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Environmental Projects: Volume 2

Underground Storage Tanks Compliance Program

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Jet Propulsion Laboratory
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The work described in this publication was carried out under the direction of the Jet Propulsion Laboratory, California Institute of Technology, and was supported by the National Aeronautics and Space Administration.

ABSTRACT

The Goldstone Deep Space Communications Complex (GDSCC), located in the Mojave Desert in San Bernardino County about 45 miles north of Barstow, California, and about 150 miles northeast of Pasadena, is part of the National Aeronautics and Space Administration's (NASA) Deep Space Network, one of the world's largest and most sensitive scientific telecommunications and radio navigation networks. The Goldstone Complex is managed, technically directed, and operated for NASA by the Jet Propulsion Laboratory (JPL) of the California Institute of Technology in Pasadena, California.

Six, large, parabolic dish antennas, at sites called Deep Space Stations, are located at the GDSCC. As a large-scale facility located in a remote, isolated desert region, the GDSCC operations require numerous on-site storage facilities for gasoline, diesel oil, and hydraulic oil. These essential fluids are stored in underground storage tanks (USTs).

Because USTs may develop leaks with the resultant seepage of their hazardous contents into the surrounding soil, San Bernardino County, State of California, and the Federal Government have adopted stringent regulations for the testing and maintenance of USTs.

Under supervision of JPL's Office of Telecommunications and Data Acquisition, a year-long program has brought 27 USTs at the Goldstone Complex into compliance with Federal, State of California, and County of San Bernardino regulations. Of these 27 USTs, 15 tanks remain operating today, there have been temporary closures of 11 tanks, and 1 tank has been permanently closed (abandoned in place). In 1989, the 15 USTs now operating at the Goldstone DSCC will be replaced either by modern, double-walled USTs equipped with automatic sensors for leak detection, or by above ground storage tanks. The 11 USTs that are temporarily closed will be excavated, removed, and disposed of in an environmentally suitable manner.

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GLOSSARY

A-ESB	Architects-Engineers Services Board (JPL)
CS	Carbon steel
CS/FG	Carbon steel/Fiberglass
DSCC	Deep Space Communications Complex
DSN	Deep Space Network
DSS(s)	Deep Space Station(s)
EPA	Environmental Protection Agency
GCF	Ground Communications Facility
GDSCC	Goldstone Deep Space Communications Complex
H E-C	Horner Ezy-Chek Leak Detection System
HEF	high efficiency (antenna)
JPL	Jet Propulsion Laboratory
KES	Kern Environmental Services
LEL	lower explosive level
MBGA	M.B. Gilbert Associates
NASA	National Aeronautics and Space Administration
NOAA	National Oceanic and Atmospheric Administration
NOCC	Network Operations Control Center
O&M	Operation and Maintenance
R&D	research and development
SBC/DEHS/HWTCS	San Bernardino County/Department of Environmental Health Services/Hazardous Waste and Toxic Control Section
STS	Space Transportation System (Space Shuttle)
STDN	Space Tracking and Data Network
TDA	Office of Telecommunications and Data Acquisition (JPL)
USTs	Underground Storage Tank(s)

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SECTION I

REGULATIONS CONCERNING UNDERGROUND STORAGE TANKS IN CALIFORNIA

This report describes the manner in which the Goldstone Deep Space Communications Complex (GDSCC) responded in compliance to the applicable regulations pertaining to Underground Storage Tanks (USTs).

In 1983, California became one of the first states in the Nation to regulate the construction, permitting, and monitoring of USTs containing hazardous substances. The requirements of the California UST statute and regulations implementing that statute are discussed below.

A. DEFINITION OF UNDERGROUND STORAGE TANKS STATUTE

The UST statute applies to "any one or combination of tanks, including pipes connected thereto, which is used for the storage of hazardous substances and which is substantially or totally beneath the surface of the ground." A "tank" is defined as any stationary device designed to contain an accumulation of hazardous substances which is constructed primarily of non-earthen materials (e.g., wood, concrete, steel, and plastic) which provides structural support."

