FINAL DESIGN ANALYSIS

TITAN II DISMANTLEMENT

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Arizona

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Prepared for: US Army Corps of Engineers
Los Angeles District

US Army Corps
of Engineers
Omaha District

FINAL DESIGN ANALYSIS
FOR
TITAN II DISMANTLEMENT
DAVIS-MONTHAN AFB, ARIZONA

TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
I.	GENERAL PROJECT REQUIREMENTS	I-1
	A. Authority, Purpose, Scope, and Schedule	I-2
	B. General Requirements, Background and Design Methodology	I-5
	C. Special Requirements	I-8
	D. Environmental Permits	I-10
II.	TECHNICAL REQUIREMENTS	II-1
	A. Site Work	II-2
	B. Grout Materials	II-8
	C. Structural	II-12

APPENDIX	TITLE	PAGE
A.	STATEMENT OF WORK AND CORRESPONDENCE	A-1
B.	CONSULTANT'S REPORT	A-2
C.	TRIP REPORT (SITE INSPECTION)	A-3
D.	ENVIRONMENTAL ASSESSMENT	A-4

CHAPTER I

GENERAL PROJECT REQUIREMENTS

CHAPTER I
GENERAL PROJECT REQUIREMENTS

SECTION A

AUTHORITY, PURPOSE, SCOPE, AND SCHEDULE

1. AUTHORITY. The preparation of design documents for this project by the Omaha District for the Air Force is authorized by OCE (DAEN-MPC-F) message No. R281442Z to MRD, Subject: Design Responsibiity Titan II Deactivation, dated September 1982 and subsequent indorsement to the Omaha District dated 29 September.

2. PURPOSE. The purpose of this project is to render the designated Titan II missile sites unusable as Intercontinental Ballistic Missile (ICBM) launchers and to insure that these sites are completely safe to the general public and free of the possibility of any future liability to the Government.

3. SCOPE. The project consists of dismantling Titan II missile launch complexes located in the vicinity of Davis-Monthan Air Force Base, Tucson, Arizona. The missiles, missile propellants, and complex equipment will be deactivated by the Air Force prior to initiation of this project. In general, this project consists of dismantlement and general demolition of 18 Titan II sites.

3.1 GENERAL SCOPE OUTLINE. A general outline of the dismantlement work for each site is as follows:

3.1.1 Remove the top five meters of the Launch Silo including the Silo Closure Door.

3.1.2 Fill the Silo Launch Duct and Exhaust Ducts and render any remaining void areas inaccessible.

3.1.3 Abandon the Launch Control Center and render void areas inaccessible.

3.1.4 Fill the Blast Lock and Cableway located between the Launch Silo and Launch Control Center.

3.1.5 Fill the Access Portal.

3.1.6 Fill all miscellaneous small structures such as manholes, septic tanks, and air intake and exhaust shafts.

3.1.7 Remove all facilities which project above finish grade.

3.2 SPECIFIC SCOPE OUTLINE. A more specific project scope is described in an Air Force letter dated 3 December 1982. This letter is contained in Appendix A. Minor changes in design from that presented in the Statement of Work have been coordinated with Air Force representatives. This is discussed briefly in the 8 February 1983 letter also contained in Appendix A. Unresolved issues will be discussed at the design review conference.

4. SCHEDULE. The overall schedule for this project is attached at the end of this section. This schedule reflects the change in fiscal year construction funding from 1983 to 1984 as directed by Air Force letter dated 26 April 1983, Subject: Titan II Dismantlement Program. This letter is included in Appendix A.

DAVIS MONTHAN AFB
TUCSON, ARIZONA
TITAN II DEACTIVATION

Start Design	6 December 1982
Predesign Meeting & Site Visit	24 January 1983
Submit 35% for Review	23 February 1983
Review Meeting	16 March 1983
Submit 90% for Review	5 May 1983
Review Meeting	24 May 1983
Complete Design	21 June 1983
Forward to Los Angeles District for Advertising	5 July 1983
Advertise	6 September 1983
Open Bids	10 October 1983
Award	24 October 1983

Revised Schedule - 2 May 1983

SECTION B

GENERAL REQUIREMENTS BACKGROUND AND DESIGN METHODOLOGY

1. REGULATIONS, MANUALS, AND STANDARDS. The following regulations, manuals, and standards are applicable to this design package:

1.1 DEPARTMENT OF DEFENSE (DOD) PUBLICATIONS.

4270.1-M	Construction Criteria (Adv Ed 1 Jun 78)
5154.4S	Ammunition and Explosive Safety Standards (Jan 78)
6050.5M	Hazardous Materials Information System Procedures (July 81)
6055.1	Occupational Safety and Health (OSH) Program (30 Sep 81)

1.2 AIR FORCE REGULATION (AFR).

125-37	The USAF Resources Protection Program (6 May 82)

1.3 U.S. ARMY CORPS OF ENGINEERS, ENGINEERING MANUAL (EM).

385-1-1	Safety and Health Regulations Manual (April 1981)

1.4 U.S. DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) STANDARD.

2206	General Industry (Revised Jan 76)
2079	Construction Standards Interpretations (July 80)

2. BACKGROUND. Some background on deployment and site identification for the Titan II weapons system is outlined below.

2.1 OVERALL DISMANTLEMENT. This project is the first part of the Air Force's overall proposed plan to dismantle the Titan II launch facility. These launch facilities are deployed in three Strategic Missile Wings (SMW) consisting of the following:

2.1.1 The 308th SMW, Little Rock AFB, Little Rock, Arkansas.

2.1.2 The 381st SMW, McConnel AFB, Wichita, Kansas.

2.1.3 The 390th SMW, Davis-Monthan AFB, Tuscon, Arizona.

2.2 THE DAVIS-MONTHAN WING. The 390th SMW, headquartered at Davis-Monthan Air Force Base, is comprised of the 570th and 571st Squadrons. Each squadron is assigned nine sites, giving a total of eighteen sites. Construction of these sites was started in 1961 and thus, these sites are approximately 20-years old.

2.3 DAVIS-MONTHAN SITE DESIGNATIONS. The Davis-Monthan sites are currently identified by a squadron and site number. However, during construction, a different identification numbering scheme was used. This numbering scheme (sometimes called the Corps of Engineers Construction Number) identified the sites merely as Sites 1 through 18 and appears on many of the as-built drawings. A correlation between the squadron-site numbering scheme and the Corps of Engineers Construction numbering scheme is shown in Table 1 below. For purposes of this project, the squadron-site numbers will be used for identification.

TABLE 1

Davis-Monthan Titan II Identification Numbers

Squadron-Site Numbers	Corps of Engineers Numbers
570-1	1
570-2	11
570-3	12
570-4	13
570-5	14
570-6	15
570-7	16
570-8	17
570-9	18
571-1	2
571-2	3
571-3	4
571-4	5
571-5	6
571-6	7
571-7	8
571-8	9
571-9	10

2.4 DEACTIVATION AND DISMANTLEMENT is a joint effort by the Air Force and the private sector.

2.4.1 Deactivation is being performed by the Air Force and involves the removal of most Support Equipment (SE), the removal of other equipment valuable to the Air Force as spare parts for operational wings or for other purposes and the removal of items and equipment which might present an environmental contamination hazard. The Air Force deactivation program at Davis-Monthan was started in October 1982 and is scheduled to be complete prior to award of the work covered in this project.

2.4.2 Dismantlement includes all work covered in this project.

3. DESIGN METHODOLOGY Due to the short time constraints and priority placed on preparing contract drawings and specifications for this project, the following design methodology has been adopted.

3.1 SCOPE. The dismantlement project design was done for the entire wing allowing the Air Force the flexibility to advertise and award all or any group of sites.

3.2 MAXIMUM UTILIZATION OF DESIGN. The drawings and specifications have been prepared in such a way as to maximize reuse for future Titan II dismantlement projects.

3.3 ITEMIZATION OF EXISTING FACILITIES. No attempt will be made by the Omaha District to itemize or determine the condition of equipment and materials remaining at the sites covered by this project (by visiting each site) prior to contract advertisement.

SECTION C

SPECIAL REQUIREMENTS

1. APPLICABLE PUBLICATIONS. The following publications are applicable to this Section.

1.1 CODE OF FEDERAL REGULATIONS (CFR).

49	Transportation, Parts 100 to 177 (Dec. 1980) Parts 178 to 199 (Dec. 1980) and Parts 200 to 399 (Oct. 1980)

1.2 U.S. ARMY CORPS OF ENGINEER MANUAL.

EM 385-1-1	Safety and Health Requirement Manual (April 1981)

1.3 BUREAU OF MINES REPORT OF INVESTIGATION (RI).

8485	Structure Response and Damage Produced by Airblast from Surface Mining (1980)
8506	Measurement of Blast-Induced Ground Vibrations and Seismograph Calibration (1980)
8507	Structure Response and Damage Produced by Ground Vibration from Surface Mine Blasting (1980)
8508	Airblast Instrumentation and Measurement Techniques for Surface Mine Blasting (1981)

1.4 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) CODE.

495-1982	Code for the Manufacture, Transportation, Storage, and Use of Explosive Materials

2. SITE VISITATION BY PROSPECTIVE BIDDERS. Prospective bidders will be allowed the opportunity to visit Site 570-2 during the bidding period.

3. SECURITY, SAFETY AND ENVIRONMENTAL PROTECTION. Background and Corps of Engineers recommendation for these items are outlined below.

3.1 SECURITY. The Air Force has requested that the sites be guarded by the Contractor prior to the waiting (observation) period and that the sites be locked and checked once a day during the waiting period. Recommended specifications to accomplish this security is contained in specification Section 1B, paragraph 3.

3.2 SAFETY DURING DISMANTLEMENT. Recommendations for safety are contained in specification Section 1B, paragraph 4.

3.3 ENVIRONMENTAL PROTECTION. Research on permits required for dismantlement is contained in Section ID of this design analysis. Recommendations for environmental protection, including dust control and burning are covered in specification Section 1B, paragraph 5.

4. SALVAGE. The Air Force has provided the Omaha District with a list of salvage items and requested that the list be edited. The final edited list is contained in specifications Section: Special Provisions. Removal procedures for salvaged items are contained in specification Section 2B, paragraph 4.

5. BLASTING. Requirements for blasting are contained in specification Section 2B, paragraph 5 and are discussed below.

5.1 QUALIFICATIONS AND EXPERIENCE REQUIREMENTS for blasters is specified because of the nature of the blasting to be performed and because there are no local state or county permits required for blasting (see Section D of this Design Analysis).

5.2 SAFETY. General blasting safety is specified to be in accordance with U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1, Section 25. It should be noted that this manual references CFR 49, Parts 171 to 179 for transportation of explosives over highways and that these Federal regulations must be followed. Storage of explosives is specified to be in accordance with NFPA 495.

5.3 BLASTING LIMITS. The blasting limits specified were taken from RI 8485 and 8507.

5.4 MONITORING OF BLAST EFFECTS. The required capability of equipment was taken from RI 8506 and 8508.

SECTION D

ENVIRONMENTAL PERMITS

1. ENVIRONMENTAL CONSTRUCTION PERMITS. The Omaha District Environmental Construction Permit Manager contacted the Arizona State Department of Health (Mr. Carl Billings, Chief, Engr. Services Section, 602-255-1140) to determine if there are any environmental construction permits required for this demolition work.

1.1 DUST CONTROL, OPEN BURING, AND BLASTING. Mr. Billings stated that there are no environmental construction permits required at the State level. However, there are, as a minimum, State regulations that a construction contract must adhere to in regard to dust control, open burning, and blasting. Mr. Billings stated that most of the county health departments regulate these activih, 602-792-8803, regarding permits. Mr. Fox stated that dust control, open burning, and blasting are regulated by Pima County. There is no application fee, and a construction contractor is usually issued the permit the same day he applies for it. The County has an enforcement officer and the permits are issued by Mr. John Mann, 602-792-8686. Mr. Fox stated that the County discourages the open burning applicant. The County reviews this application on a case-by-case basis. If issued, the burning must be supervised by a public official.

1.1.1 Santa Cruz County. Ms. Pam Schweikert, Sanitarian for Santa Cruz County (602-287-4401), stated that dust control for Santa Cruz County is regulated by the State Air Quality Bureau. Open burning is permitted by the County Health Department after the applicant secures the District Fire Chief's approval and makes a formal application with her department. There is no application fee and the burning permit is usually issued on the same day the application is filed. Ms. Schweibert stated that blasting is not regulated by the County Health Department and that she suggested coordination with the Arizona State Fire Marshall's office.

1.1.2 Pinal-Gila County. Ms. Dorothy Rankin, Director, County Air Quality Control Office, 602-868-5801, stated that the county dust control regulations are compatible with the State's regulations; however, in some areas, the county regulations are more restrictive. Ms. Rankin requested a set of the plans and specifications to review. She would respond immediately if the Corps' dust control specification was not in accordance with the County rules. The Permit Manager stated that the Corps could send a copy of the as-advertised plans and specifications to her office for review. Open burning is by permit only, no application fee, and the permit is usually issued the same day. Ms. Rankin stated that burning of construction debris would not be permitted. The County tends to discourage open burning in her district. Blasting is not regulated by her office. She suggested coordination with the State Fire Marshall's office.

1.1.3 Cochise County. Mr. Arnold Manez, Chief Sanitarian for Cochise County, 602-432-5703, Ext. 436, stated that as long as the specifications are prepared to meet the State air quality regulations, they meet the County's requirements for dust control. Generally, open burning is prohibited, however, special permission can be granted. The County office can provide information on the special permission. His office does not regulate blasting. He suggested coordination of this requirement with the State Fire Marshall's office.

1.2 BLASTING. Mr. David Dale, an employee of the Arizona State Fire Marshall's office, 602-273-9665, stated that as far as handling explosives (manufacture, transportation, storage, and use of explosive materials), the State of Arizona goes by NFPA 1979 manual. The State Fire Marshall's office does not license contractors, however, there is an agency that handles this license requirement. Mr. Dale stated that if our specifications, for blasting, are prepared in accordance with the 1982 NFPA Code, then we should be in compliance with the blasting regulations of the State of Arizona. Ms. Adrienne Fleming, Arizona State Registrar of Contractors 602-255-1502, stated that there is no blasting license required by her department when a contractor is involved with commercial or military projects.

2. U.S. FISH AND WILDLIFE SERVICE, ENDANGERED OR THREATENED SPECIES. Mr. Don Metz, Field Supervisor, Arizona Area, 602-241-2493, stated that it appears our project would have no impact on any endnagered or threatened species, however, his office would respond directly to our correspondence identifying the project locations and a description of what the Corps intends to do. The Permit Manager stated that a letter would be sent in the near future (approximately 9 May 1983).

3. ENVIRONMENTAL ASSESSMENT. An Air Force-prepared environmental assessment for this project is included in this Design Analysis as Appendix D.

4. CONCLUSION. From the investigation conducted by the Omaha District's Environmental Construction Permit Manager, there are no environmental construction permits that need to be obtained by the U.S. Air Force prior to the start of construction. There are permitting requirements that the successful demolition contractor will be required to obtain. The Corps' standard specifications clearly delienate this as a responsibility of the Contractor. The Omaha District's Environmental Construction Permit Manager will mail plans and specifications, without charge, to the following individuals upon concurrence with the Air Force:

Mr. Fred Iacobelli
Acting Chief
Arizona Bureau of Air
Quality Control
1740 West Adams Street
Phoenix, Arizona 85007

Mr. Arnold Manez
Chief Sanitarian, Cochise County
P.O. Drawer 1858
Bisbee, Arizona 85603

Ms. Dorothy Rankin, Director
Pinal-Gila Air Quality
Control District
P.O. Box 1076
Florence, Arizona 85232

Mr. C. Lee Fox, Director
Pima County Air Quality District
151 West Congress
Tuscon, Arizona 85701

Ms. Pam Schweikert
Acting Chief Sanitarian
Santa Cruz County
303 Morley Avenue
Nogales, Arizona 85621

CHAPTER II

TECHNICAL REQUIREMENTS

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TECHNICAL REQUIREMENTS

SECTION A

SITE WORK

1. GENERAL. This section outlines the dismantlement of site facilities including sanitary and water supply facilities; buried tanks; pits, manholes and handholes; buried antennas; above grade antennas; poles and pole mounted equipment; concrete pads, stands, anchors and curbs; below grade shafts; fencing; and other miscellaneous site facilities. The dismantlement of major structures such as the Control Center, Access Portal and Blast Lock Structure, Cableway and Launch Silo are covered in Section: STRUCTURAL.

2. SITE FACILITY DISMANTLEMENT. Except for facilities designated to remain, site facility dismantlement will consist of removal or filling with suitable soil material or grout. Items removed will be either salvaged and turned over to the Government or scapped. Suitable soil fill material will consist of soil material free from debris, roots, organic matter, and stones greater than 6 inches in any dimension. Grout is covered in Section: GROUT MATERIAL.

3. SANITARY AND WATER SUPPLY FACILITIES. Dismantlement of these facilities is outlined below. Unless otherwise indicated, these facilities are located outside of the chain link security fence.

3.1 EVAPORATION PONDS are located at sites 571-5, 571-6, 570-4, and 570-8. These ponds are approximately 30 feet by 30 feet and are surrounded by a six strand barb wire fence. The fence and posts will be removed and the dikes will be filled with suitable borrow material and graded to conform to the shape of the typical sections on the drawings.

3.2 OXIDATION PONDS are located outside of the security fence at sites 570-4, 570-8, 571-1, 571-3, and 571-6; and inside the security fence at sites 570-1, 570-2, 570-3, 570-7, 571-2, 571-4, and 571-5. The ponds located outside the security fence occupy an area 50 feet by 50 feet and are surrounded by a six strand barb wire fence. The ponds located inside the security fence are unfenced. The work performed on these ponds will be the same as that for the evaporation ponds.

3.3 SEPTIC TANKS. Each site has a 540 gallon septic tank. These tanks will be drained and filled with grout.

3.4 TILE FIELDS exist outside the security fence at sites 570-6, 570-9, 571-1, 571-8, and 571-9; and exist inside the security fence at site 570-5. These sites have buried tile field piping, tile field warning signs (four per site), and 8- to 12-inch diameter observation risers. The buried tile field piping associated with the sewage treatment plants will be abandoned, the warning signs will be removed, and the observation risers will be broken off at grade and filled with suitable fill material.

3.5 WATER STORAGE RESERVOIR. A 100,000 gallon storage reservoir exists at all sites and occupies an area 60 feet by 60 feet surrounded by a 7-foot high chain link fence. These tanks are buried concrete structures with wooden covers. The fence, posts, and wooden covers will be removed and the reservoir will be filled with borrow material and graded to conform to the shape of the typical section on the drawings.

3.6 CHLORINATOR VAULTS exist at sites 570-1, 570-3, 570-8, 571-1, 571-3, 571-4, 571-5, and 571-6. The vaults are of two sizes, 6 feet by 9 feet or 12 feet by 12 feet and are surrounded by a 7-foot chain link fence. The vaults are buried concrete structures with wooden tops at grade. The work performed on these vaults will be the same as that for the storage reservoirs.

3.7 CHLORINATOR WELL VAULTS. Ten of the sites, 570-2, 570-4, 570-5, 570-6, 570-7, 570-8, 571-2, 571-7, 571-8, and 571-9 have chlorinator well vaults surrounded by a 7-foot chain link fence. The vaults and fencing will remain undisturbed.

3.8 ABANDONED WELL. An abandoned well exists at the south side of site 571-1. The well casing will be cut flush with existing ground and plugged with a 10-foot deep concrete plug.

4. BURIED TANKS. Three buried tanks will be filled with grout at each site. These tanks are located inside the security fence and consist of the following:

4.1 Fuel Dump Tank, 60,000 gallon capacity.

4.2 Oxidizer Dump Tank, 20,000 gallon capacity.

4.3 Diesel Storage Tank, 8,000 gallon capacity. The fuel pump located above the tank will be removed.

5. PITS, MANHOLES, AND HANDHOLES will be removed or filled with grout. All pits, manholes, and handholes are located inside the security fence.

5.1 TRANSFORMER, WATER CHILLER, AND VALVE PIT. One such pit exists at each site. The chillers will be removed by the Air Force. The 500 kVA transformer, steel frame transformer pit cover, wood frame chiller platform, and the concrete combination transformer-water chiller-valve pit will be removed under the dismantlement contract.

5.2 SITE TUBE CLOSURE PIT. The site tube closure pit (one per site) will be either filled with grout or removed at the option of the Contractor. The site tube will be removed if required.

5.3 P.T.S. RECEPTACLE PIT. The P.T.S. pit (one per site) will be either removed or filled with grout at the option of the Contractor.

