	800 kW , 1 ea	8,800
Batch Plant	150 kW , 1 ea	1,650
Trench Ventilation	500 kW , 1 ea	5,500
TOTAL KWH		23,320
TOTAL CO emissions (lbs/day)		209
TOTAL HC emissions (lbs/day)		77
TOTAL NO_x emissions (lbs/day)		968
TOTAL PARTICULATE emissions (lbs/day)		69
TOTAL SO_2 emission (lbs/day)		64

The construction site is a potential source of fugitive dust emissions which may have a temporary impact on air quality. Dust emissions from trenching, concrete batch plant operations, aggregate handling and vehicular operations vary substantially from day to day. The dust levels from these activities based on estimated activity levels and material quantities range up to 6750 lbs/day (3068 kg/day), using emission factors available from the EPA. When converted to airborne concentration levels at the rest stop on Interstate 8 by the method used in compiling Table 12 (details of the computation are given in the baseline studies (88), the resulting value is 507 $\mu g/m^3$. This exceeds the Arizona Air Quality Standard but indicates a visibility of 71 miles (114 km) so little restriction to the generally good area visibility would be noticed. In effect dust clouds visible in the construction area would be attenuated by the time they reach the highway. The movement of large dust particles due to wind (i.e., the erosion of exposed surface soil) is sensitive to the wind speed with a threshold value of approximately 12 mph (85).

The amount of material that will be entrained and suspended by the wind is a complex function of the particulate distribution in the soil, surface roughness, soil moisture, vegetation cover, and soil surface cementation. A simplified "windblown dust" equation adopted by the Environ-

mental Protection Agency (86) and based on a method developed by the Department of Agriculture (87) has been used to estimate soil erodability of the area and is of the form:

$$E_s = AIKCL'V'$$

where E_s = suspended particulate fraction of wind losses of tilled fields, tons/acre/year

A = portion of total wind erosion losses that would be measured as suspended particulates

I = Soil erodability (geological units), tons/acre/year

K = surface roughness (h^2/W, h = ridge height, W = ridge spacing)

C = climatic factor ($0.345\ U^3/(PE)^2$, U = wind velocity, PE = soil moisture

L' = unsheltered field width factor, dimensionless

V' = vegetative cover, lbs of air dried residue/acre

For this analysis the bajada was considered to be composed of three soil types (see Figure 13 for the three major geologic units), and E_s was calculated independently for each of the three. The mean effective soil erodability for the bajada soils was thereby calculated to be 2.5 tons/acre-year (full calculations appear in Reference 88). For the purposes of comparison, the area mapped geologically in Figure 13 (and shown as an outline in Figure 18) was considered the existing source of particulates on the site. Its total area is 14,000 acres (5668 ha). Based on the 2.5 tons/acre-year value, yearly wind erosion for this nominal source area are 35,000 tons/year. The calculations made some nominal assumptions about variations in soil moisture, or surface stabilizing factors such as the carapace crust, and surface vegetation. Values have not been determined experimentally onsite and the true values could result in less erosion than predicted.

The potential erodible surface of the spoils piles compacted on top of the trenches (0.7 ft or 0.2 m deep and 328 ft or 100 m wide) will have an estimated total exposed area, including access roads, of 200 acres (0.8 km^2). The initial (1st year) erodibility of this material is estimated to be approximately 10 tons/acre-year or approximately 4 times that of the undisturbed alluvium. The maximum potential soil loss due to wind erosion would be approximately 2,000 tons/year or 5 to 6 percent of the present estimated background erosion loss. By contrast, a 200 acre (0.8 km^2) undisturbed area along the alignment would contribute an estimated 500 tons/year.

Under the normal low wind conditions (average velocity 5 mph), maximum particulate levels at the Mohawk Pass or at the Interstate 8 rest stop would be in the estimated range of 14 to 28 $\mu g/m^3$ which is typical of desert background sites (Table 4). Additional windblown dust could reach the rest stop from the spoils piles on the construction site during periods of winds as low as 5 mph. Winds of this speed are calculated to add approximately 3.6 $\mu g/m^3$ to the background levels. Under these conditions, total particulate levels will remain below the federal air quality standards of 60 $\mu g/m^3$ (annual geometric mean) listed in Table 4. Progressively more particulates become airborne as wind speeds increase, and at wind speeds above 12 mph (85) visible dust is expected in the vicinity of the spoils piles. Substantial dust generation is not expected, however, except during the severe dust storms that occur naturally in the region. Such storms occur about 0.5 percent of the time annually or 2 to 3 days each year in southwestern Arizona, and are generally most frequent in March (12.)

The amount of dust that will be raised by vehicular travel along roads and the trench alignment of the project site has been estimated at 4 to 6 lbs/mi traveled based on studies done in a similar situation on gravel roads near Tucson, Arizona (60). The speed range of vehicles on the access roads of the project site was assumed to be 15 to 20 mph and the silt content of the road surface material to be around 17 percent by volume which is typical of the kind of road on the site. These values were used along with the projected average distances of onsite travel to provide a reasonable upper limit of 30 tons/day of dust likely to be generated as a result of construction activities. Watering the roads, as will be done on the project site, will reduce the dust emissions by at least one half (60).

Erosion potential of the finished trench surfaces is expected to decrease rapidly because of the formation of crust (carapace) on exposed surfaces in the short term. The invasion by soil lichens and annual plants, as well as the formation of desert pavement in rocky areas, is possible in the long term. Revegetation of rutted areas (that collect water) has been observed to occur rapidly on site. Conversely, revegetation of raised berms adjacent to Stoval Airfield has not occurred at all, but the soil has nevertheless stabilized. The potential for revegetation of the spoils areas may not be great, but the erosion potential is expected to reduce rapidly.

During the two breakout tests, dust will be generated. Also exhaust gases resulting from the gas-driven hydraulic lifters will be expelled into the atmosphere. The chemical constituents of the exhaust gases are unknown since the propellant composition for the gas generator has not yet been selected. However, due to the short duration of the action time and the thermal buoyancy of the exhaust gases, the concentrations of particulates and exhaust gases are not expected to be detectable at the Interstate 8 rest stop or at Dateland.

3.1.5 Noise Impacts

Noise originating on site will be either undetectable or completely masked by nearby traffic at the two areas identified as being sensitive from a human standpoint: Dateland and the rest stop on Interstate 8 at Mohawk Pass. There will be a considerable increase in vehicular traffic through Dateland, however, and the noise will be increased substantially. Since vehicular traffic will pass only during the day, impacts are expected to be small. If aggregate is obtained from Tacna, there will be additional noise in that community associated with increased truck traffic.

3.2 EFFECTS ON THE BIOLOGICAL ENVIRONMENT

The project will disturb only a small part of the existing habitat on the eastern bajada of the Mohawk Mountains. There will be permanent losses of some vegetation and its associated fauna along the trench alignments and downstream from washes in which normal drainage patterns have been disrupted. From an areawide standpoint, these losses will be minimal. The overall characteristics of the bajada ecology will not be permanently changed and any direct losses of animals will not be of any long-term significance.

Most areas disturbed during the past 25 to 35 years in the vicinity of the project site have substantial vegetative cover, but still show signs of disturbance, especially the absence of established populations of longer-lived shrubs, trees, and large cacti. Recovery for these species is, therefore, inferred to take a longer period of time than this.

Annuals recover quickly, 1 to 3 years depending upon dispersibility of the species and the rainfall conditions in the years immediately succeeding the disturbance. *Plantago insularis* and annual species of *Eriogonum, Cryptantha,* and *Camissonia* would be expected to be among the most conspicuous initial invaders. Species of Globemallow (*Sphaeralcea* spp.), Desert-trumpet (*Eriogonum inflatum*), sandmats (*Euphorbia*) and other short-lived perennials would invade relatively quickly (2-5 years). The smaller shrubs especially *Hymenoclea, Encelia,* and *Ambrosia* would invade more slowly, but some individuals are likely to become established within a decade of the disturbance. The larger shrubs, trees, and large cacti generally have fewer and less dispersible seeds, lower rates of establishment, slower growth rates, and longer time to maturity. As a result, they may not reach pre-disturbance size and density until a much longer time than 35 years has elapsed. Their establishment in some cases is further limited by the requirement of a "nurse-plant" for establishment, as has been well-documented for saguaro.

Animals directly impacted by trenching activities are expected to show no long-term detrimental effects, but will reinvade the area either immediately after disturbance or as soon as vegetative conditions allow their invasion and establishment.

Nocturnal rodents may be favored by large seed crops produced by annual plants in the disturbed soil and may also find the disturbed soil a favorable substratum for burrow construction.

3.2.1 Effects on Vegetation

The immediate effects on the project site will be the loss of vegetation wherever construction activities occur. Since there are no threatened or endangered species of plants on site, there will be no impacts on federally protected species. Plant species protected by Arizona law may be cleared or removed from construction sites. In the paved parts of the bajada near the mountains where vegetation is confined to arroyos and washes, losses will occur only at arroyos or wash crossings. On the lower bajada, vegetation also occurs between washes so that plants will be lost wherever disturbance occurs. The total densities of plants and the species composition varies with the altitudinal gradient along the bajada so that total numbers and species of plants removed vary depending on location. Plant densities at various locations are documented in the baseline studies. The amount of vegetation that will be lost will be simply a function of the total area disturbed. As indicated in Section 3.1, the total area disturbed will be ∿0.3 percent of similar area along the eastern bajada of the Mohawk Mountains and only ∿0.03 percent maximum of watercourse area. The direct vegetation losses will not in any measurable way alter the overall biological processes or productivity of the bajada.

Secondary impacts on vegetation include the probability that wherever water is sprayed on surfaces for dust suppression, adjacent vegetation is likely to thrive and to be more productive than that in the surrounding areas, which are dependent on natural precipitation and run-on. At the HAVE HOST site 32 miles (51 km) to the west, for example, ocotillo immediately adjacent to the watered roads have become considerably more lush than those even several meters away from roads. Additional secondary impacts on vegetation may occur as a result of diversion of surface and subsurface water transport away from watercourses crossed by the trenches and roads. The fact that most of the vegetation on the bajada is associated with watercourses, however small, indicates clearly the dependence of such biological communities on the periodic runoff following storms. Similarly, the vegetational pattern in each watercourse has become established in the existing flow regime and would likely change in species composition or abundance were water to be diverted to that watercourse.

Examination of arroyos that have been blocked by highway construction near the site shows that these watercourses, which once were heavily vegetated with trees, now support only a relatively uniform population of creosote bushes. A similar effect can be anticipated if any existing drainage patterns on the project site are permanently disrupted by any construction activities. Similarly, wherever new drainage channels are made intentionally, or result from erosion following surface disturbance, an increase in vegetation can

be expected to result. Since procedures will be followed to prevent any permanent surface diversion in arroyos, it is unlikely that there will be significant changes in distribution of perennial vegetation except in smaller washes.

Desert plants are not generally deeply rooted except where rainwater accumulates (63,64). One of the potential deep-rooted invaders that would benefit from increased standing water on the project site that could occur following construction and clearing along the watercourses at lower elevation is saltcedar (*Tamarix* sp.). This exotic species has replaced native plant associations in much of the Gila River drainage as a result of disturbance and changes of flow regimes (66) and it is well established to the north of Stoval Airfield across Interstate 8. Disturbance of drainage patterns in San Cristobal Wash, particularly any activities that result in ponding of water (67) could result in saltcedar invasions. Historically, however, where berms and ditches have been established around Stoval Airfield, the resultant vegetation where there was increased water consisted primarily of dense thickets of mesquite. Some of these are visible on the aerial photographic base maps (Figure 3) and one of the oblique aerial photographs (Figure 7) in this EIS.

The raised berms around the edge of Stoval Airfield have remained essentially barren (after probably 30 years of no disturbance) even though they are adjacent to thickly vegetated drainage channels. Apparently they do not absorb a sufficient amount of direct precipitation to support plants. This lack of revegetation may be instructive in predicting the vegetational fate of the raised surface of the trench alignment following construction. A compacted raised surface may eliminate runon and consequently may never become vegetated.

In the lower areas of the bajada where the surface is silty and unpaved, the more than 80 percent of the surface not covered with shrubs is populated to varying degrees with a thick black crustose lichen which is clearly of structural value. Soil lichens (68) and soil algae (69,70) are ubiquitous in desert soils and there is increasing evidence that they are important in preventing soil erosion. A single vehicle traverse over moist lichen-stabilized silty surfaces appeared, during a site survey, to have disrupted the surface enough to encourage erosion.

Tire ruts produced in late summer 1976 on the project site were inspected again in April, 1977, following a season in which winter rains and annual plants had been relatively abundant. It was clear that most of the ruts had become stabilized and had been populated with stands of the annual, *Plantago insularis* (Indian wheat). Individual plants within ruts were significantly larger and had significantly more seeds than those in undisturbed areas (see Table 4). The density of plants within ruts was also higher. Rapid revegetation of depressed areas which serve to catch water can be predicted. Some of the ruts parallel to existing watercourses eroded heavily during late fall rainstorms, effectively resulting

in new watercourses where previously there had been none. If as seems likely, these new watercourses persist, then it is probable that they will become vegetated in a manner similar to the naturally occurring watercourses. The lower third of the bajada where water erosion was most severe is also the part where watercourses are least well defined, and where they probably shift from time to time naturally, so that minor alterations of drainage patters will have little long-term vegetational significance.

3.2.2 Impacts on Wildlife

Impacts on Birds

Tomoff (71), studying an altitudinal habitat gradient comparable in many respects to that occurring on the site, concluded that there was an increasing breeding population density and species diversity of birds with habitat complexity "...extending from valley bottom *Larrea* communities upslope through bajada and rockslope *Cercidium* communities." Consequently, it can be anticipated that removal of vegetation from the lower bajadas will have less effect on birds than removal of vegetation from the upper bajada. Except for black throated sparrows which are known to construct nests in the bases of creosote bush (72) all other birds on the project site usually build nests either in cacti (chollas or sahuaro) or in trees. In the playa area, particularly in the drainageways and mesquite hummocks near Stoval Airfield, there were many bird nests in the mesquite trees. It is probable that some species will be disturbed during construction, and will not nest in the vicinity of Stoval Airfield during the spring of 1978. Because of the relatively small area involved, and the abundance of similar nesting habitat in the Gila River Floodplain a few miles to the north, the impact will be small.

In the lower third of the bajada where most of the watercourse alteration is expected to occur there are very few trees and no cacti suitable for nesting. The impact on breeding birds in this habitat will be negligible. Nesting habitat will be lost at wash crossings in the upper bajada, and during construction, nesting probably will not occur close to construction activities. The total losses, however, will be very small relative to the amount of similar habitat on the bajada, on the order of between 0.003 percent (direct vegetation loss) and 0.3 percent (total percentage of of bajada disrupted).

Impacts on Mammals

The rodents of the project site are the only group of mammals present that may be killed by construction activities. However, since most rodents are associated with shrubs, trench construction in the unvegetated areas between arroyos would probably not encounter rodent burrows. Rodent population sizes are notoriously unstable in desert environments, fluctuating

with the annual seed production. The number killed during construction would not be expected to have any long-lasting effects on populations in the area.

Larger mammals or their sign observed on the site include rabbits, coyotes, kit foxes, desert bighorn sheep, and one horse. The possibility also exists that the endangered Sonoran pronghorn may occasionally use the site as well. All these species will probably avoid construction activities. It is not likely that any of them will be killed, and considering the localized nature of the project, they are not likely to be displaced for extended periods of time. The two species of most interest, bighorn sheep and Sonoran pronghorn, are discussed below.

Sonoran Pronghorn Antelope

It is probable that the project will have no impact whatever on Sonoran pronghorns, an endangered species. None has been reported within 12 to 15 miles of the project site although the habitat is suitable, and it is unlikely that pronghorns will be displaced. During the construction period, pronghorns that might otherwise visit the area will probably be excluded, but since the project is of relatively short duration and the disturbed area relatively small, no long-term exclusion is likely.

The nature of the project...continuous construction activity at one location for several months...is such that pronghorns are not likely to be startled into flight by unexpected human incursion. It is such abrupt disturbances that cause increased activity during periods of water shortage and that are of most concern to pronghorn specialists in the area (34). In order to avoid adverse modifications of the potentially critical habitat by project activities, formal consultation with the FWS will remain in effect throughout project planning and implementation.

Desert Bighorn Sheep

It is probable that the resident bighorn sheep population in the Mohawk Mountains will be aware of the construction activities of the project. Construction activities have been scheduled not to occur within several miles of the base of the mountains during the period in which the sheep normally occupy inselbergs on the bajada (January through April). It is during this period also that the sheep are lambing and are most likely to be sensitive to disturbance. It is felt by the game management official responsible for bighorn sheep in the area that any potential impact of the project on bighorn sheep will be largely alleviated by the proposed scheduling (37).

3.3 EFFECTS ON THE SOCIOECONOMIC ENVIRONMENT

3.3.1 Burden on Existing or Proposed Public Service Facilities and Utilities

Requirements for electrical energy will be supplied through onsite facilities (generators) and thus not affect community services. Requirements for water are expected to be met from Dateland. Indirect requirements of water and electrical energy to sustain craft and supervisory personnel who relocate to the local area will be minor and well within the fluctuation of demand normally associated with a tourism supported economy. No demands are expected to be placed on the Yuma Fire Department. The contractor will be responsible for onsite fire protection. Generally sparse vegetation makes spreading of any fire unlikely.

Effects on local housing are dependent on the total number of construction personnel required, the number imported from other areas temporarily relocating near the job, and the communities relocated workers choose for residential areas. At least 25 contractor supervisory personnel will be relocated for the life of the project. In addition, a variable number of Air Force supervisory (usually approximately 6) will be present. Most union hiring halls* are located in Phoenix but have members in the Yuma area as several Yuma locals have recently been consolidated into the Phoenix organization. From the available data a peak of 80 relocated workers (craftsmen and supervisors) has been projected in Table 14. Craftsmen are unlikely to move families because of short duration of the job (most positions last only 2 to 3 months) and the proximity of Phoenix for weekend commutes. Perhaps half the supervisory personnel will relocate an average of 1.4 dependents each so the total number of relocated people in the peak activity month, April 1978, will be about 100 people.

Although proximal communities between the site and Yuma are small, and have limited amenities, a few workers may live in Dateland, Tacna or Wellton. These should number no more than five people. Because of its location between the site and Phoenix, Gila Bend may attract five to ten people, although resources in the town are limited. Adequate housing for these people is available in these communities.

Gila Bend and particularly the City of Yuma have extensive tourism facilities including mobile home parks, apartments and motel/hotel rooms. During the winter tourism season, peaking in December-January, occupancy rates are in the range of 95-100 percent. The length of the tourist season is dependent on several variables including the

* Construction craftsmen will not necessarily be union members but the union's membership and locations have been used to approximate the availability of crafts in the region.

Table 14. Anticipated local and relocated employment by classification and month.

CLASSIFICATION	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT
Craft Labor								
From Yuma Area	56	107	158	120	20	2	0	0
From Other Areas *	25	33	49	48	7	0	0	0
Total Craft Labor	81	140	207	168	27	2	0	0
Professional and Supervisory **								
From Yuma Area	0	0	0	0	0	0	0	0
From Other Areas	31	31	31	31	31	31	24	17
Total Professional and Supervisory	31	31	31	31	31	31	24	17
Total								
From Yuma Area	56	107	158	120	20	2	0	0
From Other Areas	56	64	80	79	38	31	24	17
All Sources	112	171	238	199	58	33	24	17

* Primarily from Phoenix but some may be from Tucson or San Diego.

** All contractor and governmental supervisory personnel projected from areas other than Yuma.

economy and severity of winter in other areas but generally starts about October and ends in March. During off-peak seasons occupancy rates for apartments falls slightly to 90-95 percent, for hotels/motels to 60-65 percent, and for mobile home parks to 35-45 percent. Thus, there should be more than adequate temporary housing available for imported workers within 1.5 hours of the site. The work force from Phoenix will likely live in their own campers/trailers during the week. They can park in either Gila Bend or Yuma and it is not possible to estimate how many will choose which town. Yuma has more extensive facilities, whereas Gila Bend is closer to Phoenix. Gila Bend is also somewhat closer to the site (48 road miles) than Yuma (64 road miles). No onsite housing facilities are anticipated.

3.3.2 Effects on Transporation

A total of 765 truckloads has been estimated to be necessary to supply the site from the east and 3,100 truckloads to supply the site from the west. Materials carried will be primarily constituents of concrete. Assuming deliveries occur over a 30-day period, truck traffic will average 100 per day west of the site and 25 per day east of the site. Each truck will increase the average daily trips (ADT) by two since it will return to its point of origin. During the peak month of April, transportation of construction workers will increase ADT about 400 additional trips daily (238 workers at an average vehicle occupancy of 1.2 both entering and leaving the site). Current ADT is about 5,200 vehicles so average daily traffic volumes will increase about 11 percent. The available highway, Interstate 8, is lightly traveled and this additional traffic will not lower Level of Service below the current Level A (free-flowing traffic).

A total of 50 railcar loads will be required to transport steel fibers from the eastern United States. This volume could be handled by a single train so no impacts on train traffic should result from the project.

The only impact on air transportation will be a few incidental visits to the area by governmental and contractor personnel.

Traffic Safety

The project will generate additional traffic on Interstate 8, through Dateland, and at the Dateland Interchange. Thus, there is an increased potential for vehicle-vehicle or vehicle-pedestrian accidents.

The greatest potential for highway congestion with related accidents is associated with arrival and departure of workers. A peak employment of 238 persons is projected for April, 1978. A conservative value of 1.2 riders per car has been assumed for this environmental statement, so that arrival/departure of 198 passenger vehicles per day can be assumed as a worst case. If all of these vehicles arrive and depart over a 15-minute period, and the highway is at peak load for normal traffic, conditions will remain free flowing (Level A), and no problems are anticipated. Each lane of a multilane roadway has a nominal capacity of 2,000 passenger vehicles per hour for uninterrupted flow (78). Present "worst case" existing traffic is 364 passenger-car equivalents/hr, and the increment from commuting workers is 792 per hour, for a total of 1,156 per hour. This is well within the free-flowing capacity of the highway.

Traffic entering and leaving the site from the west will enter and leave Interstate 8 at Tacna. Access to the freeway is at the eastern edge of Tacna and traffic will not pass through the town per se. The area most subject to disturbance is the Interstate 8 rest stop.

Traffic from the east will pass through the center of Dateland (a gasoline station on one side of the street and a restaurant/general store/post office complex on the other).

The percentage of traffic from the two directions is unpredictable. The Draft Environmental Statement stated that all commuting traffic leaving the site would pass through Dateland over a short period of time, thus creating a safety hazard. Two mitigating changes have now been made: part of the traffic will exit to the west, and there is a strong possibility that some of the construction work will occur at night because of the difficulty in handling concrete at the air temperatures prevalent on the site during the day in summer. Therefore, there will be a spread of commuting traffic over a longer period of time thus reducing the hazard.

Commuting traffic associated with the project and its associated truck traffic are not scheduled to overlap. For analysis of truck traffic, it has been assumed as a worst case that all such traffic will occur over a one-month period, or in 20 working days. Under these conditions, during an 8-hour shift, one truck would be inbound or outbound on the average of every 2-1/2 minutes. If half of this traffic were routed through Dateland and the other half through Tacna, one truck would pass through each community every 2-1/2 minutes. This level of truck traffic is not expected to represent a significant hazard to vehicles or pedestrians.