Containers exempted from regulation under the UST statute include sumps, separators, catch basins and storm drains, oil field gathering lines, lagoons, evaporation ponds, and lined and unlined pits. It should be noted that these structures may, however, be regulated by the state Water Resource Control Board (WRCB). Also exempted are household tanks that contain 1,100 gallons or less of home heating fuel, and farm tanks for storing motor vehicle fuel. Also, any tanks that have received a permit as a hazardous waste storage facility pursuant to the California hazardous waste control law are exempt from coverage under the UST statute.

B. HAZARDOUS SUBSTANCES

The UST statute and regulations apply to "tanks" (as defined above) that store "hazardous substances." These substances are defined to include any liquid or solid listed by the California Director of Industrial Relations, any substance listed by the National Fire Protection Association as a flammable liquid, a Class II or III-A combustible liquid, or which is a hazardous substance pursuant to Health and Safety Code 25316. Hazardous substances listed under that section include any designated hazardous or toxic waste under the Federal Clean Water Act, the Federal Comprehensive Environmental Response, Conservation, and Liability Act (CERCLA), the CERCLA Federal Resource Conservation Recovery Act (RCRA), the Federal Clean Air Act, the Federal Toxic Substances Control Act (TSCA), and any waste considered hazardous or extremely hazardous pursuant to the California hazardous waste control law.

C. LOCAL UNDERGROUND STORAGE TANKS AUTHORITY

The UST statute specifically permits counties or cities to enact their own UST ordinances which may supplant the requirements of the state statute.

Any city or county which, prior to January 1, 1984, adopted an UST ordinance providing for double containment, monitoring, and permitting at least as comprehensive as the state statute provided as of that date, may enforce such ordinance in lieu of the state statute. Thus, for owners and operators of USTs located in cities or counties that adopted a qualifying UST ordinance prior to January 1, 1984, the provisions of the local ordinance would have control over the provisions of the state statute. The GDSCC is located in San Bernardino County, and San Bernardino County had adopted laws concerning regulations of USTs in December 1983.

D. UNDERGROUND STORAGE TANK REGISTRATION AND PERMITTING

1. Registration Requirements

A separate statute (Water Code) required persons who stored hazardous substances in various underground containers as of January 1, 1984, to register those containers with the WRCB. The registrant was required to submit a registration statement to the WRCB containing information on the tank's ownership, its location, age, type of construction and capacity, a list of hazardous substances stored therein, and any leak detection method in use. The state registration program under the Water Code applied only to tanks in existence as of January 1, 1984. For tanks in use after that date, registration is accomplished through the permitting process discussed below.

2. Permitting

All USTs covered by the provisions of the UST statute are required to be permitted. Permits are issued through local agencies, county, or city departments charged under the statute with implementing its provisions.

The UST statute provides that the local agencies may grant an interim permit for use of the UST in lieu of a final permit. A UST owner or operator must install an approved monitoring system (see discussion below) within 6 months after receipt of the interim permit. However, the owners' or operators' failure to install the monitoring system within the 6 month period does not violate the statute if the owner or operator has (1) an interim permit specifying a monitoring alternative requiring installation of equipment, (2) a binding agreement for installation of the monitoring system, or (3) can demonstrate to the local agency that it is making a "good faith effort" to enter into such an agreement. For tank owners who have not installed a monitoring system, daily gauging and inventory reconciliation and annual precision tank test and leak detection devices for pressurized piping systems are required. In any event, the statute requires completion of the monitoring system by no later than January 1, 1989.

E. CONSTRUCTION AND MONITORING REQUIREMENTS

The heart of the UST regulation in California is the detailed requirements in the statute and implementing regulations for the construction and monitoring of tanks. Those requirements differ for tanks installed on or before January 1, 1984 ("existing tanks") and for those installed thereafter ("new tanks").

With respect to monitoring requirements, the operator of the facility where the tanks are located must keep sufficient records of monitoring activities. Also, UST facilities are subject to inspection by the local agency at least once every 3 years to determine compliance of the tanks with construction and monitoring requirements of the statute, regulations, and permit. Tank owners may also be responsible for employing special inspectors to determine the facility's compliance with applicable laws and the permit.

Owners of existing tanks are required to outfit the tanks with a monitoring system capable of detecting unauthorized releases from the containers. Monitoring programs can be selected from among the following:

(1) Visual monitoring.

(2) Monthly tank testing.