5.4 MANHOLE "J" (one per site) will be filled with grout.

5.5 MANHOLE "B" (one per site) will be filled with grout.

5.6 HANDHOLES "A," "B," AND "C" (one each per site) will be filled with grout.

6. BURIED ANTENNAS. All buried antennas are located within the security fence. All voids in buried antenna pits will be filled with grout. The type, number, and location of these antennas is outlined below.

6.1 H.F. (COLLINS) HARD ANTENNA. All sites have one of these antennas except that sites 570-2, 570-5, 570-8, and 571-1 have two.

6.2 IRCS (G.E.) HARD ANTENNA. All sites have two such antenna.

6.3 U.H.F. (CONE) ANTENNA. All sites have one such antenna.

7. ABOVE GRADE ANTENNAS. All above grade antennas will be removed. The type, number, and location of these antennas is outlined below:

7.1 H.F. DISCAGE (UNBREALLA) ANTENNA. All sites have one such antenna located outside of the security fence.

7.2 IRCS SPACE DIVERSITY ANTENNA. One such antenna is located at sites 570-1, 570-3, 570-4, 570-7, 570-8, 570-9, 571-8, and 571-9. The antenna located at site 570-4 is mounted on a steel frame tower having a uniform triangular cross section. All other antenna are mounted on steel poles.

7.3 IRCS FREQUENCY DIVERSITY (SOFT) ANTENNA. All sites have one such antenna.

7.4 REPEATER ANTENNA. These antennas are located at sites 570-2 and 570-6 only. The antennas are mounted on a steel frame tower approximately 200 feet high.

8. POLES AND POLE MOUNTED EQUIPMENT. Unless otherwise indicated, all poles and pole mounted equipment will be removed. The type and number of poles is outlined below:

8.1 WIND DIRECTION POLE. One steel pole is located at each site.

8.2 DELTA "T" POLE. One wood pole is located at each site.

8.3 P.A. POLE. Three wood poles are located at each site.

8.4 STATUS POLE. One wood pole is located at each site.

8.5 WARNING SIREN. One wood pole mounted siren is located at each site.

8.6 LIGHT POLES. Four light poles are located at each site.

8.7 POWER POLES. Power poles are the property of the local utility company and will remain.

8.8 ORANGE AND BLACK POLE. One such steel pole is located at each site.

9. CONCRETE PADS, STANDS, ANCHORS, AND CURBS. The type and number of these items is outlined below:

9.1 CONCRETE BUMPER PAD. The bumper pad (one per site) will be removed.

9.2 OXIDIZER UNLOADING HARDSTAND. One oxidizer hardstand is located at each site. The pipe support wall will be removed and the sump will be filled with grout.

9.3 FUEL UNLOADING HARDSTAND. One fuel hardstand is located at each site. The pipe support wall and overhead spray piping and spray piping supports will be removed. The sump will be filled with grout.

9.4 CRANE HARDSTAND. One crane hardstand will be removed at each site.

9.5 CRADLE SUPPORT FOUNDATIONS. Four cradle supports are located at each site. Cradle supports will either be removed or remain at the option of the Contractor.

9.6 TAG LINE ANCHORS. Fourteen tag line anchors are located at each site. These anchors will either be removed or remain at the option of the Contractor.

9.7 CONCRETE CURB. The curb located near the concrete bumper pad at each site will be removed.

9.8 FLUSH CONCRETE RIBBON. The 64-foot long flush concrete ribbon will be removed or remain at the option of the Contractor.

10. BELOW GRADE SHAFTS. Below grade shafts will be removed or filled with grout as follows:

10.1 CONTROL CENTER AIR INTAKE AND ESCAPE SHAFT. This shaft (one per site) will be filled to refusal with grout. No attempt will be made to vent the delay path to insure that the delay path is filled.

10.2 ACCESS SHAFT. The access shaft located near the valve pit at each site will be removed.

10.3 LAUNCH SILO AIR INTAKE SHAFT AND AIR EXHAUST SHAFT. One air intake and one exhaust shaft at each site will be filled with grout. No attempt will be made to vent the delay paths to insure that the delay paths are filled with grout.

10.4 RUPTURE DISC ACCESS SHAFT. The rupture disc access shaft (one per site) and the rupture disc structure will be filled with grout.

11. FENCING.

11.1 BOUNDARY FENCE. The existing four strand barb wire fence which marks the property line for each site will remain. Upon completion of the contract, a new section of 4-strand barb wire fence will be erected across the access road and tied into the existing fence so that the entire site is renced off.

11.2 CHAIN LINK SECURITY FENCE. Upon completion of all dismantlement, removal, filling, and grouting on site, the Contractor will remove the chain link fence and gate. All disturbed areas and depressions from removal items not previously covered in this or other sections will be graded to match existing topography using suitable fill to maintain a free draining site utilizing existing drainage patterns.

12. MISCELLANEOUS SITE FACILITIES. The type and dismantlement of these facilities is outlined below.

12.1 MOTION SENSING EQUIPMENT. All sites have one double unit and eight single unit pad mounted motion sensors. All sensing equipment and concrete pads will be removed.

12.2 GUARD POSTS. All steel pipe concrete filled guard posts will be removed.

12.3 FUEL FLARE STACK AND OXIDIZER FLARE STACK. One fuel flare stack and one oxidizer flare stack at each site will be removed at grade.

12.4 WIND INDICATOR. One wind indicator located outside the security fence will be removed at each site.

12.5 CULVERTS. All culverts under main access drives, all culverts outside of the security fence, and all culverts providing site drainage will remain to provide drainage.

12.6 WHEEL STOPS. Wooden and concrete wheel stops located at the parking areas will be removed.

12.7 THEODOLITE STATION. The theodolite station located near the site closure pit will be removed or remain at the option of the Contractor.

12.8 THEODOLITE STATION MONUMENTS. The theodolite station monuments located outside of the site boundary fence will remain.

12.9 WHITE TELEPHONE TRAILERS. These trailers are the property of the telephone company and will remain undisturbed.

12.10 METAL BUILDINGS. Two metal buildings, one approximately 22 feet by 55 feet in plan dimensions and the other approximately 10 feet by 13 feet in plan dimensions, are located at sites 571-8 and 517-9. These will be removed.

SECTION B

GROUT MATERIALS

1. APPLICABLE PUBLICATIONS. The publications listed below are referred to in the text by basic designation only.

1.1 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS.

C 33-82	Concrete Aggregates, Spec. for
C 150-81	Portlant Cement, Spec. for
C 618-80	Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete, Spec. for

1.2 DEPARTMENT OF THE ARMY TECHNICAL MANUALS (TM).

TM 5-818-6	Grouting Methods and Equipment

1.3 U.S. ARMY CORPS OF ENGINEERS WATERWAYS EXPERIMENT STATION (WES) TECHNICAL MEMORANDUM.

6-419	Tests of Sanded Grouts

2. GENERAL. In the proposed dismantlement plan, a Portland cement grout will be used to fill the Cableway, Control Center, Air Intake and Escape Shaft, Silo, Intake and Exhaust Shafts, dump tanks, fuel tanks, and other areas as indicated on the plans. A sanded grout consisting of Portlant cement, sand, and water, with or without mineral filler (flyash) or fluidifier is proposed. Tentative mix designs, materials sources, placement details, and specification requirements are presented in the following paragraphs.

3. GROUT PROPERTIES. A suitable grout mix should have the following properties:

3.1 HIGH FLUIDITY to fill voids and minimize placements in confined areas. For a give ratio of cement-sand-water, the fluidity increases with an increase in percent passing the No. 100 sieve size of the sand. For sand deficient in the No. 100 sieve size, fluidity is improved by adding a mineral filler or a fluidifier. The use of either a mineral filler or a fluidifier will be permitted as a Contractor's option, but will not be required. A maximum efflux time (grout flow) of 20 seconds will be specified for fluidity control.

3.2 ADEQUATE CEMENTITIOUS MATERIAL to set up and develop strength. For this cavity grouting application, strength is a secondary requirement. However, strength will affect set time of the grout, heat of hydration, and fluid pressures against structures, etc. A 28-day compressive strength of 1,000 pounds per square inch will be specified to meet the above criteria without excessive cement content.

3.3 ADEQUATE SAND CONTENT to increase yield and decrease costs.

4. GROUT STUDY.

4.1 GROUT PROPORTIONS. Tentative grout proportions for a sanded grout, both with and without mineral filler, are presented below. These tentative mix designs are based on guidance provided in TM 5-818-6 and WES Technical Memorandum 6-419, Reports 1 and 2.

4.1.1 Sanded Grout Without Mineral Filler. Based on one bag of cement, tentative proportions are shown in Table 1 below. This mix contains the maximum amount of sand that is pumpable for this water to cement ratio. The high compressive strength could be reduced by either: (1) decreasing the water/cement ratio, or (2) adding a fluidifier to carry more sand in the grout, resulting in an increased sand/cement ratio.

TABLE 1

Tentative Proportions for Sanded Grout Without Mineral Filler

Cement	94# (1 bag)
Sand (depends on percentage minus #100 sieve)	282#
Water	82#
Yield	3.51 cubic feet
Unit Weight	130.3 pcf
Efflux Time	13 seconds
Initial Set	4 hours
Compressive Strength	2,120 psi @ 28 days age
Water-Cement Ratio	0.87

4.1.2 Sanded Grout With Mineral Filler. The advantages in using a mineral filler are: (a) decreased cement content, (b) increased ability to carry sand, and (c) improved fluidity. The disadvantage is a decrease in compressive strength. Based on one bag of cement, tentative proportions are shown in Table 2 below.

TABLE 2

Tentative Proportions for Sanded Grout
With Mineral Filler

Cement	94# (1 bag)
Mineral Filler (flyash)	63#
Sand (depends on percentage minus #100 sieve)	508#
Water	127#
Yield	6.02 cubin feet
Unit Weight	131.5 pcf
Efflux Time	12.5 seconds
Initial Set	3 hours
Compressive Strength	855 psi @ 28 days age
Water-Cement Ratio	0.81

4.2 RECOMMENDED MIX. The project specifications will require a Contractor mix design using specific job materials. A sanded grout (sand, cement, and water) is recommended and will be specified with a Contractor option for use of flyash and fluidifier. The mix design criteria will require a 28-day compressive strength of 1,000 pounds per square inch and a maximum efflux time (increase of grout flowability) of 20 seconds.

5. MATERIALS. Sources of materials have been located for the cement, flyash, and sand requirements of the grout mix.

5.1 FLYASH. ASTM C-618 Type F flyash is available from two sources: Cochise Apache Plant (70 miles from Tuscon) and the Coronado Plant (180 miles from Tucson). This flyash is marketed by Western Ash Company, 5227 North Seventh Street, Phoenix, Arizona 85011. Currently, this flyash is approved by the Bureau of Reclamation for use in concrete.

5.2 CEMENT. ASTM C-150 Type II cement is available from a distribution terminal in Phoenix or two cement plants: California Portland Cement Company of Rillito, Arizona (18 miles from Tucson), and Phoenix Cement Company at Clarkdale, Arizona (210 miles from Tucson). Type II cement should be used because the moderate heat of hydration will permit placing thicker sections without subsequent thermal cracking.

5.3 SAND. Pit run sand is readily available throughout the vicinity. The subrounded to rounded particle shape of these alluvial sands will aid the flow properties of the grout. Fine aggregate should conform to the quality requirements of ASTM C33. The sand gradation should meet the requirements shown in Table 3 below:

TABLE 3

Sand Gradation for Sanded Grout

Sieve Designation U.S. Standard Square Mesh	Cumulative Percent by Weight Passing
8	100
16	95-100
30	60-85
50	20-50
100	10-30
200	0-5

6. PLACEMENT. Grout would probably be mixed at a batch plant located at one site and brought to other sites by trucks. Grout will be placed by pumping. It is estimated that the pumping rate will be between 50 and 110 cubic yards per hour.

SECTION C

STRUCTURAL

1. APPLICABLE PUBLICATIONS. The publications listed below are referred to in the text by basic designation only.

1.1 AMERICAN CONCRETE INSTITUTE (ACI) STANDARDS AND PUBLICATIONS.

318-77	Building Code Requirements for Reinforced Concrete with Commentary
SP-17(73)	Design Handbook, Volume 1

1.2 AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC) PUBLICATION.

Manual of Steel Construction (8th Ed 1980)

1.3 MCGRAW-HILL BOOK COMPANY, INC., TEXTBOOK.

Theory of Plates and Shells, (S. Timoshenko and S. Woinowsky-Krieger, 2nd Ed. 1959)

2. NEW CONCRETE CAP. After removal of the top portion of the launch silo, a new concrete cap will be installed. This cap was designed as follows:

2.1 DESIGN LOAD. The design load for the cap was assumed to consist of combined earth and concrete rubble having a depth of 24.5 feet and a unit weight of 130 pounds per square foot.

2.2 ANALYSIS. The cap was analyzed using the beam formulas contained in AISC Manual of Steel Construction, Part 2, and circular plate formulas contained in "Theory of Plates and Shells," Chapter 3.

2.3 REINFORCED CONCRETE for the cap was designed in accordance with ACI Standard 318 using the design aids contained in ACI Publication SP-17. The concrete compressive strength and reinforcing yield strength used in the design were 3,000 and 60,000 pounds per square inch, respectively. A conservative load factor of two was applied to the design load to account for uncertainties such as vehicle load during constructon and future construction over the capped silo.

2.4 GEOTEXTILE AND SAND CUSHION. The specifications and drawing allow a geotextile and sand cushion to be used as an option to fixed forms for forming the concrete cap. The geotextile would operate as (1) separation medium between the sand cushion levelling course and the ungraded rubble fill, and (2) a tensile reinforcement layer.

2.4.1 This application is similar to conventional use of geotextiles in vehicle and railroad subgrade stabilization and strengthening. The

main physical properties required of the fabric for this application include: tensile strength and elongation, seam strength, puncture and tear resistance, burst strength, and equivalent sieve opening size (EOS).

2.4.2 Either a woven or a nonwoven fabric would be suitable for this application. The physical properties to be specified are typical of those used in this type of application.

3. DISMANTLEMENT OF MAJOR STRUCTURES. The Cableway, Access Portal and Blast Lock Structures, Control Center, and Launch Silo will be dismantled as follows:

3.1 CABLEWAY. The Cableway between the Blast Lock Structure and the Launch Silo will be filled with grout. A contractor-designed grout form will be constructed at the Launch Silo cableway port to contain the grout.

3.2 ACCESS PORTAL AND BLAST LOCK STRUCTURE. The bottom portion of these structures will be filled with grout to a level even with the top of the Cableway. The top of the Access Portal will be removed and the void area will be filled with earth and rubble.

3.3 CONTROL CENTER. The Control Center will be abandoned.

3.4 LAUNCH SILO. The top portion of the Launch Silo, including the Silo Closure Door, will be removed and the Launch Duct and Exhaust Ducts will be filled with rubble. The equipment areas will be abandoned.

3.4.1 Depth of Silo Top Removal. The Air Force requirement for removal depth is 5 meters (16.4 feet). This depth was increased to 24.5 feet for the following reasons.

3.4.1.1 An existing concrete construction joint is present at this depth which forms a weak point in the silo wall because of short bar lap splices.

3.4.1.2 This depth coincides with the bottom of the structural steel box girders. Since the box girders are embedded in the concrete silo wall, removal at a lesser depth makes the box girder removal more awkward.

3.4.1.3 This depth coincides with the top of the Launch Duct. This allows the new concrete cap to be supported by the top of the Launch Duct and the remaining silo wall simplifying the cap design and construction.

3.4.2 RUBBLE FILL will consist of concrete, structural steel, reinforcing steel, miscellaneous metal, or soil material. This fill will be required to be free of any paper, wood, or other combustible material. Analysis has shown that during the placement of rubble in the exhaust ducts, it is likely that the exhaust duct walls will fail and collapse or buldge

toward the equipment areas. For this reason, no Contractor's personnel will be allowed in the equipment areas during or after rubble placement. The Launch Duct will contain the rubble fill without any failure.

APPENDIX A

STATEMENT OF WORK W/O ATTACHMENTS

AND

CORRESPONDENCE

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS STRATEGIC AIR COMMAND
OFFUTT AIR FORCE BASE, NEBRASKA 68113

3 DEC 1982

REPLY TO ATTN OF: DELD

SUBJECT: Titan II Demolition Statement of Work

TO: Commander
U.S. Army Engineer Division Missouri River
P. O. Box 103, Downtown Station
Omaha, NE 68101

1. We are transmitting with this letter the Statement of Work for the Titan demolition design effort being coordinated through the Special Projects Section of the Omaha District. Please note that changes have been made from the draft statement previously provided. Changes to the Statement of Work are noted in the margins by the use of change bars. Attachments one through nine have not changed. Attachments 10 and 11 contain minor changes and are forwarded with this Statement of Work. Request a meeting be held between Air Force representatives and the Omaha District Office for contract coordination as soon as possible. Also, a coordination meeting should be held as soon as practical between the Air Force and District representatives for those districts that will be performing contract surveillance. An important aspect in proceeding with this project is the condensed time lines which must be strictly followed due to budget considerations.

2. It is anticipated that funds will be available to begin design work by 1 Dec 82. I will be your point of contact for budgeting matters and Mr. Richard Zumbehl, 3925 ICBMFES/DEBM will be the SAC Project Manager and the Air Force liaison for contract review and acceptance.

Robert D. Mack

ROBERT D. MACK, GM-13, DAF
Chief, ICBM RPIE Design Division
Director, Missile Facilities
DCS/Engineering and Services

1 Atch
Statement of Work

Cy to: U.S. Army Engineer
District Omaha
Attn: MROED-S/Mr. Thompson
6014 U.S. Post Office &
Courthouse
Omaha, NE 68102 w/o Atch

Titan II Demolition

Davis-Monthan AFB, Arizona
McConnell AFB, Kansas
Little Rock AFB, Arkansas

1. Description of Project. This project consists of the design and preparation of plans, specifications, government cost estimate, and a procurement-ready contract package for the demolition of 53 Titan II Intercontinental Ballistic Missile (ICBM) Facilities at Davis-Monthan AFB, Arizona, McConnell AFB, Kansas, and Little Rock AFB, Arkansas. Vicinity maps for the three operating locations are provided as attachments 1 through 3.

a. Intent. The demolition effort is intended to render the sites unuseable as ICBM launchers, to provide a disposable real property item ready for GSA processing, and to minimize any hazards to the public throughout the disposal process.

b. Scope. The facility shall be demolished so that the launcher is no longer useable and in a manner that permits verification by national intelligence means. All facilities that project above the site surface shall be removed and all utilities services to surface facilities (i.e., piping, conduits, etc.) shall be permanently sealed. All buried structures that could present a long term hazard shall be backfilled. Specific demolition requirements are provided in the following paragraphs:

(1) Facilities outside of the security fence:

(a) The evaporation pond shall be drained. The dikes shall be graded flush with the surrounding terrain. Dike material and backfill (soil material similar to the in-site soil) shall be used to restore the pond area to match adjacent surface contours. The filled area shall be final graded and restored (seeded, etc.) to match the surrounding area. Evaporation ponds do not exist at all sites. Additionally, pond size varies from site to site. Information on the ponds is provided below and in attachment 4.

1. McConnell AFB. Sixteen of the eighteen sites at McConnell have evaporation ponds. Sizes are summarized below.

SITE	POND DIMENSIONS
532-1	50 x 100
532-2	50 x 100
532-3	50 x 100
532-4	no pond
532-5	50 x 100
532-6	50 x 100
532-7	50 x 100
532-8	30 x 170
532-9	50 x 100
533-1	25 x 200
533-2	50 x 100
533-3	no pond
533-4	50 x 125

SITE	POND DIMENSIONS
533-5	50 x 100
533-6	30 x 170
533-7	40 x 125
533-8	50 x 100
533-9	50 x 100

2. Davis-Monthan AFB. Twelve of the 18 sites at Davis-Monthan have oxidation ponds (ref. sheets 2-4, atch 4). A sites applicability listing is included on sheet 2 of attachment 4.

3. Little Rock AFB. Fourteen of the 17 sites at Little Rock have a sewage lagoon. Details and applicability listings are shown in sheets 5-6 of attachment 4.

(b) The 100,000-gallon capacity ground storage reservoir shall be filled with granular material. The 18 sites at Davis-Monthan AFB have wooden reservoir covers. Those covers shall either be removed or opened to permit backfill, then left in place over the reservoirs. Details of the reservoirs and covers are provided in attachment 5. Sheets 1 and 2 of attachment 5 provide details of reservoirs and covers at McConnell AFB.

(c) The water treatment building shall be filled with granular material. These buildings exist at each of the 53 sites. Details of building construction is provided in attachment 6.