3.3.3 Impacts on Aesthetics

The proposed project is in sight of an established rest area on Interstate Highway 8, and the shorter alignment comes within approximately 1 mile (1.6 km) of that highway. During construction, the project will be highly visible, particularly activities on the short alignment. Following completion of the project, it is expected that the short trench will be unnoticeable from the highway much as Stoval Airfield presently is.

The long trench alignment is far enough away from the highway that construction activities there will not be particularly noticeable. The appearance of the desert pavement along the long alignment, even if it eventually becomes reestablished as a surface covering, will always be distinguishable from the original surface. The very gradual slope of the alluvial fan is such that the alterations of the surface will not be very visible from the highway but will be highly visible to persons at or above the site, an uncommon occurrence so long as public access remains restricted.

3.3.4 Effects on Surface Cultural Resources

In compliance with appropriate regulations, archaeological surveys of the project site have been performed by professional archaeologists:

the Arizona State Historic Preservation Officer has been contacted; and copies of this Environmental Statement have been sent for review to the Director, Office of Environmental Project Review, Department of the Interior and to the Advisory Council on Historic Preservation.

Effects on Archaeological Sites

The trench construction, wherever it disrupts the surface, will obliterate the surface archaeological features. The only type of preservation regarded as essential by the Arizona State Museum for most of the sites identified in this environmental statement is an accurate record. The record compiled for this EIS and Reference 88 is sufficient. An exception to this conclusion is appropriate for potential subsurface features in the vicinity of sites MAV-3 and MAV-4.

Effects on Subsurface Cultural Resources

It is possible that subsurface archaeological features exist in the area of the two temporary campsites, MAV-3 and MAV-4. MAV-3 is at the periphery of the direct impact area and thus it should be possible to avoid it during construction. This would result in no impact on the site. MAV-4 is very close to the southwest terminus of the longer trench and avoidance is unlikely. This site will probable be destroyed as a result of the construction activities. This site may be of significant value for a full understanding of man's prehistoric activity in the area and it may be eligible for the National Register. If so, an appropriate data recovery program will be accomplished. A determination of National Register eligibility is currently being pursued.

3.3.5 Evaluation of Secondary or Indirect Effects

The project is short-term and involves only a limited work force. For these reasons, secondary effects are also expected to be minimal. Long-term public or private indirect investments to support the project will not occur. A brief stimulus to the local economy will be experienced but even this will be so minimal that it will probably not be separately noted by local communities. The economic and employment effects are summarized in Table 15.

Indirect Economic Effects

To measure indirect effects on local economies a series of assumptions has been made:

- Total project cost will be $20 million. This will include $2 million for engineering costs; $14 million for construction costs; and $4 million for specialized equipment.
- Only the construction costs portion of expenditures will occur in the local two-county area.

Table 15. Economic and employment effects.

Output (million dollars)	37.7
Earnings (million dollars)	
Direct	3.6
Indirect	7.8
Total	11.4
Employment (manyears)	
Direct	71
Indirect	712
Total	783
Employment (job opportunities)	
Direct	238
Indirect	712
Total	950

- The project is best approximated by Standard Industrial Classification (SIC) Industry 1625, "Construction of New Military Facilities."
- Labor costs for construction and supervision will total $3.6 million (88).
- The project will require about 71 manyears of labor effort with a peak labor force of 238 people.

The Regional Industrial Multiplier System (RIMS) has been applied to estimate the effect of Construction of New Military Facilities on the Yuma-Maricopa region. A multiplier is a measure of total economic effect of project expenditures including both the effect of direct expenditures on the project and indirect and induced effects resulting from the direct expenditures. RIMS measures each of these components by matching locally available supplier industries described in *County Business Patterns* with the 484 sector national model and generates a list of required, locally-available, supplier industries and a direct requirements coefficient for each. These direct requirements coefficients, when summed, form the direct component of the multiplier. A linear homogenous function is used to produce the indirect-induced component. The final demand multiplier is the sum of the direct component, the indirect-induced component and a component to represent the initial expenditures which is always unity or 1.00. For the construction of New Military Facilities in Yuma-Maricopa Counties, the results of this analysis are contained in Table 16.

Table 16. Regional direct requirement coefficients (Industry 1625 - New Military Facilities).

SIC CODE	INDUSTRY NAME	PROPORTION OF GROSS OUTPUT
07	Agricultural Services	.0017
14	Nonmetallic Mineral Mining and Quarrying	.0053
15-17	Contract Construction	.0003
24	Lumber and Wood Products, Exc Furniture	.0130
25	Furniture and Fixtures	.0006
26	Paper and Allied Products	.0091
28	Chemicals and Allied Products	.0010
29	Petroleum and Related Industries	.0007
30	Rubber and Miscellaneous Plastic Products	.0021
32	Stone, Clay, and Glass Products	.0930
33	Primary Metals Industries	.0107
34	Fabricated Metals Products	.0675
35	Machinery except Electrical	.0110
36	Electrical Machinery	.0260
38	Instruments	.0043
39	Miscellaneous Manufacturing	.0002
42	Motor Freight Transportation and Warehousing	.0108
44	Water Transportation	1
48	Communications	.0039
49	Public Utilities	.0089
50	Wholesale Trade	.0367
52-59	Retail Trade	.0282
60	Banking	.0027
62	Security and Commodity Brokers, Dealers, and Services	.0002
63	Insurance Carriers, including Solicitors	.0045
65-66	Real Estate and Combinations	.0005
73	Miscellaneous Business Services	.0216
75	Auto Repair and Services	.0047
81+89	Legal and Miscellaneous Professional Services	.0517
84+86	Museums and Nonprofit Membership Organizations	.0010
	Households	.2790
	SUM OF DIRECT REQUIREMENT COEFFICIENTS	.6837

RIMS MULTIPLIER AND COMPONENTS			
INITIAL EXPENDITURES	DIRECT COMPONENT	INDIRECT-INDUCED COMPONENT	FINAL DEMAND MULTIPLIER
1.000	0.684	1.099	2.783

(1) Less than .00005

Application of the RIMS output multiplier of 2.783 to the estimated local expenditures of $14 million yields an estimated increase in output in the two-county region from the project of $39 million. For each million dollars spent in the region directly on the project, a total of $2.8 million dollars in local economic activity will result.

The RIMS procedure also produces an output-to-earnings ratio that is region and industry specific. For the construction of New Military Facilities in Yuma-Maricopa the ratio is 0.293; that is, of each million dollars of increased output, $293,000 will be in the form of earnings. Thus, the $39 million increased regional output resulting from the project will include $11.4 million in earnings. Total direct earnings are known to be $3.6 million and indirect earnings will therefore be $7.8 million. The 1972 total earnings in Yuma-Maricopa was $5,344 million so the project will account for about 0.2 percent of 1974 regional earnings. This is a beneficial, but minor, increase.

In terms of employment, a total of 238 direct labor job opportunities has been identified. Indirect employment can be estimated through the earnings-to-employment ratio also available through the RIMS process. In the Yuma-Maricopa region, for each million dollars of direct earnings, 91.3 indirect employment job opportunities will result. Since indirect earnings were estimated at $7.8 million, about 712 indirect employment job opportunities will result in Yuma-Maricopa from the project expenditures. Total regional employment, both direct and indirect, will be about 914 job opportunities. In July 1976, Yuma-Maricopa had nonagricultural wage and salary employment totaling 452,350 jobs.

Indirect Social Effects

It is not anticipated that the project will result in more than incidental minor social effects given the level of economic effects anticipated. Most of the required labor force will be available from the existing supply in Yuma County. Since these people are currently living in the area, no increased demands on water, wastewater, education, police, fire protection, health services or other utilities and services are anticipated. Demographic effects and changes in patterns of social activity will not occur since no long-term growth is anticipated. Up to 100 people may be temporarily relocated to the local area to live in apartments, trailers, and motels. Local winter tourist oriented facilities can accommodate this load with no problem. Local investments in roads, schools and the like will not be required for direct or indirect effects.

Because of the presence of the project and improved roads constructed for the project there exists the possibility of increased human incursion, probably exclusively by local people, into the project area. Access is possible now by four-wheel-drive vehicles, and at termination of the project, access to the improved roads on site will be made impassable, thus returning ease of access to the site to its current status.

SECTION 4

ALTERNATIVES TO THE PROPOSED ACTION

Alternatives considered for the proposed action included (1) no project, (2) project postponement, (3) construction of the project at a reduced scale, (4) alternative site options, and (5) alternative construction methods.

4.1 NO PROJECT

The "no project" alternative would maintain the status quo at the proposed site. There would be no physical, biological, or localized socioeconomic impacts, other than those which have resulted from site investigations, and the site area would remain in its present relatively undisturbed state. On a national scale, however, the no project alternative would mean that hard data would not be available for evaluation of the buried trench option and its cost effectiveness with respect to the shelter option. The no-project option would thus result in significant technical and cost risks to the continuing development of the MX weapons system.

4.2 PROJECT POSTPONEMENT

Scheduling the construction effort for a different time of year could alter the physical, biological, and socioeconomic effects. Some of these changes would result in increased adverse environmental effects, and others would reduce the impacts of the project. On balance, the proposed project schedule results in the least adverse impact.

Adverse impacts that would result from project postponement include the increased possibility of encountering heavy rains with attendant problems of erosion, ponding of water, and increased sensitivity of land surfaces to damage. In addition, postponement into the winter season could result in project activity near the base of the Mohawk Mountains during the period of heavy usage by desert bighorn sheep. Finally, if construction activity were substantially delayed into the winter months it would overlap maximum seasonal occupancy of temporary housing in Yuma and other nearby towns, so that a temporary housing shortage could occur.

Beneficial aspects of a construction delay into the rainy season include a natural reduction of potential for dust on the project site and, therefore, the amount of water required for dust suppression. Also, the possibility of disturbing breeding activities of birds would be eliminated

if the project were to take place during the fall and winter when breeding does not occur. (The disturbance to bird breeding is considered minor in any case.) Finally, a slight delay in the construction schedule would have the small but beneficial effect of spreading demand for housing more evenly. The only one of these improvements considered potentially significant is that of decreased water usage for dust control, and the size of the reduction could be very small depending on the somewhat unpredictable weather patterns in the area.

In summary, a minor delay in start of construction could slightly reduce some impacts (if, for example, there were still wet weather in February) and could increase others (were major construction activities of the project to extend into wet weather in August).

A longer delay would adversely impact the project schedule and cost without offsetting benefits to the environment.

4.3 CONSTRUCTION OF THE PROJECT AT A DIFFERENT SCALE

Construction of the project at a different scale to reduce the amount of environmental disturbance can be considered in three contexts: (1) construction at full diameter but reduced lengths, (2) construction at less than full diameter with results extrapolated to full diameter, and (3) construction of only one segment of trench to satisfy all program objectives.

Reduced scale would lessen many negative environmental impacts discussed in Section 3, although a linear reduction related to scale would not necessarily be anticipated. For example, access roads and other support facilities would still be required and their environmental impacts would remain, even if the scale of the project were reduced. In general, construction at a reduced scale would be accompanied by reduced effects on terrain-related features, air quality associated with combustion of fuels and dust generation, and noise impact because of the shorter duration of the project (although peak noise levels would likely be similar).

If the length of the long trench were shortened enough to avoid the varnished desert pavement on the upper bajada, two environmental impacts would be decreased. First, areas temporarily occupied by bighorn sheep would be avoided, and second, the essentially permanent aesthetic degradation of the pavement would be eliminated. However, bighorn sheep usage of the lower mountains and bajada is limited largely to the winter months (December through April). Since scheduled construction would not reach the upper bajada prior to May, this advantage of shortening the long trench is substantially reduced. Reducing the length of the long trench to avoid degrading the varnished pavement could result in a failure to meet project objectives. Construction of the long trench will provide data to establish what reasonable

rate of construction can be achieved across a variety of geologic features, to determine potential difficulties encountered at stream crossings, and to evaluate the effect of lithology on problems encountered.

A string of specialized pieces of construction equipment will most likely be used in the project. In order to meet the objective of evaluating what rate of construction is achievable, this string of equipment must be deployed and operate over a relatively long line to ensure that a representative sample of typical excavation difficulties is encountered. In addition, once the desired rate is achieved, the equipment must operate continually over a number of sequential working days to validate the rate. These circumstances dictate the planned maximum length of 20,000 ft (6 km).

Reducing the diameter of the trenches could result in a reduction in the width of the disturbed zone along the trench alignments. However, the construction rate depends on the ability to design, fabricate, and operate large size, specialized construction equipment. Specialized equipment of the size required for a full-size trench has never been designed, fabricated, or operated and is itself a key technological challenge. Thus, it is not practical to scale up data from smaller equipment. If a smaller diameter trench were constructed, the objectives of the erection and breakout tests would not be met. Similarly, only information at full-scale will truly verify the feasibility of missile breakout, which is a primary objective of the project.

Construction of only one trench would reduce somewhat the impact on the environment. If only the long trench were constructed, plans could be adjusted to perform erection and breakout tests in it, subsequent to accomplishing construction rate objectives. This alternative would slightly reduce the terrain-related impacts since the short trench would not be constructed. However, other environmental impacts might result from the fact that equipment, personnel and activity would have to continue on site for an extended period of time beyond September. In addition, this alternative could result in adverse impacts on planned project objectives. For example, construction of the short trench will be used as a test bed to shakedown construction procedures. If the shakedown had to be done on the long trench, its length might have to be extended to accomplish all objectives. This lengthening could result in additional environmental impacts. Finally, the spacing between the short and long trench has been selected to provide information on the rates at which this large, specialized construction equipment can be deployed from one site to another. If only one trench were constructed, this objective would not be met.

In conclusion, changing the scale of the project by reducing the length, diameter, or number of trenches would at best only slightly reduce the environmental impact, while imposing a potentially large adverse impact on accomplishment of program objectives.

4.4 ALTERNATIVE SITE OPTIONS

4.4.1 Overall Site Screening

The screening process for the Buried Trench Construction and Test Project began in January 1976. The objectives of the program were:

1. Validate construction cost.
2. Validate construction rate.
3. Demonstrate breakout and erection hardware.

Criteria applied to site selection included:

1. Diversity of geologic conditions within an area of a few tens of square miles that is typical of accessible DOD controlled land.
2. Less than 10 percent topographic grade.
3. Groundwater and marginally excavatable rock conditions greater than 25 feet below the surface.
4. Reasonable physical access.
5. Accessibility around-the-clock during the construction period.
6. Compatibility with any existing activity.
7. Accessibility to an existing rail line.

Using these criteria, six candidate site areas were selected for consideration:

1. Edwards AFB, California
2. Kirtland AFB, New Mexico
3. White Sands Missile Range, New Mexico
4. Luke Air Force Range, Arizona
5. Nellis Air Force Range, Nevada
6. Fort Irwin, California

Conditions which detract from the feasibility of five of the above candidates include:

1. Kirtland and Edwards AFBs have a limited range of geologic conditions which would make it difficult to relate results obtained to those that might be encountered in any operational area.
2. Fort Irwin, a former Army base, has substantial areas of unexploded ordnance, and a high probability of rock near the surface that would be difficult to excavate (igneous intrusives).
3. Both Nellis Air Force Range and the White Sands Missile Range are intensively used by agencies other than the USAF, and potential problems of co-use with those agencies were indicated. Current activities at the Luke Air Force Range would be impacted less than at these two locations.

The Luke Air Force Range best meets the siting criteria because of its geologic conditions and accessibility both by highway and railroad. Three potential siting areas, designated the Childs Valley Site, the Sentinal Plain Site, and the San Cristobal Valley Site were then subjected to a screening process based on overall geotechnical, environmental and physical access characteristics (75).

4.4.2 Site Evaluation on LAFR*

4.4.2.1 CHILDS VALLEY SITE

The Childs Valley Site is in southwestern Maricopa County and encompasses approximately 60 miles^2 (155 km^2) between the Growler Mountains and the Crater Range. The area lies between manned Range 1 and portions of the North-South Tactical Range, and is subject to overflight by aircraft with "hot" guns and practice/live ordnance.

Around-the-clock access to the Childs Valley site would have required either terminating operations at Range 1, or construction of a new road, possibly through the Cabeza Prieta National Wildlife Refuge to the south. The Tucson, Cornelia and Gila Bend Railroad, and U.S. Highway 85 are approximately 6.3 miles (10 km) east of the siting area.

The trench construction area that was considered is the center of Childs Valley, a broad northwest-trending alluvial-filled basin bounded by the Crater Range on the north and the Growler and Childs Mountains on the south. Slopes are relatively gentle, ranging from approximately 20 to 40 ft (6 to 12 m) per mile (0.4 to 0.8 percent grade) over most of the alluviated area. Near the Growler Mountains, surface slopes average approximately 180 ft (55 m) per mile, or 3.4 percent grade.

*This information is derived principally from Reference 75.

Four distinguishable alluvial deposits were considered mappable in the area. Precise depth to bedrock was unknown. The depth to water was estimated as at least 100 ft (30 m), and probably greater than 200 ft (60 m). Most of the material was believed to be easily excavatable, with the possible exception of older deposits of relatively small areal extent near the valley edges. Here, there was some evidence that excavation might have been difficult at depths less than the nominal trench depth. Some of the materials were not expected to be sufficiently well cemented to sustain vertical slopes, so that shoring would have been required in the trenching operation.

Vegetation is present both on the alluvial surfaces and in the washes. Vegetation identified included creosote bush, cholla, paloverde, mesquite, ocotillo, and ironwood.

In summary, the Childs Valley site met most of the geotechnical criteria, but around-the-clock accessibility would have had a major impact on existing range operations.

4.4.2.2 SENTINEL PLAIN SITE

The Sentinel Plain site is in southwestern Maricopa County and encompasses approximately 73 miles^2 (187 km^2) west of the Sauceda Mountains and north of Range 2 and the Crater Range. The area borders the ordnance delivery pattern for Range 2 and Range 4, including a 22,000 ft (6706 m) strafe fan extending west from Range 1. All flights leaving all gunnery ranges overfly the area. Some recovery flights may have live or unexpended ordnance.

Both U.S. Highway 85, an unrestricted public and commercial transportation route, and the Tucson, Cornelia and Gila Bend Railroad transect the siting area.

The Sentinel Plain is a broad, northwest-trending alluvial-filled basin bounded by the Sauceda Mountains on the east and the Crater Range on the west and south. The potential trench site occupied the east central portion of this valley. Slopes are relatively gentle, approximately 20 feet per mile, or less than one percent topographic grade. Near the Growler and Sauceda Mountains, surface slopes range from 80 to 120 feet per mile (1.5 to 2.3 percent topographic grade).

Four distinguishable alluvial deposits were considered mappable in the area. Bedrock could be expected at 100 to 200 ft (30 to 60 m) below the surface within several hundred feet basinward of the volcanic bedrock outcrops in the northeastern, southeastern, and southwestern portions of the site area. Depth to bedrock is probably much greater than 250 ft (76 m) in most other portions of the area, but may be shallower than 1000 ft (305 m) as indicated by a well terminating in rock at 615 ft (184 m) depth in the south-central portion of the Sentinel Valley.

The depth to water in the basin-fill materials was believed to be greater than 100 ft (30 m) in all portions of the site area, and is probably greater than 400 ft (122 m).

Excavation conditions and slope stabilities were considered to be roughly equivalent to those of the Childs Valley site. Older deposits near the mountains were considered likely to require abnormal excavation techniques such as heavy pre-ripping or drilling and blasting. In the younger fans, where there is no cementation or where there is a predominance of sand-sized particles, vertical unsupported slopes were not considered feasible, and a shoring system would have been required or the slopes would have had to be cut back.

Vegetation is present both on the alluvial surfaces and in the washes. Vegetation includes creosote bush, cholla, bur sage, mesquite, paloverde, ironwood, greasewood, and several species of grasses.

In summary, the Sentinel Plain site met many of the geotechnical criteria, although it was somewhat limited in desired geologic diversity. Around-the-clock accessibility for proposed construction would have had a major impact on existing range operations.

4.4.2.3 SAN CRISTOBAL VALLEY SITE (PROPOSED SITE)

The San Cristobal Valley is primarily within southeastern Yuma County and extends southeastward into Pima County within the LAFR. The proposed trench siting area within this valley encompasses approximately 68 miles^2 (178 km^2) on the east flank of the Mohawk Mountains in the northwestern portion of the valley.

The San Cristobal Valley site area lies along the boundary between the western and eastern sectors of LAFR. The western portion encompasses part of the buffer zone jointly administered by Luke AFB and the U.S. Marine Corps Air Station (MCAS), Yuma. The eastern portion of the siting area includes a small part of the air-to-air gunnery range. The western sector is used for training of fighter/attack squadrons, and live 20 mm ordnance may be expended within the buffer zone. The eastern sector is a low-level (1000 ft, 400 m above ground level) route to Target 5 for aircraft with training munitions.

Interstate Highway 8 is approximately 0.2 mile (0.4 km) north of the northernmost site boundary (as defined by reference 75). The Southern Pacific Railroad follows the highway, approximately 0.1 mile (0.2 km) north of the site. This commercial railroad has a siding near Stoval Field, but there are no nearby railroad crossings for automotive vehicles.

San Cristobal Valley is a broad, northwest-trending alluvial-filled basin bounded within the LAFR by the Aquila and Granite Mountains on the east and the Mohawk Mountains on the west. Metamorphic and granitic detritus from

the Mohawk Mountains have formed a broad planar northeast trending alluvial slope in the siting area. The alluvial slope is relatively gentle, averaging approximately 65 ft (12.3 m) per mile, or about 1.25 percent topographic grade.

One major alluvial fan was mapped. This alluvial fan was subdivided into several subunits. Recent stream-channel deposits and flood plain deposits were found in the area. Small local areas of wind-blown sand deposits were also found to be present.

The precise depth to bedrock was not determined throughout the site area, but the bedrock was expected to be within 100 to 250 ft (30 to 76 m) of the surface in areas within several hundred feet of the metamorphic rock outcrops near the Mohawk Mountains. Depth to bedrock was expected to be greater than 250 ft (76 m) elsewhere in the area. The depth to bedrock was determined to be greater than 700 ft (213 m) in the northeastern portion of the site area along San Cristobal Wash.

The depth to groundwater was judged to be more than 100 ft (30 m) in the majority of the siting area. However, groundwater could occur at depths less than 100 ft (30 m) in the northern and northeastern portions of the site. A perched groundwater table (i.e., water retained by localized impermeable layers above the true water table) was found to occur within 50 ft (15 m) of the surface along San Cristobal Wash.

Excavation conditions and slope stabilities were considered to be roughly equivalent to those of the other two sites.

Vegetation identified in Reference 75 included creosote bush, cholla, bur sage, mesquite, ironwood, paloverde, ocotillo, and several species of grasses. Areas with well-developed desert pavement were reported to be vegetation-free. In addition to the vegetation reported as present, sahuaro cactus is also known to occur in all three areas, but less abundantly in the San Cristobal Valley than at the other sites.

The San Critobal site is proposed because it meets geotechnical criteria, provides a diversity of desired geology, is accessible by road and rail, and because it would have the least impact on existing range operations.