(3) A series of alternatives using various combinations of vadose zone (the subsurface zone located above the water table) monitoring, groundwater monitoring, soil testing, inventory reconciliation, continuous pipeline leak detection, and tank gauging.

F. LEAK REPORTING

The statute requires the reporting of any unauthorized release from a UST that escapes from the secondary containment or from the primary containment if no secondary containment exists, or that increases the hazard of fire or explosion, or that causes any deterioration of the secondary containment if it is caught therein. Such releases must be reported by the UST operator to the designated local agency and the state Office of Emergency Services or the regional water quality control board within 24 hours after the release has been detected or should have been detected. A written report also must be transmitted to the local agency by the owner or operator of the tank within 5 working days of the release. If a release does not escape the secondary containment of a new UST and can be cleaned up within 8 hours of discovery, and also does not increase the hazard of fire or explosion or cause any deterioration of the secondary containment, it must be recorded on the operator's monitoring reports, but need not be reported to the local agency.

G. CLOSURE REQUIREMENTS

No UST may simply be abandoned in California. A tank that is temporarily taken out of service, but which is intended for reuse within the next 2 years, must continue to be permitted and remains subject to inspection and monitoring requirements. The owner who elects permanently to abandon the tank must demonstrate to the local agency that, among other things: (1) all residual amounts of hazardous substances have been removed and properly disposed of; (2) the tank is adequately sealed both to minimize the threat to public safety and the possibility of water intrusion into, or runoff from, the tank; (3) the owner has provided for any maintenance required by the local agency; and (4) there was no "significant soil contamination" resulting from a discharge in the areas surrounding the UST or facility. With respect to local ordinance closure requirements, San Bernardino County has required that the closed tank be filled with an inert substance.

H. CIVIL AND CRIMINAL PENALTIES

The statute provides both civil and criminal penalties for both owners and operators of USTs. Operating a tank without a permit, failing to monitor the tank as required by the permit, failing to maintain records or to report an unauthorized release, or failing to properly close a tank, can subject UST operators to a civil penalty of between $500 and $5,000 per day per event. With respect to owners of USTs, the same penalties apply for the failure to obtain a permit, for the failure to repair an UST in accordance with the statute, for the abandonment or improper closure of a tank, or for the "knowing failure" to "take reasonable and necessary steps to assure compliance with this chapter by the operator of an underground tank."

Also, the knowing failure by any responsible person to report an unauthorized release or the falsification by any person of monitoring records subjects that person to criminal liability of a fine of between $5,000 and $10,000 per day and/or imprisonment in the county jail for 1 year. The statute provides that civil penalty and criminal sanctions are separate and both may be imposed for the same violation. In determining the amount of civil penalties or criminal fines to be imposed, the court is directed to consider, among other factors, the extent of harm or potential harm caused by the violation, the nature of the violation, and the period of time over which it occurred, and the frequency of past violations and the corrective actions, if any, taken by the permitholder.

In addition to civil penalty and criminal sanctions, the statute authorizes a city attorney, district attorney, or the Attorney General to seek injunctive relief to halt any practices that violate, or are about to violate, the statute or any rule, regulation, permit, or order adopted to implement the statute.

I. FEDERAL UNDERGROUND STORAGE TANK REGULATIONS

The Federal Government has been given authority to regulate USTs pursuant to the Hazardous and Solid Waste Amendments (HSWA) of 1984 to the Resource Conservation and Recovery Act (RCRA). To date, the Environmental Protection Agency (EPA) has promulgated no final regulations with respect to tank construction and monitoring methods. Both the statute and interim regulations provide that no "underground storage tank" may be installed unless it will prevent release, caused by corrosion or structural failure. USTs should be protected against corrosion or otherwise designed to prevent the release of any stored substance and that the material used in the tank is compatible with the substance stored. Because the more strict requirements of California law discussed above already meet these requirements, tanks that conform to the state law should already meet the interim Federal requirements. The principal exception would be in those cases where the tank to be installed was exempted from regulation under either the state UST law or a local ordinance, but not by the Federal statute. In such cases, the Federal interim regulations would apply.