(d) The tile field piping associated with the sewage treatment plant shall be abandoned in place. The three septic tanks (2-250 gallon and 1-180 gallon) and the distribution box shall be filled with grout.

(e) The High Frequency Discage Antenna shall be removed and shall become the property of the disposal contractor. The antenna is described in attachment 7.

(2) Facilities within the security fence.

(a) The 20,000-gallon buried oxidizer dump tank shall be drained, filled with grout, and abandoned in place.

(b) The oxidizer flare stack shall be cut off at grade and removed from the site. Any open piping shall be plugged or permanently capped at grade.

(c) The piping associated with the Oxidizer Unloading Hardstand shall be cut off at grade and removed from the site. Any open piping shall be plugged or permanently capped at grade. The hardstand itself shall be abandoned in place. Hardstand drainage shall remain intact.

(d) The fuel flare stack shall be cut off at grade and removed from the site. Any open piping shall be plugged or permanently capped at grade.

(e) The rupture disc (RD-2) access shaft shall be filled with granular material.

(f) All manholes and handholes shall be filled with granular material. Where installed, covers shall be removed.

(g) The P.T.S. pit shall be filled with granular material.

(h) In general, all piping and structures that project above grade shall be cut back flush with grade and permanently capped or sealed.

(i) The 60,000-gallon buried fuel dump tank shall be drained, filled with grout, and abandoned in place.

(j) The piping associated with the Fuel Unloading Hardstand shall be cut off at grade and removed from the site. Any open piping shall be plugged or permanently capped at grade. The hardstand itself shall be abandoned in place. Hardstand drainage shall remain intact.

(k) The valve pit shall be filled with granular material.

(l) The cooling towers shall be removed from the cooling tower pit and shall become the property of the demolition contractor. All sites at Little Rock and McConnell AFBs have two cooling towers installed per site (ea 562,000 BTU/hr, 120 gpm). The Davis-Monthan AFB sites utilize air cooled chillers that will be removed by the Air Force prior to award of the demolition contract. The cooling tower pit shall be backfilled with granular material.

(m) The 500 KVA transformer shall be removed from the transformer pit and shall become the property of the demolition contractor. The transformer pit shall be filled with granular material.

(n) The guard rail around the top of the cooling tower/valve/transformer pits shall be cut off flush with the concrete structure and removed from the site.

(o) The buried 8,000-gallon capacity diesel fuel storage tank shall be filled with grout. These tanks will be pumped out by the Air Force prior to the demolition effort. The diesel fuel transfer pump (P-4) shall be removed and associated piping shall be cut off at grade and sealed or capped. The pump shall become the property of the demolition contractor.

(p) The following antennas shall be removed and shall become the property of the disposal contractor. All anchors, utility service, etc., shall be cut back flush with grade and sealed. Additional information on antenna systems is included in attachment 8.

1. IRCS Freq. Diversity Antenna
2. IRCS Space Diversity Antenna
3. UHF Antenna
4. Radio Type Maintenance Net Monopoles
5. HF (Collins) Hard Antennas

6. Intersite Radio Communications System (IRCS) G.E. Hard Antenna

7. Interbase Radio (IBR) Antenna Structure

8. TPS-39 Surveillance System

(q) The surface warning beacon and siren and the civilian warning siren and their mounting poles shall be removed and shall become the property of the demolition contractor. All utility connections and mountings hardware will be cut off flush with grade and sealed (if required). See attachment 9 for additional information.

(r) The Delta T Pole, Wind Direction/Speed Transmitter, Light Poles/Lights, and Wire Type Maintenance Net Jack Stations shall be removed and shall become the property of the demolition contractor. All utilities connections and mounting hardware will be cut off flush with grade. Open pipe/conduits shall be sealed or capped. See attachment 9 for additional information.

(s) At McConnell AFB only (19 sites), remove and dispose of the access portal entry shelter (wooden structure).

(t) The grating over the Launch Control Center (LCC) Air Intake and Escape Shaft shall be removed. The shaft shall be filled to grade with granular material.

(u) Blast door number 8 (between the Control Center Cableway and the blast lock area) shall be closed and secured and the Control Center and the West (short) Cableway shall be abandoned as is.

(v) The Access Portal, Blast Lock, Decontamination Room, Junction Room, and East (long) Cableway shall be backfilled with granular material, grout, or a combination of the two fill materials. Fill shall be continued to grade. All topside structures (railings, ventilators, etc.) shall be removed from the top of the access portal structure.

(w) The Silo Closure Door shall be removed from the site and shall become the property of the demolition contractor.

(x) The Silo Closure Door Rails, Door Bumpers, and any other structures that project above grade in the door rail area shall be removed. Door access pits shall be filled with granular material.

(y) The flame deflector vanes (7/8" steel plate) located at the top of the silo shall be removed.

(z) In the launch silo, the "W" area (flame deflector) sump areas, and silo equipment areas shall be filled with grout. The exhaust ducts shall be filled with granular material. The launch duct shall be filled with concrete rubble (from the headworks demolition), granular material and grout as determined by the demolition plan. All launch silo fill shall be terminated 10'-0" below finished grade (i.e., top of fill shall be at Reference Elevation 290'-0").

(aa) The launch silo intake and exhaust ventilation shafts shall be filled with granular material and grout. Grout shall be used in the area of the junction of the vertical shaft and the horizontal ducting to provide as much fill of the delay lines as is possible.

(bb) The steel box girders at the top of the launch duct shall be removed. The concrete silo cap above the box girders and all concrete and steel structure to a depth of 5 meters shall be demolished (refer to the sketch provided as attachment 10).

(cc) After the launcher closure door is removed from the site, each site must remain open and observable for a period of 180 days. At the completion of this waiting period, the demolition contractor shall complete backfill of the launch silo, finish grade the silo area, remove the chain link fence, and clean up the site.

2. Safety and Security. The demolition contractor shall be responsible for all safety and security requirements throughout the contract period.

3. Site Visitations.

a. Design Preparation. The Corps of Engineers Project Manager (or his designated representative) shall visit a Titan II site to perform a site survey and obtain topside photographs, sketches, measurements, etc., to support definition of the scope of the demolition contract.

b. Demolition Contract Pre-Bid Site Visit. The demolition contract shall require a pre-bid visit for prospective bidders to clarify demolition requirements.

4. Project Manager. The Omaha District Corps of Engineers shall assign a member or employee as the Project Manager for development of his project design. He will oversee the correlation of the entire project design and will be able to administer all instructions from 3925th ICBMFES/DEBMC, and to answer or obtain answers to all questions from 3925th ICBMFES/DEBMC during and after the design work.

5. Price Schedule. The price schedule shall be set up a per site lump sum basis.

6. Performance Period. The design period shall be 26 calendar weeks.

7. Design Reviews.

a. Preliminary Design Review. A preliminary design review representing approximately 35% design completion shall be conducted on-board at the Omaha District Offices on or about the end of the 8th week of the performance period.

(1) Drawings. The drawings shall be sufficiently complete to permit meaningful evaluation of major elements of work. Five (5) sets of prints shall be furnished for review and approval a minimum of five (5) working days prior to the review.

(2) Design Analysis. The tabulation of criteria, design analysis, and outline specifications shall be assembled into one document and identified as the Preliminary Design Analysis. A separate section shall be added listing unresolved or requirements. Five (5) copies of the Preliminary Design Analysis will be submitted for review. The submittal shall also include five (5) sets of design calculations.

(3) Cost Estimate. A preliminary cost estimate shall be prepared in five (5) copies and submitted for review and approval five (5) working days prior to the review. The cost estimate submittal shall include summary sheets, worksheets, and backup material.

b. Final Design Review. A final design review representing approximately 90% design completion shall be conducted on-board at the Omaha District offices on or about the end of the 20th week of the performance period. Five (5) copies of the total deliverable package shall be furnished for review and approval a minimum of five (5) working days prior to the review.

8. Deliverables. The final deliverable shall consist of 10 copies of the demolition contract plans specifications and 10 copies of the cost estimate. One set of the drawings shall be provided in reproducible format.

9. Construction Management Services. As a part of the design effort, the Omaha District Corps of Engineers shall establish the necessary agreements and define cost requirements for Corps of Engineers construction management support in the areas of the three Titan II operating locations. Throughout the construction period, the Omaha District shall provide support to the construction management agencies for information, consultative services, and problem analysis regarding the design. That requirement shall include TDY support of Omaha District personnel as needed.

10. Demolition Timelines and Constraints. The rate of progress of the demolition effort is controlled by the site phasedown timelines. The phasedown effort is planned to start at Davis-Monthan AFB, Arizona on 1 October 1982, proceed sequentially through all three Wings, and be completed at the 53rd site on 1 October 1987. It is projected that the phasedown work will require an average of one and one-half months per site at the first wing and an average of one month per site at subsequent wings. The phasedown schedules is summarized below:

Davis-Monthan AFB	1 Oct 82 - 1 Nov 84
Second Wing	1 Nov 84 - 1 Apr 86
Third Wing	1 Apr 86 - 1 Apr 87

We anticipate award of the first demolition contract within 3-1/2 months of design completion. Assuming a design start date of 1 December 1982, the demolition contract could be awarded by 15 September 1983. With a 15 November 1983 start work date, 9 sites will be available for the demolition contractor. The initial demolition phase of the work must be completed on the first 8 sites by 1 July 1984. All demolition work has to be completed by 1 July 1988. A timeline flow chart is provided as attachment 11 and is intended to assist you in your work planning effort.

11. Salvage. Within the timeline constraints, the demolition contractor shall be permitted to salvage any material/equipment remaining in the complexes.

LIST OF ATTACHMENTS

1. Vicinity Map, Davis-Monthan AFB, Arizona
2. Vicinity Map, Little Rock AFB, Arkansas
3. Vicinity Map, McConnell AFB, Kansas
4. Evaporation Pond Details
5. 100,000-Gallon Capacity Ground Storage Reservoir Details
6. Water Treatment Building Details
7. HF Discage Antenna Sketch
8. Antenna Information
9. Warning Beacon/Sirens
10. Silo Demolition Sketch
11. Timeline Chart

Note: Attachments withdrawn.

DEPARTMENT OF THE AIR FORCE
3925 ICBM FACILITY ENGINEERING SQUADRON (SAC)
OFFUTT AIR FORCE BASE, NEBRASKA 68113

8 FEB 83

REPLY TO ATTN OF: DEBC (Mr. Zumbehl, 46251)

SUBJECT: Air Force Inputs to Titan Dismantlement Design Project

TO: Commander
U.S. Army Engineer Division Missouri River
P.O. Box 102, Downtown Station
Omaha, NE 68101

1. As a result of site investigations made during 24-28 Jan at Davis-Monthan and a discussion by phone on 3 Feb 83, items of clarifications pertaining to the design effort and statement of work are as follows.

2. The environmental assessment and A-95 review process is currently being performed through Air Force resources by the SAC Directorate of Environmental Quality. That effort will be completed and available by the beginning of the construction management phase of the project. Clarification of environmental issues concerning contractor disposal of the 500 KVA Transformer is currently under study. Definitive direction on this matter will be provided the Corps design team at a later date.

3. We are working with personnel from our headquarters to provide definitive justification and dollar amounts for requiring that a substantial liquidated damages clause be included in the contract. These liquidated damages will reflect real costs to the government in the event delays occur. The magnitude and basis for proposed costs will be discussed during the design review.

4. The statement of work contains several items that may require minor changes due to design, environmental and cost trade off considerations. These changes are continually being evaluated and direction will be by verbal agreement between the Air Force and Omaha District Corps. A revised Statement of Work will be prepared and provided the Corps in the near future detailing these changes.

5. If you have comments or questions concerning this matter, please contact Richard Zumbehl, 294-6251.

MICHAEL J. HOWAYECK, Lt Col, USAF
Commander

Cy to: U.S. Army Engineer
District Omaha
ATTN: MROED -S/Mr. Baker
6014 U.S. Post Office &
Courthouse
Omaha, NE 68102

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS STRATEGIC AIR COMMAND
OFFUTT AIR FORCE BASE, NEBRASKA 68113

26 APR 1983

REPLY TO
ATTN OF: DEL

SUBJECT: Titan II Dismantlement Program (Your Ltr, 1 Mar 83)

TO: O.H. Asleson, Chief Engineering Division
DA, Omaha, District Corps of Engineers
6014 USPO & Courthouse
Omaha, NE 68102

1. By 1 Jul 83, we will provide you written confirmation that funds are allocated for the subject project and those funds will be transferred to the Los Angeles District Corps by 1 Oct 83, the scheduled bid opening date.

2. The first nine sites will comprise the basic bid package with the next nine sites being additives to the contract. A list of all 18 sites in the order they should be bid will be supplied the Corps at least 20 days prior to the beginning of the invitation for bid period.

3. The following additional areas require clarification:

a. The contractor will salvage several items for the Air Force. He may salvage other items for his own use prior to demolition of the silo. Request you prepare a list of fans, pumps, transformers and Hydraulic System (HS-1) equipment that can be salvaged for government reuse. Request these items be addressed as a separate bid item. Also, request separate bid items be included in the contract for the diesel generator and the warning siren. The air cooled chillers will be removed by the Air Force prior to the contractor's arrival on site. Notification of any other major removals by the Air Force will be provided the Corps prior to contract award. However, no removals are contemplated that will affect the bid package.

b. A determination of justifiable liquidated damages is being developed. Direction concerning the results of this effort are forthcoming.

c. No off-site facilities will be addressed in this contract. All securing and removal of off-site facilities will be performed by the Air Force.

d. If sufficient volume is not available in the silo and exhaust ducts for all rubble resulting from contractor operations, the Corps resident office may allow rubble to be placed at a location inside the security fence, well away from the silo, during the observation period. However, all rubble must be removed from the site prior to government acceptance of any given site.

e. By 1 Jun 83, we request a reporting of projected expenditure of design funds as of 30 Sep 83 and a projection of FY 84 funding requirements in addition to the $265K already provided you. At this time, we are aware of $23K additional expenditure for Los Angeles District involvement. Other possible overruns must be addressed documenting the need for additional funds and amounts required.

f. Site 0-7 will be used for the contractor to demonstrate his demolition plan.

g. Site 0-2 will be used for contractor pre-bid visit.

4. If you have any question concerning these matters, please contract Mr. Richard Zumbehl at 294-6251.

Philip R. Pombrio

PHILIP R. POMBRIO, P.E.
Director, Missile Facilities
DCS/Engineering and Services

MROED-S (18 Feb 83) 1st Ind
SUBJECT: Titan II Deactivation Program, Davis-Monthan AFB, Arizona (Estimate of Funds)

DA, Omaha District, Corps of Engineers, 6014 USPO & Courthouse, Omaha, Nebraska, 68102 1 March 1983

TO: Commander, 3925 ICBMFES, ATTN: LTC Howyeck, Offutt AFB, NE 68113

1. As requested in paragraph 1 of the basic correspondence, $19,000 of the Titan II design funds previously allocated to the Omaha District are being transferred to the Los Angeles District. These funds are required by the Los Angeles District to provide Titan II program support through award of the contract on the first phase of the dismantlement at Davis-Monthan AFB, Arizona.

2. Please review the request made by the Los Angeles District in paragraph 2 and notify this office of your decision by 1 April 1983. Also, since our design schedule projects submittal of the final design documents on 3 May 1983, it is imperative that the Omaha District be notified of the sites which are to be included in the first contract package (Phase I) no later than 1 April 1983.

3. Should you have any questions concerning this matter, please contact Mr. Michael Baker of this office. Telephone: (402) 221-4371

FOR THE COMMANDER:

O. H. ASLESON
Chief, Engineering Division Baker/jcg/4371

CF: Hokens
SPLED-DM
MRDMD-F ASLESON
MROAA (MAJ Martini)
MROED-MA

DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT, CORPS OF ENGINEERS
P. O. BOX 2711
LOS ANGELES, CALIFORNIA 90053

IN REPLY REFER TO

18 FEB 1983

SPLED-DM

SUBJECT: Titan II Deactivation Program, Davis - Monthan AFB, Arizona (Estimate of Funds)

Commander, Omaha District
Corps of Engineers
ATTN: MROED-S (Mr. Michael Baker)
215 North 17th Street
Omaha, Nebraska 68102

1. In accordance with telcon Messrs. Baker and Latham on 3 February 1983, the estimated additional amount needed by this District for the FY 83 (Phase I) portion of subject program is $19,000. This amount should be sufficient up to award of construction contract.

2. In view of the compressed schedule, the District would prefer to receive funds for construction about 1 July 83. The amount required will be the sum of a) Estimated Construction Cost b) 5% Supervision and Administration Costs c) 0.5% Engineering During Construction Cost and d) 0.2% As-Built Drawing Cost. In the event this date for funding document transmittal is not possible, a message certifying availability of funds would be acceptable, with actual receipt of funds prior to bid opening.

3. Point of contact in this District during design phase will be Robert E. Latham (SPLED-DM), FTS 798-5529.

4. This office looks forward to working with the Omaha District on this interesting program.

FOR THE COMMANDER:

Robert J. Hall

NORMAN ARNO
Chief, Engineering Division

APPENDIX B

CONSULTANT'S REPORT W/O ATTACHMENTS

LOIZEAUX GROUP INTERNATIONAL

26 January 1983

Mr. Michael Baker
Project Manager, Special Projects Division
U. S. Army Corps of Engineers
215 North 17th Street
Omaha, Nebraska 68102

RE: Consultation Services
Demolition Operations
Titan Missile Systems
O. H. Assleson Letter 1/5/83

Dear Mr. Baker:

The following is a modified Level I Consulting Report per the request in Mr. O. H. Assleson's letter of 5 January 1983. Information listed below was furnished by your group for my review prior to furnishing answers on the Titan II Deactivation Scope of Work attachment to Mr. Assleson's letter:

Source Data Reviewed

U. S. Army Corps of Engineers Safety and Health Requirements Manual - EM-385-1-1 April, 1981.
Ralph M. Parsons Company, SM68B Technical Facilities Standard Plans, Sheets numbered 2, 5, 6, 7, 8, 190, 194, 195, 196, 197, 198, 199 and 200.
U. S. Army Corps of Engineers Draft of Special Provisions, October, 1982.
Air Force Regulations AFR 127-100, 31 March 1978 (already returned to your office).

POINT BY POINT QUESTION AND ANSWER SECTION

Question #1 - Discuss general methodology for removal of the top five (5) meters of the launch silo, including reinforced concrete structural steel, deflector vanes and structural steel box girders.

Opinion -- As covered in our meeting in your offices on January 12, 1983, demolition of the upper five meters of the silo launch and exhaust duct structure does not represent any "special problem" for industry standard demolition operations. The reinforced concrete portion of the structure lends itself ideally to explosives handling operations in order to fragment the material for subsequent placement at the bottom of the launch and exhaust duct. Some attention would have to be given to the box columns and hydraulic power areas immediately below the surface slab, and it may be prudent for the successful bidder to "pre-remove" elements in these areas prior to dealing with the heavily reinforced concrete itself.

P.O. Box 216 / 2737 Merryman's Mill Road / Phoenix, Maryland 21131 U.S.A. / Phone: (301) 667-6610 / Telex: 87683-CDI-PHNX

Operations would begin typically at the edge of the launch duct itself and work back in a "concentric circle pattern" to the exhaust duct openings. At that point, the explosives contractor would work explosives delays around the deflector vanes which would have been pre-cut by conventional torch operations. This approach will generate debris of a size which can be dropped into the exhaust duct itself. Precautions should be taken in the specification language to insure that the Contractor will not drop any elements large enough to "bridge" cross appurtenances extending into any of these duct openings. This would result in not only a lack of volume for subsequent debris disposal, but generate a hazardous working condition for persons attempting to dislodge such a blockage. Larger protuberances and service decks in the ducts should be pre-removed or lowered to a "down position".

Steel plates, tracks and other "non-concrete attachments" should be dealt with in a "pre-burned mode" so that the energy induced by explosives operations can tear loose these structures for disposal. By working blasting delays in concentric circles toward the duct openings, the explosives contractor can encourage debris separated from the massive reinforcing mats into the opening. Use of a hydraulic backhoe with appropriate reach capabilities (such as a Caterpillar 235) would prove more than adequate to "push" the debris off of rebar mats, down into the ducts. Backhoe equipment has adequate rip out power to tear loose the rebar as it separated from the concrete by high velocity explosives charges. In that vein it would be prudent to recommend only Class A explosives for this operation as they will produce detonation velocities adequate to incur differential resonance between reinforcing steel and concrete. This helps break the bond between materials, facilitating their subsequent handling.

Question #2 -- Discuss removal methods for the silo closure door.