4.5 ALTERNATIVE METHODS OF CONSTRUCTION

There exists one major alternative method of construction of the buried trench which is currently receiving study and which may ultimately be selected as the project instead of the techniques described in Sections 1.1.7, 1.1.8, and 1.1.9 of this report. This alternative construction method would consist of precasting the concrete tunnel and trucking it to the trench site in pieces rather than forming it in place. Section 4.5.1

identifies the technical differences between the two techniques, and Section 4.5.2 discusses the differences of environmental impact that are anticipated. There is, in fact, very little difference in anticipated impact between the two.

There presently exists also a range of alternative methods for excavation and surface restoration which are under study as a part of the research effort to establish the best trench configuration. These alternatives differ in terms of width of excavation and width and height of the berm forming the finished trench surface. The environmental impacts of these alternative methods and final configuration will not differ greatly from those of the project as described. Section 4.5.3 discusses the differences in technique and impact.

4.5.1 Differences Between Slipform Concept (the Project) and Precast Concept

The precast concept proposes that in addition to the onsite concrete batch plant, there would be a casting plant to cast the tunnel sections and a storage yard to store precast sections. The sections themselves would be 30 ft (9 m) long with an inside diameter of 13 ft (4 m) and a wall thickness of 0.83 ft (0.25 m). Each section would weigh 110 tons (99 tonnes). The size of the storage yard would be increased from 10 acres (4 ha) to 60 acres (24 ha). The total area inside Stoval Airfield (not including the runways) is approximately 100 acres (40.5 ha) so that the usage of that space would increase from 10 percent to 60 percent.

There would be a 15 percent decrease in the amount of concrete required if the precast method were used: from 46,000 yd^3 (35,167 m^3) to 40,000 yd^3 (30,580 m^3). This would result in an equivalent decrease in the number of truck trips required to deliver the concrete. It is estimated there would be an approximately 10 percent increase in labor personnel (craftsmen) if the precast method is utilized. It is estimated that the decreased costs and deliveries of materials would be offset by the increased labor requirements, and no substantial cost differences between the two methods are anticipated.

The precast method would require a larger excavation than the slipform concept. In the precast method, approach ramps would be required to be excavated at 30 to 45° angles laterally from the trench to allow access by trucks carrying the precast sections. All excavation would still fall within the nominal 328 ft (100 m) wide strip, however. There are no apparent differences between the two methods in terms of the physical appearance of the completed project.

4.5.2 Differences in Impacts Between the Two Construction Methods

Decreased traffic levels resulting from decreased material requirements are expected to be essentially offset by increased traffic because of

increased labor requirements. There will be a 15 percent decrease in material consumption, but the impacts of material consumption are not considered significant in either case.

A wider excavation would be required with the precast option, and there would be a resultant incremental increase in potential for dust, erosion, and emissions from internal combustion engines on site. It does not appear at this stage of planning that the differences would be significant. The increased width of excavation of the trenches would fall within the nominal 328 ft (100 m) zone of disturbance, so that loss of biota is predicted to be identical. The use of more land at Stoval Airfield would cause essentially no increase in impact because the interior of the airfield is highly altered from its original condition and largely barren.

In summary, the two potential methods of construction differ very little in characteristics likely to cause environmental impact, and at this point no significant differences of impact have been identified.

4.5.3 Alternative Trench Construction Technique

The alternative means of trench emplacement being considered could result in a higher berm over the trench surface at completion than the project now calls for. The maximum size berm would result from establishment of the top of the concrete tunnel near grade with the spoils mounded over the top to a depth of 5 ft (1.5 m) high and 12 ft (3.6 m) wide at the centerline. The berm would then be tapered toward grade at a maximum slope of 1:4, reaching the existing surface 26 ft (8 m) to either side of the centerline for a minimum total finished width of 52 ft (16 m). Intermediate approaches resulting in a lower but wider berm are also under consideration. The berm would not be of uniform height over the entire alignment. In some places the existing topography would provide the desired 5 ft (1.5 m) of cover. In other places, such as the bottoms of arroyos there would be no berm at all.

There are several potentially substantial differences in impact that could result from this alternative. First, the presence of a berm 5 ft (1.5 m) high could constitute a much more visually obvious structure than the proposed berm less than 1 ft (0.3 m) high. Consequently, the aesthetic degradation of the area could be increased. Second, the height of the berm would cause it to be more exposed to wind erosion than would the lower berm and the potential for dust resulting would be increased. Also, there is a minor increase in the potential for deposition of windborne particulates in the lee of the berm. The slopes at the sides of the berm will encourage rapid runoff of water from direct precipitation, and may erode more rapidly than would the lower berm. Increased erosion would result in increased sedimentation downstream. A concomitant result of more rapid runoff is a lack of subsurface wetting, and a decreased potential for revegetation. Based on the lack of revegetation of lower berms at Stoval Airfield, it

can be assumed that revegetation of the 5 ft (1.5 m) high berm would occur very slowly if at all. Where small washes are blocked by the higher berm, there would be potential for more extensive ponding than would occur behind the lower berm.

From this analysis and from that in Section 3, it is apparent that the lower the spoils berm, the less the potential environmental impacts. There are no threshold effects, however, and during further engineering study advantages of a higher berm configuration may be found to offset incremental increased in environmental impact.

4.5.4 Alternative Configurations of the Protective Structure

Alternative configurations of the protective structure may be identified which could result in thinner walls and reduced steel reinforcement. These alternatives would require less concrete and steel fiber and would proportionately reduce impacts of obtaining and transporting these materials.

SECTION 5

PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED SHOULD THE PROPOSAL BE IMPLEMENTED

5.1 PROBABLE ADVERSE IMPACTS ON THE PHYSICAL ENVIRONMENT

- Temporary degradation of air quality as the result of dust generation due to excavation activities and vehicular traffic over unpaved roads.
- Temporary degradation of air quality as the result of increased exhaust emissions from transportation vehicles to and from the site, onsite traffic, and diesel generators.
- Temporary increases in ambient noise levels near the site and in the community of Dateland.
- Disruption of approximately 200 acres (81 ha) of earth surface over the two buried trenches, on roads, and at Stoval Airfield where the office and yard facilities will be located.
- Temporary drawdown of the water table in the immediate vicinity of the well onsite. The effects are not expected to be detectable at any other wells.
- Increased potential for wind and water erosion during and following the project.
- Permanent loss of areas of well-varnished desert pavement on the upper bajada.

5.2 PROBABLE ADVERSE IMPACTS ON THE BIOLOGICAL ENVIRONMENT

- Loss of existing vegetation (except sahuaro cacti which will be salvaged) over both alignments, on roads, and in yard areas.
- Mortality of some rodents and reptiles from road kills on and from direct effects of trenching.
- Displacement of breeding birds from the construction area for one season owing to noise and disturbance, and permanent loss of a small amount of breeding habitat in the vegetation that will be lost.
- Temporary exclusion of the Mohawk Mountains population of desert bighorn sheep from part of their range.

5.3 PROBABLE ADVERSE IMPACTS ON THE SOCIOECONOMIC ENVIRONMENT

- Minor temporary increases in traffic on Interstate 8. Major temporary increases through Dateland.
- Permanent loss of minor archaeological artifacts and remnants along the alignments and roads.
- Long term aesthetic degradation of the trench alignments, particularly in the upper bajada in areas of well varnished desert pavement.

5.4 MITIGATIONS

These unavoidable impacts will be limited, and other avoidable impacts will be mitigated by the following actions.

- Construction equipment and personnel will be limited to established access roads to and from Stoval Airfield and between the airfield and the trench alignments. No cross-country vehicular activity will be permitted. Off duty personnel will not be allowed access to areas other than the established roads. At termination of the project, access to the project site will be eliminated.
- Surface archaeological remnants that will be disturbed or destroyed should construction be implemented have been examined, cataloged, and where desirable, collected and deposited in the Arizona State Museum. If necessary, an additional data recovery program will be initiated prior to construction.
- Dust will be suppressed during the time construction activity is taking place by periodically traversing all roads and construction areas once per hour with a water spray truck.
- All arroyos disturbed by construction will be restored to their preexisting configurations, when feasible, to prevent blocking of permanent drainage systems.
- Sahuaro cacti that must be removed for construction will be removed intact and made available to the Arizona Commission of Agriculture and Horticulture for whatever disposition they recommend.
- Where areas of varnished desert pavement are disturbed during construction, the surface layer of rocks will be stockpiled and spread evenly over the surface following backfilling.
- Following completion of various parts of the project, soil surfaces will be inspected periodically to be certain that soil stabilization is occurring and that erosion is minimized. In the event of severe wind or water erosion, appropriate soil stabilization measures will be taken.

- The effectiveness of environmental protection (dust suppression, confinement of vehicles and personnel to the established project area, etc.) will be under surveillance throughout the construction to be sure that environmental protection is proceeding as planned.
- Follow-up actions to determine the effectiveness of the measures adopted to protect the environment will be accomplished.

SECTION 6

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

6.1 SHORT-TERM GAINS

- Resolution of key uncertainties and reduction of risks associated with the buried trench concept. These include construction feasibility, construction rate, economic cost, and breakout feasibility.
- Stimulated economic activity in Yuma and Maricopa Counties.

6.2 SHORT-TERM COSTS

- Temporarily increased traffic with local congestion and associated noise impacts in neighboring communities.
- Temporarily decreased air quality from combustion products and dust during construction and to a lesser extent during the breakout tests.

6.3 LONG-TERM GAINS

- Identification of cost-effective MX basing mode concepts to ensure conservation of natural resources while meeting cost, operation, maintenance and survivability criteria.
- Identification and testing of mitigative measures to reduce several environmental impacts associated with potential MX basing decisions and construction and operational activities.

6.4 LONG-TERM COSTS

- Permanent disruption of archaeological resources and of the varnished desert pavement on the upper parts of the Mohawk Mountains bajada.
- Degradation of the scenic character and natural quality of the bajada.

SECTION 7

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES THAT WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED

7.1 LOSS OF NATURAL RESOURCES

The commitments of natural resources to the project fall into two categories:

1. Consumption of permanent deposition of resources of offsite origin.
2. Alteration or destruction of some resources at the project site.

Category 1 comprises the consumption of cement, water, aggregate, steel reinforcing fibers, fuels, and time by construction personnel. Category 2 is the loss of the relatively undisturbed character of the alluvial fans of the Mohawk Mountains. Losses of biota will be irreversible only in the sense that the individuals killed or displaced will be lost. There will be no permanent change in the ecology and biology of the bajada as a whole.

7.2 LOSS OF CULTURAL RESOURCES

Destruction of some of the trail segments identified in the archaeological survey will result from construction along the present alignment. There is reason to believe that a network of trails exists in the area so that alternative alignments would affect other trails.

SECTION 8

CONSIDERATIONS THAT OFFSET THE ADVERSE IMPACTS

Full-scale tests of construction procedures and trench breakout capabilities are required as part of the studies to determine feasibility of use of the trench concept should an eventual decision be made to proceed with MX deployment. The goal of the proposed project is to establish the technical feasibility of construction and breakout, attainable physical characteristics including strength, probable realistic construction rates, and baseline cost data for the buried trench MX deployment concept as it is currently envisioned. Additionally, mitigative measures will be identified and evaluated to reduce potential environmental impacts associated with the MX basing, construction and operation. These data and evaluations are also vital to determine accurate cost-effective analysis to be used in future decisions on selecting the final basing system for full-scale development.

Deployment of a full-scale, deceptive land-based MX missile force will require a commitment of the resources available for national defense. It is vital, therefore, that the best possible deployment method be selected, based on hard, reliable data. The full-scale construction will test equipment and technical capabilities and greatly increase the reliability of projected cost and performance estimates. The current program will provide such data at relatively modest cost and is essential to the aims of the overall MX program.

SECTION 9

DETAILS OF UNRESOLVED ISSUES

The two issues unresolved at the time the DEIS was submitted to the Council on Environmental Quality and the public dealt with:

- The effects of drilling a waterwell and extracting groundwater on site, and
- The proposed critical habitat area for the endangered Sonoran Pronghorn Antelope which includes the project area.

The first issue has been addressed in revised Sections 1.2.1.5.2 and 3.1.3, as well as being influenced by a decision to pipe water in from Dateland rather than to drill on site.

The second issue has been resolved as a result of formal consultation with the United States Fish and Wildlife Service. The FWS response to the formal consultation is included in Appendix 2. It says, in brief, that in the opinion of the FWS, the project, as described in this FEIS, will not adversely affect the pronghorn or its essential habitat.

SECTION 10

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SECTION 11
GLOSSARY

TERMS

Air Quality Monitoring Stations	Stations set up at scattered and strategic locations in an area, which continually sample for and measure pollutants which may be present in the atmosphere.
Alluvial Fan	A fan shaped deposit of alluvium (fill) made by a stream where it issues from the mountains unto the lowland. The abrupt decrease of slope reduces the streams energy and the stream loses its velocity and drops its burden of silt or gravel, which spreads out in an ever widening arc. Over time this deposition builds up and an alluvial fan is formed.
Ambient Air (Meteorology)	Refers to surrounding external or unconfined conditions, i.e., outdoor air.
Arroyo	A watercourse or water-carved gulley (as a creek or a stream) in an arid region.
Bajada	An alluvial plain formed at the base of a range of mountains by the coalescing of several alluvial fans.
Boring Log	A written record of the properties of the materials encountered by boring into the ground.
Borrow Areas	Areas where soil/rock/sand/gravel, etc. is excavated and transported to a construction site where it is used for filler for making concrete, roadbed material, etc.
Caliche (Geology)	A calcium carbonate deposit formed in surficial rocks of arid regions.

Deflocculation	The change from an aggregated mass to a more loosely organized state.
Dendritic Riparian Pattern	A pattern of watercourses joining together at acute angles, e.g., as branches on a tree.
Desert Pavement	A relatively thin, fragile surface deposit on alluvial fans in desert regions, consisting of pebble to cobble sized rocks from which all fine interstitial material has been removed by wind erosion.
Desert Varnish	A dark, lustrous coating or crust, usually of manganese and iron oxides, that forms on rocks, pebbles, etc. in the desert.
Desert Riparian Associations	Plants or animals which live in groups along the dry desert washes.
Detritus	Loose material resulting from disintegration or wearing away of rock.
Environmental Impacts	Resultant changes in the quality of the environment due to specific and summary changes in measurable environmental parameters which are used to describe the existing condition of the biological, physical, and socio-economic sectors.
Ephemeral Plants	Plants that germinate, produce seed, and die during a period of a few months or less. Identical to annuals except that the complete cycle can occur more or less frequently than annually.
Fossorial	Adapted for digging or burrowing as gophers, moles, etc.
Fugitive Dust	Temporary, transient dust as from construction activities.
Gallery Forest	A forest growing along a watercourse in a region otherwise devoid of trees.

Granivorous	Feeding or subsisting on grain, as granivorous rodents or birds.
Habitat	The natural environment of a plant or animal or communities of these species.
Interim Control (Land)	A zoning classification used in the City of Yuma for land annexed by the City for which final zoning has not been established by the City Council.
Lithic Scatter	Archaeologist's term for chips of rock thought to have resulted from human tool making.
Lithology	The study of rocks; the character of a rock formation.
Man Year	Amount of labor effort from one person during one year. A desirable quantity so that one man year may be one person working for a full year or two people working for a half year each.
Multiplier	An economic term used in the estimation of the total amount of economic stimulation in an area resulting from direct expenditures on a project.
Neotropic	The area of the New World Extending from the Tropic of Cancer southward.
Overburden	Material overlying a deposit of useful geological materials.
Pediment	A broad gently sloping bedrock surface with low relief that is situated at the base of a steeper slope and is usually thinly covered with gravel and sand.
Pedogenic Carbonate	Carbonate formed in the soil.
Plant or Animal Communities or Associations	The assemblage of plants and animals inhabiting a specific area.

Playa	The flat-floored bottom of an undrained desert basin that becomes at times a shallow lake (after a rain when water may stand and where its evaporation characteristically leads to alkali deposits).
Raptor	An order of predatory birds which are adapted for seizing prey, i.e., bills or claws.
Riverine	Referring to rivers.
Seismic Refraction Studies	A technique for inferring the configuration and properties of subsurface geologic formations by measuring and interpreting the arrival times at a subsurface location of pressure pulses (e.g., generated by an impact or explosion) produced at another location.
Sheet Flow (of runoff)	The rain storm or snow melt runoff water which flows over the ground surface as a thin layer - as opposed to the channelized (concentrated) runoff which occurs in rills and gulleys.
Slip Forms	Reusable forms (usually metal) for shaping concrete. The forms are put in place, then loosened and moved after the concrete is poured and set. Used especially for towers, tunnels and like configurations.
Spoil Areas	Storage areas where the soil overburden which is removed as a result of construction or excavation operations is disposed of.
Sympatric	Originating in or occupying the same geographical area.
Terrestrial Ecology	The interrelationships of organisms that live on the earth's surface to one another and their environment.
Transect	A sample area (as of vegetation) usually in the form of a long continuous strip.

ACRONYMS

AMB	Air Mobile Basing
ARS	Arizona Revised Statutes
BEA	Bureau of Economic Analysis
BLM	Bureau of Land Management
BTU	British Thermal Unit
CEQ	Council on Environmental Quality
CL	Sandy Clay
dBA	Decibel values for sound measured using the A-weighting framework of a standardized sound level meter
EIS	Environmental Impact Statement
FEA	Formal Environmental Assessment
LAFR	Luke Air Force Range
MAP	Multiple Aim Point
MAV	Multiple Aim Point Validation
MCAS	Marine Corps Air Station
ML	Clay Silt
MLCC	Mobile Launch Control Center
MSL	Mean Sea Level
NAFR	Nellis Air Force Range
NOAN	National Weather Service
PIP	Project Impact Potential

RFP	Request for Proposal
RIMS	Regional Industrial Multiplier System
SAMSO	Space & Missile Systems Organization
SC	Clayey Sand
SIC	Standard Industrial Classification System
SIOH	Supervision, Inspection and Overhead
SN	Silty Sand
SSTL	State Surface Trust Lands
TL	Missile Transporter/Launcher
WSMR/FBMR	White Sands Missile Range/Fort Bliss Military Range
YPG/LAFR	Yuma Proving Grounds/Luke Air Force Range

METRIC SYSTEM

ABBREVIATION	NAME OF UNIT	EQUIVALENT	UNITS	APPROXIMATE U.S. EQUIVALENT
		LENGTH		
km	Kilometer	1,000	Meter	0.62 mile
m	Meter	1	Meter	39.37 inches
cm	Centimeter	0.01	Meter	0.39 inch
mm	Millimeter	0.001	Meter	0.04 inch
		AREA		
ha	Hectare	10,000	Square Meters	2.47 acres
		MASS AND WEIGHT		
MT or t	Metric Ton	1,000,000	Gram	1.1 ton
g or gm	Gram	1	Gram	0.035 ounce
mg	Milligram	0.001	Gram	
		ADDITIONAL UNITS USED		
nm	Nautical Mile - Measure of distance - 6076 feet, 1.151 statute mile, 1.852 km			
fps	Feet per second - Measure of velocity - 0.348 meter/sec			
K	Knot - Measure of velocity - 1 Nautical mile/hour			
BTU	British Thermal Unit - Measure of heat energy, 1055 watts			
Kph	Kilometers per hour			

APPENDIX 1

ANSWERS TO WRITTEN QUESTIONS

Written questions or observations requiring answers are contained in this Section. Questions are identified by numbers in the margins of the letters, and numbered answers follow each letter.

APPENDIX 1a

ARIZONA STATE
UNIVERSITY
UNIVERSITY LIBRARY
TEMPE, ARIZONA 85281

August 31, 1977

Civil Engineering Division
SAMSO/MND
Norton Air Force Base, California 92409

Gentlemen:

We wish to thank you for the copy of the Draft Environmental Impact Statement, MX: Buried Trench Construction and Test Project, received several days ago.

I have read this report thoroughly and critically, and find it the finest environmental impact report I have seen of a very large number that have come across my desk. Aside from my duties at the University Library I am a citizen member of the Advisory Council on Historic Preservation, and thus am in close contact with environmental studies.

You are to be congratulated on the quality of this report.

At the same time, you have stimulated my curiosity about the contents of your section 3.3.5 Evaluation of Secondary or Indirect Effects, (pages 88-91) and particularly Table 16. Regional direct requirement coefficients.

The concept of Regional Industrial Multiplier Systems has not surfaced often, and I am fascinated by the possible application of this measurement to other government undertakings in our region. I cannot find any mention of this system in your bibliography, nor have we been able to find reference to the system in our government documents section, with particular attention to the Bureau of Economic Analysis of the U. S. Department of Commerce.

Could you kindly give the citation of the report or publication from which this excellent table was derived?

Sincerely

Bert M. Fireman
Curator, Arizona Collection

APPENDIX 1a

1. The information requested was transmitted to Mr. Fireman by letter. The publication requested by Mr. Fireman is now listed (Reference 90) in the References Cited Section.

APPENDIX 1b

(2) PA (1) +PM

Arizona Commission of Agriculture and Horticulture

1688 WEST ADAMS • PHOENIX, ARIZONA 85007 • (602) 271-4373

September 2, 1977

DCS/F&R
Asst DCS
Executive
Asst Exec
Action PIZE V
Susp
Info IZD
(SB)

Mr. Joe F. Meis
Deputy Assistant Secretary (Installations)
Department of the Air Force (SAF/MIQ)
Washington, D.C. 20330

RE: Draft Environmental Impact Statement (EIS) on the proposed "MX" Buried Trench and Construction Project in Yuma County, Arizona

Dear Mr. Meis:

The Commission is highly concerned with the building of the underground tunnel on the gunnery range. The Arizona Native Plant Law which protects the native vegetation in Arizona is very specific about the destruction of Protected Native Plants as described under ARS-3-904E, where all landowners are required to notify the Commission of possible destruction or removal of these plants.

The Commission, from confiscated plants due to legal action, has been donating these plants to both Luke and Williams Air Force Bases for landscaping. If the plants are going to be destroyed in this area, every effort should be made to salvage these plants and transport them to these Bases under our supervision. 2a

The delay in answering the request by the Deputy Assistant Director was overlooked while I was on vacation. I feel that the Commission's imput is very vital to your E.I.S. to keep the project from running afoul of Environmental Organizations on the destruction of these plants.

Thank you for your consideration of the problem affecting this Project.

Respectfully yours,

R. A. Countryman
Assistant Director

RAC:db

1626-77

APPENDIX 1b

2a. As indicated in Section 5.4 (Mitigations) "Sahuaro Cacti will be removed intact and made available to the Arizona Commission of Agriculture for whatever disposition they recommend." In response to this request, these cacti either will be transported to the Marine Air Station, Luke Air Force Base, or Williams Air Force Base for landscape use, or will be stockpiled on site for replanting at the termination of the project.

AH-N.500 - Rev. 8-77-R-0

Arizona Commission of
Agriculture and Horticulture
1688 WEST ADAMS • PHOENIX, ARIZONA 85007 • 602/271 4373

ARIZONA NATIVE PLANT LAW

Arizona Revised Statutes, Chapter 7

ARTICLE 1. PROTECTION

Sec. 3-901. Protected group of plants; botanical names govern; power to add or remove plants

A. The botanical names of the plants referred to in this article shall in all cases govern in the interpretation of this article. Protected native plants shall be any plant or part thereof, except its fruit, named in the protected group which is growing wild on state land or public land or on privately owned land without being propagated or cultivated by human beings and the dead plants or parts thereof of those plants which are named in subsection C, paragraph 4, of this section.