The Federal statute and regulations also require notification of various state agencies as to tanks in existence as of May 8, 1986. This requirement does not apply where such agencies have already been notified. Because

California already requires tank registration (either through the Water Code for tanks in existence prior to January 1, 1984, or through the permitting process for new tanks), the Federal notification would not apply. However, if a tank owner has not registered the tank with the state, the owner could face both state and Federal penalties for failure to register.

SECTION II

OVERVIEW

A. THE GOLDSTONE DEEP SPACE COMMUNICATIONS COMPLEX

The Goldstone Deep Space Communications Complex (GDSCC) is located in a natural, bowl-shaped depression in the Mojave Desert, in San Bernardino County about 45 miles north of Barstow, California, and about 150 miles northeast of Pasadena, California, where the Jet Propulsion Laboratory (JPL) is located.

The GDSCC is part of the National Aeronautics and Space Administration's (NASA) Deep Space Network (DSN), one of the world's largest and most sensitive scientific telecommunications and radio navigation networks. The Goldstone Complex is managed, technically directed, and operated for NASA by the Jet Propulsion Laboratory of the California Institute of Technology in Pasadena, California. The primary purpose of the DSN is to support the tracking of both manned and unmanned spacecraft missions and to provide instrumentation for radio and radar astronomy in the exploration of the solar system and the universe.

The 52-square-mile Goldstone Complex lies within the western part of the Fort Irwin Military Reservation on land NASA leases from the U.S. Army (Figure 1). The GDSCC is a self-sufficient, working community with its own roads, airstrip, cafeteria, electrical power, and telephone systems and is equipped to conduct all necessary maintenance, repairs, and domestic support services. Facilities at the GDSCC include about 100 buildings and structures that were constructed during a 20-year period from the 1950s through the 1970s.

Goldstone is one of three Deep Space Communications Complexes (DSCCs) located on three continents: at Goldstone in Southern California's Mojave Desert; in Spain, near Madrid; and at Tidbinbilla, in Australia, near Canberra. Because these three DSCCs are approximately 120 degrees apart in longitude, a spacecraft always is in view of one of the DSCCs as the Earth rotates on its axis (Figure 2).

The Network Operations Control Center (NOCC), which controls and monitors the DSN, is located at JPL in Pasadena. A Ground Communications Facility (GCF) of the DSN operates to link together the NOCC at JPL and the three DSCCs.

Activities at the GDSCC operate in support of six, large, parabolic dish antennas, at sites called Deep Space Stations (DSSs): four DSSs are operational, one is devoted to research and development (R&D) activities, and one has been deactivated. There also are four, similar, operational DSSs in Spain and in Australia. Thus, the NASA DSN consists of a worldwide network of 12 operational DSSs. A seventh parabolic dish antenna at Goldstone is operated by the National Oceanic and Atmospheric Administration (NOAA).

B. THE PROBLEM WITH UNDERGROUND STORAGE TANKS AT THE GDSCC

Any large facility, particularly if it is located in a remote, isolated desert region as is the GDSCC, requires numerous on-site storage sites for the various fluids the facility needs to operate. These essential fluids are