Opinion -- The door represents the most "challenging" aspect of this particular project. Construction details shown on sheets 2 and 200 as furnished by your group indicate that the two main structural of materials must be dealt with separately. There is absolutely no efficient means of handling this particular configuration except through the use of explosives as applied by a qualified explosives contractor.

Our recommendation would be to slide the door back into the "open position", and pre-burn the steel plates on the side toward the launch duct opening to prepare them for "loosening" by explosives charges. Pre-segmentation of these and all other steel plates should be performed to reduce the size of construction elements so they will not create blockage when dropped in the duct openings. Using a thermal lance, the contractor can "pre-lance" holes through the $3\frac{1}{2}$" plate on top of the door for subsequent drilling of the concrete fill in a blast pattern configuration to be designed by the explosives contractor. Ideally, I would suggest a pattern which places holes immediately behind and immediately in front of each of the transverse and longitudinal steel baffles which are butt welded to the upper and lower silo door plates. This means that the overall blasting pattern would be rows of "pairs of holes"

with approximately 6" between the two holes of each pair row, and 3'7" between the "pair rows" in both directions. Using sequential delays the Contractor would fracture and resonate the structural materials to break the bond between the concrete and steel. This would be done on a baffle by baffle basis allowing for conventional torch cutting of the heavy plate on the top, bottom and sides of the door as demolition progresses. Materials would then be either dropped into the silo for disposal or (at the option of the Contractor based on steel salvage prices) remove for salvage purposes.

Question #3 -- Discuss monitoring of ground motion and air blast.

Opinion -- The U. S. Army Corps of Engineers Safety and Health Requirements Manual covers this topic under Section 25.C. I concur with the requirements in this section as long as the peak particle velocity limitation is "as monitored" at the closest adjacent exposure to be protected. There is more than adequate back up information on the vibration levels you allow under this section and I believe it to be the standard industry criterian which all qualified parties would expect as working parameters for this type of project.

Question #4 -- Discuss pre-survey of existing structure.

Opinion -- In consideration of Mr. Assleson's comment that the nearest structure is a shopping center approximately 2,000 feet from the center line of the closest silo, I believe that there would be no requirement whatsoever with respect to be pre-blast and post-blast surveys. I make this comment solely because the average specification used on a commercial basis requires pre-blast surveys for structures within 150' of conventional demolition blasting operations. This type of pre-blast survey and the distance requirement should not be confused with surveys where quarrying or mining operations are being conducted. In such cases, explosives are introduced into bedrock upon which adjacent properties are also are founded. Transmission of energy in that type of situation is far greater than that which will be experienced on this type of work.

High water table situations should be considered relative to my recommendation in this area, and I think the most prudent means of approaching vibration in general would be for the Contractor to perform test blasting in each of the three locations on the silo "farthermost" from the closest adjacent exposure. Such monitoring of vibration caused by standard load ratios and delay sequences would provide more than adequate data for the protection of not only the government and Contractor but independent third party property owners. I cannot see any reason at this time to write pre and post blast requirements into specifications where the taxpayer will "absolutely have to pay for such services". Why not try test operations at each site and then establish a load ratio and delay criterian for subsequent production blasting based on the test results.

Question #5 -- Discuss contracting approach including damage liabilities.

Opinion -- In consideration of the "absolute liability nature of explosives handling" as recognized by most States and common law, I would strongly suggest that you provide as few specific recommendations as possible to the Contractor as to his methodology in the demolition of these structures. I would certainly not "recommend" the use of explosives. Rather, you can achieve the same end and protect your group to a greater extent by "allowing" the use of explosives with appropriate qualifications for the blasting contractor in conjunction with guidelines and parameters established by your spec. Again, I feel that your Safety and Health Requirements Manual does an adequate job in consideration of the relative isolation of these structures from the general public.

Question #6 -- Provide a written report documenting the information discussed during the meeting.

This transmittal represents the report requested.

Question #7 -- Provide sample Specifications from similar project or "canned" guide Specifications.

Attached.

In my initial discussion concerning this project with Mr. Don Robinson of your Procurement Supply Division, I indicated that our review would be a "brief overview" only. The simplistic aspects of the project itself and the relatively standard solutions to the problems offered indicate that the free-market approach by a qualified Contractor is adequate to "get the job done". You are, indeed, moving toward a Performance Specification Project. Our review has been a brief one and I hope that the verbalization offered in our meeting in your office helped "turn on some lights" as far as your thinking on the project. Our upcoming billing for services rendered will also reflect the cursory aspects of our review. In consideration of the foregoing and any other questions that might come up, please feel free to get back in touch.

Sincerely,

LOIZEAUX GROUP INTERNATIONAL

J. Mark Loizeaux
President

JML:mcb

Attachments

STANDARD CONSULTING DISCLAIMER

This report is not an offer to perform any of the services as described. The assistance given to U. S. Army Corps of Engineers is strictly LGI's opinion based on available historical and current data. LGI does not suggest that the recommendations given in this report are the only means to approach the demolition of the referenced project or that they are necessarily the best or safest methods. Selection of proper demolition procedures, techniques and methods must be made solely by contractors actually performing the work in consideration of on-site developments. Since LGI is not directly involved in these activities, we cannot and will not assume any responsibility for on-site demolition operations.

APPENDIX C

TRIP REPORT (SITE INSPECTION)

DISPOSITION FORM

For use of this form, see AR 340-15; the proponent agency is TAGO.

REFERENCE OR OFFICE SYMBOL	SUBJECT
MROED-S	Trip Report - Titan II Deactivation, Davis-Monthan AFB, Arizona, Pre-Design Briefing and Site Inspection (24-28 January 1983)

TO: //THRU: Chief, Spec Proj Ofc
TO: Chief, Engrg Div

FROM: M. H. Baker

DATE: 8 February 1983

CMT 1

1. On 24 January 1983, a Pre-Design Briefing was held at Davis-Monthan AFB, Arizona, to discuss the project and the various coordination and support requirements. Representatives from the Omaha and Los Angeles Districts, 3925 ICBM, HQ SAC, 390 SMW, and 836 CES were present as indicated on the inclosed attendance list.

2. Mr. Rich Zumbuhl of the 3925 ICBM presented an overview of the project and the schedule. Mr. Zumbuhl explained that eight of the eighteen silos need to be available to the contractor for dismantlement by October 1983. By June 1984, these eight silos are to be filled with rubble and left in this state for a period of approximately six months. After this period, the contractor will complete the final filling, grading and general cleanup. The sites will then be turned over to the Air Force Real Estate for disposal. The sequence of deactivation and the first eight silos to be available for dismantlement is not known at this time. Mr. Zumbuhl also explained that the remaining ten silos would probably be deactivated shortly following the initial eight.

3. After Mr. Zumbuhl's presentation, Mr. Bill Gaube of the Omaha District showed several viewgraphs of a typical silo and explained the current demolition plan. Mr. Gaube indicated that there are several schemes being considered ranging from filling the entire silo, cableway, etc. with granular material, rubble, and/or grout to filling the launch duct with rubble and covering with a reinforced concrete slab and finishing to grade with earth fill. Mr. Gaube stated that the various possibilities would require analysis before a decision is made.

4. The current design schedule was then discussed (see Inclosure 2). The design will be conducted in two phases - early preliminary design and final design. The early preliminary design submittal and review will emphasize procedures of demolition while the final design will be a detailed design of the approved demolition plan. The Los Angeles District will manage the construction.

5. After discussing the schedule, a short coordination meeting was held with the Los Angeles District representatives. Mr. Bob Latham indicated he would be the Los Angeles District's contact for design support. Mr. Latham stated that the Los Angeles District will handle advance notice to bidders, advertising, bid opening, and reproduction and distribution of the bid package. The Los Angeles District will provide Omaha with a sample bid form, examples of guide specifications and special provisions (for format only), general provisions and the front end portion of the specifications. We will develop the bid package and send an original and two copies to the Los Angeles District for final editing (front end) and reproduction. Mr. Latham also indicated that the Los Angeles District will provide the constructibility review. The Los Angeles District will provide Omaha District with drawing, contract and specification numbers. The Los Angeles District will issue any modifications or amendments and the Omaha District will provide technical assistance. This project is expected to have a "DX" priority. The final point discussed with Mr. Latham was funding requirements. He indicated that the current construction allowances are 5% S&A, 0.5% EDC, 0.2% as-builts, and 2% or more for contingencies. Costs for assistance during design will be estimated and forwarded to the Omaha District. Overall design fund requirements will be reevaluated after receiving this estimate.

6. Mr. Bill Fisk of the Los Angeles District stated the greatest concern he had at this time was the short construction time and salvage operations. The presence and condition of items identified for salvage need to be assured to the contractor to receive credit. Mr. Fisk was concerned that the contractor may continue salvage operations instead of completing demolition work on schedule. Two suggestions to minimize this problem are: First, increase the liquidated damages as high as can be justified; and second, possibly limit the salvage period (e.g., two weeks) for each site. The Air Force will assess liquidated damages and provide justification.

7. The following day, representatives of the Omaha and Los Angeles Districts, TSgt Arnold, TSgt Karl, Mr. Graydon of the 836 CES, and Mr. Zumbuhl and CAPT Kaufman of HQ SAC visited three Titan sites south of Tucson, Arizona. Site 1-6 had been deactivated and was inspected in detail. The primary purpose of the inspection was to become familiar with all the sites' various facilities.

8. The remainder of the week, Omaha District representatives visited the other fifteen sites. Numerous photographs were taken at all the sites. Site 0-9 was deactivated and was inspected in detail. Differences between sites were documented.

9. On the afternoon of 27 January 1983, Mr. Zumbuhl, Mr. Garry Dalrymple, CAPT Bradley, and Mr. Mike Baker briefed COL Comeaux, 390 SMW Commander. The presentation consisted of a general overview of the work and schedules. COL Comeaux requested that he be kept informed of project progress and status. He also asked that Mr. Zumbuhl check out the possibility of preserving one of the sites as a museum. He realized that the control room would probably be the only part of a site available for this type of use. Public relations on all aspects of this project should be coordinated by the Air Force with the 390 SMW.

10. Several concerns which developed from the site inspections were:

a. Availability of water for use in soil compaction and mixing grout. Consensus of the Omaha District staff was to leave the water, which is already on site, which includes 100,000 gallons in both the above ground soft reservoir and below ground hard tank. The availability of water would have to be assessed at the time of the pre-bid inspection by the Corps and potential bidders.

b. Availability of fill material for backfill and surface cover will require borrow from off site.

c. Salvage of the 500 KVA diesel generators was of concern. The units were quite old (approximately 20 years); therefore, their condition and the cost of removal would be the deciding factors. Each silo has one generator located in the equipment area on Level 3. To remove the unit will require blasting a hole in the launch duct and lifting the unit through the launch duct. Estimated cost was about $16,000. After checking the maintenance records, it was found that the units have less than 3,500 hours use and all were in excellent condition. Complete overhaul was accomplished in 1981. Price of a new unit is about $60,000. Due to the high demand and condition, the salvage value of these units should be about 80% of $60,000. It was decided that these units should be salvaged.

d. Many of the sites have wells which supply water to the site. Several of the wells are located off site. The question was raised as to what will be done with the

wells. This is currently being checked out; however, if the wells are abandoned, the wells will need to be filled with a 10-foot concrete plug in accordance with Arizona state law.

e. The Omaha District has been assured by the Air Force that the sites will be environmentally safe when turned over to the contractor. All volatile, toxic and flammable fluids will be removed from the site. The scope of work states that the 500 KV transformer will be removed by the contractor and disposed of in a landfill. However, there is concern that the transformer's oil contains PCB's. In this event, the Air Force will dispose of the transformers. Another concern is that capacitors such as surge arrestors, filters, etc. contain PCB's. These will also be removed by the Air Force.

f. It is proposed that explosives be used in demolition. Electronic detonation is the preferred method of detonation. However, if high RF levels exist in the area, electronic detonation may not be possible. A few of the sites have microwave antennas located just outside the site parameter. I checked with Mr. Bennie Simmons of Mountain Bell Telephone Company (602) 235-1046, and he said the antennas belonged to them. Mr. Simmons provided the following information: Frequency 6 to 9 Giga Hertz, 1 watt output, 0.3° beam width, and continuous operation. He did not think the extraneous RF levels would be detectable at the site. This should be verified by the contractor before using electronic blasting.

11. I wish to express my personal thanks to Mr. Garry Dalrymple and his staff for the excellent support during our visit.

2 Incls
as

M. H. BAKER
Project Manager

CF:
MROAA (MAJ Martini)

CONFERENCE

PROJECT TITLE: Titan II Deactivation

TYPE OF CONFERENCE: Pre-Design Briefing & Site Inspection

DATE: 24 Jan 83 TIME: 1:30 LOCATION: Davis-Monthan AFB, Arizona

NAME: (LAST, FIRST, MI, RANK)	POSITION OR TITLE	ORGANIZATION/ OFFICE SYMBOL	COMMERCIAL TELEPHONE NO.
Baker, Michael	Proj Mgr	Omaha District	(402)221-4361
Zumbehl, Richard	Proj Mgr	3925 ICBM	AV 374-6251
Palma, Jim	Civil Engr Tech	Omaha District	(402)221-4433
Latham, Robert	Proj Mgr	Los Angeles Dist	(213)688-5529
Fisk, Bill	Supv Civil Engr	Los Angeles Dist	(602)241-2018
Bender, Gary C. 2LT	Missile Engr	836 CES/DEL	AV 748-3706
Graydon, Charles	Missile Engr	836 CES/DEL	AV 748-3706
Arnold, Robert B. TSgt	QC	836 CES/DELQ	AV 748-3706
Karl, Kevin E. TSgt	QC	836 CES/DELQ	AV 748-3706
Orozco, Ruben E. SSgt	QC	836 CES/DELQ	AV 748-3706
Dalrymple, Garry R.	CH Missile Engrg Br	836 CES/DEL	(602)748-3706
Goodson, Edward B., Jr. LT COL	Asst DEM	390 SMW/AMB	361-4535
Etzel, Robert B.	Photographer	Omaha District	(402)221-3238
Kaufman, Susan J.	Explosives Safety-SAC	HQ SAC/IGFW	(402)294-3893
Eaton, James W.	Civil Engr	Omaha District	(402)221-4477
Gaube, Bill	Struct Engr	Omaha District	(402)221-3062
Borg, Scott 2LT	Deputy Chf Civil Engr	390SMW/DE	748-4769
Bradley, Lance P. CAPT	Chf Civil Engr	390SMW/DE	748-4769

APPENDIX D

ENVIRONMENTAL ASSESSMENT

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS STRATEGIC AIR COMMAND
OFFUTT AIR FORCE BASE, NEBRASKA 68113

REPLY TO
ATTN OF: DEP

SUBJECT: Titan II Dismantling Environmental Assessment (EA) (Our Ltr, 4 Mar 83)

TO: See Distribution List

Attached is a proposed final EA for subject action. Please review for accuracy, consistency and completeness. Provide review comments to HQ SAC/DEPVQ by 2 May 83. SAC POC is Mr. Douglas Jansing, AV 271-5854.

George R. Rasmussen
Deputy Director, Programs
DCS/Engineering and Services

2 Atch
1. Distribution List
2. EA

DISTRIBUTION LIST

HQ USAF/XOOTS/LEEV
HQ SAC/DEL/DPXP/JAM/SGPB/XPP
AFRCE/CR
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HQ MAC/DEEE
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8 AF/DE
15 AF/DE
381 SMW/CC
381 CSG/DE
308 SMW/CC/DE
314 CSG/DE
390 SMW/CC/DE
836 CSG/DE

ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED DISMANTLING OF TITAN II MISSILE COMPLEXES

I. Overview of the Proposed Action and Alternatives.

This section provides an overview of the proposal to dismantle Titan II missile complexes. Introductory remarks on the weapon system and the need for the proposed action are presented first, followed by a discussion of the activities and schedules for the planned dismantling under a proposed action alternative. Finally, alternatives to the proposed action are discussed.

The proposed dismantling action is a follow-on to the system deactivation action. The system deactivation encompassed removal and disposition of system components (propellant, booster, etc.) from the missile complex and placing the complex in caretaker status. Specific details of the weapon system deactivation are contained in the "Environmental Assessment for the Proposed Deactivation of the Titan II Missile System" dated August 1982.

A. Introduction:

The Titan II weapon system was first deployed by the Air Force at Davis-Monthan AFB, Arizona, in December 1962. Shortly after, two other wings, with 18 launch complexes each were established at Little Rock AFB, Arkansas, and McConnell AFB, Kansas.

The Titan II missile complexes consist of both aboveground and underground facilities. Above ground facilities include communications antennas, vehicle parking areas, security fencing, lighting, and surveillance systems, weather instruments, propellant and electrical connections, and an access portal for entry into the underground portion of the launch complex. A typical complex configuration is shown on Figure I-1. The underground facilities include the missile silo, blast lock area, interconnecting cableways, and a launch control center (Figure I-2).

B. Purpose and Need:

A Deputy Secretary of Defense Program Decision Memorandum, dated 2 October 1981, directed the Titan II weapon system be retired as soon as possible. HQ USAF Program Management Directive (PMD) X-02103(1) was then issued to direct Air Force