B. The following shall constitute certain protected native plants that are prohibited from collection except for scientific or educational purposes under permit from the commission of agriculture and horticulture: Washingtonia filifera (fan palm), lysiloma thornberi (ornamental tree), bursera fagaroides (elephant tree), cereus schottii (senita or "old one"), cereus thurberi (organ pipe cactus), toumeya papyracantha, toumeya peeblesiana, neoevansia diguetii (dahlia cactus) pediocactus paradinei, all pediocactus species, all sclerocactus species and all agave arizonica.

C. The following shall constitute the protected group of plants:

1. All species of the following families: liliaceae (lily family), amaryllidaceae (amaryllis family), orchidaceae (orchid family), crassulaceae (orpine family), cactaceae (cactus family).

2. All species of the following genera: aquilegia (columbine), lobelia (lobelia), dodecatheon (shooting star), primula (primrose), fouquieria (ocotillo).

3. The following species: atriplex hymenelytra (desert holly), cercis occidentalis (western redbud), dalea spinosa (smoke tree), holacantha emoryi (crucifixion thorn), fremontia californica (flannel bush), pinus aristata (bristlecone pine), rhus kearneyi (kearney sumac), sapium biloculare (Mexican jumping bean) and sabastiana pavoniana (Mexican jumping bean).

4. The following species of live or dead plants or parts thereof shall include: prosopis juliflora (common or honey mesquite), prosopis pubescens (screwbean mesquite), cercidium microphyllum (little leaf palo verde), cercidium floridum (blue palo verde), parkinsonia aculeatal (jerusalem thorn, long leaf palo verde), olneya tesota (ironwood tree).

D. The Arizona commission of agriculture and horticulture may, after public hearing, add or remove any native plant to or from the protected group. A public hearing on native plants shall be held at least every twelve months.

Sec. 3-902. Native plant permits and tags; fees; regulatory powers of commission

A. The commission of agriculture and horticulture shall issue permits, wood receipts, tags and seals for a fee as prescribed by the commission, which fee shall not be less than one dollar per plant for all native plants except cereus giganteus (saguaro) and not less than two dollars per plant for each cereus giganteus (saguaro), except for trees, live or dead, mesquite, palo verde or ironwood species of trees cut or removed for wood, as provided in subsection C, which fee shall not be less than one dollar per cord, to persons who take protected native plants from their original growing sites. When the Arizona department of transportation or any other state agency engages in large scale removal of protected native plants from state land, such agency shall notify the commission of agriculture and horticulture not less than ten days prior to commencing such removal. The commission shall make such rules and regulations necessary to effect the disposal of these plants either by donation to other governmental entities, nonprofit organizations, or sale to the general public. Housing developments, reclamation of desert land, or other activities conducted by commercial entities on private land shall be encouraged to salvage protected native plants to the greatest extent feasible. Permits to donate or sell such plants may be issued by the commission of agriculture and horticulture after ascertaining the validity of the request and determining the kinds of plants and the approximate number involved. The permit shall specify the species of protected native plants which may be taken, the area from which plants may be taken and the manner in which plants may be taken. No person, except as provided in this article, shall take or transport or have in his possession any protected native plant from its original growing site in the state of Arizona unless at the time of taking he has a valid permit therefor on his person, a valid wood receipt where required, attaches the tags and seals as may be required to the native plants at the time of taking, and exhibits the permit, wood receipt and tags and seals upon request for inspection by any duly authorized agent of the Arizona commission of agriculture and horticulture or by any peace officer as provided for in this chapter. No wood receipt or tag and seal is valid unless it is issued with a valid permit and such permit bears the tag number or wood receipt on its face.

B. With each permit authorizing the taking, transporting or possessing of protected native plants, except trees cut or removed for wood as provided in subsection C, the commission shall provide such tags and seals as the commission may prescribe, which the permittee or his agent shall attach to the protected native

plants at the time of taking and before transporting and in such manner as prescribed by the commission. After any protected native plant has been legally taken and tagged as provided by this article, it shall be unlawful to remove such tag or seal until the plant has been transplanted into its ultimate site for landscaping or beautification purposes. Removal of the tag or seal from the plant shall be only by an agent of the commission or by the ultimate owner of the plant, who shall retain such tag or seal as proof of ownership. No permit or tag or seal as such is transferable by the permittee or his agent, nor shall it be used by anyone except that person to whom such permit or tag or seal was issued, nor shall it be used for more native plants than indicated thereon and no refunds shall be made for the purchase thereof. Any permittee shall be responsible for the acts of any other person or persons acting under any authority expressed or implied of the permittee.

C. With each permit authorizing the taking, transporting or possessing of live or dead mesquite, palo verde or ironwood species of trees which are cut or removed for wood, the commission of agriculture and horticulture shall provide such wood receipts as the commission may prescribe, which must be in the possession of the person taking, transporting or possessing the tree. No permit or wood receipt as such is transferable by the permittee or his agent, nor shall it be used by anyone other than the person to whom such permit or wood receipt was issued, except that the wood receipt shall be transferred by the permittee to the purchaser of the cord of wood covered by the receipt as proof of ownership.

D. A person in possession of a valid permit for the removal of dead plants or wood issued by the United States department or agriculture or the United States department of the interior for use on lands under the administration of the United States forest service or the United States bureau of land management shall be exempt from the required permit as defined in section 3-904.

E. The commission of agriculture and horticulture may make necessary rules and regulations not in conflict with this chapter for the enforcement of its provisions.

F. The commission of agriculture and horticulture is empowered and directed to enter in or upon any premises or other place, train, vehicle or other means of transportation within or entering the state, suspected of containing or having present therein or thereon protected native plants in violation of this article.

G. When any power or authority is given by any provision of this article to any person, it may be exercised by any deputy, inspector or agent duly authorized by such person. Any person in whom the enforcement of any provision of this article is vested as the power of a peace officer as to such enforcement, which shall include state, federal or Indian agencies with which cooperative agreements have been made by the commission to enforce any provisions of this article.

H. The commission may enter into agreements with any agency of this state to conduct native plant surveys and appraisals on state lands, and may collect monies as reimbursement for providing such services. Notwithstanding the provisions of subsection A of section 35-148, any monies received under the provisions of this subsection shall be deposited in the special fund created by section 3-908.

Sec. 3-903. Board of supervisors; power to preserve plants

The board of supervisors of each county is authorized to adopt and enforce ordinances not in conflict with law for the preservation of protected groups of plants.

Sec. 3-904. Taking of plants; permit; tag fees; importation; exceptions

A. Except as provided in this article, it shall be unlawful for any person to destroy, dig up, mutilate or take any living plant, or the living or dead parts of any trees, except fruit, of the protected group from state land or public land without obtaining a permit and any required wood receipts or tags and seals from the Arizona commission of agriculture and horticulture, or from private land without obtaining written permission from the landowner, and a permit and any required wood receipts or tags and seals from the commission of agriculture and horticulture. It shall be unlawful for any person to falsify any paper or document issued to give permission for any person to take native plants of the protected group or to take more native plants than authorized by the permit or to take native plants from areas other than those authorized by the permit.

B. The commission of agriculture and horticulture may give written permission for a person or a scientific or educational institution to take a definite number of specified plants in the protected group from areas specified by the commission for scientific or educational purposes. In addition the commission may give written permission for a person to take specific plants or parts of plants in the protected group from areas specified by the commission for manufacturing or processing purposes or for the cutting or removal of wood and assess reasonable and proper fees for such taking of the plants or parts thereof. It shall be unlawful, for any person or scientific or educational institution to misuse a permit in any manner.

C. Permits issued for the removal of native plants including live or dead mesquite, palo verde or ironwood species of trees, will be for a stated period of time to allow the permittee to remove the specific amount of plants or wood stated in the permit, or that period of time stated by the landowner as part of such landowner's permission, whichever is shorter. Such permit will expire on the termination date shown on such permit.

D. Any permit provided by subsections A and B shall expire when the tags and seals issued therewith have been attached to the plants covered by such permit and such plants are no longer in the possession of the permittee. Any permit shall be valid until expiration or for one year from date of issuance, whichever occurs first, except that any permit and the tags and seals or wood receipts issued therewith shall be null and void when the land on which the plants are growing, as described in the permit, changes ownership, unless the new owner certifies in writing that the permittee may continue taking such plants as specified on the permit.

E. Nothing in this article shall be construed to prevent the clearing of land, cleaning or removal of protected native plants from a canal, lateral ditch, survey line, building site, or road or other right-of-way by the owner of the land or his agent where such protected native plants are not to be transported from the land or offered for sale and provided the commission is given at least ten days notice. Use of dead wood for branding fires or at permissible camping or cooking sites, for camping or cooking fires, is exempt from this section.

F. Nothing in this article shall be construed to prohibit any person from cutting, removing, transporting or possessing any dead mesquite, palo verde or ironwood in amounts less than one cord in quantity from land owned or leased by such person, other than state-owned land or other public land, or from land, the owner of which has given consent to such person to cut, remove, transport or use such wood.

G. The commission of agriculture and horticulture shall collect fees for the issuance of permits, tags and seals and wood receipts under this article, except for scientific and educational purposes, or for a landowner moving protected plants from one of his properties to another, providing that no such plants are to be offered for sale.

H. Any protected native plant found without a valid tag and seal securely and properly affixed thereto, or any mesquite, ironwood or palo verde wood found in the possession of a person without a valid wood receipt, may be confiscated as evidence of a violation.

Sec. 3-905. Shipment of plants; exhibition of permit and certificate of inspection to carrier

No person or common carrier shall transport a plant, or any part thereof, belonging to the protected group, nor receive or possess a protected native plant for transportation within or without the state, except for manufactured wood articles, unless the person offering the plant for shipment exhibits to the person or common carrier a valid written permit for the transportation of the plant or part thereof, and has securely and properly attached thereto a valid native plant tag and seal. If for transport without the state, the plant shall also bear a certificate of inspection by the commission. All protected native plant species or varieties, when not grown in Arizona and imported into this state, shall be declared at an Arizona agricultural inspection station or a district office of the commission, and proceed to destination under quarantine orders issued by agents of the commission employed at such station or district office.

Sec. 3-906. Arrests without warrant; confiscation of plants

A peace officer or an officer or employee of the commission of agriculture and horticulture may, in the enforcement of this article, make arrests without warrant for a violation of this article which he may witness, and may confiscate plants or

parts thereof belonging to the protected group when unlawfully taken, transported, possessed, sold or otherwise in violation of this article.

Sec. 3-907. Violations; penalties

A. A person violating any provision of this article is guilty of a misdemeanor punishable by a fine of not less than one hundred dollars nor more than one thousand dollars for each violation or by imprisonment in the county jail not to exceed one year, or both, and each violation constitutes a separate offense.

B. Upon conviction of a violation of this article, all permits issued to the person convicted shall be revoked and the permittee shall be required to surrender any unused tags and seals or wood receipts to the commission and no new or additional permits shall be issued to the permittee for a period of ninety days from date of conviction.

Sec. 3-908. Arizona commission of agriculture and horticulture fund

A. All fees or monies collected under the provisions of this article shall be deposited with the state treasurer at the end of each month, who shall place it in a special fund which is created to be known as the Arizona commission of agriculture and horticulture fund.

B. Ninety per cent of all money deposited with the state treasurer shall constitute a separate and permanent fund for the use of the Arizona commission of agriculture and horticulture in the enforcement of the provisions of this chapter, and ten per cent shall be credited to the general fund of the state.

Approved by the Governor - May 23, 1977

Filed in the Office of the Secretary of State - May 24, 1977

Effective - August 24, 1977

James R. Carter

James R. Carter, Director

JRC:db

APPENDIX 1c

Mr. James R. Carter, Director
Agriculture & Horticulture Dept.
421 Capitol Annex West
Phoenix, Arizona 85007

State Application Identifier (SAI)
SEP 20 '77 State AZ Number 77-80-0040

Region I, IV

Economic Sec.
Mineral Res.
Game & Fish
Ag. & Hort.
Environmental Studies
Archaeological Research
Renewable Natural Resources
Center for Public Affairs
Emergency Serv.
Az Atomic Energy Comm.
Transportation
Health
Water
ACRCC
Bureau of Mines
Land
Parks
OEPAD-R. Kingery
Library & Archives

om: Arizona State Clearinghouse
1700 West Washington Street, Room 505
Phoenix, Arizona 85007

This project is referred to you for review and comment. Please evaluate as to:

(1) the program's effect upon the plans and programs of your agency
(2) the importance of its contribution to State and/or areawide goals and objectives
(3) its accord with any applicable law, order or regulation with which you are familiar
(4) additional considerations

Please return THIS FORM AND ONE XEROX COPY to the clearinghouse no later than 17 working days from the date noted above. Please contact the clearinghouse if you need further information or additional time for review.

☐ No comment on this project
☐ Proposal is supported as written
☐ Comments as indicated below

Comments: (Use additional sheets if necessary)

Page 47 - Plant Species Protected by Arizona and Table 6, Page 48 - fully identify those protected native plants occurring at the proposed Buried Trench Construction and Test Project Site; 3.2.1. Effects on Vegetation Page 79 - describes the removal of protected native plants which the Commission wishes to address to fulfill the requirements of the Native Plant Law, ARS-3-904-E. 2b

The salvaging of Protected Native Plants from the construction site is desired and those plants be transferred to the local air bases for use as landscaping plants. The trees cannot be saved except as their value as wood.

The Commission has been furnishing the Marine Air Station, Luke Air Force Base and Williams Air Force Base native plants for landscaping their grounds for a number of years and the population of plants aren't that great that it would be a burden for the Air Force to remove and use these plants. In the case of *Peniocereus greggii* var. *Transmontanus*, Night Blooming Cereus, it is suggested that the Commission be notified before construction is started to enable personnel to search out and salvage these plants as it takes a trained eye and experience to find these plants. 2c

Your attention to this matter would be greatly appreciated.

R. A. Countryman
Assistant Director - Compliance Division

Reviewer's Signature _____ Date _____

Title _____ Telephone _____

APPENDIX 1c

2b. See answer to Question 2, Appendix 1b.

2c. The Commission will be notified before construction is started to enable personnel to search out and salvage any *Peniocereus greggii* var. *Transmontanus*, night-blooming cereus. Also, see answer to Question 2, Appendix 1b.

APPENDIX 1d

TO:

Mr. Robert Jantzen, Director
Game and Fish Dept.
2222 W Greenway
Phoenix, Arizona 85023

State Application Identifier (SAI)
SEP 20 1977 State AZ Number 77-80-0040

From: Arizona State Clearinghouse
1700 West Washington Street, Room 505
Phoenix, Arizona 85007

Economic Sec. Region I, IV
Mineral Res.
Game & Fish
Ag. & Hort.
Environmental Studies
Archaeological Research
Renewable Natural Resources
Center for Public Affairs
Emergency Serv.
Az Atomic Energy Comm.
Transportation
Health
Water
AORCC
Bureau of Mines
Land
Parks
OEPAD-R. Kingery
Library & Archives

This project is referred to you for review and comment. Please evaluate as to:

(1) the program's effect upon the plans and programs of your agency
(2) the importance of its contribution to State and/or areawide goals and objectives
(3) its accord with any applicable law, order or regulation with which you are familiar
(4) additional considerations

Please return THIS FORM AND ONE XEROX COPY to the clearinghouse no later than 17 working days from the date noted above. Please contact the clearinghouse if you need further information or additional time for review.

☐ No comment on this project
☐ Proposal is supported as written
☒ Comments as indicated below

Comments: (Use additional sheets if necessary) See attached letter

Reviewer's Signature [illegible] Date 9-27-77

Title [illegible] Telephone 942-3000

ARIZONA GAME & FISH DEPARTMENT

2222 West Greenway Road, Phoenix, Arizona 85023, 942-3000

September 6, 1977

Director
Asst DCS
Executive
PRE
RD

Mr. Joe F. Meis
Deputy Assistant Secretary, Installations
Department of the Air Force
Washington, D. C. 20330

Dear Mr. Meis:

Arizona Game and Fish Department biologists have reviewed the Draft Environmental Impact Statement for the MX: Buried Trench Construction and Test Project. We feel that the proposal is quite thorough and specific in delineating the environmental impacts of the program. The effects on wildlife habitat would be minimal. The goals of the U.S. Air Force on clean-up and restoration, after testing is completed, are well taken.

One correction that we would suggest is the federal agency that has jurisdiction on the Cabeza Prieta National Wildlife Refuge (p.58). Sole jurisdiction now lies with the U.S. Fish and Wildlife Service. 3

The impact of this program on desert bighorn sheep can be kept at a minimum by regulating the timetable of construction for the longer trench. Construction should begin first on the eastern end and progress to the western end. The construction impact on bighorns would then be reduced as their use of the construction site later in the year would be reduced. However, forage and water availability will ultimately determine the actual bighorn use areas. 4

We do not know what additional mitigation features, other than the ones listed in the statement, will be considered. It would be helpful if the Department could have aerial and ground access for bighorn surveys in the Mohawk Mountains during late March or early April. Construction activities would be in progress at this time. Approximately eight (8) hours of helicopter time would be welcomed.

There is a dire need for establishing permanent wildlife (bighorn) water sources in the Mohawk Mountains. Mitigation monies for developing a water source or for a water survey, possibly as part of the bighorn census, would be desirable.

1626-77

Our Department appreciates the opportunity to review and comment on this DES. Please contact us if further comments are desired.

Sincerely,

Robert A. Jantzen, Director

Bruce R. Duke

By: Bruce R. Duke
Project Evaluation Specialist

BRD:dd

cc: Don Wingfield, Supervisor, Region IV, Yuma

APPENDIX 1d

3. The suggested correction has been made.

4. This question has been addressed in Section 3.2.2.

APPENDIX 1e

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
REGION NINE
Two Embarcadero Center, Suite 530
San Francisco, California 94111

ARIZONA
CALIFORNIA
NEVADA
HAWAII
GUAM
AMERICAN SAMOA

September 15, 1977
IN REPLY REFER TO
HED-09

Office of the Secretary
United States Air Force
(SAF/MIQ)
Washington, D. C. 20300

Dear Mr. Secretary:

We have reviewed the Draft Environmental Impact Statement for the MX Buried Trench Construction and Test Project in Yuma County, Arizona, and provide the following comment.

Figure 12, page 17, shows a slip-ramp off Interstate 8 providing truck access during construction. To avoid construction traffic interferring with interstate traffic, it is suggested that the point of access be moved to the east-bound ramp of the Mohawk Interchange as indicated on the enclosed diagram. This turnout has good visibility in both directions along with being a two-way road. 5

A permit from the Arizona Department of Transportation, Highways Division is required to gain access to Interstate 8. Therefore, please contact Mr. Milem C. Livesay, District 1 Engineer or Mr. Ronald E. Romley, District 1 Permit and Encroachment Supervisor at 2140 West Hilton Avenue, Phoenix, Arizona 85009 to obtain a permit.

We appreciate this opportunity to review the subject Draft EIS and would like to receive a copy of the Final Statement when it becomes available.

Sincerely yours,

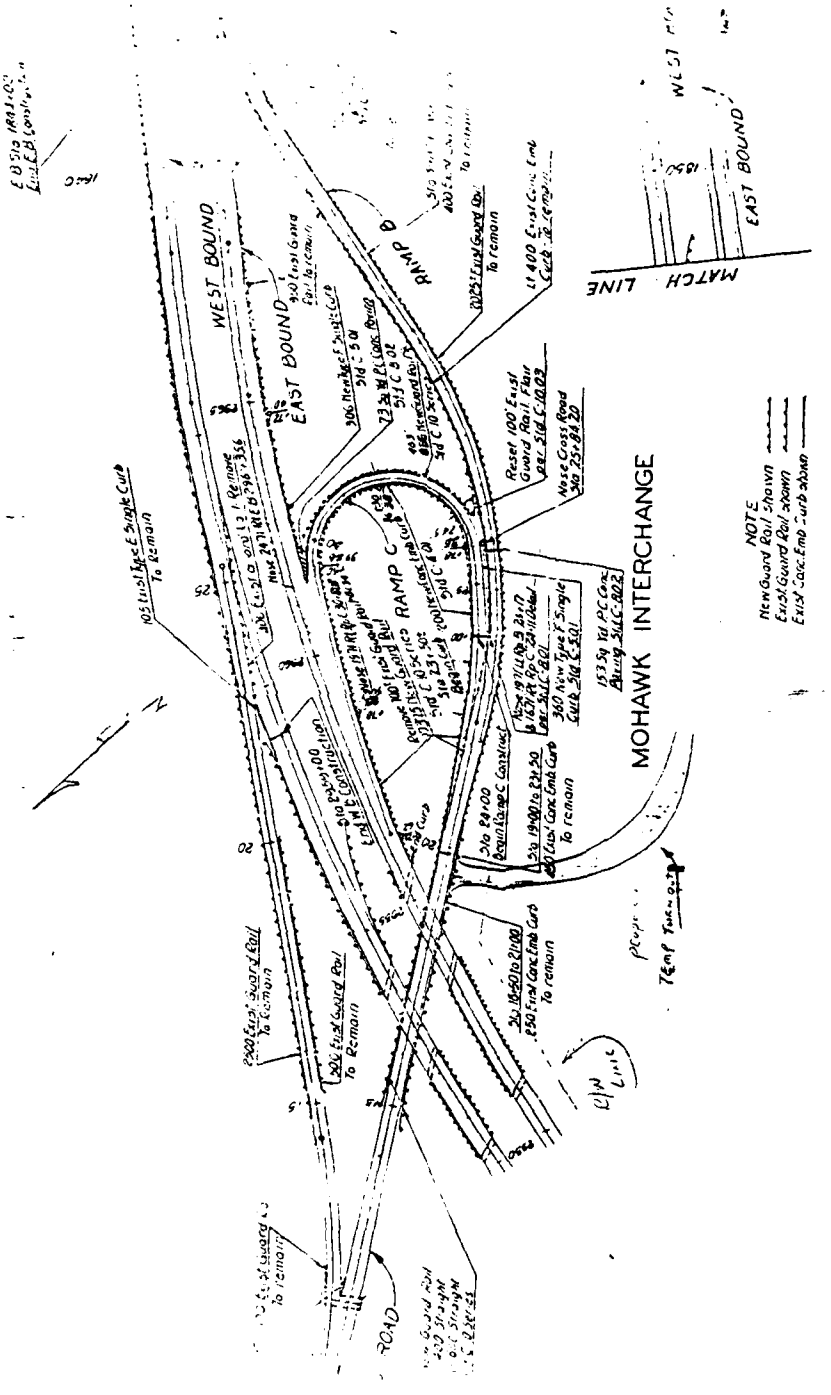
R. G. S. Young, Director
Office of Environment and Design

Enclosure

APPENDIX 1e

5. This suggestion has been incorporated in Section 1.1.6.1.

APPENDIX 1e (Cont.)