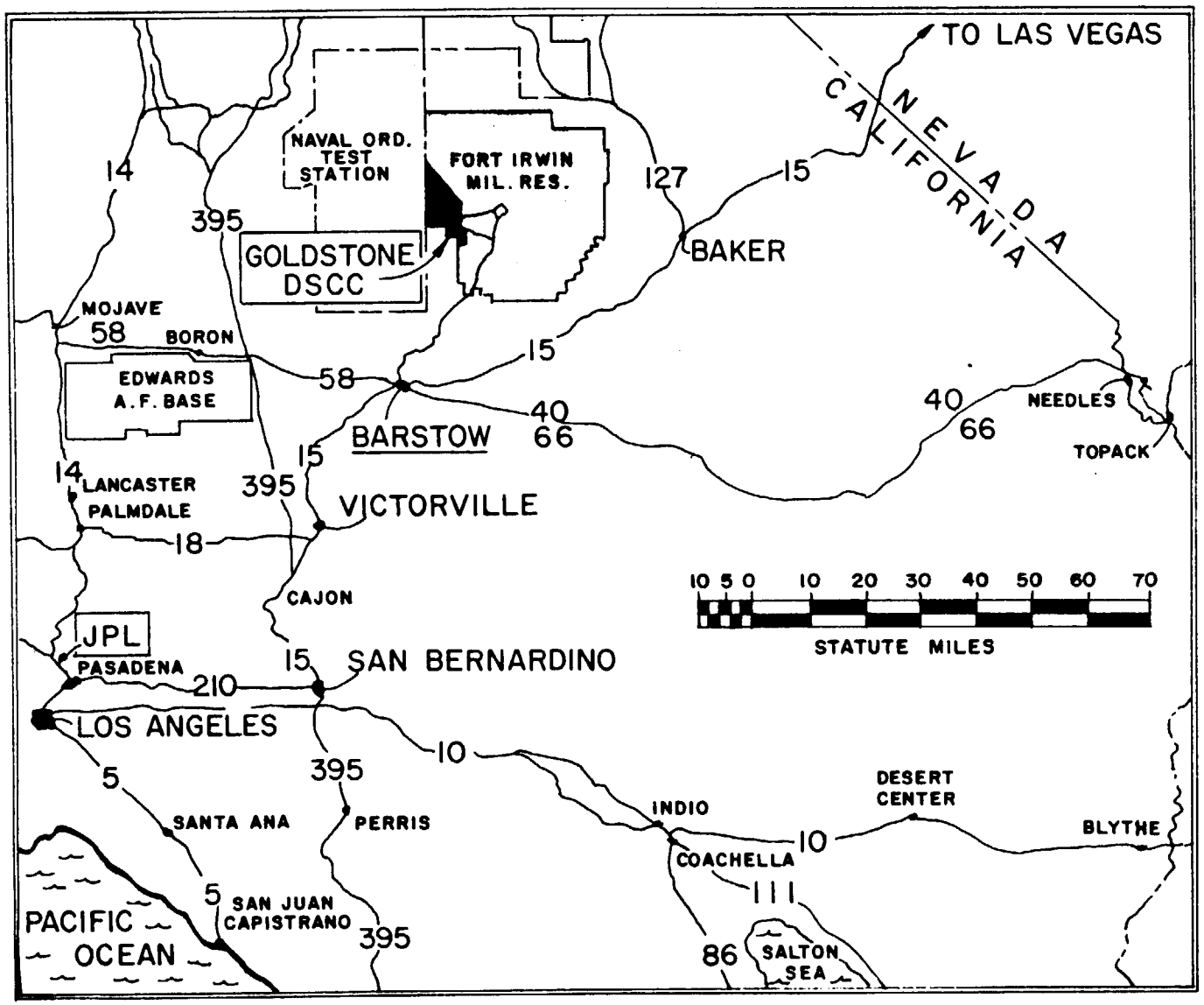


Figure 1. Geographic Relationship of the Goldstone Deep Space Communications Complex to JPL in Pasadena