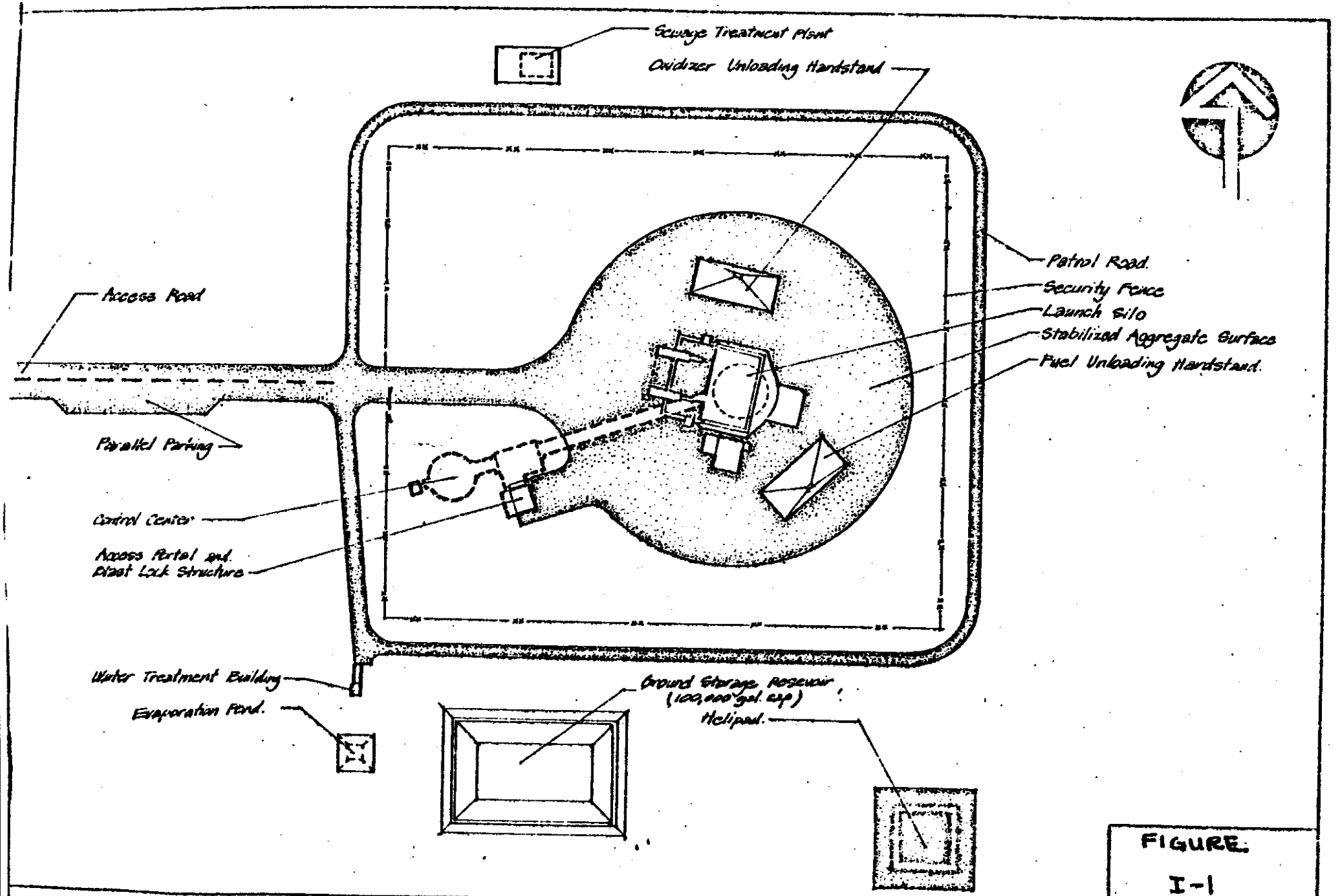
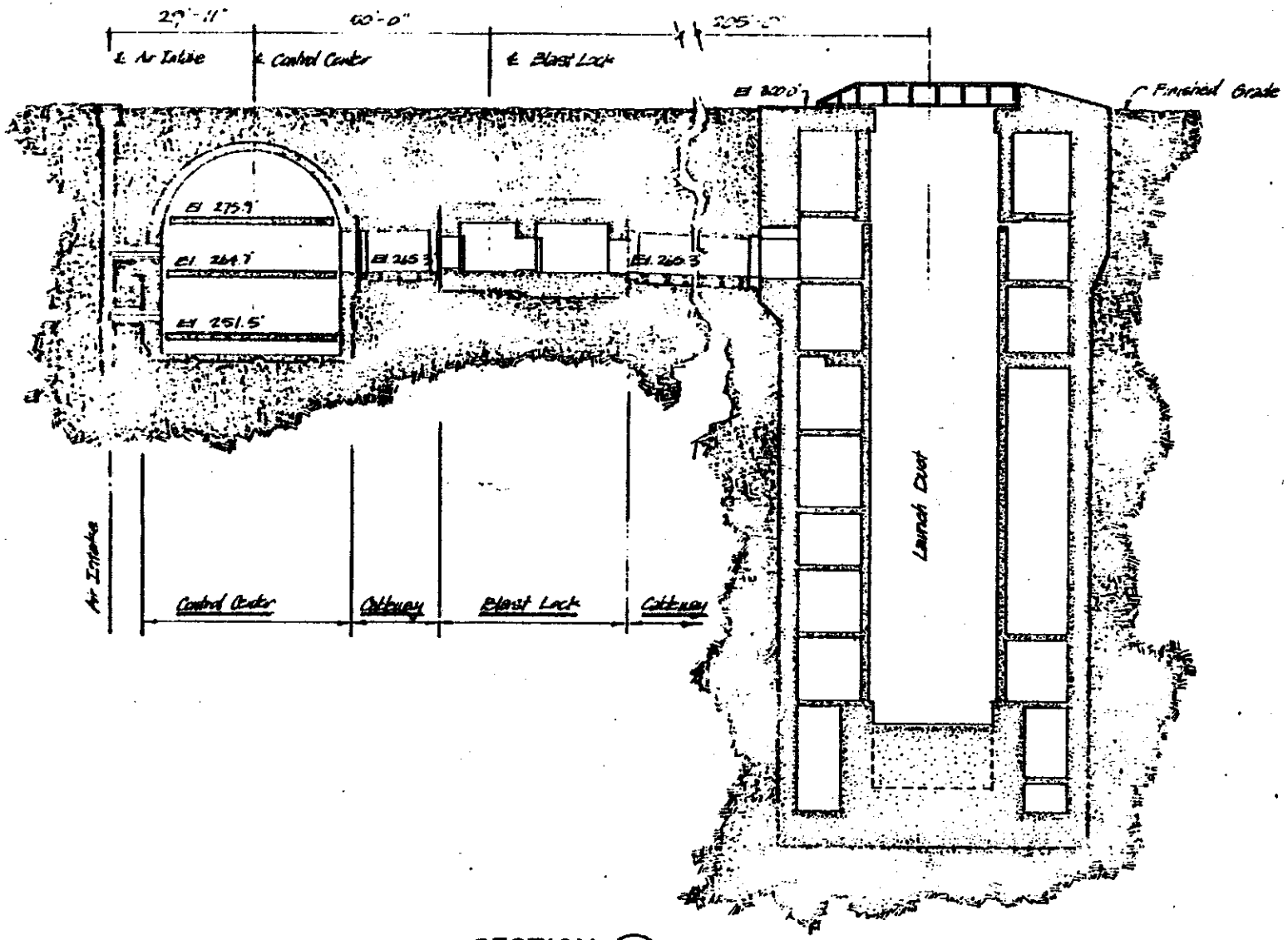

Sewage Treatment Plant
Oxidizer Unloading Hardstand
Patrol Road
Security Fence
Launch Silo
Stabilized Aggregate Surface
Fuel Unloading Hardstand
Access Road
Parallel Parking
Control Center
Access Portal and Blast Lock Structure
Water Treatment Building
Evaporation Pond
Ground Storage Reservoir (100,000 gal. cap)
Helipad

FIGURE I-1



SECTION (A)

FIGURE
I-2

actions to accomplish this effort. In response to these directives the Air Force developed a document entitled "Titan II Deactivation Management Plan." This plan called for deactivated Titan II launch complexes to be placed in austere caretaker status until final dispostion of the equipment and property was determined.

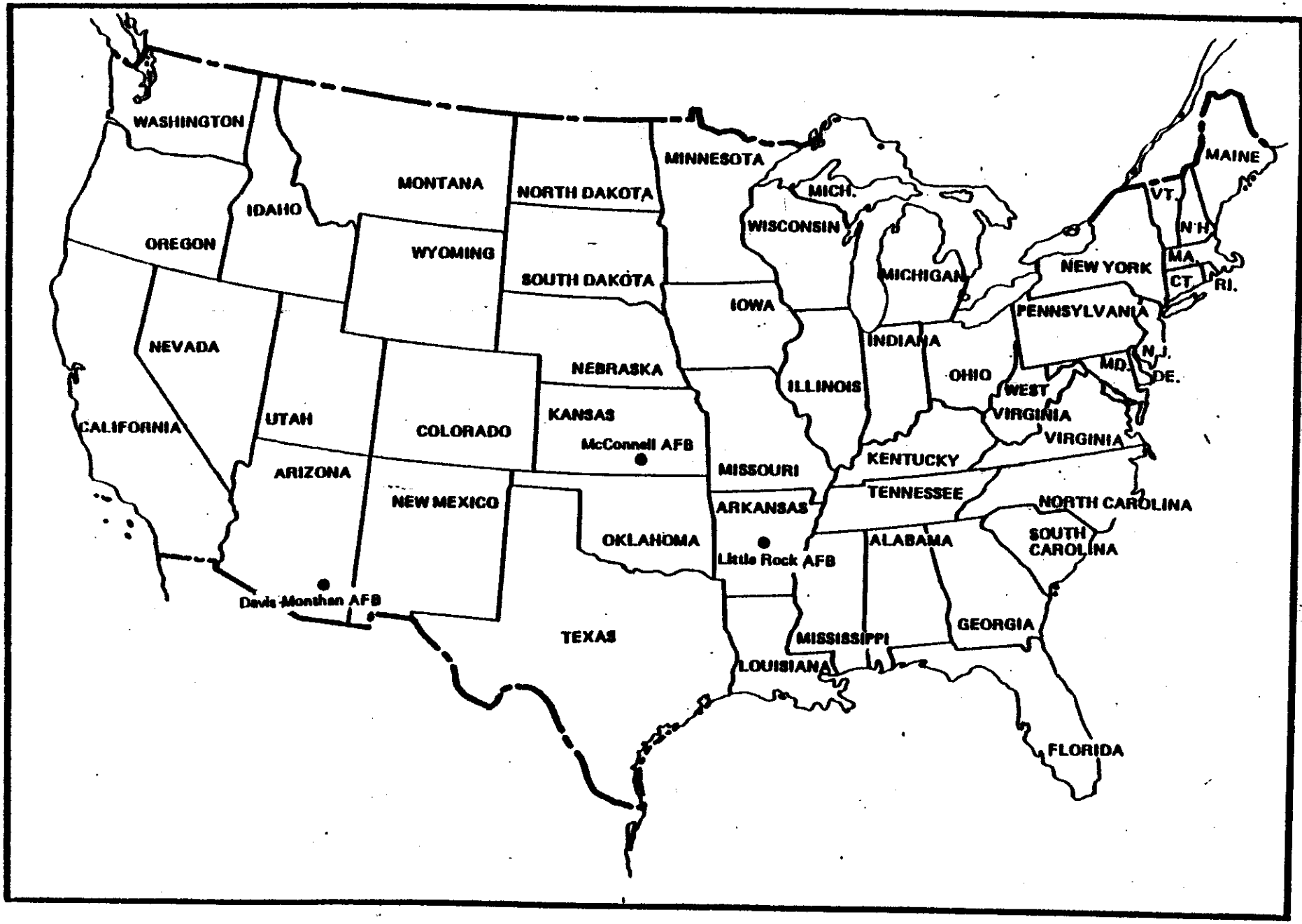
On 31 May 1982, the President announced that the US would not undercut existing arms control agreements as long as the Soviets showed equal restraint. Those existing agreements and protocols thereto, require ICBM launchers be dismantled if they are to be deleted from arms control accountability. Based on that announcement, the Air Force began developing plans to dismantle Titan II missile complexes.

C. Background:

In 1970, the US Congress passed the National Environmental Policy Act (NEPA) PL 91-190 (42 U.S.C. 4341). NEPA requires agencies of the Federal government make available information on the environmental impacts of its proposed actions. Section 102(2) requires an environmental impact statement (EIS) be prepared for major Federal actions significantly affecting the quality of the human environment.

The Council on Environmental Quality (CEQ), issued regulations governing this process (40 CFR 1500-1508). These regulations are based on NEPA and Executive Orders 11514 and 11991 which provide Presidential direction to Federal agencies to implement NEPA's requirements. In its regulations, CEQ directs an environmental assessment (EA) be prepared when it is unclear whether an EIS is required. The Federal agency in question then is to use the EA to determine whether an EIS is in fact necessary (40 CFR 1501.4). Accordingly, the Air Force prepared an EA on the Titan II weapon system deactivation proposal which was published in August 1982. As previously stated, the assessment assumed that once a missile was removed the missile complex would be placed in austere caretaker status until a decision was made concerning complex disposition. A finding of no significant impact (FONSI) was issued by the Air Force on 31 August 1982. In October 1982, the Air Force began weapon system deactivation procedures at Davis-Monthan AFB.

The Titan II weapons system currently includes 53 missile complexes located around three support installations (Figure I-3). The Titan II missile system deactivation is scheduled over a five year period beginning October 1982. Under the current schedule, operational missile complexes near Davis-Monthan AFB, Arizona, would be deactivated first with planned completion by September 1984. The schedule for deactivation of the remaining missile complexes near McConnell AFB, Kansas, and Little Rock AFB, Arkansas, has not yet been officially announced.


WASHINGTON
OREGON
CALIFORNIA
IDAHO
NEVADA
MONTANA
WYOMING
UTAH
ARIZONA
COLORADO
NEW MEXICO
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
TEXAS
MINNESOTA
IOWA
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ARKANSAS
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ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NORTH CAROLINA
VIRGINIA
WEST VIRGINIA
PENNSYLVANIA
NEW YORK
MD.
DE.
N.J.
CT.
RI.
MA.
VT.
N.H.
MAINE
McConnell AFB
Little Rock AFB
Davis-Monthan AFB

FIGURE
I-3

D. Proposed Action:

The Air Force proposes to dismantle deactivated Titan II missile complexes in accordance with existing protocols to the Salt I arms control agreement. The dismantling program is to be implemented as expeditiously as possible. Work could begin as early as October 1983.

The following describes general provisions of a plan for missile complex dismantlement. The plan proposes the removal of all major structures that project above grade and filling subsurface voids. Dismantling activities would render each complex unusable for support of ICBM launch. Dismantling work will be performed by a contractor selected by the competitive bidding process.

Under this plan, the launch complexes would be dismantled as outlined below:

1. Surface (topside) Facilities Deactivation

Off-site Facilities. Disposition of facilities outside of the security fence is shown at Figure I-4. The earthen, sewage oxidation pond/sewage lagoon would be drained and the dike graded flush with the surrounding terrain. Soil material similar to the in-situ soil would be used to restore the pond area to match adjacent surface contours. Sewage treatment ponds do not exist at all complexes.

Twelve (12) of eighteen (18) Davis-Monthan complexes and fourteen (14) of seventeen (17) complexes at Little Rock have oxidation ponds. McConnell complexes do not treat sewage effluent in this manner. Oxidation pond dimensions vary from site to site; however, ponds generally cover about 5,000 square feet. Where septic tank effluent is not discharged into an oxidation pond, it empties onto a tile-absorption field. Tile field piping associated with the sewage treatment system would be abandoned in place and the septic tank pumped out and filled with grout.

Four complexes at Davis-Monthan and sixteen complexes at McConnell have earthen evaporation ponds for water treatment plant water softener regeneration discharge. These ponds would be disposed of in the same manner as the sewage treatment oxidation ponds. The 100,000 gallon capacity ground storage reservoir is a reinforced concrete, 60 foot square structure. It would be drained, filled with granular material and abandoned. The water treatment equipment would be removed and the equipment pit filled with granular material. The high frequency discage antenna would be removed, and the helicopter landing pad would be abandoned in place.

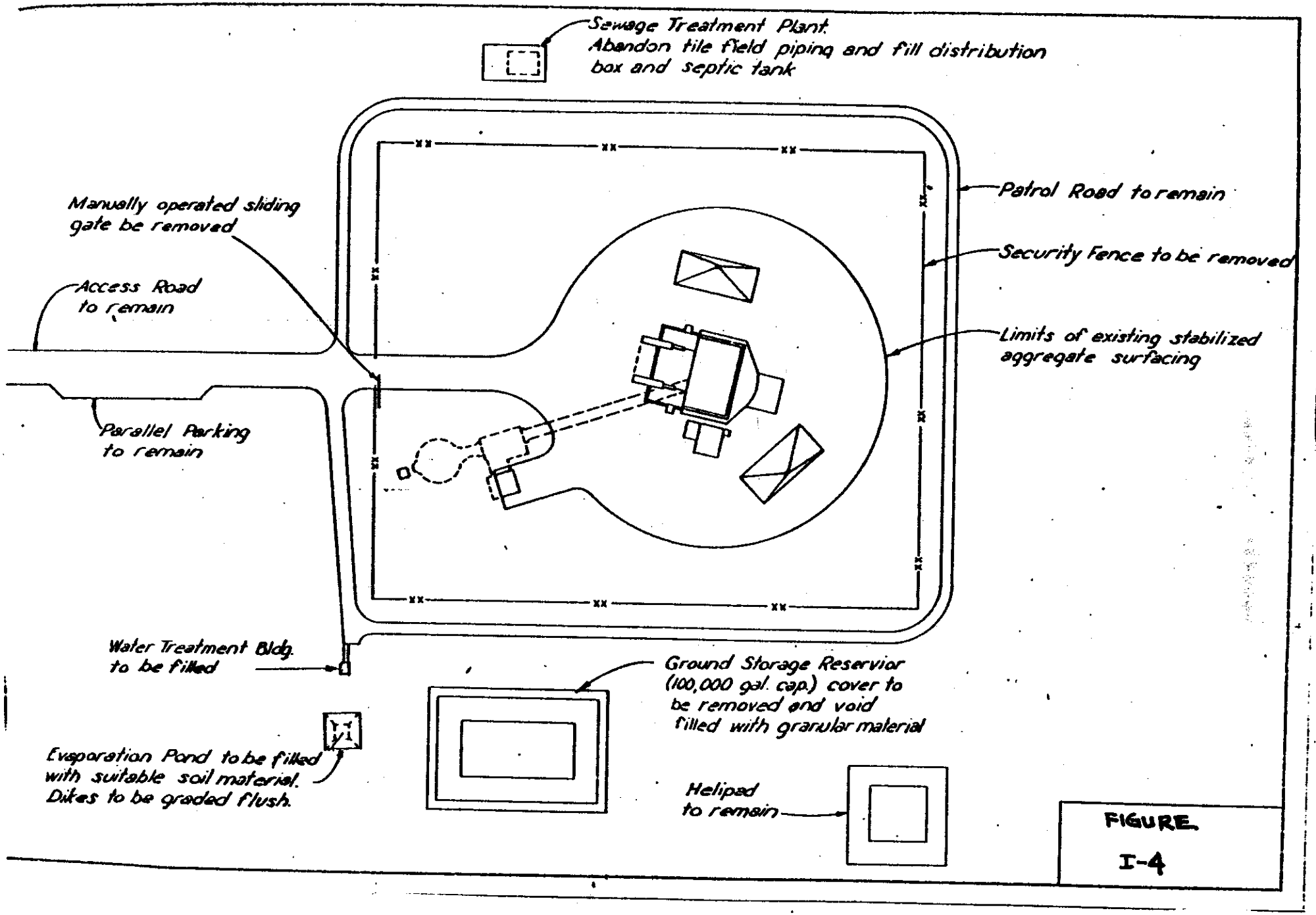

Sewage Treatment Plant
Abandon tile field piping and fill distribution box and septic tank
Manually operated sliding gate be removed
Access Road to remain
Parallel Parking to remain
Patrol Road to remain
Security Fence to be removed
Limits of existing stabilized aggregate surfacing
Water Treatment Bldg. to be filled
Ground Storage Reservior (100,000 gal. cap.) cover to be removed and void filled with granular material
Evaporation Pond to be filled with suitable soil material. Dikes to be graded flush.
Helipad to remain

FIGURE I-4

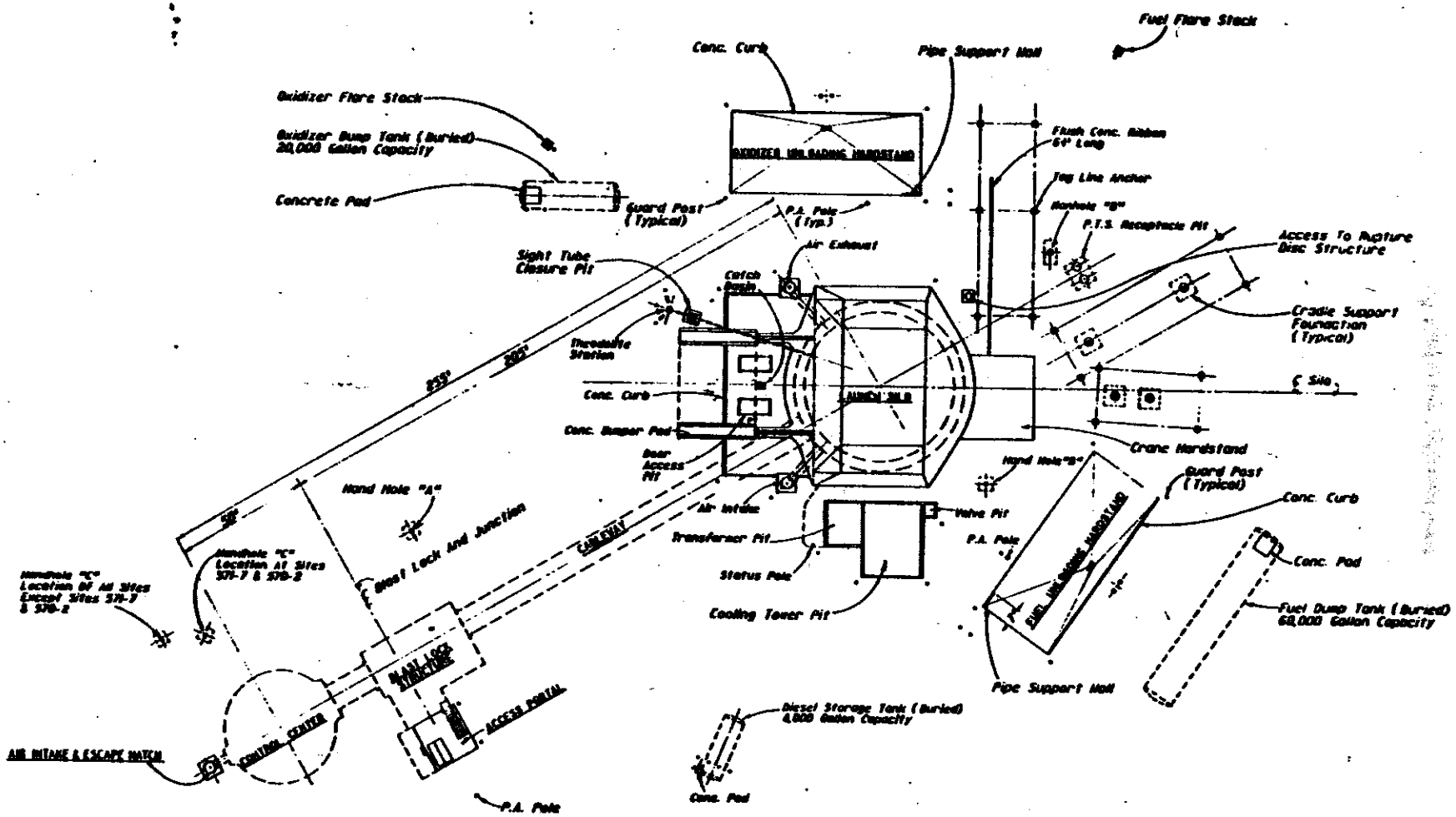
On-site Facilities. A typical layout of on-site facilities is shown on Figure I-5. Facilities within the complex and projecting above grade would be removed. Disposition of on-complex facilities is shown on Figure I-6. The actual configuration of surface facilities varies slightly among complexes. One variation involves the cooling towers located near the launch silo opposite the oxidizer hardstand. Complexes surrounding Davis-Monthan AFB use air cooled chillers in lieu of cooling towers. These chillers would be removed by the Air Force. The cooling towers at complexes near the other Titan bases would be removed by the demolition contractor.