APPENDIX 1f Follows

APPENDIX 1f

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
3008 Federal Building, Phoenix, Arizona 85025

September 23, 1977

Mr. Joe F. Meis
Deputy Assistant Secretary
(Installations)
Office of the Secretary of
the Air Force (SAF/MIQ)
Washington, D. C. 20330

Dear Sir:

We have reviewed the draft Environmental Impact Statement for a buried trench construction and test project for Luke Air Force Range, Yuma County, Arizona. We offer the following comments:

1. There is a good discussion of geology and geomorphology on pages 22-27, but the soils discussion on page 28 is very cursory. It has been written from a soils engineering rather than the soil scientist approach. If you plan to revegetate the area after construction you will probably need additional soil information.

2. You should consider revegetation using native materials after construction is complete.

3. An evaluation of soil losses due to water erosion similar to the wind erosion analysis (pages 75-78) should be made.

We appreciate being given the opportunity of reviewing this statement.

Sincerely,

For:
Thomas G. Rockenbaugh
State Conservationist

cc: (1) Director, Environmental Services Div.
Soil Conservation Service
Washington, D. C.

(5) Council on Environmental Quality
722 Jackson Place NW
Washington, DC 20006
Attn: General Counsel

1626-77

APPENDIX 1f

6. Additional soils information has been included in Section 1.2.1.3.

Because site visits have shown that there is a rapid invasion of disturbed areas by annual plants (see revised material in Section 3.2) it is not anticipated that revegetation will be necessary. The stockpiling and replanting of saguaro cacti is under consideration, however. (See answer to question 2, Appendix 1b.) Section 3.2 discusses the successional changes anticipated to occur following termination of the project.

7. The response to this question is contained in Section 3.1.1.

APPENDIX 1g

DEFENSE NUCLEAR AGENCY
WASHINGTON D C 20305

VPA

LGEC

27 SEP 1977

MEMORANDUM FOR THE DEPUTY ASSISTANT SECRETARY OF THE AIR FORCE
(Installations) (ATTN: SAF/MIQ)

SUBJECT: Draft Environmental Impact Statement (DEIS) -
MX Buried Trench Construction and Test Project

The DEIS on subject project raises no issues of potential significance to DNA. Recommend attached comments be included in the Final Statement. | 8

FOR THE DIRECTOR:

1 Enclosure:
as stated

THOMAS P. JEFFERS
Director for Logistics

Comments on Draft Environmental Impact Statement,
MX Buried Trench Construction and Test Project

Section 1, para 1.1.1, subpara 7, page 2.

Recommend paragraph be changed to read:

"A proposed third element of the MAV effort, to be conducted by the Defense Nuclear Agency, is MISERS BLUFF, which is a series of high explosive tests similar to the HAVE HOST tests, but at larger scales. The test series is to be conducted in two increments. Phase I is to be conducted in the Queen 15 area, White Sands Missile Range, NM (WSMR) through 1977, and Phase II is to be conducted on Planet Ranch in West Central Arizona during 1978. A separate Environmental Analysis is currently being prepared on the MISERS BLUFF program by the Defense Nuclear Agency."

1626-77

APPENDIX 1g

3. This statement, modified to indicate that the referenced document has been prepared and is included in Section 1.1.1.

V

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D C 20240

In Reply Refer To:
ER-77/801

Mr. Joe F. Meis
Deputy Assistant Secretary (Installations)
Office of the Secretary of the Air Force
(SAF/MIQ)
Washington, D.C. 20330

(SB)

Dear Mr. Meis:

We have reviewed the Draft Environmental Impact Statement for the Proposed MX: Buried Trench Construction and Test Project. We have the following comments.

General Comments

On the whole, the statement appears to be adequate regarding the examination of environmental impacts due to the construction activities. However, we are concerned because two projects closely related to the buried trench project, the Have Host and Miser's Bluff high explosive test programs, will have greater impacts on several aspects of the environment. Yet these two test programs are being analyzed only in environmental assessments which will not be circulated for general public review.

To avoid "piecemealing" the environmental analysis of these related activities, preparation of an environmental statement covering all activities under the Multiple Aim Point Validation (MAV) program would be most desirable. If this cannot be done in the time available, the final environmental statement for the buried trench project should include a more detailed description of the high explosive tests, ongoing gunnery activities, and their impacts, so that the cumulative environmental impacts of all activities in the area can be recognized. 9

1626-77

Any conflicts or resolved conflicts between the proposed new activities and ongoing Air Force activities on Luke Air Force Base should be indicated. | 10

We are also concerned that the program activities represent an intensification of use and environmental impacts on public lands withdrawn for military purposes. The Department of the Air Force should maintain close consultation with the Bureau of Land Management State Office in Phoenix regarding such intensification of use. The TAV activities and their environmental impacts should be included in the environmental statement being prepared in conjunction with renewal of the Luke Air Force Base military withdrawal. | 11 | 12

Permitting Requirements

It is desirable to identify, in the project description, any Federal, State or local permitting requirements which affect project implementation, i.e., issuance of permits/licenses for railroad signals, temporary access for on-off ramp from interstate highway, extension of railroad spur right-of-way, change in land use and the like. | 13

Surface and Ground-Water

Potential flash flood danger, i.e., the 25, 50 and 100-year flood potentials for the area, should be identified in the final environmental statement. | 14

The final statement should also include any additional mitigative measures that may be identified and evaluated (page 113, paragraph 1) to reduce any potential adverse effects resulting from surface-water infiltration and shallow groundwater concentration in the back fill material of trench excavations (page 74, section 3.1.3, paragraph 3). | 15

The final statement should include information on the type and distribution of aquifer(s) and on depth to water. Direction of ground-water flow should be given, and the possibility that the proposed structure may act as a barrier to shallow ground-water flow should be more adequately assessed. Such assessment should include the possibility that rises in water levels may occur as a result of the partial barrier to ground-water flow, thus promoting changes in evaporation losses and related changes in quantity of shallow ground water. | 16

Indirect impacts such as interference with biotic communities resulting from ground-water changes should be indicated. 17

Soils

Soil types should be discussed in terms of their permeability, erodibility, expansion, compaction, etc., as they may be affected by delivery of materials, construction equipment, lay-down areas, and the like. The sensitivity of the desert environment and the long time period required for recovery from certain types of impacts should be indicated at appropriate points throughout the impacts section. 18

Archaeological Values

The State Historic Preservation Officer should be contacted to determine if there are any properties in the project area that are included on, pending, or eligible for the National Register of Historic Places. This information, in addition to the determination of eligibility for AV-4, should be included in the final document. If it is determined that AV-4 is eligible for inclusion, and the resource cannot be avoided, then the final statement should discuss the appropriate data recovery program developed in consultation with the State Historic Preservation Officer and the Advisory Council on Historic Preservation. 19

Alternatives

Although there is an effort to present a comparative analysis of environmental impacts for the alternatives, the summary or conclusion provided at the end of most of the alternatives seems justificatory in tone. It might be preferable to let the comparative analyses stand on their own.

We appreciate the opportunity to provide these comments and we urge close coordination between the Department of the Air Force and this Department regarding activities on public lands withdrawn for military use.

Sincerely yours,

Larry E. Meierotto
Deputy Assistant Secretary of the Interior

APPENDIX 1h

9. In response to this request for a more detailed description of the Misers Bluff and HAVE HOST tests, the Summary from the Misers Bluff Environmental Impact Assessment, and a summary of the HAVE HOST Environmental Assessment are provided at the end of this Appendix, p. A-31.

10. This question is addressed in Sections 2.2 and 4.4.2.3.

11. The U.S. Department of the Interior, Bureau of Land Management Regional Director in Phoenix was formally briefed on this project on 14 September 1977 at the Phoenix BLM office.

12. Headquarters, Tactical Air Command (the agency responsible for preparation of the Environmental Impact Statement in conjunction with the renewal of the Luke Air Force Range military withdrawal) has been provided a copy of this letter for their consideration.

13. Permits required are identified on Section 1.1.6.1.

14. The short trench intersects only minor drainage channels no more than two feet deep.

The long trench intersects major drainage channels at two places on the bajada. The largest of these is the subsidiary channel at Section 3b (see Figures 14 and 16). A series of much smaller channels typified by Section 5 (Figures 14 and 16) is crossed in the mid-bajada. These mid-bajada channels are braided into many parallel segments and storm water that has not infiltrated into the upper bajada may leave these channels in the form of sheet flow during heavy storms.

The larger channel of Section 3b is not expected ever to run full based on storm hydrographs calculated for this project.

The project itself will not measurably change the flash flood potential of the site. Stream courses will not be altered, and exposed paved structures (entrance ramps) will be backfilled. No personnel will be stationed permanently on site, and no structures will be exposed to drainage.

The greatest flash flood danger to personnel and equipment can be expected to occur during the time that excavation (emplacement/backfilling) are occurring across the major arroyo. Large storm systems capable of causing flooding can occur in mid summer during the time construction of the long trench is taking place. Because the Mohawk Mountains are adjacent to the project site and the drainage basins are visible to personnel on site, a storm capable of causing flash flooding would be evident in time to move personnel from the arroyos and minimize danger.

15. No additional mitigative measures have been found to be necessary.

16. This question has been addressed by revising Sections 1.2.1.5.2 and 3.1.3.

17. This impact is addressed in Section 3.2.1.

18. More information on soil types has been included in Section 1.2.1.3. Section 3.2 has been modified to include sensitivity of the biological environment and time periods required for recovery. The impacts section emphasizes the fragility of desert surfaces and times required for recovery. Further details are given in Reference 88.

19. The State Historic Preservation Officer has been contacted and is considering the eligibility of MAV-4 for inclusion in the National Register of Historic Places. A data recovery program is being developed in consultation with the State Historic Preservation Officer and with the Advisory Council on Historic Preservation and will be implemented prior to the start of construction.

DEFENSE NUCLEAR AGENCY, WASHINGTON, D.C. 20305
ENVIRONMENTAL IMPACT ASSESSMENT FOR
PHASE II OF THE MISERS BLUFF FIELD TEST SUMMARY
SEPTEMBER 1977

This is an Environmental Impact Assessment (EIA) for Phase II of MISERS BLUFF, a proposed DoD high-explosive field test program to conduct ground motion and structural response experiments for evaluating the vulnerability/survivability of candidate MX systems (missile system concepts designed to replace the Minuteman system). Phase II consists of single-charge event equivalent to 100 tons of TNT to be exploded in late March 1978 and a multi-charge event consisting of an array of six 100-ton TNT-equivalent charges to be exploded nearly simultaneously in late June 1978. The proposed test site is a remote valley known as the Rincon at the end of a larger valley known as the Planet Valley along the intermittent Bill Williams River in west-central Arizona. The property is privately owned and operated as the Planet Ranch. The nearest neighboring ranch is eight miles away, and a trailer park is 13 miles away. The nearest communities are 25 miles or more from the Rincon.

The construction actions to support the program consist of improving 10 miles of existing private roads, building two miles of new road, preparing the test beds, preparing the experiments, installing the explosive charges, setting up as many as three instrumentation trailer parks, and building an administration area approximately one acre in size. A gravel borrow area and a sanitary landfill site will also be required, and a septic tank with leach field may be installed. After completion of the test program most of the experimental structures and test facilities will be removed and the excavations and craters filled in. A total of approximately 175 acres of land area will be disturbed, approximately 125 acres of which will be in the area of the test bed.

Damage to animals and vegetation from the explosions will be limited to those biota within the 3 psi peak overpressure level, i.e., within approximately 1100 feet of the single-charge event and 2000 feet of the multi-charge event. The vegetation in the vicinity of the test beds is sparse and it is unlikely that any large animal would be within these distances without being noticed and driven from the area. No man-made structures or important natural features are close enough to suffer structural damage fromthe airblast or ground shock. Some rockfalls may occur from the cliff bordering the test bed. Based on statistical data for the relationship between window breakage and airblast overpressure, if the multi-charge event were to be executed in a calm nonrefracting atmosphere 0.004 percent of the windows in Parker and 0.0015 percent of the windows in Lake Havasu City might be broken (i.e., approximately two windows in Parker and four windows in Lake Havasu City) as would six percent of the windows at the Planet Ranch headquarters. Since meteorological conditions will be monitored and since it should be relatively easy to obtain atmospheric conditions that will reduce airblast at long distances, no window damage is expected.

There will not be any significant adverse physical or sociological effects on humans. There will be some economic benefit to the nearby communities, primarily Lake Havasu City.

None of the explosion cloud products will exceed air quality standards nor will such products have any effect on water quality. The ground shock and craters will not have any effect on water levels or quality, nor any lasting effect on the land.

The program objectives cannot be met without conducting the program. Ten alternative sites were considered and the proposed site was rated as the preferred site. Damage to animals and vegetation at the site will be mitigated by the fact that such damage will occur in any event when the land is converted to agriculture as is planned by the owner. For this reason, it is unlikely that a different site would result in less environmental impact. The size and scope of the project are necessary to achieve the objectives.

The main issues of environmental concern in the area appear to be those which could have impact on water, land use, and bighorn sheep, and critical man-made structures (dams, a tunnel and pipelines), none of which should be significantly affected by the proposed program.

In summary, the expected adverse effects do not seem significant, nor is there any reason to expect the program to be environmentally controversial.

KIRTLAND AIR FORCE BASE, NEW MEXICO
AIR FORCE SYSTEMS COMMAND
HAVE HOSE TEST PROGRAM
ENVIRONMENTAL ASSESSMENT

This is an Environmental Assessment for the HAVE HOST Test Program. The HAVE HOST Test Program is a portion of the MX Weapon System Survivability/Vulnerability (S/V) Validation Phase Program. HAVE HOST is the code name for the test program portion of the Multiple Aim Point (MAP) Basing option of the MX Weapon System. The objective of the HAVE HOST Test Program is to validate the basing options on a cost, performance, and survivability basis and to develop simulation techniques to be used during future full-scale development. HAVE HOST is planned as a series of scaled high explosive field tests to evaluate two of the MAP basing options: the Closed Shelter and the Buried Trench. Simulators and/or simulation techniques capable of simulating nuclear overpressures and dynamic pressure loadings are being developed during HAVE HOST such that validation of Shelter and Trench concepts may be accomplished. Approximately 600 tons total of explosives will be used during the test program for nine test events. The HAVE HOST construction and testing activities of the Closed Shelter and Buried Trench Options will be conducted concurrently at the same test locality on the Luke Air Force Range (LAFR) in Arizona. Ownership and control of the land within LAFR resides with the Federal Government. LAFR is now under primary control of Luke AFB (TAC), near Phoenix. The nearest community to the HAVE HOST test site is Wellton, approximately 10.7 nm on an azimuth of 229° from grid north. The Marine Corps Air Station, Yuma is located adjacent to the southeast limits of the city of Yuma, approximately 25.8 nm from the HAVE HOST test site.

Portions of the HAVE HOST test program are presently in the planning stage. Construction operations to support the program consists of providing site access, setting up instrumentation vans and support vans, preparing the explosives, installing instrumentation cables and sensors, preparing the test beds, and preparing the experiments. The facilities for the Closed Shelter Option will entail the construction of hard structures on or about the existing ground level. Explosives in the form of detonating cord and/or AN slurry will be placed inside of the diver section of the simulator. Test beds for the Buried Trench Option will consist of cavities up to 3 ft below existing ground level. A number of other facilities in addition to the test beds will be provided such as an administration building, a shop/laboratory building, a security building, a pressurized water system, and a chain link security fence. After completion of the test program, all of the experimental structures and test facilities will be removed and the excavations and craters filled in. The perimeter of the test area is a square of approximately 3000 feet on each side. Within this area, approximately 20 acres will be disturbed for new bladed roads and test structures.

Damage to animals and vegetation from the explosions will be limited to those biota within the 1 psi peak overpressure level, i.e., within approximately 900 feet of the In-Trench Environmental Definition Test. The vegetation in the vicinity of the test beds is sparse and it is unlikely that any large animal would be within these distances without being noticed and driven from the area. No man-made structures or important natural features are close enough to suffer structural damage from the airblast or ground shock. Based on statistical data for the relationship between window breakage and airblast overpressure, if the In-Trench Environmental Definition test were to be executed in a calm nonrefracting atmosphere 1 window in 1000 might be broken in Wellton. At a level of 0.29 psi 1 window in 10,000 to 100,000 might be cracked. Since meteorological conditions will be monitored and since it should be relatively easy to obtain atmospheric conditions that will reduce airblast at long distances, no window damage is expected.

There will not be any significant adverse physical or sociological effects on humans. There will be some economic benefit to the nearby communities, primarily Yuma.

None of the explosion cloud products will exceed air quality standards nor will such products have any effect on water quality. The ground shock and craters will not have any effect on water levels or quality nor any lasting effect on the land.

The program objectives cannot be met without conducting the program. Four alternative sites were considered and the proposed site was rated as the preferred site. The size and scope of the project are necessary to achieve the objectives.

In summary, the expected adverse effects do not seem significant, nor is there any reason to expect the program to be environmentally controversial.

ARIZONA DEPARTMENT OF TRANSPORTATION

HIGHWAYS DIVISION

206 South Seventeenth Avenue Phoenix Arizona 85007

RAUL H. CASTRO
Governor

WILLIAM A. BROADWAY
Director

SAM A. LACAGNINA
Assistant Director
and State Engineer

October 6, 1977

Deputy for Environment and Safety
Office of the Secretary
United States Air Force
SAF/MIQ
Washington, D.C. 20330

RE: Draft Environmental Impact
Statement
MX: Burried Trench Construction
and Test Project

Gentlemen:

We have reviewed the above referenced environmental impact statement for the proposed MX test project to be constructed in Yuma County, Arizona and offer the following comments.

The Final Environmental Impact Statement should reflect changes that have been agreed upon to delete the proposed temporary slip ramp off Interstate 8 eastbound, near milepost 61, intended to provide truck access during construction. This connection to be changed is described on pages 16 and 17 of the Draft EIS. 20

In June of 1977 the Arizona Department of Transportation denied a permit request from the Ralph M. Parsons Company, the Department of Air Force contractor, to construct the temporary ramp at this milepost 61 location due to the unsafe traffic conditions that would be created on this main highway. Since that time, negotiations have taken place between the Ralph M. Parsons Company, the Federal Highway Administration and the Arizona Department of Transportation Engineering District I, resulting in an acceptable alternative.

The attached copies of correspondence and drawings reflect the present plan for travel between the Yuma materials area and the construction site near Stoval. As an alternative to the temporary slip ramp and turnout at milepost 61 on eastbound Interstate 8, the plan now is to construct a temporary turnoff at the eastbound ramp at the Mohawk Interchange on Interstate 8. This turnout will provide good visibility in both directions along with being a two-way road. The proposed ingress and egress will not interfere with interstate traffic and ramp "C" has

only a small amount of traffic per day (10 to 15 vehicles). The contractor plans to construct a temporary road between the railroad track and the highway right of way from this turnoff to the proposed railroad crossing at milepost 61. This road and turnoff will facilitate both east and westbound traffic between Yuma and the construction site. Eastbound traffic will exit the freeway at Tacna Interchange and travel east on old U.S. Highway 80 to the proposed turnoff. Westbound traffic will follow the same route entering the freeway to Tacna Interchange. Trucks hauling gravel from the Tacna area would not travel on the I-8 through traffic lanes.

Advance warning signs will be required for traffic control. The freeway off-ramp needs to be signed with truck crossing ahead. These signs will start halfway down the ramp but there will be no signs placed on the Interstate.

It will be necessary for the contractor to treat the dusty surface of the portion of the haul road located opposite the Interstate Highway 8 rest stop.

Negotiations are currently underway between the project contractor and the Arizona Department of Transportation District I concerning design details and Highway Use Permit. The ADOT contacts are Mr. Milem C. Livesay, District I Engineer or Mr. Ronald E. Romley, District I Permit and Encroachment Supervisor at 2140 West Hilton Avenue, Phoenix, Arizona 85009, telephone (602) 261-7381.

We appreciate the opportunity to review and comment on this Draft EIS and would appreciate receiving a copy of the Final statement when it becomes available.