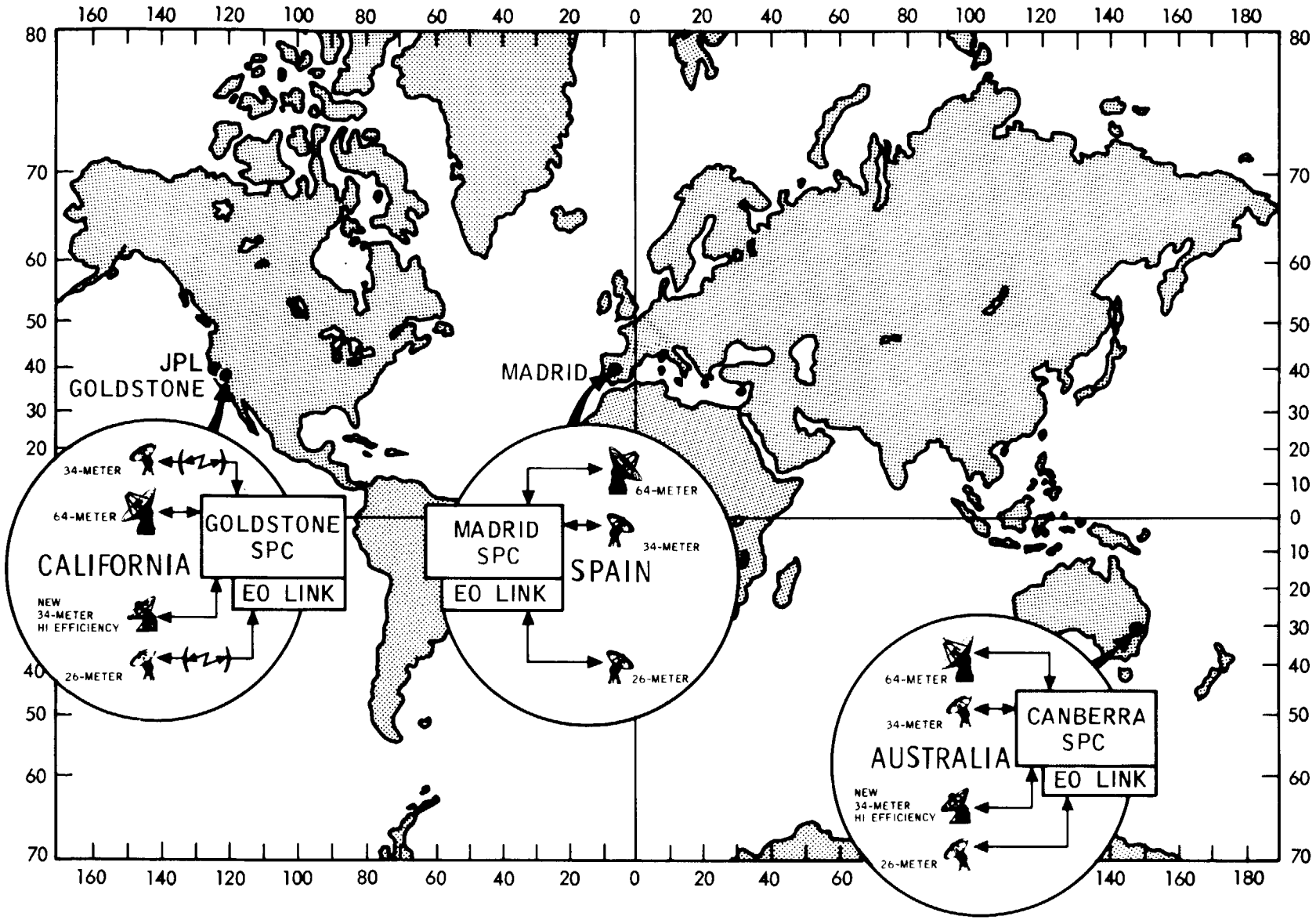


Figure 2. The Three-Continent NASA Deep Space Network as it Existed in 1986

stored in underground storage tanks (USTs). A typical, cross-sectional diagram of a UST at the GDSCC is presented in Figure 3.

Thus, there are USTs that store:

(1) Gasoline to operate the facility's motor vehicles.

(2) Diesel oil to operate the facility's electrical engine-generators and large, diesel-engine operated vehicles.

(3) Hydraulic oil to operate various hydraulically-activated equipment.

With the passage of time, these USTs may corrode, break, or crack. As a result, leaks may develop with the resultant escape of the tank's contents into the surrounding soil. This leakage of a tank's fluid contents may give rise to hazardous environmental situations, including the contamination of subsurface soils and the subsequent possible contamination of underground water supplies.

The antenna-sites, their control facilities, and other ancillary installations at the Goldstone Complex make liberal use of numerous and diverse USTs. Because of environmental regulations for these USTs enforced by both the County of San Bernardino and the State of California, the JPL Office of Telecommunications and Data Acquisition implemented a leak-detection and monitoring plan to bring the USTs at GDSCC into environmental compliance.