Other equipment which would be removed includes a 500 KVA transformer, a diesel fuel transfer pump and various communication and weather antennas and equipment.

The chillers/cooling towers and transformers are located in concrete pits adjacent to the silo. The concrete structures may require removal during silo headworks demolition. In either case these pits would be filled.

Underground tanks within the security fence area include a 20,000 gallon oxidizer dump tank, a 60,000 gallon fuel dump tank, and an 8,000 gallon diesel fuel storage tank. These tanks would be removed or filled and abandoned in place. The oxidizer and fuel dump tanks have never been used and were, in the mid-1970s, isolated from the propellant transfer system. Most likely, these tanks are filled with groundwater, in varying amounts from complex to complex. These tanks would be drained, if necessary, prior to final disposition. The diesel fuel storage tank at each complex will have been drained and capped, during activities to place the complexes into caretaker status. Only a residual amount of diesel fuel will exist in the tank. Other underground facilities to be filled include the rupture disk (RD-2) access shaft, the propellant transfer system pit, and all manholes and handholes.

In general, all piping, utility connections and mounting hardware, and structures that project above grade would be cut back flush with grade and permanently capped or sealed. The oxidizer and fuel hardstands would be abandoned in place; however, the pipe support wall will be removed. Hardstand drainage would remain intact. The surface warning beacon and siren and the civilian warning siren and their mounting poles would be removed. All utility connections and mounting hardware would be cut off flush with grade and sealed. Two complexes per wing have pre-engineered metal buildings which would be removed.



TYPICAL LAUNCH SITE LAYOUT
SCALE: 1" = 20'

FIGURE
I-5

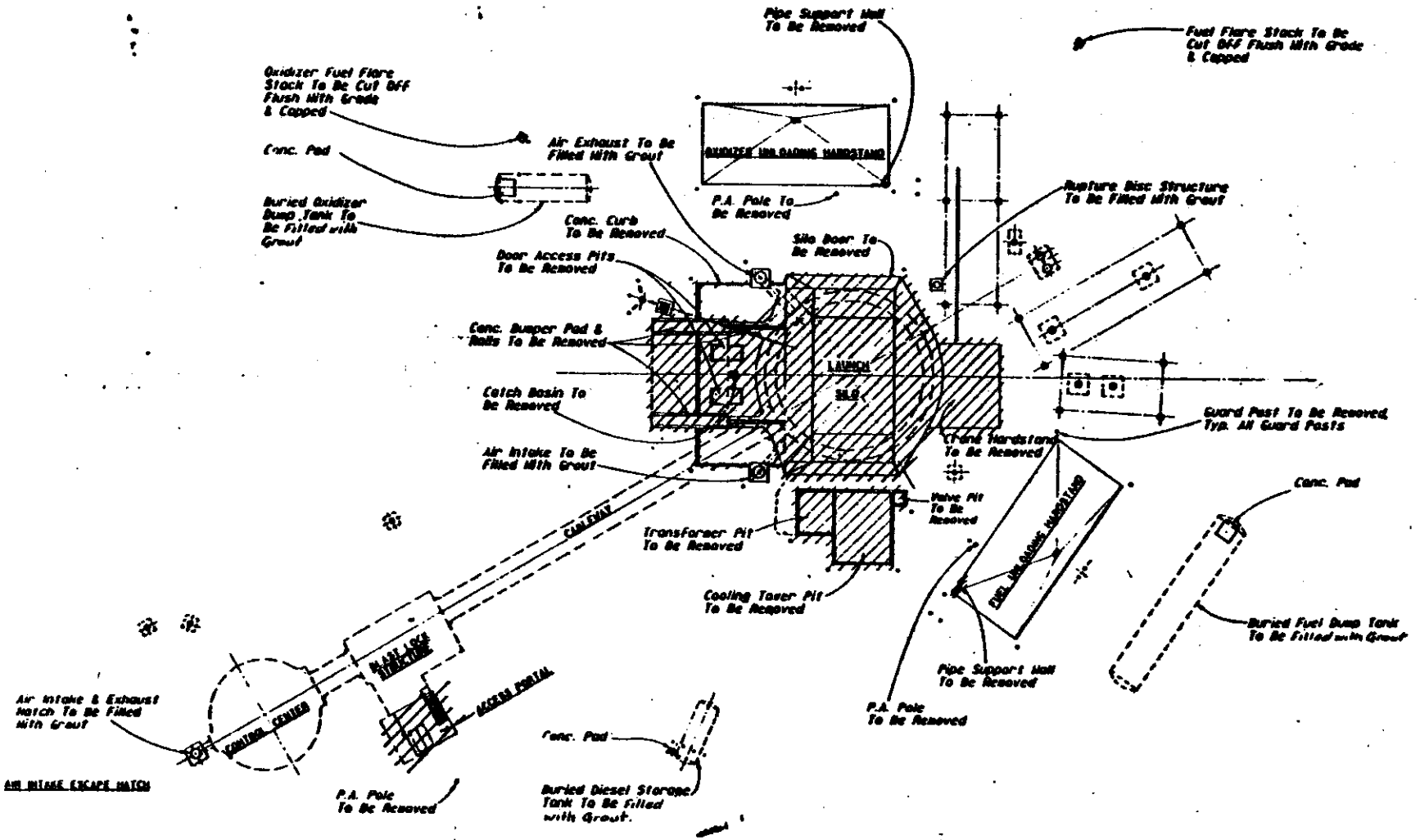

Pipe Support Wall To Be Removed
Fuel Flare Stack To Be Cut Off Flush With Grade & Capped
Oxidizer Fuel Flare Stack To Be Cut Off Flush With Grade & Capped
Air Exhaust To Be Filled With Grout
Conc. Pad
Buried Oxidizer Dump Tank To Be Filled with Grout
P.A. Pole To Be Removed
Rupture Disc Structure To Be Filled With Grout
Conc. Curb To Be Removed
Silo Door To Be Removed
Door Access Pits To Be Removed
Conc. Bumper Pad & Rails To Be Removed
LAUNCH SILO
Catch Basin To Be Removed
Guard Post To Be Removed Typ. All Guard Posts
Air Intake To Be Filled With Grout
Valve Pit To Be Removed
Conc. Pad
CAMLEVAT
Transforaer Pit To Be Removed
Cooling Tower Pit To Be Removed
Buried Fuel Dump Tank To Be Filled with Grout
Pipe Support Wall To Be Removed
P.A. Pole To Be Removed
Air Intake & Exhaust Hatch To Be Filled With Grout
BLAST LOCK STRUCTURE
ACCESS PORTAL
Conc. Pad
AIR INTAKE ESCAPE HATCH
P.A. Pole To Be Removed
Buried Diesel Storage Tank To Be Filled with Grout.

FIGURE I-6

2. Silo Preparation.

Prior to any other work in the silo all hydraulic lines and the diesel standby generator system would be drained. The generator system includes the diesel service tank (2500 gallon capacity) located on silo equipment area level 5, the slop tank (150 gallon capacity) located on silo equipment area level 5, and the diesel fuel lines. The diesel crankcase would be drained of oil. The 100,000 gallon hard water storage tank located in the silo would be drained into the sumps and pumped topside. These activities are currently being accomplished as each complex is placed into caretaker status. Therefore, at the start of dismantling activities, only residual amounts of fluid will remain in the silo. The diesel generator assembly may be removed during the dismantling work.

3. Tasks Performed Prior to Filling.

The silo closure door would be dismantled and the silo closure door rails and door bumpers removed. The launch duct wall would be stripped of all equipment worthy of salvage (Figure I-7). Mechanical duct work, electrical lights, conduits, and mechanical piping also may be salvaged by the demolition contractor. Equipment of structural members which would interfere with dismantlement activities, including the hydraulic surface closure door operator and other equipment on level 1, would be removed.

4. Silo Top and Flame Deflector Removal/Filling Operations.

Flame deflector vanes and the boxed girders would be removed. The concrete headworks would be demolished to a depth of five meters (Fig I-8). Concrete rubble from the headworks would be deposited in the silo launch and exhaust ducts to a depth of about 25 to 15 feet below grade. Because the concrete rubble, including voids, may exceed the volume in the launch and exhaust ducts some concrete rubble could be hauled from the site. A concrete cap would be constructed on top of the rubble and covered with fill to a depth of about ten to fifteen feet below grade. Figure I-9 illustrates this. The launch silo intake and exhaust ventilation shafts would also be filled.

5. Access Portal and Blast Lock Structure/Cableway Deactivation.

The blast door between the launch control center cableway and the blast lock would be closed and secured. The interior portions of the blast lock area and the blast lock/silo cableway would be backfilled with granular material, grout, or combination of the two fill materials. Fill would be continued to grade and topside structures removed.

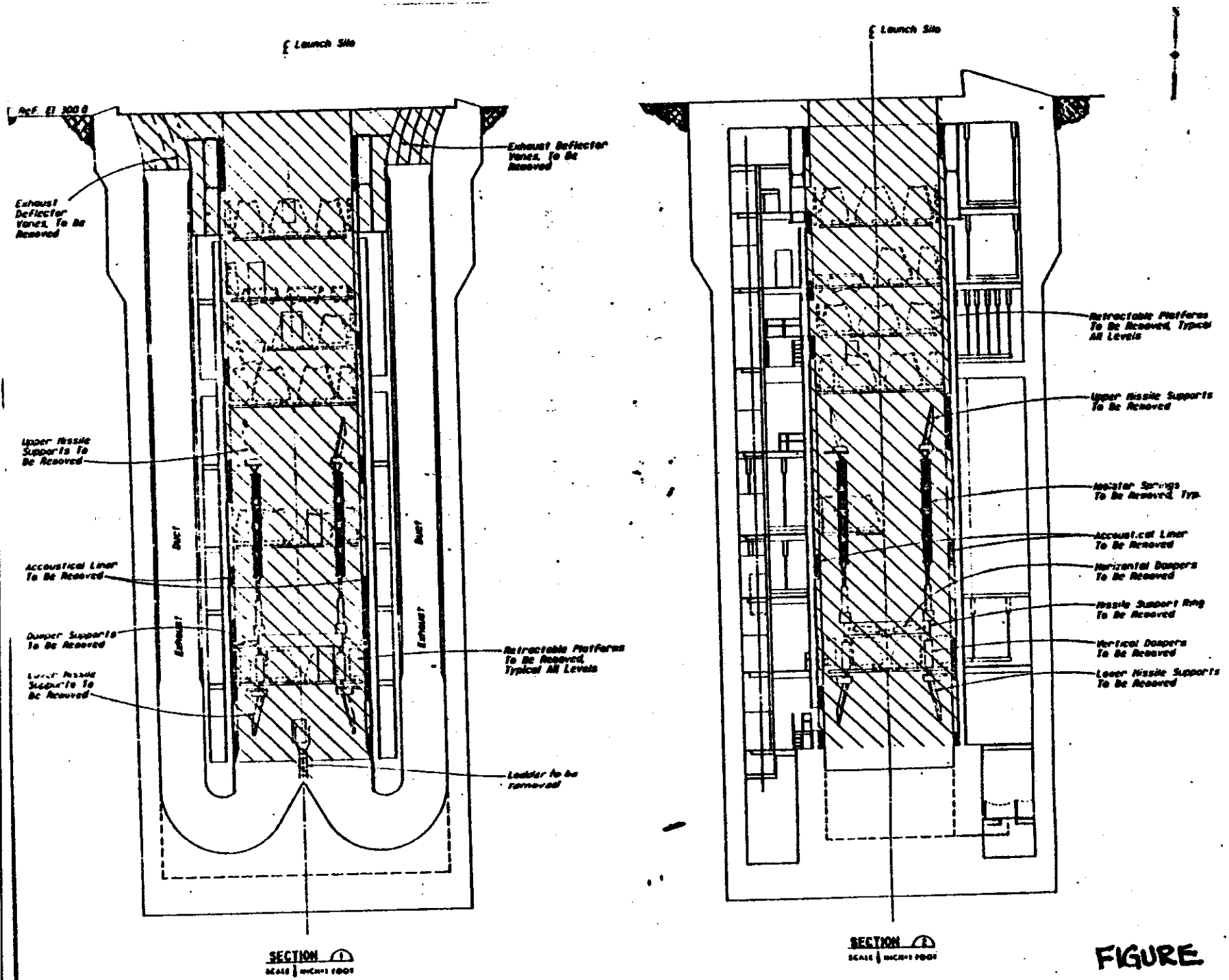

℄ Launch Site
Ref. El 100.0
Exhaust Deflector Vanes, To Be Removed
Exhaust Deflector Vanes, To Be Removed
Upper Missile Supports To Be Removed
Duct
Duct
Exhaust
Exhaust
Acoustical Liner To Be Removed
Damper Supports To Be Removed
Retractable Platforms To Be Removed, Typical All Levels
Ladder To Be Removed
SECTION 1
SCALE 1/8" = 1'-0"
℄ Launch Site
Retractable Platforms To Be Removed, Typical All Levels
Upper Missile Supports To Be Removed
Isolator Springs To Be Removed, Typ.
Acoustical Liner To Be Removed
Horizontal Dampers To Be Removed
Missile Support Ring To Be Removed
Vertical Dampers To Be Removed
Lower Missile Supports To Be Removed
SECTION 2
SCALE 1/8" = 1'-0"

FIGURE I-7

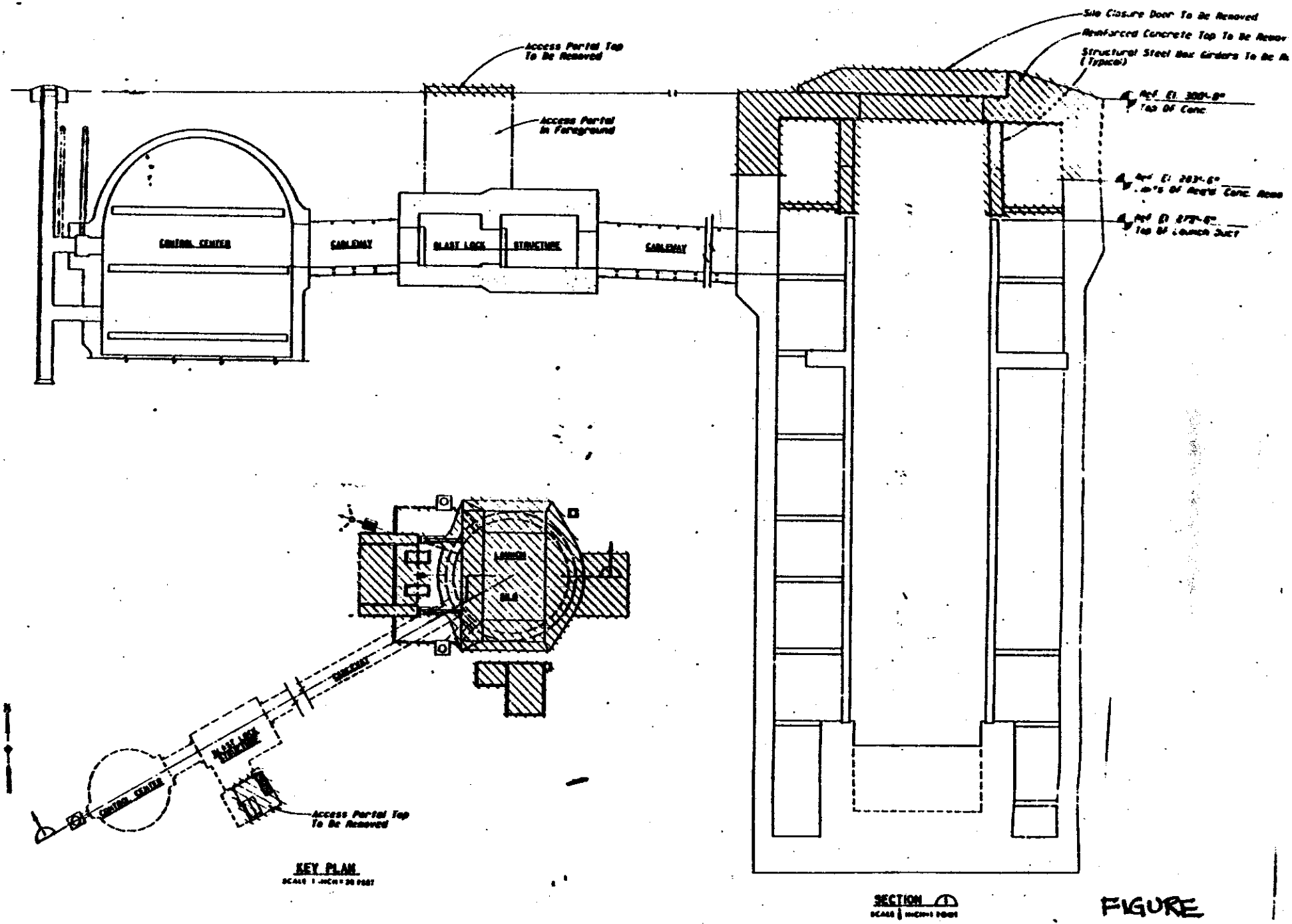
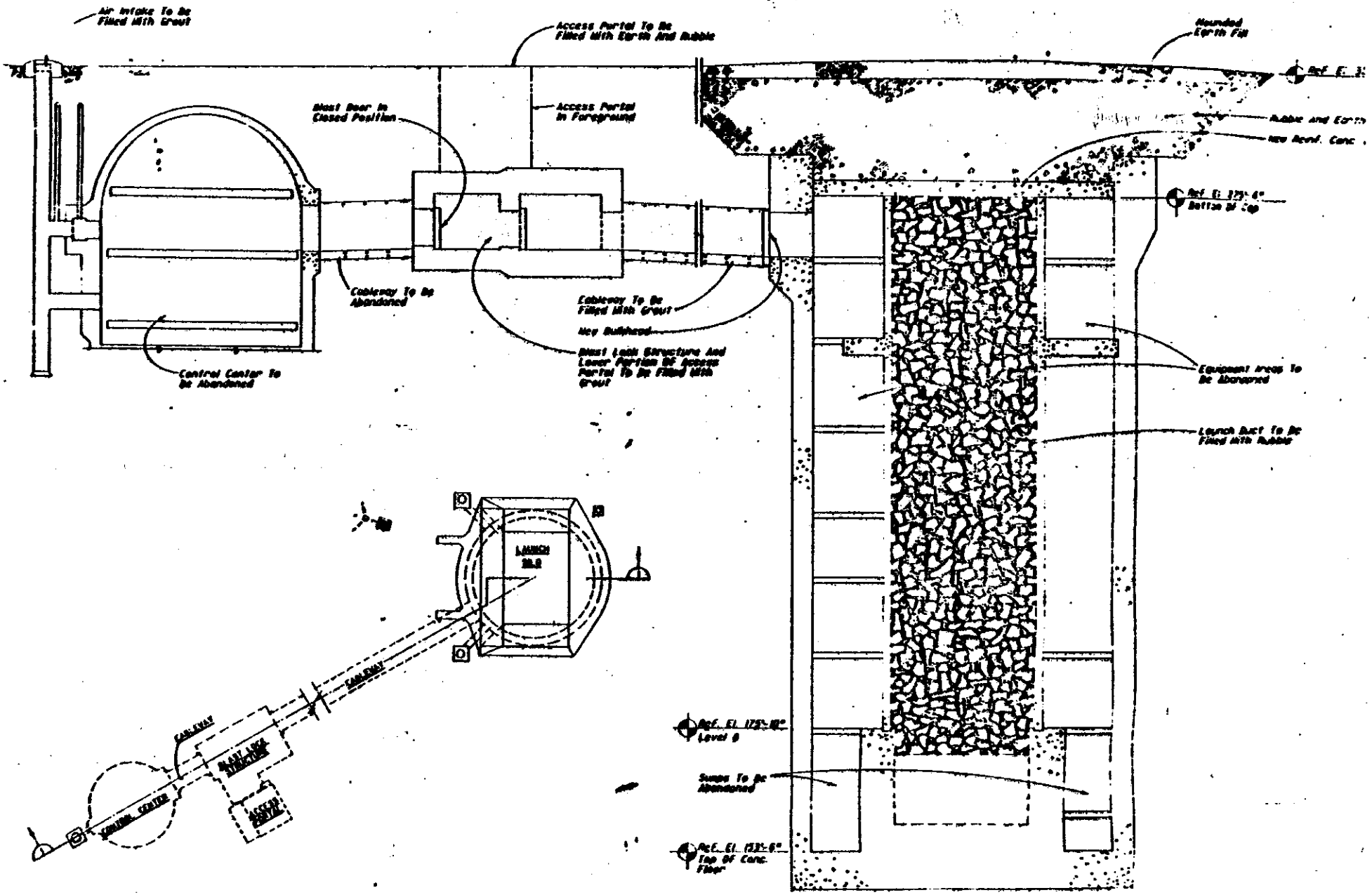

Access Portal Top To Be Removed
Access Portal In Foreground
CONTROL CENTER
CABLEWAY
BLAST LOCK STRUCTURE
CABLEWAY
Silo Closure Door To Be Removed
Reinforced Concrete Top To Be Remov
Structural Steel Box Girders To Be R (Typical)
Ref. El. 300'-0" Top Of Conc.
Ref. El. 283'-6" Tops Of Recess Conc. Roof
Ref. El. 273'-0" Top Of Launch Duct
LAUNCH SILO
CONTROL CENTER
BLAST LOCK STRUCTURE
Access Portal Top To Be Removed
KEY PLAN
SECTION

FIGURE I-8



KEY PLAN

SECTION 1

FIGURE I-9

6. Launch Control Center Deactivation.

Equipment from the launch control center would be removed. The grating over the air intake and escape shaft would be removed and the shaft filled to grade. The launch control center would be sealed and abandoned.