Very truly yours,

OSCAR T. LYON, JR.
State Engineer

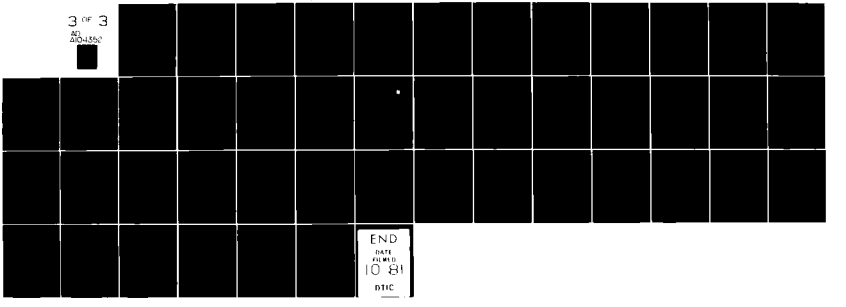
James E. Dorre

JAMES E. DORRE, Manager
Environmental Planning Services

JED:ADG:bjw

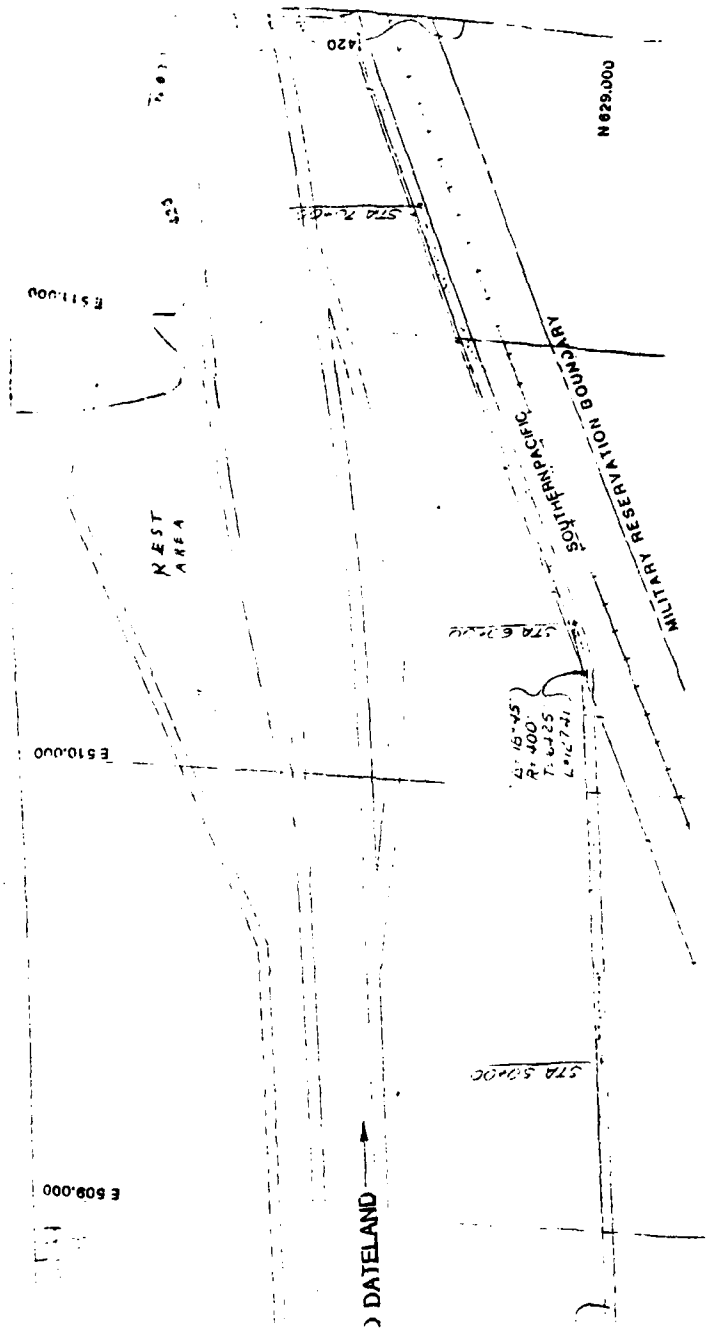
Enclosures

AD-A104 352 AIR FORCE SYSTEMS COMMAND WASHINGTON DC F/G 13/2
ENVIRONMENTAL IMPACT STATEMENT MX: BURIED TRENCH CONSTRUCTION A--ETC(U)
NOV 77
UNCLASSIFIED AFSC-TR-81-50 NL



APPENDIX 1i

20. The suggested changes have been made in Section 1.1.6.1.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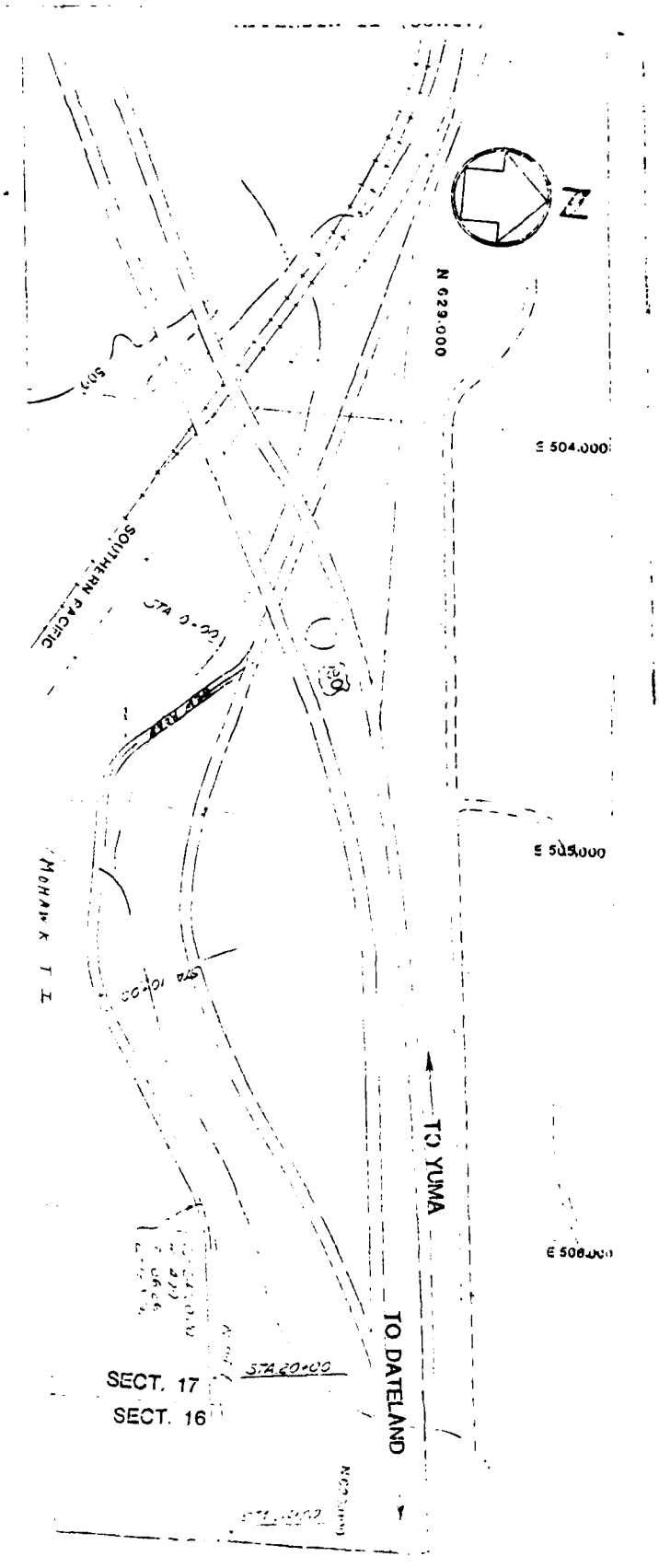
DATELAND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TO DATELAND
SECT. 17
SECT. 16
STA 20+00

APPENDIX 1j

State Application Identifier (SAI)

SEP 20 1977 State AZ Number 77-80-004

From: Arizona State Clearinghouse
1700 West Washington Street, Room 505
Phoenix, Arizona 85007

Economic Sec. Region I, IV
Mineral Res.
Game & Fish
Ag. & Hort.
Environmental Studies
Archaeological Research
Renewable Natural Resources
Center for Public Affairs
Emergency Serv.
Az Atomic Energy Comm.
Transportation
Health
Water
ACRCC
Bureau of Mines
Land
Parks
OEPAD-R. Kingery
Library & Archives

This project is referred to you for review and comment. Please evaluate as to:

(1) the program's effect upon the plans and programs of your agency
(2) the importance of its contribution to State and/or areawide goals and objectives
(3) its accord with any applicable law, order or regulation with which you are familiar
(4) additional considerations

Please return THIS FORM AND ONE XEROX COPY to the clearinghouse no later than 17 working days from the date noted above.
Please contact the clearinghouse if you need further information or additional time for review.

☐ No comment on this project
☐ Proposal is supported as written
☒ Comments as indicated below

Comments: (Use additional sheets if necessary)

Several inconsistencies occur in the comparisons that are made in the second paragraph of section 1.2.1.7 (p.37).

a) A 50-mile visibility corresponds to a particulate concentration of 20-25 ug/m^3.

b) A 7-mile visibility corresponds to a particulate concentration of around 150 ug/m^3. 21

c) A particulate concentration of 715 ug/m^3 corresponds to a visibility of around 1 mile.

d) A particulate concentration of 2700 ug/m^3, which is seldom ever measured except in the "eye" of an "Haboob", corresponds to a visibility of near zero.

Reviewer's Signature: Bruce Scott

Date: OCT 4 1977

Title: ASSISTANT DIRECTOR
ARIZONA DEPT. OF [illegible] SERVICES
OFF. OF [illegible] [illegible]TH SERVICES

Telephone

APPENDIX 1j

21. The visibilities referred to in Section 1.2.1.7 are correct and are based on calculations presented in Reference 91. The apparent discrepancy may arise from the use of urban visibility data by the commentor.

APPENDIX 1k

REG. GEOLOGIST (CA., ME.)
CERT. ENGINEERING GEOLOGIST (CA.)

REG. CIVIL ENGINEER (MA., CA.)
REG. GEOLOGICAL ENGINEER (AZ.)

ALLEN W. HATHEWAY, PhD
ONE TYLER ROAD
BELMONT, MASSACHUSETTS 02178
(617) 489-3234

12 October 1977

Office of Secretary of the Air Force
Deputy for Environment and Safety (SAF/MIQ)
Washington, D. C. 20330

Subject: Review Comments - Draft EIS, MX Buried Trench

Gentlemen:

As a recipient of a review copy of the Draft EIS for the proposed MX Buried Test Trench, San Christobal Valley, Arizona, I have prepared a set of comments, in letter form, attached to this communication. In addition to my 17-year residence on the Colorado and Sonoran deserts, extensive travel in those areas, and graduate-level academic training in Arizona, I am a Reserve Officer vitally interested in maintenance of a sound national defense posture.

If I may be of future assistance in non-renumerative public service, I would be pleased to review materials in the fields of geology, geophysics, geomorphology, surface hydrology, and geotechnical engineering, and to offer appropriate comments for use in hearings or other public arenas. My resume is attached for this purpose.

Yours truly,

Allen W. Hatheway
LTC, Corps of Engineers, USAR

cc: CPT Langdon Kellogg
SAMSO/MNND

REG. GEOLOGIST (CA., ME.)
CERT. ENGINEERING GEOLOGIST (CA.)

REG. CIVIL ENGINEER (MA., CA.)
REG. GEOLOGICAL ENGINEER (AZ.)

ALLEN W. HATHEWAY, Ph.D.
ONE TYLER ROAD
BELMONT, MASSACHUSETTS 02178
(617) 489-3278

12 October 1977

Office of the Secretary of the Air Force
Deputy for Environments and Safety (SAF/MIQ)
Washington, DC 20330

Subject: Review Comments - Draft EIS, MX Buried Trench

Gentlemen:

As a 17-year resident of the Colorado and Sonoran Deserts, and Arizona educated, I have been following the MX test projects with great interest. Accordingly, I wrote to CPT Langdon Kellog, at Norton AFB, requesting a copy of the present Draft EIS concerning the MX Buried Trench Construction and Test Project. I have enjoyed reading this document and am herein offering comments, based on my areas of professional expertise, for your consideration and use in whatever fashion you may deem most appropriate.

General Comment: The Draft EIS is generally of superior quality in terms of content, coverage, and presentation, than many other Federally-sponsored Statements that I have personally reviewed. Within those areas of my expertise, I would say that sufficient research and field explorations have been accomplished to support the conclusions presented in the Statement.

Figures 3 and 5: Should not the "Approximate Alignment of Long Trench" extend to the left edge of Figure 5? Such is indicated by comparison with the Field of View shown on Figure 3. | 22

1.1.7.2): Reference is made to "... the need to rip or blast hard deposits ...", yet no data are contained in discussions to support the presence of such material; presumed to be caliche.

1.1.7.5): It would be appropriate to include a sentence in explanation of the reason for choosing 90 percent Proctor density. I presume that this is so that the replaced adjacent excavation materials will provide adequate support for the tunnel, rather than attempt to duplicate in-situ soil density. | 23

1.1.7.6): Reference should be made to the fact that the alignment has been carefully selected so as to make a minimal impact on arroyos. Figure 14 shows that only three such features are actually traversed by the alignment | 24

However, Figure 14 also depicts near incidence of the alignment (possibly within the 100-m disturbed zone) to several other arroyos at or near measured channel cross sections 2, 3, 3a, 3b, 10, 15, and 19. Plans may have to include modification of the construction use of the proposed disturbed zone so as not to impact the near bank of the adjacent arroyo. 24 (CONT)

1.1.7.6): Critics may ask for insurance that the "top layer of rocks" will be stockpiled during excavation and spread later over the final graded compaction surface. This action would appear necessary to me, but also complicated in nature of placement, although no specification is mentioned for compaction control (in terms of Proctor density) of the final placement of spoil along the trench alignment. 25

3.1.1, par. 2 of p. 72: It appears that a word may be missing from the text; should the sentence read "...some development of erosion washes..."? 26

4.4.1, p. 97: In reference to Fort Irwin, California, I believe that this post is still an active Army installation. I would also question the fact that there is indeed a "high probability of rock near the surface" that would have to be excavated. The main disadvantage of using the Fort Irwin Reservation would be the fact that it is highly compartimentalized by topography and the resulting long and relatively narrow valleys are the scene of fairly high-density armored vehicle traffic during the summer military training season and less frequently during larger springtime combined services exercises.

In my opinion, the EIS, at this point, has successfully demonstrated a least-impact concept of land utilization for the test trench through careful consideration of governing geological factors. If certain outstanding questions, including those mentioned above, are treated in the final EIS, I would predict timely approval for construction.

Yours truly,

Allen Stockwell

cc: CPT Langdon Kellogg
SAMSO/MNND

APPENDIX 1k

22. The angle of view shown on Figure 3 for Figure 5 is slightly more acute than it should be.

23. Compaction to 90 percent Proctor density is used to provide adequate support for the buried trench.

24. Care has been taken to minimize crossing of arroyos. All arroyos disturbed by construction will be restored to their preexisting condition when feasible, to prevent blocking of permanent drainage systems (see Sections 3.1.1, and 3.1.2, and 5.4).

25. Where areas of varnished desert pavement are disturbed during construction, the surface layer of rocks will be stockpiled and spread evenly over the surface following backfilling.

26. This has been corrected.

APPENDIX 2

Written Responses not Requiring Answers.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

POST OFFICE BOX 1306
ALBUQUERQUE, NEW MEXICO 87103

October 21, 1977

Mr. R. O. Roig, Chief
Environmental Protection Office
Directorate of Civil Engineering
Headquarters Space and Missile Systems Organization
Los Angeles Air Force Station
P. O. Box 92960, Worldway Postal Center
Los Angeles, California 90009

Dear Mr. Roig:

This responds to your letter of July 1977 in which you formally requested initiation of Section 7 Consultation, pursuant to the Endangered Species Act of 1973, for the USAF in regard to the proposed construction and operation of a new ICBM system located on the Luke Air Force Range in Arizona.

As you are aware, the endangered species of concern is the Sonoran pronghorn (Antilocapra americana sonoriensis) of which probably no more than 50 to 60 exist in the United States today. Due to the desert environment and habitat changes by man over the last 100 years or so, pronghorn numbers have dwindled and these remaining animals are forced to range over a rather vast area in order to maintain themselves. Although the Cabeza Prieta National Wildlife Refuge is the primary use area for these remaining pronghorns, they, at times, utilize the Luke Air Force Range and other lands adjacent to the Refuge.

The Air Force is proposing to do certain work of an experimental nature involving underground tunnels which will house mobile ICBM's. In order to establish this system it is necessary to carry out related construction and maintenance work associated with the program. This is being done in an area of Luke Air Force Range which has had little direct human intrusion or land modification for some time. It is our understanding that the project area will be located in and confined to the San Cristobal Valley south of Interstate 80. This area is a part of a larger geographical area which has been recommended for designation as "Critical Habitat" under Section 7 of the Endangered Species Act of 1973 by the Sonoran Pronghorn Recovery Team. This recommendation is currently under biological evaluation by cooperating agencies, both State and Federal, prior to any formal submission and recommendation to Washington. Critical habitat for a species

is that area deemed necessary for both the maintenance and the recovery of a listed species. Although designation of an area as critical habitat does not preclude other activities within the designated area, it does serve as a cautionary warning to all Federal agencies to carefully review and evaluate any activities which they may propose or support within an area so designated to assure that these actions do not adversely modify this habitat or, more directly, jeopardize the species.

In assisting the Air Force in evaluating the possible impacts of their proposed experimental MX Missile project, we have asked the Recovery Team for their biological opinions regarding the probable impacts on the pronghorn and its habitat as related to your proposal. In addition, we have carefully evaluated your agency's draft EIS and other pertinent data regarding the pronghorn and the area in question.

Based on this evaluation it is our biological opinion that the project proposed by the Air Force on Luke Air Force Range will not adversely modify habitat critical to the survival of the Sonoran pronghorn nor will it jeopardize the continued existence of this species provided the project and its various supporting systems and activities are confined to that area of the San Cristobal and Monawk Valleys as identified on the enclosed maps as well as in discussions and meetings between Air Force representatives and representatives of the Fish and Wildlife Service and Arizona Game and Fish Department both in Yuma, Arizona, and our Albuquerque Regional Office.

As you are aware, concern was raised on the part of the Fish and Wildlife Service at an earlier date in regard to the project's initial exploratory work outside of the actual current project site. This was work of a hydrologic and geophysical nature which took place during the summer months in areas of documented pronghorn use. Our concern was that potential stress could have been put on the pronghorns at this critical period when they may be least resistant to additional disturbance-induced stress. Subsequent meetings between our respective representatives settled this particular concern.

In keeping with the intent of Section 7 of the Endangered Species Act, it is our biological opinion that your project will not adversely affect the pronghorn or its essential habitat provided the following recommendations are adhered to:

1. Confine project activities to that area south of Interstate 80 within the San Cristobal Valley delineated as Unit A on the enclosed map.

2. Confine all associated project support activities to that area south of Interstate 80 in the Monawk Valley delineated as Unit A on the enclosed map.

3. Since township corners are in place, we recommend that the Air Force delineate, through placed visual markers, the area boundaries within both the San Cristobal and Monawk Valleys.

The east boundary of Unit A in Mohawk Valley is a well traveled road while the west and south boundary follows section lines. Unit A in the San Cristobal Valley runs from Dateland to a point on the northwest point of the Aquila Mountains. A survey line from the Aquila point westward could be run to the point in the Mohawk Mountain ridge as shown on the map. The Mohawk Mountain crest and Interstate 80 form the west and north boundary.

Identifying the delineated Unit A (2) through visual ground markers may help prevent unnecessary problems in the future.

The areas delineated as Unit B are critical and actions which would modify habitat or disturb pronghorns within this delineated area should be avoided. Units D and C are also considered essential habitat for the pronghorn although use in present years has been less than in Unit B.

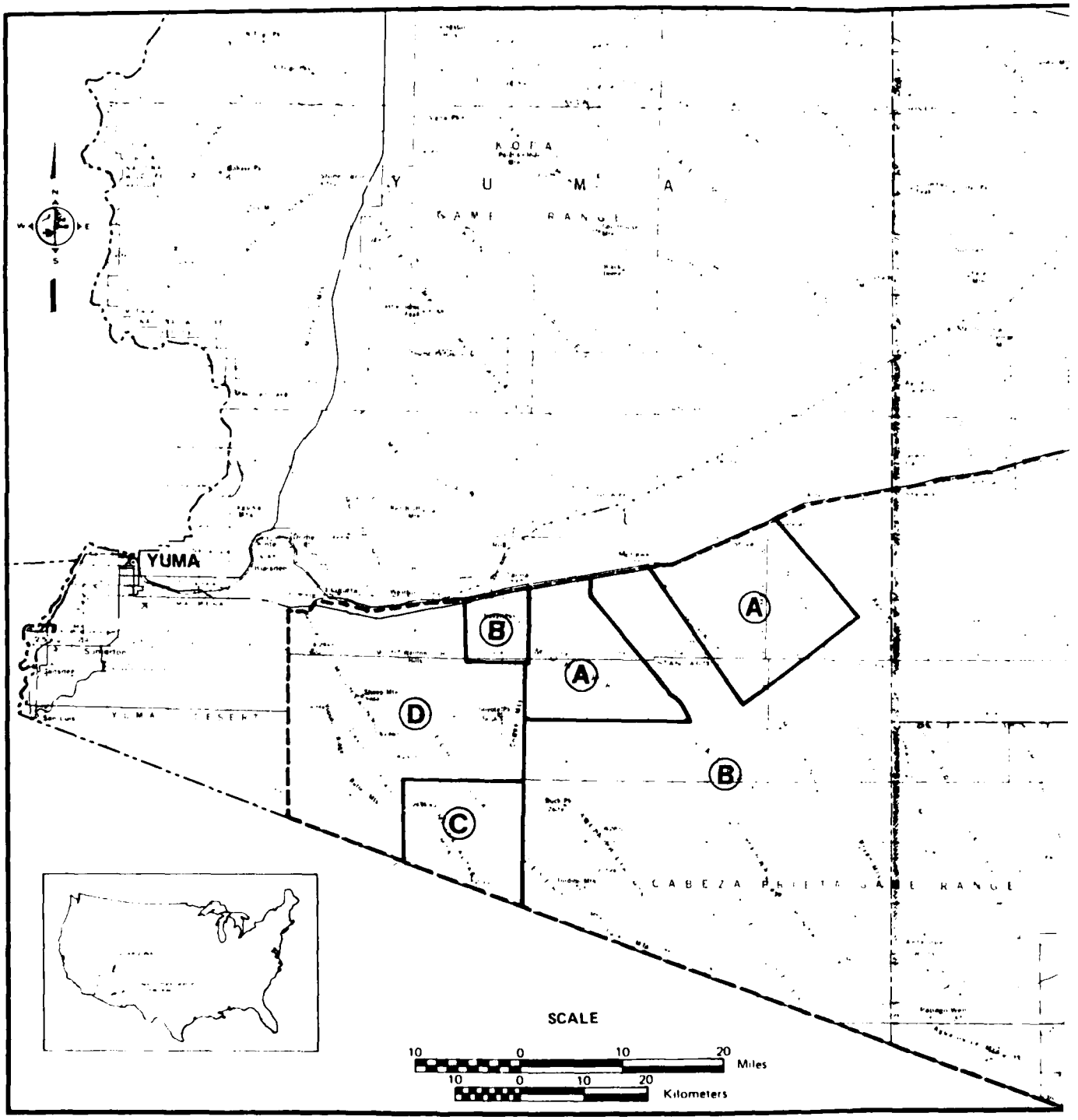
The entire area delineated on the attached map in double lines has been recommended by the Recovery Team to be designated as Critical Habitat for the Sonoran pronghorn.

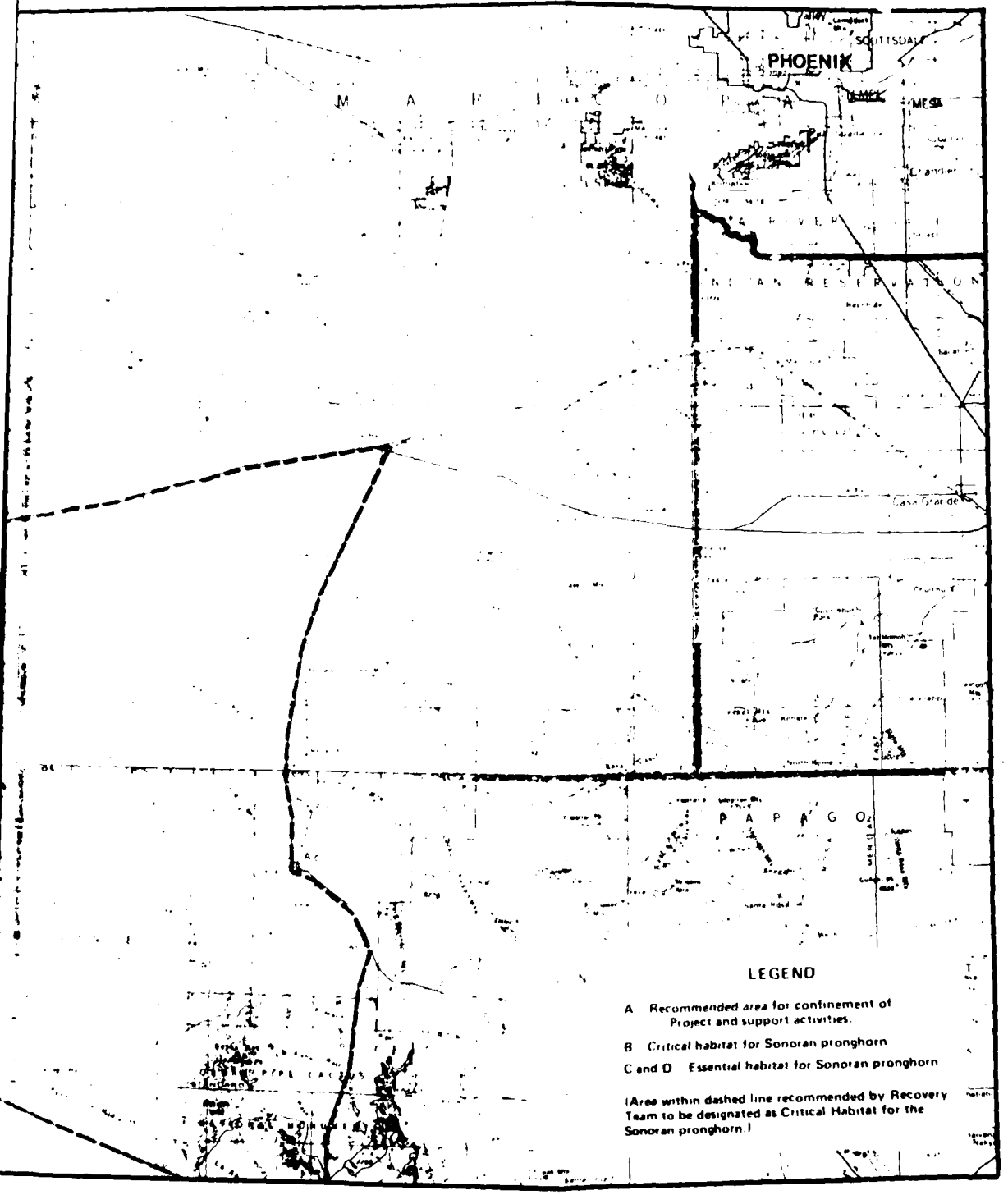
If the Air Force is able to meet these recommendations it is our belief that your project will not jeopardize the continued existence of the Sonoran pronghorn or adversely modify its essential habitat. If these recommendations cannot be followed we ask that you so inform us of the specific problems and any alternatives you may wish to suggest. We will then attempt to find a satisfactory solution and continue Section 7 Consultation.