7. Final Deactivation Activities. After the concrete cap is constructed and hole backfilled as outlined above each complex would remain open for an observation period (at least 180 days). At the completion of the observation period, the demolition contractor would finish grade the silo area. The launch duct area fill would be mounded to a height of approximately 2 to 3 feet. The chain link security fence would be removed, and no debris left on site. Air Force property line fence would remain until disposition of the land.

After complex dismantling and surface regrading are completed, the Air Force plans to transfer responsibility for the complex real estate to the General Services Administration for disposal in accordance with standard procedures. Safety and security of the complex would be maintained throughout the entire dismantling process.

E. Alternatives:

The Air Force has considered several possible alternatives to the proposed action, including retaining the complexes in austere caretaker status (the "no action" alternative).

If the complexes are not dismantled they will continue to count as ICBM launchers under existing arms control protocols. This would be inconsistent with both the President's "no undercut" policy and US Strategic Arms Reduction Talks (START) proposals, which seek to reduce missiles and launchers in both the US and Soviet arsenals. A change in the launcher accountability rules would have to be negotiated with the Soviets, an approach which is neither practical in the near-term nor desirable in the long-term.

Options which include less extensive silo dismantling than the proposed action were also considered, but were rejected because they failed to meet requirements of existing arms control protocols. Among these options was a proposal to simply fill and seal the launch silo and a proposal to dismantle the inner portion of the silo headworks (but not the outer structure).

A final alternative considered was the option of selling the intact complexes to the public through the General Services Administration. As with the other alternatives, this option fails to comply with the existing arms control agreements and would result in the complexes counting as ICBM launchers.

II. Affected Environment.

An extensive treatment of the environment surrounding the Titan II support installations and missile complexes is contained in the "Environmental Assessment for the Proposed Deactivation of the Titan II Missile System." Environmental attributes reported in that document are condensed in this section. This section deals with the natural and socioeconomic environments of the Titan II missile complexes. Environmental factors considered include earth resources, atmospherics, hydrology, biology, special interest areas, and natural hazard areas. Additional factors include socioeconomic elements, including cultural resources, land use, and transportation.

The Davis-Monthan AFB region is depicted in Figure II-1. The associated missile complexes are about equally distributed north and south of the base and are located in Pinal, Pima, Cochise, and Santa Cruz Counties.

The McConnell AFB vicinity is illustrated in Figure II-2. Missile complexes associated with McConnell AFB are about evenly distributed over portions of the six surrounding counties of Reno, Kingman, Sedgwick, Butler, Sumner, and Cowley.

The Little Rock AFB vicinity is shown in Figure II-3. The Little Rock missile complexes are all located to the north of the base. The deployment area includes portions of Conway, Van Buren, Cleburne, Faulkner, and White Counties.

A. Natural Environment.

A number of elements of the natural environment may be impacted by the proposed action and are discussed at a level sufficient to define and/or explain them.

1. Earth Resources.

The Davis-Monthan AFB area is located in the Basin and Range Physiographic Province. This province is characterized by northerly trending ranges of rocky mountains which are separated by broad partially debris-filled valleys. Quaternary sedimentary deposits of fluvial origins are interspersed with volcanic masses that are of Cenozoic and Mesozoic age. Soils in the region are of the Aridisol Order, gray or red in color with surface organic layers thin or absent.

The McConnell AFB area is located in the Arkansas River Lowlands Division of the Interior Lowland Physiographic Province. This province is characterized by little elevation and a general lack of topographic relief. Subsurface geological structure is commonly masked by layers of alluvial deposits.

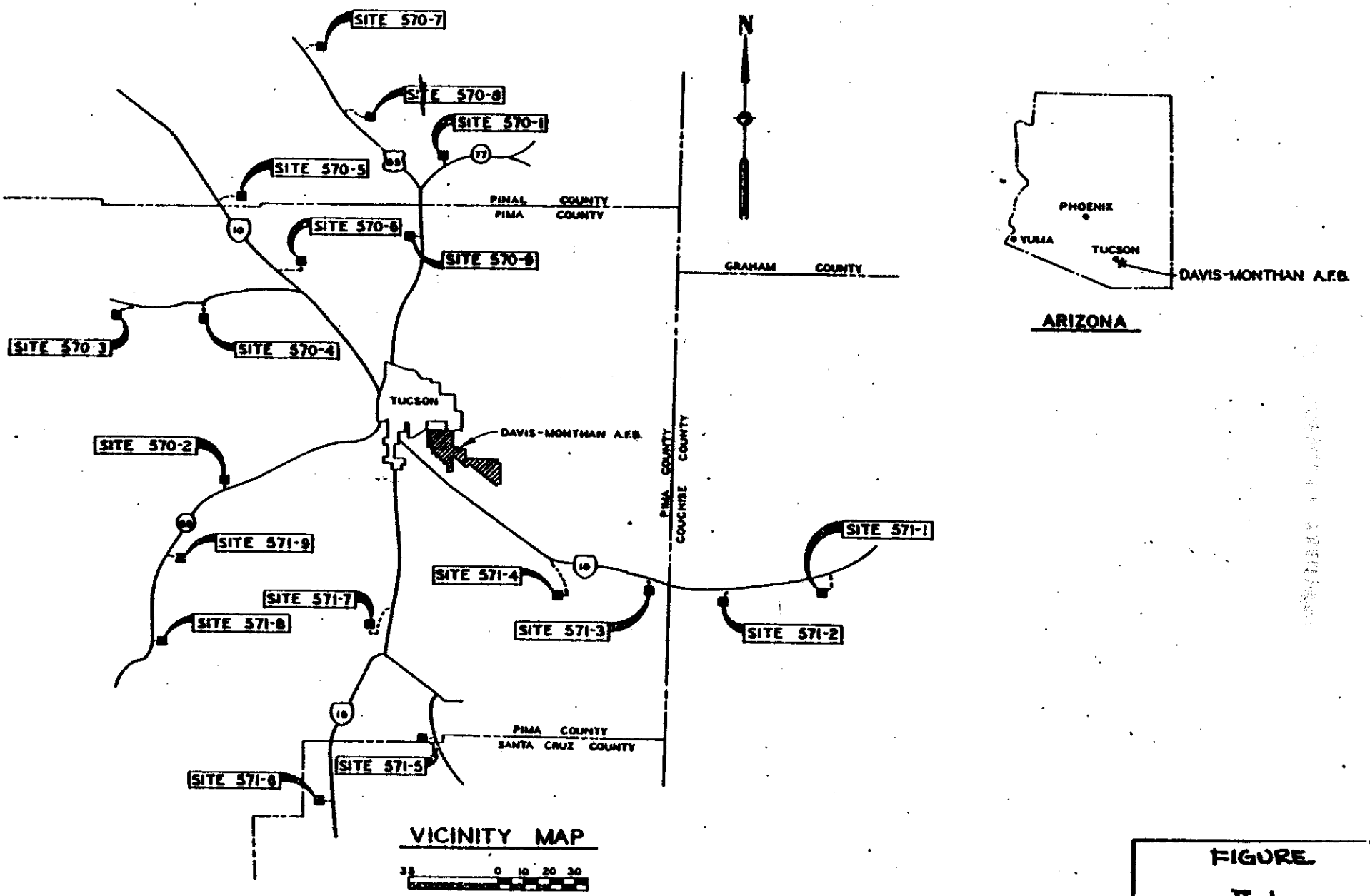
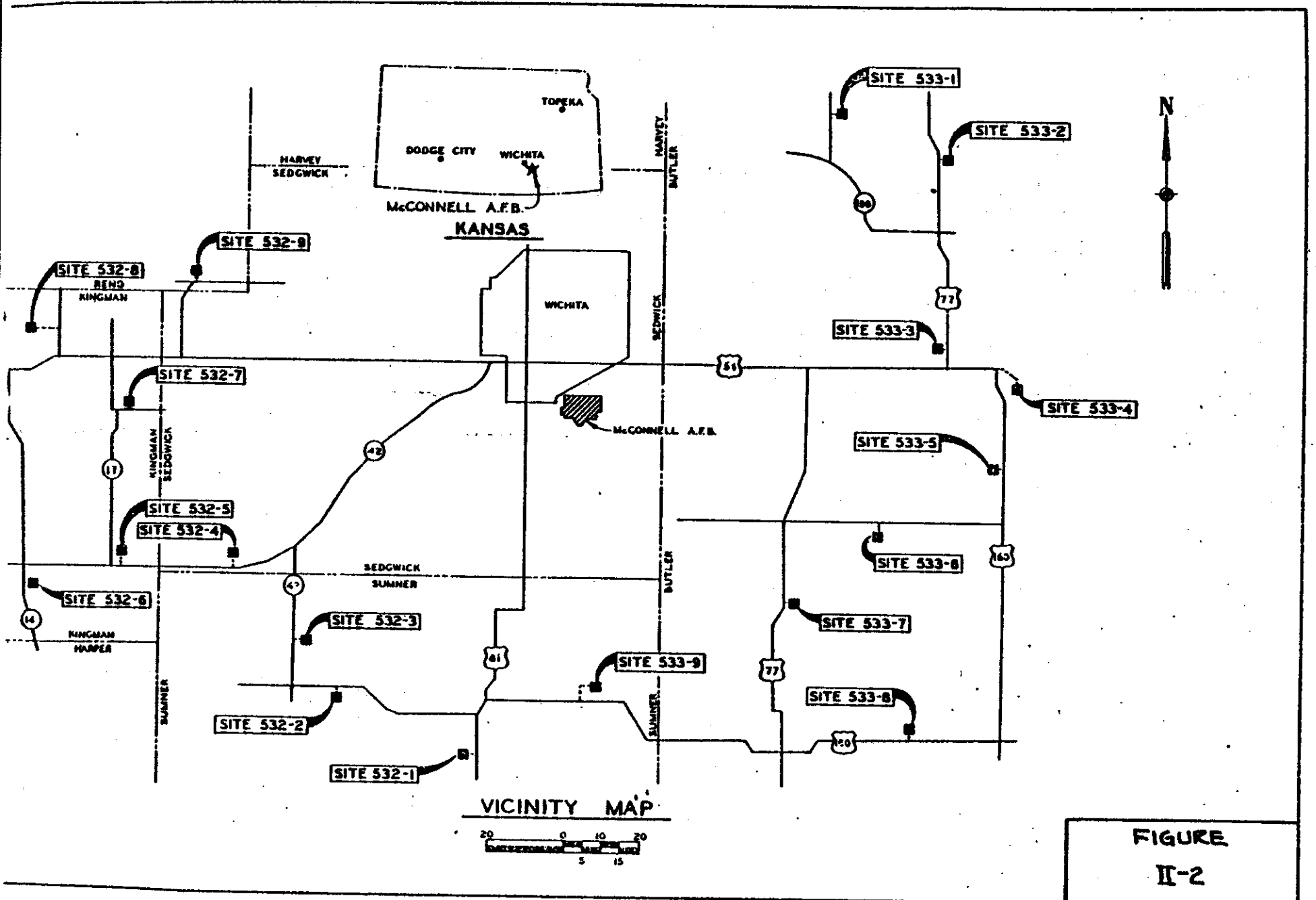

SITE 570-7
SITE 570-8
SITE 570-1
SITE 570-5
SITE 570-6
SITE 570-9
SITE 570-3
SITE 570-4
SITE 570-2
SITE 571-9
SITE 571-7
SITE 571-8
SITE 571-4
SITE 571-3
SITE 571-1
SITE 571-2
SITE 571-5
SITE 571-6
N
PINAL COUNTY
PIMA COUNTY
GRAHAM COUNTY
PIMA COUNTY
COCHISE COUNTY
PIMA COUNTY
SANTA CRUZ COUNTY
TUCSON
DAVIS-MONTHAN A.F.B.
10
77
83
19
VICINITY MAP
35
0 10 20 30
PHOENIX
YUMA
TUCSON
DAVIS-MONTHAN A.F.B.
ARIZONA

FIGURE
II-1


TOPEKA
DODGE CITY
WICHITA
McCONNELL A.F.B.
KANSAS
HARVEY
SEDGWICK
HARVEY
BUTLER
SITE 533-1
SITE 533-2
N
SITE 532-9
SITE 532-8
RENO
KINGMAN
WICHITA
SEDWICK
SITE 533-3
SITE 532-7
McCONNELL A.F.B.
SITE 533-4
SITE 533-5
KINGMAN
SEDGWICK
SITE 532-5
SITE 532-4
SITE 533-6
SEDGWICK
SUMNER
BUTLER
SITE 532-6
SITE 532-3
SITE 533-7
KINGMAN
HARPER
SITE 533-9
SUMNER
SITE 533-8
SITE 532-2
SITE 532-1
VICINITY MAP
20 0 10 20
5 15
FIGURE
II-2

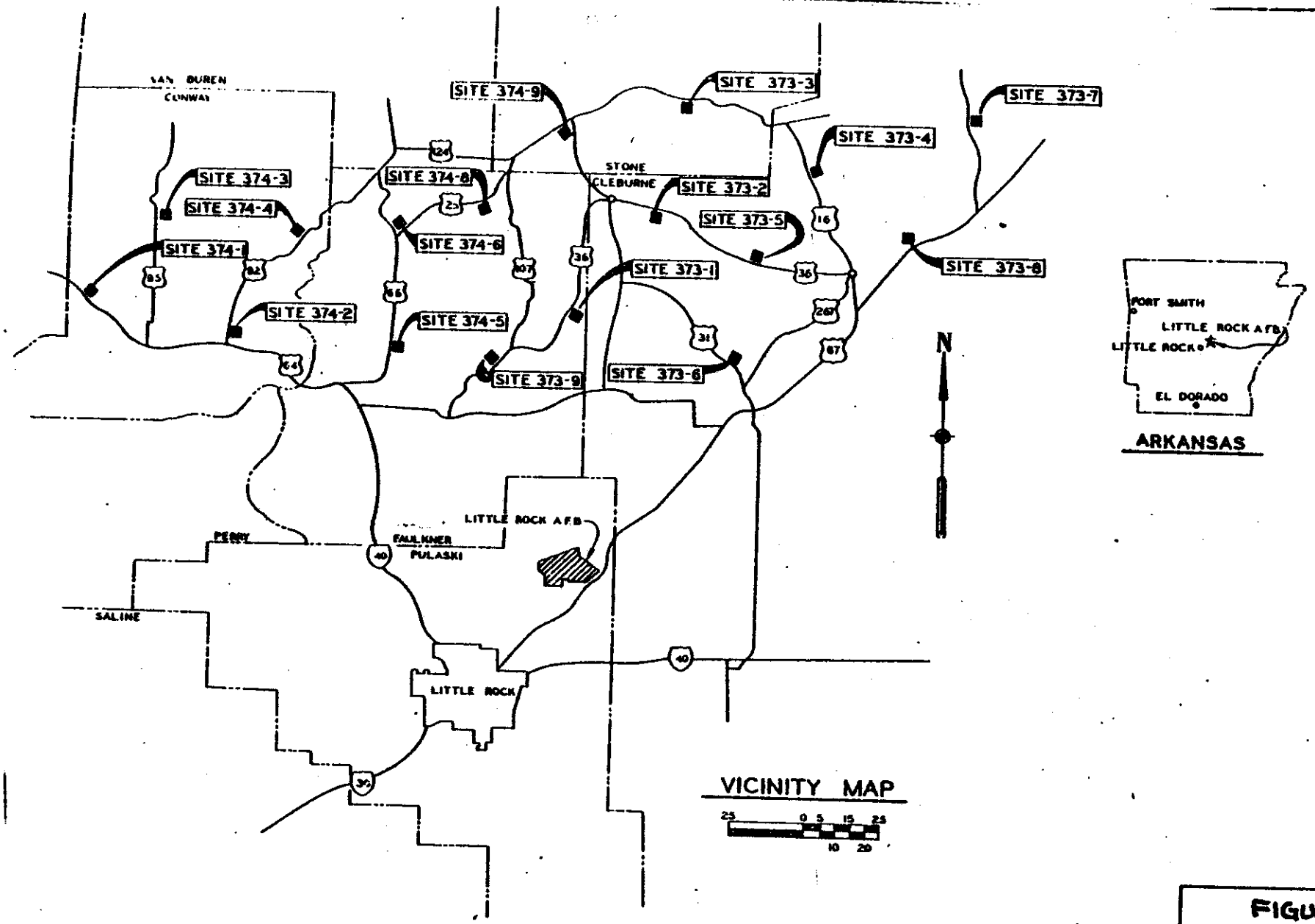

SAN BUREN
CONWAY
SITE 374-9
SITE 373-3
SITE 373-7
SITE 373-4
SITE 374-3
SITE 374-8
STONE
CLEBURNE
SITE 373-2
SITE 374-4
SITE 373-5
SITE 374-1
SITE 374-6
SITE 373-1
SITE 373-8
SITE 374-2
SITE 374-5
SITE 373-9
SITE 373-6
N
PORT SMITH
LITTLE ROCK A.F.B.
LITTLE ROCK
EL DORADO
ARKANSAS
LITTLE ROCK A.F.B.
PERRY
FAULKNER
PULASKI
SALINE
LITTLE ROCK
VICINITY MAP
25 0 5 15 25
10 20

FIGURE
II-3

Some outcrops of limestone can be seen in areas where the local soils are not well developed. Soils in the region are classified in the Mollisol Order and are dark in color, have an organic-rich surface layer and are well suited to agriculture.

Three major physiographic provinces meet in the Little Rock AFB area. As a result, the local topography changes drastically within the region. Soil depths range from thin on the folded ridges of upland regions to deeper and better developed in the alluvial valleys. The Coastal Plain area is characterized by flat terrain and lack of relief. Soils in this portion of the area are of the Ultisol Order. They are red-yellow in color, have low organic matter, and are of modest to low agricultural value.

2. Atmospheric Environment.

The two aspects of the atmospheric environment pertinent to the present study are climatic conditions and existing air quality at a given site. Selected representative climatological statistics within the Titan II support base areas are summarized in Table II-1.

As may be seen from Table II-1, over the course of the year; the Davis Monthan area precipitation averages about 10 inches and air temperature is greater than 80 degrees about 27 percent of the time. The base is located in an area classified non-attainment for carbon monoxide (CO) and particulates. However, CO problems occur primarily along congested urban centers such as in Tucson and a large proportion of the particulates are derived from natural sources.

There is a relatively high incidence of thunderstorms (53 days of the year) at McConnell AFB. The other climatological parameters are normal for the area. The existing air quality data for this area can be termed "very good" with air quality standards being met 99 percent of the time.

Little Rock AFB experiences on the average about 60 thunder-storms and 51 inches precipitation per year. The air quality in and around Little Rock AFB is relatively clean.

3. Hydrologic Environment.

Most of the Davis-Monthan missile complexes are located in the Upper Santa Cruz River Basin and are drained through numerous washes. Due to the low annual rain fall (10 inches) and the seasonality of the rain, the washes are dry most of the year and subject to flooding during the rainy season. No major natural waterbodies are found proximate to any of the complexes with the exception of dry washes. The upper soil horizons are highly permeable.

Table II-1. SELECTED CLIMATOLOGICAL STATISTICS

FACILITY LOCATION	PRECIP. (in/yr)	PERCENTAGE OF TIME AIR TEMPERATURE EXCEEDS 80°F	NUMBER OF DAYS PER YEAR WITH		
			Thunder storms	Hail	Fog
Davis-Monthan	10	27	40	2	5
McConnell	32	15	53	4	96
Little Rock	51	17	60	2	132

SOURCE: ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED DEACTIVATION OF THE TITAN II MISSILE SYSTEM

Sanitary waste from the silos is treated on site using septic tanks and oxidation ponds or leach fields. No significant problems have been encountered.

Most of the McConnell AFB associated missile complexes lie in the Arkansas River Basin. Cheney Reservoir, northwest of Wichita, is the other major water resource in the region. Flooding is a recurrent problem in the area, although none of the missile complexes are involved.

Groundwater is plentiful in the McConnell AFB area, as are surface waters. However, much of the groundwater has a high content of solids and sulfates and requires treatment before use. The water table is quite high at a few complexes which requires in some cases constant sump pumping.

Sanitary sewage is treated at each complex using a septic tank/leach field system. No significant problems have been encountered.

The Little Rock missile complexes lie within the Arkansas River Basin. Due to the topography, geology and the average 51 inches of rainfall annually, the area is rich in water resources. The area is subject to periodic flooding, although flood intensities have lessened somewhat in recent years. Groundwater in the area is quite hard and infiltration is a problem at some complexes requiring pumping to prevent silo flooding.

Sanitary sewage is treated at each complex using either lagoons or septic tanks and leach fields. Given the volume of discharge at these complexes, both systems have been adequate.

4. Biotic Environment.

The natural vegetation surrounding the missile complexes near Davis-Monthan AFB is influenced by the topography and the varied land uses found in this area. Vegetation varies from scrub desert forms to dense stands of trees in the higher and moister elevations of the nearby mountains. Natural vegetation around the missile complexes is dominated by cacti and desert species typical of this Sonoran desert-creosote bush, bursage communities.

Virtually all the native vegetation is protected by the Arizona Native Plant Law. At the present time over 140 threatened or protected plants are on the list of protected cacti.

There is no evidence of unique or prime farm land proximate to any Davis-Monthan missile complex. Some land in the area is used for grazing, poultry farming, cattle feed lots, and cotton

growing. No wetlands are close to these complexes. Due to the dry habitats and the lowering of the water table, aquatic and associated riparian habitats are declining in numbers and acreage.

Federally listed, threatened and endangered species such as the masked bobwhite and the yuma clapper rail could inhabit the areas near the complexes; however, the small size and disturbed quality of the complexes make it unlikely that threatened and endangered species occur frequently on the complexes, except for transients.

The natural vegetation surrounding the McConnell missile complexes is described as a short grass prairie, dominated by blue stem, buffalo, indian, rye, and side oats gramma grasses. The primary cultivated crop is wheat.

No wetlands are located near the missile complexes; however, many are within prime agricultural land areas. Threatened or endangered species such as the prairie chicken, and gray bat are known to occur in the general area of the base, but none have been identified on any of the missile complexes, although transients might occur.

Aquatic resources are common in the McConnell AFB area, and the Cheney Reservoir and the Cheyenne Bottom National Wildlife Reserve (wetlands) are both within a 75-mile radius of Wichita. Neither are affected by the Titan system.

The area around Little Rock missile complexes is gently rolling, with few remanents of the natural vegetation left. Most of the land is cultivated in hay, sorghum, wheat, and rice. Dairy and beef cattle are common grazers near the complexes. Prime agricultural land does occur in the area, but none is known to exist proximate to any complex. Residual natural vegetational areas include hardwood forests, wetlands, grasslands, and pine stands.

Nine federally listed threatened or endangered species, including the red-cockaded woodpecker and the Indiana bat are known to occur in habitats similar to those found near some of the missile complexes, but none are known to occur on the complexes themselves. However, occasional transients or migrants may occur.

5. Special Interest Areas.

There are many areas of special interest within a 75 mile radius of Davis-Monthan AFB. The San Xavier Del Bac Mission, San Xavier Papago Indian Reservations, Saguaro National Monument, Coronado National Forest, and Madera Canyon Recreational Area are relatively close to several of the missile complexes in the area.

In the McConnell AFB region there are numerous special interest areas. These include the Bartlett Arboretum at Belle Plaine, Castle and Monument Rocks, numerous historic military sites, several game preserves and recreational areas, in addition to the Flint and Smokey Hills natural resource areas. Some of the McConnell AFB missile complexes are located near or adjacent to the special interest areas.

There are various areas of special interest in the Little Rock AFB region. These include state and national historic sites and memorials, National Forest areas, recreational use areas, National Scenic and Wildlife Refuge areas, and numerous bayou wildlife management areas. Many of the Little Rock missile complexes are located near these areas of special interest.

6. Natural Hazards.

Natural hazards include some stationary and somewhat predictable zones, such as flood, ice, and seismic areas. Other natural hazards are not as predictable, such as violent and sudden storms, hurricanes, and tornadoes.

Both Davis-Monthan and McConnell AFBs have identifiable inactive fault zones near missile complexes and faults are known to occur within 150 miles of Little Rock AFB. However, no seismic problems are known to exist near any of these bases.

B. Socioeconomic Environment:

Principal socioeconomic factors were given consideration in the "Environment Assessment for the Proposed Titan II Deactivation." Existing and projected socioeconomic baseline conditions for demographic, economic, housing, and institutional characteristics are reported in that document and will not be repeated here.

1. Land Use Characteristics.

Urban, agricultural and mining are the three general categories of land use which exist in the Davis-Monthan region. Rural land use areas near Tucson are divided among grazing and agriculture (62 percent), urban (8 percent) and mining (1 percent), with the remainder in public and other uses. Missile complexes are located, except in a few cases, in open areas away from urban and other sensitive land uses. About 4,380 acres around Davis-Monthan AFB are presently committed to missile basing. A typical complex affects an area of 235 acres. Of this total approximately 12 acres are owned by the Federal government. The remainder is restrictive easement held on renewable five-year leases. Encroachment on complexes by private development has taken place at several locations. A worst-case example has occurred north of Tucson in the Site 570-9 vicinity. A mobile

home development, a state juvenile detention center, and a public elementary school have been constructed within the last eight years. Both the detention center and the school are within a half-mile of the complex. Sites 571-7 and 571-5 also have had encroachment related to housing and recreational development.

Land near McConnell AFB is devoted predominantly to urban or agricultural uses. The missile deployment areas, in contrast, are situated in open agricultural lands which are generally well away from towns and other built-up areas. Cheney State Park and Reservoir is one of the few special use areas located in the rural McConnell AFB region.

Approximately 4,600 acres of missile site land are presently in use. The typical missile complex affects an area of about 250 acres. Of this approximately 16 acres are fee owned and the remainder is an easement, license or permit status. Some complex encroachment, by persons who have located dwellings within a short distance of site boundaries, has occurred in the missile deployment area. A worst-case example exists at Site 532-9, located 25 miles west of Wichita and immediately to the east of Cheney Reservoir. A number of conventional and mobile homes have been erected both east and west of the complex. Distances vary but several inhabited dwellings are within 1,800 to 3,000 feet of the complex boundary.

Land use in the Little Rock AFB region is predominantly rural, but small areas of urban development exist. Rural lands are devoted to growing rural crops, grazing and dairy farming. Special land use areas such as park and management areas exist in the region.

Approximately 4,340 acres of land are currently used at missile complexes. A typical complex in the Little Rock AFB area affects an area of 240 acres. Of this total about 10 acres are fee owned and the remainder is in easements and licenses. Structures which encroach complexes exist at several places in the missile deployment area. A local farmer near Site 373-1 located north of the base in east-central Faulkner county, has constructed an animal shelter within the 1800-feet restrictive easement. In addition to this structure, six dwellings are presently located within a half-mile of the complex.

2. Cultural Resource Characteristics.

The earliest people thought to have lived in the three Titan II AFB's regions are referred to as Paleo-Indians. They were primarily nomadic hunters of large game animals. Potential artifact discoveries have been found in many of the counties associated with the missile complexes, however, no known archaeological sites exist on any of the complexes. There are no historic sites on any complex.

3. Transportation Networks.

The transportation networks serving each of the three Titan base areas can be characterized as well developed. Further, the roadway network within each complex provides by far the most important means of transportation within each region. The three geographically distinct wings are actually similar with respect to the general accessibility of each missile complex via the regional road system.

The roadway serving the complexes consist of major highways, arterials, secondary streets, and local site access road. The main road network for each complex area is depicted on Figures II-1, II-2, and II-3. Missile complexes surround each host base and are generally located adjacent to highways or major county roads.

Most missile complexes are located within about 0.5 mile of a highway. Such access roads are primarily used by the very light traffic directly associated with missile complex activities. In some areas, these roads do provide improved access to adjacent crop land and may be used by farm vehicles.

4. Noise Environment.

The noise environment in the missile deployment area varies from place to place but is generally quiet. This is due to the isolated nature of most missile complexes.

III. Environmental Consequences.

A discussion of the proposed project's impact on the environment is presented in this section. Impacts potentially resulting from the proposed silo dismantling include those on the atmospheric and hydrologic environments, biota, esthetics, demography, land use, local transportation networks, and the noise environment. Because of the sequential phasing of the proposed project activities and the geographic spread of the involved project locations, individual occurrences of impacts will, for the most part, vary temporarily and/or spacially with respect to one another. In reviewing these impacts, consideration should be given to (1) the temporary nature of certain described impacts at each specific missile complex, and (2) the potential for the diminishing occurrence of some potentially impacting situations as dismantling techniques become better defined as the action proceeds from one missile complex to the next.

A. Impacts to the Natural Environment.

1. Earth Resource Impacts.

Impacts to earth resources occur due to soil disturbance resulting from vehicular traffic, earthwork activities, or deposition of foreign material which is incompatible with the environment. For the proposed action, vehicular traffic will generally remain on the stabilized aggregate surface or previously disturbed areas within the missile complex. Therefore, soil compaction will be negligible. Once topside facilities are removed and the observation period ended, final grading of the area will be accomplished. The area disturbed will be minimal (maximum of 16 acres per complex). The relatively flat areas surrounding missile complexes will minimize serious soil erosion. There is a chance of some soil subsidence if soil particles are transported with groundwater as it seeps into voids in subsurface facilities or if latent consolidation of soil and fill material takes place. Because underground tanks will be filled and at least fifteen feet of soil will rest atop a concrete cap over the silo, these impacts are expected to be negligible. Any pits or excavations which will be filled, would be compacted in accordance with good construction practices to reduce the likelihood of soil subsidences. Fill material will be mounded 2-3 feet above the launch duct to mitigate unexpected soil subsidence should it occur.

Fill material for the underground facilities will be taken from borrow areas not presently identified. Standard procedures which eliminate adverse impacts to the borrow area would be used in removing and transporting fill material. No significant impact is expected.

With the exception of some construction refuse (concrete, demolished building material, etc.) there will be no spoil taken from the site and deposited elsewhere. Material from the missile complex will be salvaged or remain in the silo. Any material which is considered hazardous will be removed by the Air Force and disposed of in an environmentally acceptable manner. There are, therefore, no impacts anticipated resulting from disposition of site refuse or material.

Evaporation ponds exist at some missile complexes for containment of water softener brine. None of these ponds receive any industrial waste from the silos and, as such, should leave no environmentally detrimental residual. The tile field at each complex handles only organic waste from the launch control center and are assumed to contain no industrial waste. Therefore, these tile fields will be abandoned. Arizona and Kansas have no closure requirements for the sewage treatment facilities. Arkansas requires septic tanks have their covers removed, be pumped out, have their bottoms broken out and be filled. No problems are anticipated.

The 500 KVA transformer or some electrical equipment in the silo might contain polychlorinated biphenyl (PCB). PCB has been shown to cause long term health and environmental effects. There are no known sources of PCB in Titan complexes. Oil-insulated transformers and surge capacitors or other equipment with possible but unknown concentrations of PCB are being tested by the Air Force. If hazardous concentrations of PCB are discovered, the equipment will be disposed of in accordance with environmental regulations covering PCB disposal.

2. Atmospheric Impacts.

Ground vehicular activity associated with complex dismantling will generate some dust, especially where operations are conducted over unpaved areas. Engine exhaust will also contribute pollutants to the area. Considering the few vehicles involved and the brevity of their operations it is reasonable to conclude that air emissions from vehicular traffic will not significantly affect air quality in the area.

It is likely that some ordnance will be used in the dismantling activity. During detonation of ordnance, materials released into the air would be the combustion products of explosives. Use of ordnance in demolition activities will be closely controlled by the contract manager. While detonation of some types of ordnance can result in emission of toxic fumes, they can be controlled by careful blasting methods. Impacts would be expected to be similar to those of other demolition projects where explosives are used. Such releases would be instantaneous and short-lasting, with insignificant consequences to existing air quality.

Residual amounts of propellants could remain within transfer lines for some time after the site has been placed into caretaker status. Unsymmetrical dimethylhydrazine (UOMH) is the Titan II fuel. If UDMH vapor remains in the silo, it will oxidize into n-nitrosodimethylamine (NDMA) a carcinogenic substance. UDMH vapors, if present, could continue to generate NDMA for three months or longer after missile propellants are removed from the complex.

Long-term air quality benefits, although small, will result from the proposed action due to the elimination of vehicular traffic between the missile complex and the support base and small releases of propellant vapors.

3. Hydrologic Impacts.

Hydrologic impacts occur as a result of spills of toxic or otherwise hazardous substances, or by introduction of pollutants into the groundwater.

Liquids within a Titan complex, with the exception of missile propellants, are relatively innocuous. These liquids include lubricants, diesel fuel, hydraulic fluid, and water for industrial, cooling, and personnel needs. In preparation of each complex for caretaker status, systems are drained and liquids properly disposed. At the start of demolition activities, only small amounts of these liquids, which are either totally enclosed or are residual from the drained system, will exist within the complex area. These will pose no threat to contaminate surface water resources.

Once dismantling activities are complete, it is expected that in many silos, groundwater will seep into the launch duct seeking voids left in the fill material. Groundwater, depending upon its acidity, could liberate bond metals from equipment not salvaged from underground facilities. Also liquid not purged from launch facilties could mix with invading groundwater. Leaching of contaminated water could enter groundwater aquifers.

Groundwater invasion into an inactive launch duct is currently taking place at Site 374-7 near Little Rock AFB. In September, 1980, at Site 374-7, an accident resulted in destruction of a Titan missile and damage to the silo. In efforts to monitor impacts to the groundwater resulting from the aqueous solution of rocket fuels, heavy metals, petroleum products, and other unknown constituents within the launch duct, eight test wells were placed around the complex 300 feet from the silo. As of the date of this report, no detectable levels of hydrazine or such heavy metals as cadmium, chromium, or lead have shown up in the test wells, although small concentrations of some of these contaminants existed in the silo.

The geology of the area surrounding this site appears to reflect a low hydraulic gradient and tight geologic structure. These conditions will result in slow movement of groundwater. We cannot, therefore, draw definite conclusions regarding pollutant migrations. It is unknown if the bottom of Site 374-7 has been fractured, thereby permitting a pathway of flow from within the silo into the groundwater aquifer. Because of these uncertainties it is impossible, without extensive study, to state that groundwater is not being invaded by silo encased pollutants. However, because there has yet been no evidence that this has taken place, and because the structural integrity of dismantled silos will likely be more sound than Site 374-7, it can be assumed that the silo structure will inhibit migration of pollutants to the extent that groundwater is not threatened.

Concentrations of pollutants which might remain in the underground facilities of dismantled complexes will be much lower than Site 374-7 as great care will be taken to remove all major potential sources of pollution prior to and during dismantling operations. It is expected that residual amounts of liquids within the dismantled silo will mix with invading groundwater, however, concentrations will be so low and releases from the missile sufficiently slow so as to pose no threat to groundwater quality. These small amounts will be oxidized naturally and should not persist for a prolonged period of time. As mentioned previously, earthquakes or other natural hazards which would threaten the structural integrity of the missile silo (thereby increasing the rate of leaching into groundwater) are not expected. For these reasons, impacts to groundwater supplies are not expected.

Any contamination of groundwater will be dependent on several factors previously mentioned. Some natural mitigations are possible in areas where soils are often alkaline such as is the case in Arizona. Alkalinity will tend to precipitate heavy metals and thus prevent their getting into groundwater. Another factor which will tend to minimize possible groundwater contamination at Davis-Monthan area is the deep groundwater table.

4. Biologic Impacts.

Impacts to biota occur either by destruction of the organism or disrupting its environment (soil, air, water, etc.). As discussed in earlier sections, major impacts to the biologic environment are not likely to occur. Dismantling operations will take place on the complex where periodic maintenance and operations activities already take place. Activities associated with this action such as vehicle transport, salvaging operations, etc., will be centralized on the silo pad or affiliated roadways, and will not adversely impact the surrounding biological environment. Impacts to air and water resources are expected to be minor or nonexistent, therefore, biotic habitat will continue to support organisms currently dependent upon them.

5. Aesthetic Impacts.

Dismantling activities will involve temporary and minor aesthetic impacts at each of the missile complexes. Some impairment of aesthetic resources will occur due to the temporary placement and operation of the support crane, military and security vehicles, and other dismantling support equipment. The temporary visual impacts are expected to be relatively insignificant with the limited duration of about 6 months at each complex. Antennae and other surface security

and hazard warning systems will be removed from the sites giving some permanent, minor area aesthetic benefits. Some permanent aesthetic impairment associated with the abandoned complex surface and hardstands will continue after deactivation operations are complete. None of the temporary dismantling and salvage operations are expected to result in any additional impacts or to have any permanent, significant adverse effects on the aesthetic quality of the nearby special interest areas.

B. Impacts to the Socioeconomic Environment.

1. Demographic Impacts.

The loss of a total of about 50 positions including about ten civilians at the three Titan II installations would have an insignificant impact on the regional or local populations.

2. Land Use Impacts.

Silo dismantling will have a minimal impact on land use near the three host bases. The small reduction in personnel requirements will slightly decrease housing demand and the accompanying demand for urbanization of rural areas. Desert grazing land near Davis-Monthan AFB and argicultural lands near McConnell AFB would be more affected. Jacksonville agricultural land near Little Rock AFB will be less affected due to lower urbanization pressures in that region. Land development might remain inhibited in the missile deployment areas following dismantling activities. The presence of a dismantled complex, due to the abandoned roadways, hardstands and other unnatural characteristics, in a specific area may continue to discourage land developers from locating residential or commercial properties nearby. However, this minor impact would likely affect only a few places such as Site 532-9. This Kansas site is close to Cheney State Park and Reservoir and is a desirable area for vacation home development.

Because a number of complexes have already incurred some encroachment pressures, reluctance to develop nearby areas can be viewed as minor and would diminish as time passes. In the long-term, dismantled complexes will revert to near natural conditions. With purposeful intent, sites can be brought into the same use as the surrounding area.

3. Cultural Resource Impacts.

Dismantlement activities will have no foreseeable impacts upon any historical or archaeological resources in the vicinity of Davis-Monthan, McConnell, or Little Rock AFB missile complexes. Cultural resource inventories at the missile complexes are not planned for this project due to the nature of the proposed

project activities and lack of identified resource potential at any of the complexes. Appropriate mitigation measures will be employed in the event that historical or archaeological sites or artifacts are identified and shown to be impacted by the proposed action.

4. Transportation Impacts.

Potential impacts to the local transportation environment are considered to be small. These impacts would primarily result from a minor, temporary increase in local site traffic. Only a small number of sites (approximately three) will be dismantled at one time which would limit and localize transportation impacts to the route between the base and the complex or other interim destinations. Impacts along routes are expected to be short term since scheduled complex dismantling is expected to last about 6 months. However, small long-term impacts may result to road surfaces due to a decrease in maintenance activity.

5. Noise Impacts.

The noise that will be generated is nearly identical or less than that which presently occurs during normal servicing operations and should be equivilent to typical salvage operation levels. Truck movements and the operation of a mobile crane will produce the highest sound levels during dismantling. These and other noise producing activities are all temporary and of short duration. Detonation of ordnance could create a short term noise impact.

Positive noise impacts at dismantled sites will result from the proposed action. Dismantled sites will be free from the minor noise which is presently produced by crews and support personnel.

IV. Preparers and Persons Contacted.

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