Sincerely yours,

Regional Director

Enclosure


YUMA
A
B
A
B
D
C
SCALE
10 0 10 20 Miles
10 0 10 20 Kilometers


PHOENIX
SCOTTSDALE
MESA
Casa Grande
PAPAGO
LEGEND
A Recommended area for confinement of Project and support activities.
B Critical habitat for Sonoran pronghorn
C and D Essential habitat for Sonoran pronghorn
(Area within dashed line recommended by Recovery Team to be designated as Critical Habitat for the Sonoran pronghorn.)

2

file 25I 8-3-1
Lake

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
100 CALIFORNIA STREET
SAN FRANCISCO CALIFORNIA 94111

SEP 19 1977

Captain Langdon Kellogg
MX Environmental Project Officer
SAMSO/MNND
Norton AFB, CA 92409

Dear Captain Kellogg:

Thank you for inviting EPA's participation in the Air Force's briefing last week on the MX project proposed in Southern AZ. This office has received and reviewed the draft environmental statement prepared for this project and found it a clear, consise document with easily understood graphics. Our formal comments will be forthcoming soon.

It is the policy of EPA Region IX to effect pre-EIS liaison with agencies proposing projects which may be environmentally damaging, or controversial on environmental grounds. Since the MX project EIS is the first in a series of four, we would ask that you continue to keep us informed of your progress through the next three projects. We would be happy to give you our input well before the draft EISs are published.

Again, thank you for the MX EIS briefing. I look forward to working with you again.

Sincerely,

Patricia Sanderson Port
EIS Coordinator

cc: Phil Lammi, USAF

file 251 8-1-1
ZOK

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
100 CALIFORNIA STREET
SAN FRANCISCO CALIFORNIA 94111

D-UAF-K10002-AZ

Langdon Kellogg, Captain
Air Force Systems Command
SAMSO/MNND
Norton Air Force Base CA 92409

OCT 13 1977

Dear Captain Kellogg:

The Environmental Protection Agency has received and reviewed the draft environmental statement for the Buried Trench Construction and Test Project.

EPA's comments on the draft environmental statement have been classified as Category LO-1. Definitions of the categories are provided on the enclosure. The classification and the date of EPA's comments will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal actions under Section 309 of the Clean Air Act. Our procedure is to categorize our comments on both the environmental consequences of the proposed action and the adequacy of the environmental statement.

EPA appreciates the opportunity to comment on this draft environmental statement and requests one copy of the final environmental statement when available.

Sincerely,

David L. Calkins

David L. Calkins, Director
Office of External Relations

Enclosure

cc: Council on Environmental Quality

EIS CATEGORY CODES

Environmental Impact of the Action

LO--Lack of Objections

EPA has no objection to the proposed action as described in the draft impact statement; or suggests only minor changes in the proposed action.

ER--Environmental Reservations

EPA has reservations concerning the environmental effects of certain aspects of the proposed action. EPA believes that further study of suggested alternatives or modifications is required and has asked the originating Federal agency to reassess these aspects.

EU--Environmentally Unsatisfactory

EPA believes that the proposed action is unsatisfactory because of its potentially harmful effect on the environment. Furthermore, the Agency believes that the potential safeguards which might be utilized may not adequately protect the environment from hazards arising from this action. The Agency recommends that alternatives to the action be analyzed further (including the possibility of no action at all).

Adequacy of the Impact Statement

Category 1--Adequate

The draft impact statement adequately sets forth the environmental impact of the proposed project or action as well as alternatives reasonably available to the project or action.

Category 2--Insufficient Information

EPA believes that the draft impact statement does not contain sufficient information to assess fully the environmental impact of the proposed project or action. However, from the information submitted, the Agency is able to make a preliminary determination of the impact on the environment. EPA has requested that the originator provide the information that was not included in the draft statement.

Category 3--Inadequate

EPA believes that the draft impact statement does not adequately assess the environmental impact of the proposed project or action, or that the statement inadequately analyzes reasonably available alternatives. The Agency has requested more information and analysis concerning the potential environmental hazards and has asked that substantial revision be made to the impact statement.

If a draft impact statement is assigned a Category 3, no rating will be made of the project or action, since a basis does not generally exist on which to make such a determination.

MARICOPA COUNTY PLANNING DEPARTMENT

300 County Administration Bldg. 111 S. 3rd Avenue, Phoenix, Arizona 85003

DCS/P&R
Asst DCS
Executive
Asst Exec
Action
Susp
Info

September 12, 1977

Joe D. Meis
Deputy Assistant Secretary
(Installations)
Department of the Air Force
Washington, D.C. 20330

Dear Mr. Meis:

After reviewing the Environmental Impact Statement for the proposed MX Buried Trench and Buriel Contract, we have determined that it would not impact Maricopa County. The proposed construction is approximately 30 miles from any community in Maricopa County (Sentinel) and approximately 30 miles from Gila Bend. Lands within this area are predominantly zoned Rural-43 with R-5 and commercial around Sentinel and remains in its natural desert state.

Sincerely,

Don E. McDaniel, Jr.
Planning Director

Frank A. Schuma
Principal Planner
Advance Planning Division

FAS:er

cc: Bob Bartel, County Manager's Office

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WESTERN REGION
P O BOX 92007 WORLDWAY POSTAL CENTER
LOS ANGELES CALIFORNIA 90009

September 7, 1977

Office of the Secretary of the Air Force
(SAF/MIQ)
Washington, D. C. 20330

Dear Sir:

As requested in your undated letter, received August 10,1977, we have completed a review of your Draft Environmental Impact Statement (EIS) on the proposed MX Buried Trench and Construction Project proposed in Yuma County, Arizona.

Our findings indicate that this proposed project will not present any problem from an environmental viewpoint to any existing or presently planned FAA facilities.

Please be advised that this approval does not obviate the requirement for the Department of the Air Force to file a notice with the FAA where applicable and as stipulated under Part 77 of the Federal Aviation Regulations.

We appreciate the courtesy extended in bringing this matter to our attention.

Sincerely,

W. BRUCE CHAMBERS
Regional Planning Officer

Arizona
State Land Department

October 17, 1977

Department of the Air Force
Space and Missile Systems Organization (AFSC)
Norton Air Force Base, California 92409

Re: Construction of MX Test Project

Dear Sirs:

The Arizona State Land Department appreciates the opportunity to review the proposed MX Buried Trench and Construction Project to be constructed in Yuma County, Arizona.

The Environmental Impact Statement and the briefing on the project mentioned the possibility that a water well may be drilled near the Stovall Air Field to provide water for the project.

The Ground Water Code for the State of Arizona requires that a Notice of Intention to Drill be completed and filed with the Water Division, State Land Department, prior to the drilling of a well. If a well is to be drilled on the subject test project, it will therefore be necessary to submit the enclosed Notice of Intention to Drill form to the Land Department.

If you have any questions, please do not hesitate to contact the department, (602) 271-4625.

Sincerely,

Andrew L. Bettwy
State Land Commissioner

By: Kelly R. Johnson
Kelly R. Johnson, Administrator
Office of Natural Resource Conservation

ALB:KRJ:nk

Enclosure

SIGNOFF

OMB Approval No. 29-R0218

FEDERAL ASSISTANCE

2. Applicant's application — a. Number: — b. Date: 19 77 08 17 (Year Month Day)

3. State application identifier — a. Number: AZ 77-80-0040 — b. Date Assigned: 19 77/09/20 (Year month day)

1. Type Of Action (Mark appropriate box): ☐ Preapplication ☐ Application ☐ Notification Of Intent (Opt.) ☐ Report Of Federal Action

Leave Blank: OCT 21 1977

Section I - Applicant / Recipient Data

4. Legal Applicant/Recipient
- a. Applicant Name: Department of the Air Force
- b. Organization Unit: Office of the Secretary of the AF
- c. Street/P.O. Box:
- d. City: — e. County:
- f. State: Washington D.C. — g. Zip Code: 20330
- h. Contact Person (Name & telephone no.): Deputy for Environment and Safety

5. Federal Employer Identification No.:

6. Program (From Federal Catalog) — a. Number: 12.999 — b. Title: Dept. of Defense

7. Title and description of applicant's project:
The MX: Buried Trench Construction and Test Project. The U.S. Air Force proposes to construct 4 sections of underground tunnel in San Cristobal Valley on Luke Air Force Range in Yuma County. The proposed construction proj will provide essential cost and construction data to analyze protective structures for mobile, land based Intercontinental Ballistic Millile (ICBM) System.

8. Type of applicant/recipient (A-State, B-Interstate, C-Substate District, D-County, E-City, F-School District, G-Special Purpose District, H-Community Action Agency, I-Higher Educational Institution, J-Indian Tribe, K-Other): Specify: Federal — Enter appropriate letter: K

9. Type of assistance (A-Basic Grant, B-Supplemental Grant, C-Loan, D-Insurance, E-Other): Enter appropriate letter(s): E

10. Area of project impact (Names of cities, counties, states, etc.): San Cristobal Valley, Yuma County

11. Estimated number of persons benefiting:

12. Type of application (A-New, B-Renewal, C-Revision, D-Continuation, E-Augmentation): Enter appropriate letter: C

13. Proposed Funding

a. Federal	$	00
b. Applicant		00
c. State		00
d. Local		00
e. Other	1	00
f. Total	$ 1	00

14. Congressional Districts Of: a. Applicant: Multi. — b. Project: 03

15. Type of change (For 12c or 12e) (A-Increase Dollars, B-Decrease Dollars, C-Increase Duration, D-Decrease Duration, E-Cancellation, F-Other Specify): Enter appropriate letter(s):

16. Project Start Date (Year month day, 19)

17. Project Duration (Months)

18. Estimated date to be submitted to federal agency (Year month date, 19)

19. Existing federal identification number:

20. Federal agency to receive request (Name, city, state, zip code): Dept. of Defense, U.S. Air Force

21. Remarks added: ☐ Yes ☐ No

Section II - Certification

22. The Applicant Certifies That
- a. To the best of my knowledge and belief data in this preapplication/application are true and correct, the document has been duly authorized by the governing body of the applicant and the applicant will comply with the attached assurances if the assistance is approved.
- b. If required by OMB Circular A-95 this application was submitted pursuant to instructions therein, to appropriate clearinghouses and (1) [illegible] (2) [illegible] (3)

No response: ☐ — Response attached: ☒

23. Certifying representative — a. Typed name and title: — b. Signature: — c. Date signed (Year month day, 19):

Section III - Federal Agency Action

24. Agency name:

25. Application received (Year month day, 19):

26. Organizational Unit:

27. Administrative office:

28. Federal application identification:

29. Address:

30. Federal grant identification:

31. Action taken: ☐ a. Awarded ☐ b. Rejected ☐ c. Returned for amendment ☐ d. Deferred ☐ e. Withdrawn

32. Funding

a. Federal	$	00
b. Applicant		00
c. State		00
d. Local		00
e. Other		00
f. Total	$	00

33. Action date (Year month day, 19):

34. Starting date (Year month day, 19):

35. Contact for additional information (Name and telephone number):

36. Ending date (Year month day, 19):

37. Remarks added: ☐ Yes ☐ No

38. Federal agency A-95 action — a. In taking above action, any comments received from clearinghouses were considered. If agency response is due under provisions of Part I, OMB Circular A-95, it has been or is being made. — b. Federal Agency A-95 Official (Name and telephone number):

424-101

Standard Form 424 Page 1 (10-75)
Prescribed by GSA, Federal Management Circular 74-7

FORM TO BE COMPLETED BY REVIEWING AGENCY

TO:

Mr. Roland H. Sharer
State Liaison Officer, AORCC
4433 N. 19th Ave., Suite 203
Phoenix, Arizona 85015

State Application Identifier (SAI)

SEP 20 1977 State AZ Number 77-80-0040

From: Arizona State Clearinghouse
1700 West Washington Street, Room 505
Phoenix, Arizona 85007

Economic Sec. Region I, IV
Mineral Res.
Game & Fish
Ag. & Hort.
Environmental Studies
Archaeological Research
Renewable Natural Resources
Center for Public Affairs
Emergency Serv.
Az Atomic Energy Comm.
Transportation
Health
Water
AORCC
Bureau of Mines
Land
Parks
OEPAD-R. Kingery
Library & Archives

RECEIVED
SEP 27
A.O.R.C.C.

This project is referred to you for review and comment. Please evaluate as to:

(1) the program's effect upon the plans and programs of your agency
(2) the importance of its contribution to State and/or areawide goals and objectives
(3) its accord with any applicable law, order or regulation with which you are familiar
(4) additional considerations

Please return THIS FORM AND ONE XEROX COPY to the clearinghouse no later than 17 working days from the date noted above. Please contact the clearinghouse if you need further information or additional time for review.

☒ No comment on this project
☐ Proposal is supported as written
☐ Comments as indicated below

Comments: (Use additional sheets if necessary)

Reviewer's Signature R. H. Sharer Date Oct. 7, 1977

Title State Liaison Officer Telephone 271-5013

FORM TO BE COMPLETED BY REVIEWING AGENCY

TO:

Mr. Wesley E. Steiner,
State Water Commission
222 N. Central Ave., Suite 800
Phoenix, Arizona 85004

State Application Identifier (SAI)

SEP 20 1977 State AZ Number 77-80-0040

From: Arizona State Clearinghouse
1700 West Washington Street, Room 505
Phoenix, Arizona 85007

Economic Sec. Region I, IV
Mineral Res.
Game & Fish
Ag. & Hort.
Environmental Studies
Archaeological Research
Renewable Natural Resources
Center for Public Affairs
Emergency Serv.
Az Atomic Energy Comm.
Transportation
Health
Water
AORCC
Bureau of Mines
Land
Parks
OEPAD-R. Kingery
Library & Archives

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(2) the importance of its contributions to State and/or areawide goals and objectives
(3) its accord with any applicable law, order or regulation with which you are familiar
(4) additional considerations

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☒ No comment on this project
☐ Proposal is supported as written
☐ Comments as indicated below

Comments: (Use additional sheets if necessary)

Reviewer's Signature Martin E Nielsen Date 9-23-77

Title Planner Telephone 255-3721

FORM TO BE COMPLETED BY REVIEWING AGENCY

TO:

Michael A. Ramnes, Director
Arizona State Parks Board
1688 W. Adams Room 109
Phoenix, Arizona 85007

State Application (Identifier (SAI)
SEP 20 '77 State AZ Number 77-80-004

From: Arizona State Clearinghouse
1700 West Washington Street, Room 505
Phoenix, Arizona 85007

Economic Sec. Region I, IV
Mineral Res.
Game & Fish
Ag. & Hort.
Environmental Studies
Archaeological Research
Renewable Natural Resources
Center for Public Affairs
Emergency Serv.
Az Atomic Energy Comm.
Transportation
Health
Water
ACRCC
Bureau of Mines
Land
Parks
OEPAD-R. Kingery
Library & Archives

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(2) the importance of its contribution to State and/or areawide goals and objectives
(3) its accord with any applicable law, order or regulation with which you are familiar
(4) additional considerations

Please return THIS FORM AND ONE XEROX COPY to the clearinghouse no later than 17 working days from the date noted above. Please contact the clearinghouse if you need further information or additional time for review.

☒ No comment on this project
☐ Proposal is supported as written
☐ Comments as indicated below

Comments: (Use additional sheets if necessary)

Reviewer's Signature Glenn Ramnes Date 9/26/77

Title RP II Telephone 271474

FORM TO BE COMPLETED BY REVIEWING AGENCY

TO:

Marguerite B. Cooley, Dir.
Department of Library Archives
Capitol Building, Third Floor
Phoenix, Arizona 85007

State Application Identifier (SAI)

SEP 20 1977 State AZ Number 77-80-0040

From: Arizona State Clearinghouse
1700 West Washington Street, Room 505
Phoenix, Arizona 85007

Economic Sec. Region I, IV
Mineral Res.
Game & Fish
Ag. & Hort.
Environmental Studies
Archaeological Research
Renewable Natural Resources
Center for Public Affairs
Emergency Serv.
Az Atomic Energy Comm.
Transportation
Health
Water
ACRCC
Bureau of Mines
Land
Parks
OEPAD-R. Kingery
Library & Archives

This project is referred to you for review and comment. Please evaluate as to:

(1) the program's effect upon the plans and programs of your agency
(2) the importance of its contribution to State and/or areawide goals and objectives
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Please return THIS FORM AND ONE XEROX COPY to the clearinghouse no later than 17 working days from the date noted above. *Please contact the clearinghouse if you need further information or additional time for review.*

☒ No comment on this project
☐ Proposal is supported as written
☐ Comments as indicated below

Comments: (Use additional sheets if necessary)

Reviewer's Signature Marguerite B. Cooley Date 9-22-77

Title Director Telephone 3701

FORM TO BE COMPLETED BY REVIEWING AGENCY

TO:

Mr. Frank Servin, Exec. Dir.
District IV Council of Gov'ts
377 South Main St., Room 202
Yuma, Arizona 85364

State Application Identifier (SAI)
SEP 20 1977 State AZ Number 77-80-004

Economic Sec.
Mineral Res.
Game & Fish
Ag. & Hort.
Environmental Studies
Archaeological Research
Renewable Natural Resources
Center for Public Affairs
Emergency Serv.
Az Atomic Energy Comm.
Transportation
Health
Water
ACRCC
Bureau of Mines
Land
Parks
OEPAD-R. Kingery
Library & Archives

Region I, IV

From: Arizona State Clearinghouse
1700 West Washington Street, Room 505
Phoenix, Arizona 85007

This project is referred to you for review and comment. Please evaluate as to:

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(2) the importance of its contribution to State and/or areawide goals and objectives
(3) its accord with any applicable law, order or regulation with which you are familiar
(4) additional considerations

Please return THIS FORM AND ONE XEROX COPY to the clearinghouse no later than 17 working days from the date noted above.
Please contact the clearinghouse if you need further information or additional time for review.

☐ No comment on this project
☒ Proposal is supported as written
☐ Comments as indicated below

Comments: (Use additional sheets if necessary)

Reviewer's Signature: ..... Date: .....

Title: ..... Telephone: .....

FORM TO BE COMPLETED BY REVIEWING AGENCY

To:
Dr. James Becker
Center for Public Affairs
Arizona State University
Tempe, Arizona 85281

State Application Identifier (SAI)
SEP 20 1977 State AZ Number 77-80-0040

From: Arizona State Clearinghouse
1700 West Washington Street, Room 505
Phoenix, Arizona 85007

Economic Sec. Region I, IV
Mineral Res.
Game & Fish
Ag. & Hort.
Environmental Studies
Archaeological Research
Renewable Natural Resources
Center for Public Affairs
Emergency Serv.
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(4) additional considerations

Please return THIS FORM AND ONE XEROX COPY to the clearinghouse no later than 17 working days from the date noted above. Please contact the clearinghouse if you need further information or additional time for review.

☐ No comment on this project
☐ Proposal is supported as written
☒ Comments as indicated below

Comments: (Use additional sheets if necessary) If this project is conducted with the kind of environmental sensitivity which the US Military can bring to the effort, it should be an acceptable distarbance.

Reviewer's Signature R. J. Becker Date 9-27-77

Title Prof Center for Public Affairs ASU Telephone 965 3926

FORM TO BE COMPLETED BY LEADING AGENCY

TO:

Dr. R. Gwinn Vivian
Arizona State Archaeologist
Arizona State Museum
Tucson, AZ 85721

State Application Identifier SAI#

SEP 20 '77 State AZ Number 77-80-0043

From: Arizona State Clearinghouse
1700 West Washington Street, Room 505
Phoenix, Arizona 85007

Economic Sec. Region I, IV
Mineral Res.
Game & Fish
Ag. & Hort.
Environmental Studies
Archaeological Research
Renewable Natural Resources
Center for Public Affairs
Emergency Serv.
Az Atomic Energy Comm.
Transportation
Health
Water
ACRCC
Bureau of Mines
Land
Parks
OEPAD-R. Kingery
Library & Archives

This project is referred to you for review and comment. Please evaluate as to:

(1) the program's effect upon the plans and programs of your agency
(2) the importance of its contribution to State and/or statewide goals and objectives
(3) its accord with any applicable law, order or regulation with which you are familiar
(4) additional considerations

Please return THIS FORM AND ONE XEROX COPY to the clearinghouse no later than 17 working days from the date noted above. Please contact the clearinghouse if you need further information or additional time for review.

☐ No comment on this project
☑ Proposal is supported as written
☐ Comments as indicated below

Comments: (Use additional sheets if necessary)

Reviewer's Signature [signature] Date [illegible]

[illegible] Telephone [illegible]

FORM TO BE COMPLETED BY [illegible] AGENCY

TO:

Mr. Roger Root, Acting Chief
Office of Planning
Dept. of Econ. Security
1717 W. Jefferson St.
Phoenix, Ariz. 85007

SEP 2 [illegible] 1977

State Application Identifier: SEP 20 1977 State: AZ Number: 77-80-0040

From: Arizona State Clearinghouse
1700 West Washington Street, Room 505
Phoenix, Arizona 85007

Economic Sec. Region I, IV
Mineral Res.
Game & Fish
Ag. & Hort.
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Archaeological Research
Renewable Natural Resources
Center for Public Affairs
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(3) its accord with any applicable law, order or regulation with which you are familiar
(4) additional considerations

Please return THIS FORM AND ONE XEROX COPY to the clearinghouse no later than 17 working days from the date noted above. Please contact the clearinghouse if you need further information or additional time for review.

☐ No comment on this project
☒ Proposal is supported as written
☐ Comments as indicated below

Comments: (Use additional sheets if necessary)

Reviewer's Signature: [illegible] Date: 26 Sept 1977

Title: [illegible] Telephone: 271-5574

FORM TO BE COMPLETED BY REVIEWING AGENCY

TO:

Dr. Richard T. Moore
Arizona Bureau of Geology & Mineral Technology
University of Arizona
Tucson, Arizona 85721

State Application Identifier (SAI)

SEP 20 '77 State AZ Number 77-80-0040

From: Arizona State Clearinghouse
1700 West Washington Street, Room 505
Phoenix, Arizona 85007

Economic Sec. Region I, IV
Mineral Res.
Game & Fish
Ag. & Hort.
Environmental Studies
Archaeological Research
Renewable Natural Resources
Center for Public Affairs
Emergency Serv.
Az Atomic Energy Comm.
Transportation
Health
Water
ACRCC
Bureau of Mines
Land
Parks
OEPAD-R. Kingery
Library & Archives

This project is referred to you for review and comment. Please evaluate as to:

(1) the program's effect upon the plans and programs of your agency
(2) the importance of its contribution to State and/or areawide goals and objectives
(3) its accord with any applicable law, order or regulation with which you are familiar
(4) additional considerations

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☒ No comment on this project
☐ Proposal is supported as written
☐ Comments as indicated below

Comments: (Use additional sheets if necessary)

Reviewer's Signature [signature] Date 9/26/77

Title Director Telephone 884-1993

Donald C. Gilbert, Exec. Dir.
Arizona Atomic Energy Comm.
2929 West Indian School Road
Phoenix, Arizona 85017

State Application Identifier (SAI)
SEP 20 1977 State AZ Number 77-80-0040

From: Arizona State Clearinghouse
1700 West Washington Street, Room 505
Phoenix, Arizona 85007

Economic Sec. Region I, IV
Mineral Res.
Game & Fish
Ag. & Hort.
Environmental Studies
Archaeological Research
Renewable Natural Resources
Center for Public Affairs
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(3) its accord with any applicable law, order or regulation with which you are familiar
(4) additional considerations

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Please contact the clearinghouse if you need further information or additional time for review.

☑ No comment on this project
☐ Proposal is supported as written
☐ Comments as indicated below

Comments: (Use additional sheets if necessary)

Reviewer's Signature Donald C Gilbert Date 9-22-77

Title Exec Dir AAEC Telephone 271-4845

FORM TO BE COMPLETED BY REVIEWING AGENCY

To:
Col. George B. Jordan, Dir.
Div. of Emergency Services
5636 East McDowell Road
Phoenix, Arizona 85008

State Application Identifier (SAI)
SEP 20 1977 State AZ Number 77-80-0040

From: Arizona State Clearinghouse
1700 West Washington Street, Room 505
Phoenix, Arizona 85007

Economic Sec. Region I, IV
Mineral Res.
Game & Fish
Ag. & Hort.
Environmental Studies
Archaeological Research
Renewable Natural Resources
Center for Public Affairs
Emergency Serv.
Az Atomic Energy Comm.
Transportation
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Parks
OEPAD-R. Kingery
Library & Archives

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(2) the importance of its contribution to State and/or statewide goals and objectives
(3) its accord with any applicable law, order or regulation with which you are familiar
(4) additional considerations

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RECEIVED
SEP 21 1977
DIVISION OF EMERGENCY SERVICES

☐ No comment on this project
☒ Proposal is supported as written
☐ Comments as indicated below

Comments: (Use additional sheets if necessary)

Reviewer's Signature George B Jordan
Title Director of Emergency Services
Date Sept 21, 1977
Telephone 273-9880

FORM TO BE COMPLETED BY REVIEWING AGENCY

To

Mr. Frank Servin, Exec. Dir.
District IV Council of Gov'ts
377 South Main St., Room 202
Yuma, Arizona 85364

State Application Identifier (SAI)
SEP 20 '77 State AZ Number 77-80-004

From: Arizona State Clearinghouse
1700 West Washington Street, Room 505
Phoenix, Arizona 85007

Economic Sec. Region I, IV
Mineral Res.
Game & Fish
Ag. & Hort.
Environmental Studies
Archaeological Research
Renewable Natural Resources
Center for Public Affairs
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☒ Proposal is supported as written
☐ Comments as indicated below

Comments: (Use additional sheets if necessary)

Date

Telephone

APPENDIX 3

PUBLIC HEARING ON THE ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED MX: BURIED TRENCH CONSTRUCTION AND TEST PROJECT

WELLTON, ARIZONA
September 19, 1977
7:30 o'clock p.m.

TRANSCRIPT OF PROCEEDINGS[1]

[1]Retyped from the original to conserve space. Misspellings in original have been corrected. Other corrections placed in brackets.

September 19, 1977
7:30 o'clock p.m.

COLONEL ALLAN C. SMITH: Good evening ladies and gentlemen, welcome to the Antelope Union High School Auditorium. My name is Colonel Allan C. Smith and I am assigned to the Fifth Judiciary Circuit located at Travis Air Force Base, California.

I have been directed to conduct this public hearing, this hearing on the Environmental Impact Statement for the Proposed MX: Buried Trench Construction and Test Project in the San Cristobal Valley on the Luke Air Force Range in Yuma County, Arizona.

My role in this hearing is simply to conduct this hearing. I am not involved in any way with the developmental project and will not be involved in any way in making a decision regarding the project or even a recommendation about the project.

Now, this hearing tonight has two purposes. The first is provide you with an opportunity to present your views to the Secretary of the Air Force on the environmental impact in your community that would result in the implementation of this proposed project.

Secondly, to provide you with the opportunity to receive information regarding the project and to ask questions of people who are knowledgeable about the project.

The agenda this evening will be as follows: First you will have Colonel Larry Molnar, who is seated behind me, of the Space and Missiles [Systems] Organization and members of his staff who will make a short—approximately 20-25 minute presentation concerning the project. Second, any person present who desires to make a comment or statement concerning the project is invited to step up here to the podium, state your name, any particular address, occupation, or other information that might be pertinent, group or organization that you represent or whatever it might be and then make whatever statement you have.

If you are representing a group, we would appreciate it if you keep your statement to 10 minutes or less. If you are speaking as an individual, we would appreciate it if you keep your statements to five minutes or less.

After presentation of all of the comments from members of the community that desire to make them, we then have a question and answer period.

Colonel Molnar and the members of his staff, who he will introduce at the time, will answer any questions that you may have. We will stay here as long as we have to to accomplish these three portions within reason that is, and hopefully we can finish and take care of it this one evening.

Now, in the event that you have prepared data or a written statement that you would like to have attached to the transcript of the proceedings, please give that statement to me either at the time you are making an oral statement here at the podium or any time thereafter. I will see to it that it is marked as an exhibit and will be attached to the transcript of the proceedings.

The proceedings this evening are being recorded verbatim by Miss Christy Olesek, a qualified Court Reporter. Now the transcript of the hearing will be forwarded to the Secretary of the Air Force and will be used in preparing a final Environmental Impact Statement, which is used in the decision making of the project.

In the event that you desire to submit comments, statements or additional data at a later time; you have until the 26th of September to submit information in written form to either of the two following addresses. The first is the Secretary of the Air Force, Washington, D. C.. Direct address there would be as follows: SAF/MIQ, Washington, D. C. 20330. An alternate address that you may submit data to in written form is the SAMSO Information Office and that address is: SAMSO/MNI, Norton Air Force Base, California 92409.

Without any further comments, Colonel Molnar will now present his presentation and I believe you are all set up. Colonel Larry Molnar.

COLONEL LARRY MOLNAR: Thank you, Colonel Smith. Good evening ladies and gentlemen. First let me say that on behalf of the Air Force's program manager for ballistic missiles, those of us that are here from SAMSO and Norton Air Force Base are happy to be here to talk with you about a project that will be going on in this local area starting next February.

Before I talk about the project itself, I would like to make a few introductory comments about ballistic missiles and about a program known as "Missile X".

Now, may I have the next slide, please. Our strategic forces are deployed to deter war. They are formed as a triad. We have bombers, ballistic missiles delivered by submarines and our land based ICBM force. Currently this land based ICBM force is made up of Minutemen 23's and Titans. There are 1,000 Minutemen and 54 Titans in fixed point-type silos.

These forces, of course, are deployed to insure that an enemy understands that he is going to have great difficulty in overcoming our capability from a nuclear weapons delivery capability. So we are ever vigilant when we understand that a new threat is arising to counter that threat.

Next slide, please. The Missile X program is a program aimed at maintaining the deterrent value of our strategic forces recognizing that the potential enemy is evolving a new and very imposing threat. This program is two pronged.

First, it deals with the survivability of the land base forces themselves and the methods by which we increase and enhance the survivability of these land base forces. Also it's a program to advance technology of missiles.

In the vein of survivability there are two concepts which have been arrived at after rather extensive studying. These concepts are those that are associated with the improvement of the survivability of our land base forces. They are called the Shelter Base Concept and the Buried Trench Concept.

The project that I'm going to be talking about is related to the Buried Trench Concept, but let me explain the objective of these two concepts.

In both, the idea is to provide a place for a missile, to occupy a place in any one of a number of places. In the case of shelters, they appear to be garages; simply garages. A large number of them. One of maybe some number, like 30, occupied at one time and the exact location of the missile unknown to the potential enemy.

This is similar in the Buried Trench Concept. We have trenches where underground missiles can be located at any place along the trench. Trenches are many miles long. It makes the job of identifying where that precise location of a missile is on the part of an enemy very difficult and therefore, maintains and even enhances the main emphasis or the line of reason we have relative to strategic forces. That is, to maintain a deterrent capability to keep the enemy from actually destroying our forces to the extent that he will not launch a force against our forces.

Next slide, please. A little bit more on the trench concept. As I mentioned, they are long trenches in the exact sense of trenches. They are buried structures underground. We are looking at models which have as their inside diameter something on the order of 13 feet. They are constructed of concrete with steel reinforcement.

They are buried approximately five feet underground. If they are to be launched, the idea is that the missile itself will break out through the cover -- the protective cover. Both the tubular structure itself and the ground, which is on top of a shelter or on top of a trench.

Now, let's turn to the project itself. This viewgraph shows the location of a tract of land that's about 200 acres which we will use for the construction of two segments of trenching. I will go into detail a little bit later, but this viewgraph gives you some idea of the location. It is roughly midway between Yuma and Gila Bend, which is a property located on the Luke Air Force Range in the close proximity of a rest area around Mohawk or between Mohawk and the small town of Stoval [Dateland].

Why did we pick this particular location? From a survivability standpoint of view, the geological features of the ground in which we are going to either deploy the system in a shelter concept sense or in a trench concept sense is important from a nuclear weapons effect standpoint of view. Other criteria are shown here also which contributed very significantly to the site location itself.

These criteria lead you to a site somewhere in the southwest United States. We are looking for DOD lands, looking for lands which are not overpopulated and we are looking for those lands which contribute to the suvivability of the system.

Next slide, please. There are other projects going on in the state of Arizona. This diagram shows that there is a project code name HAVE HOST going on here in the Wellton area. You had a public meeting about that some six or eight months ago. That project has been going on now for six to eight months and it's expected to continue for at least one more year.

In that project we are investigating the phenomena that are associated with nuclear weapons effect associated from a blast and shock point of view. That project is a series of explosion-type projects using regular explosives to simulate the blast and shock effects that a system would experience in a normal nuclear environment. I should say the abnormal nuclear environment.

There is another project going on at Misers Bluff. It's an extension of HAVE HOST only at a greater magnitude.

I want to talk just for a minute about where might MX be deployed. MX can be deployed in any place in the United States. It is more favorable in terms of survivability, in terms of other criteria that it be located someplace in the southwestern United States, as I inferred earlier in the briefing.

We have been looking at three states identied on this map. Namely; Nevada, Arizona and New Mexico because there are large tracts of DOD land, there are less populated areas and that makes the idea of the sorts of things we are after compatiable with the system.

The exact location of MX in a deployed sense has not been selected. It will become a process of selection later on. At this stage of the game our primary concern as far as the project is; as far as the project that we are looking at right now, is project oriented itself. There is no reason to believe that the system will be located on the site where we are conducting the project.

Now, I turn very specifically about what the project is itself. On that 200 acre plot of land we are going to construct two trench segments. The first trench segment will be about a kilometer long - 1500 feet. The second trench segment will be 20,000 feet long. It will be made up of a series of bends, as shown here on this viewgraph. It will be made up of a series of bends in the horizontal sense, as shown on the viewgraph.

In addition, there will be some vertical bends also made in the trench line itself.

Now, the idea of these two pieces of trenching is as follows: we need to understand how to break out. So we are going to use the short section of trench as an opportunity for contractors to demonstrate their break out mechanisms. That's one thing.

Very important to the whole of the MX concept and its probability is the investigation of problems that we see in terms of building trenches in an affordable sense. So the other trench, the 20,000 foot long trench, will be an opportunity for a construction contractor to exercise himself; first to ascertain feasibility of such a system concept and secondly, to get us some very

important data. Data in the cost sense and data in a sense of the construction features what we recognize to be the types of features we need for the system to be survivable.

Two exercises, therefore, will go on. One, an exercise involving a short piece of trench to give contractors an opportunity to exercise a break out mechanism. I will point out that the break out mechanism will not have missiles associated with it.

The other is an opportunity for a construction contractor to answer some very significant questions for us. Questions which relate to the feasibility of such an idea and the cost of that idea.

As part of the construction of the 20,000 foot trench, we are going to be looking at the construction rate along with estimating or getting a clear picture of the cost of a trench in terms of cost per mile to construct.

What will the project cost? This is a $20 million effort. It is scheduled for field activity which is about six months long. It will begin approximately in February and end sometime in September. The cost is our planned cost. We are attempting to drive these costs down. The schedule that I show you in terms of field activities is a planned schedule.

We would like to have the project begin in February. We would like to have it end in September. If it begins later than February, then it will go on longer than September. We expect the field activity to take about six months. Should it start in February, it would end in approximately September. Should it start later, it will proceed about the six or seven months indicated on the schedule.

What is going to be located at the site? All the support required to build those two pieces of trench in essence will be located at the site. We expect to have a concrete batch plant. We are going to need water. We have two options for water. One, dig a well, and the other is to buy it. The exact way we will obtain the water as yet has not been decided.

We do not expect to require any commercial power directly at that site. We will use diesel power units for on-site generation of electricity.

We do need to do something to provide better access to the location than currently exists. We are proposing to build an offramp and a railroad grade crossing for those people entering the site traveling from west to east along I8. Currently there is no offramp in that location and someplace near the rest area we will construct a railroad crossing to enable those people traveling west to east an easy access to the site location.

There is a requirement to extend a rail siding that currently exists in our proposed offramp area. We would like to add about 300 feet of siding -- additional siding.

For entrance into the area traveling from east to west we would expect to use the existing access at Dateland, which is about nine to ten miles east of the site.

Other things that you will see in the general vicinity such as access roads will be constructed to enable both the mechanism contractor that I talked about and the trench construction contractor. This will enable him the access he needs in order to get to those two sites.

For the short and for the longer trench we are going to need on the order of 46,000 cubic yards of concrete. What is shown on this viewgraph are the the constituents that go into the makeup of that concrete. There is one thing that is added to this concrete that is not existent in normal concrete. That is the steel fibers and that's the last item that you see on the bottom of this list.

If you are in the field when this activity begins, this is an artist's depiction of what you will see. There will be big machines to dig a trench. The trench will be dug in two parts. The first machine will dig through a depth of ten feet.

The second machine will dig through a depth of 20 feet and then we are going to have a mechanism which is not -- which is unique to this project. It's a large slip form. It will cast the trench in place. The slip former is shown in the bottom right hand side of this diagram.

What you see adjacent to the trench line itself are the mechanisms that will enable the contractor to deliver the quantities of concrete to go into the make up and the continuous slip forming of the trench itself.

I did mention, and I won't belabor this, that we do have an exercise testing the break out mechanism. I do want to point out that this is the mechanism for break out. Only there will be a simulated missile associated with it. There will be no actual missile. There is not a missile -- an MX missile in existence and there will not be in time for this project.

This chart gives you some idea of the manpower that will be needed and in the timeframe of the project should it start in February. It's an amplification of some basic data that I gave you in a scheduling sense previously in an earlier part of the briefing.

Please note that our contractors expect to use local manpower in order to construct the two pieces of trench.

In any project there are some gains and there are some losses. There are short term gains and there are some losses. There are long term gains and some long term losses. What you see on this chart are what we consider to be the short term gains and the short term losses associated with the project. On the next line [chart] we have the long term gains and the long term costs.

I would like to point out that this exercise that we are going through can be of benefit, as is shown on this chart, to people who are interested in tunnel digging technology.

In summary, ladies and gentlemen, I would like to say the following: there has been no decision to deploy MX. We are planning to go into a phase beyond the current phase that we are now in. A phase called the Validation Phase. It will be going from the Validation Phase until the next phase which we call Full-Scale Development. It's going to take high level decisions on the part of the Department of Defense.

Those decisions require some fundamental information in order to help the decision makers make those decisions. The objective of the project that we want to undertake here on the Luke Air Force Range is the type of investigation that provides those decision makers with fundamental information they need in making their final assesment on where the system should go.

With these words, I would like to conclude. Thank you very much.

COLONEL ALLAN SMITH: Thank you, Colonel Molnar. Could we get the lights turned on in here?

We have now had the presentation, the short summary of what the project is and the anticipated effects on the community here. Are there any people in the audience that would like to make a statement or comment concerning the matter? That's one purpose of this hearing to collect data and submit to the Secretary of the Air Force any comments, statments, etcetera of the people of the community in which the project is going to be located might have.

Do we have people who would like to make a statement? I mentioned earlier that you may do it from the podium. How about from where you are? If anyone would like to make a statement.

Well, at least at this time apparently no one would like to make a statement. Do we have any questions for Colonel Molnar and the people he brought with him. If you have a statement, could you please state your name and address or any other information in understanding or identifying the person asking the question. Any questions? There is one.

JOHN KLINGENBURG: I'm John Klingenburg from Roll. What happens to the trench when the project is over?

COLONEL LARRY MOLNAR: After the completion of it, sir, we are going to close up both ends and that's it.

JOHN KLINGENBURG: Close them up?

COLONEL LARRY MOLNAR: That's right. The trench -- let me explain it. The dirt that's excavated to allow building the trenches will be returned so that it's as nearly as possible the same in form and character as it was before we built the trenches.

We are not going to dig up the trenches and put the dirt back the way it was, but we will seal up both ends.

Now, if somebody has an idea on what those trenches might be used for, we would certainly like to entertain it and I'm serious about that.

Otherwise, they will just be sealed up.

COLONEL ALLAN SMITH: Any other questions? We must have more questions than this. Well, once again this hearing is here and we have these people gathered here to provide you with some information as to the nature of the project and the possible effects that it will have on the economy and environment of your community.

Once again these people are available here tonight to answer any questions that you may have. So I beseech you that if there are any questions, now would be a very fine time to ask them.

Apparently no questions. Once again, is there anyone who desires to make a statement or to put a comment on the record either from the podium here or from where you are standing or sitting in the audience? This hearing is to solicit the views of the community in connection of this proposal and again this is an opportunity to do so.

I see no takers on that. Arizona must be a very quiet place.

Colonel Molnar, do you have any other comments or information that you can provide? Perhaps anything further or anything from your people?

COLONEL LARRY MOLNAR: I would like to make one comment about the schedule. What I did show you was a planned schedule. It is an optomistic schedule. There could be a three to four month slip, which means we could not get into the field as was shown on the chart in the timeframe. It may be more like May or June.

We do need this information as soon as we possibly can get it. We would like to try to stick to the schedule, but this an R and D project and there are problems that you encounter.

So barring real misfortune, we will come as close to the schedule as was shown on my charts as we possibly can, but allow for the potential of a possible delay.

COLONEL ALLAN SMITH: Thank you, sir. I would once again like to offer the floor or podium, either one, to anyone who has a statement or comment to make or a question for Colonel Molnar or any of his people. Do we have any takers on that?

Apparently still no additional questions or comments. Well, once again I would like to remind you that if there are any written statements that are ready for submission tonight, if you will provide them to me right after we adjourn the hearing here this evening, I will see to it that they are attatched to the transcript of the hearing and included in the package to the Secretary of the Air Force.

You have until the 26th of September, which is a week from today, to submit written statements, facts, other information that you feel would have a bearing on the decision making process and project to either of these two addresses.

Again the first is SAF/MIQ, Washington, D. C. 20330. The second is to the SAMSO Information Office. That address is as follows: SAMSO/MNI, Norton Air Force Base, California 92409.

In the event that any of you have questions that you feel that Colonel Molnar or members of his staff could answer after we adjourn the hearing, they will be around for a few moments. I think Colonel Molnar's staff is basically right here in the front row at the present time and they will do the best they can to answer any questions you might have.

Apparently we don't have any comments or input from the community that are ready right now for additional questions. So I would like to thank everybody on behalf of the United States Air Force for being here this evening. I would like to particularly thank Harley Bridger, the principal of Antelope High School, for this meeting place and setting up the facilities we have here this evening.

Also to the Honorable Mr. John Nussbaumer, Mayor of Wellton, Arizona, for his assistance in setting up of the meeting place and in general making arrangements.

A VOICE: Colonel Smith, could you have Colonel Molnar introduce his staff?

COLONEL LARRY MOLNAR: Lieutenant Colonel George -- and I call him Mac, he likes that -- Riddle, who is our Division Chief for Civil Engineering. Please stand up.

Major Alan Sabsevitz, who is our Public Information Officer. He works for -- directly for General John Hepfer. Al, please stand up.

Captain Don Kellogg, who is a worker bee in Colonel Riddle's shop. He is really our environmentalist. He is the project officer in charge of the contracts that are associated with the Environmental Impact Statement.

We do have people here representing our contractors, Mr. Harris and Doctor Morhardt, both from Henningson, Durham and Richardson in Santa Barbara, California. They are the people who are preparing in a formal way the impact statements that we have to submit on this project.

Colonel Martin over here is a Civil Engineer. Coloneal Neal -- right? Colonel Neal, who is here representing HAVE HOST activity, which I'm sure those of you who are local peple know plenty about.

COLONAL ALAN SMITH: Once again, any comments from the audience or any questions for Colonel Molnar or any members of his staff.

JAMES RIESLAND: James Riesland and I live in Tacna. There was a little article in the paper here a couple of weeks ago that said that the TWR [TRW] Corporation was opposed to this project. Do you know anything about that?

COLONEL LARRY MOLNAR: Can I answer this off the record, sir?

(Thereupon, an off-the-record discussion ensued).

COLONEL ALAN SMITH: The record should indicate that Colonel Molnar said that there was nobody from TRW here to oppose the MX or who could really speak for TRW. So that's what the record should indicate.

Any other comments? Well, once again we thank all of you for coming this evening and once again I'm certain Colonel Molnar and his staff will be available after the adjournment of the hearing and will do their best to answer any informal questions that you might have.

Thank you ladies and gentlemen. We appreciate your presence.

(Thereupon, the hearing was concluded at 8:25 o'clock p.m.)

I CERTIFY THAT I took the foregoing matter in shorthand, that the same was transcribed under my direction, that the preceding 25 pages constitute a true and correct transcript of the testimony adduced, to the best of my skill and ability.

/s/ Christine Anne Olesek, rpr
CHRISTINE ANNE OLESEK
REGISTERED PROFESSIONAL
REPORTER

END

DATE
FILMED
10-81

DTIC