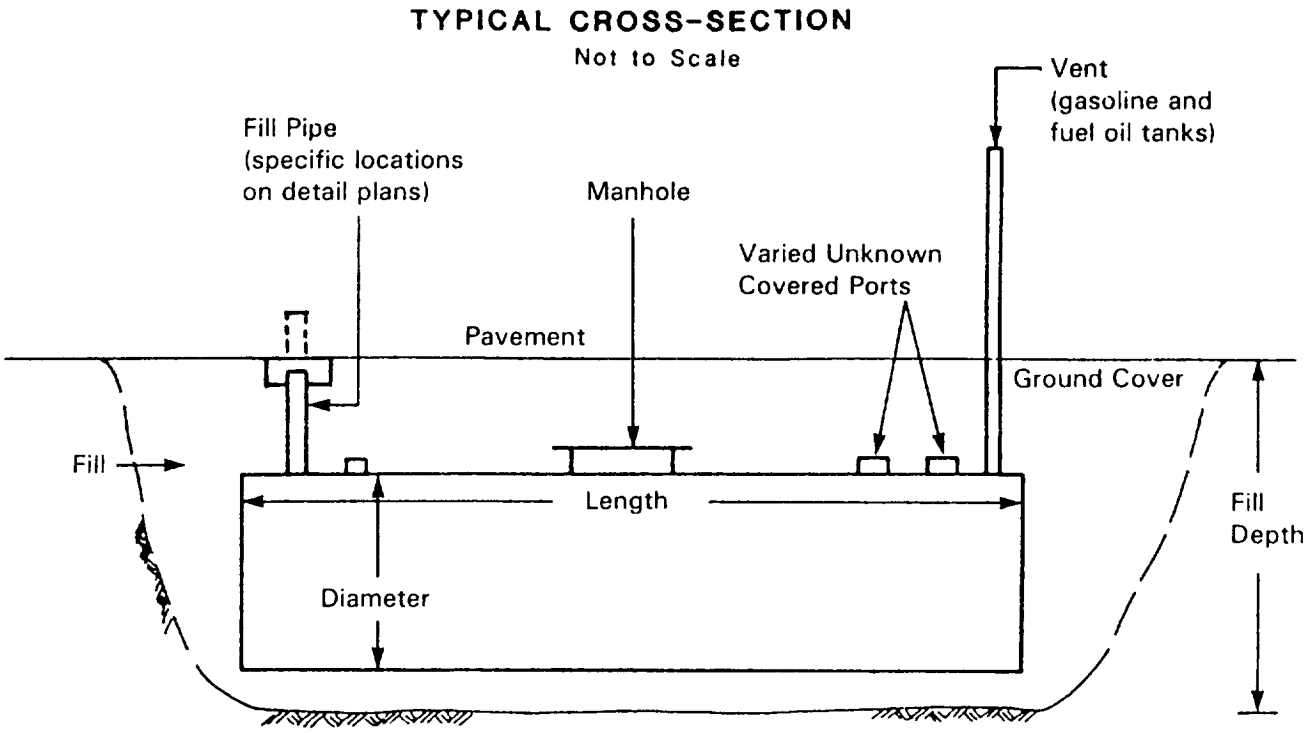
This report deals with the preparation of the leak-detection and monitoring plan, its submission for approval to the San Bernardino County/ Department of Environmental Health Services/Hazardous Waste and Toxic Control Section (SBC/DEHS/HWTCS), and the implementation of the approved plan for 27 USTs at the GDSCC. Any subsequent actions that were taken depended upon the results of the leakage tests for each tank.

C. GEOLOGY AND HYDROLOGY OF THE GOLDSTONE COMPLEX

Geologically, the GDSCC is bounded by the Garlock Fault to the north, the Tiefort Mountains to the east, and the Calico and Blackwater Faults to the south and west. Each antenna site is located on alluvial fill derived from the surrounding hills. Thickness of the alluvial fill varies from more than 70 ft thick at the Echo Site to only 15 ft thick at the Venus site.

Groundwater generally is confined and is found at varying depths, ranging from approximately 200 ft below the Goldstone Dry Lake to about 1,000 ft below the Echo Site. Because total dissolved solids in Goldstone groundwater exceeds the Federal Drinking Water Standards of 1,000 mgm/l, Goldstone groundwater is not potable. The Goldstone Complex gets its drinking water from wells located at Ft. Irwin, about 10 miles to the southeast.

Since the upper surfaces of most USTs at Goldstone lie buried 3 to 4 ft below the ground surface, the lack of ground water close to the Goldstone surface makes the Goldstone USTs less susceptible to corrosion and will make it easier to excavate these tanks when they will be replaced in the future (see Section VI).



Tank No.	Diameter (feet)	Length (feet)	Tank No.	Diameter (feet)	Length (feet)
G25-1G	8	27	G81-2D	8	32
G25-2G	8	27	G81-3D	8	32
G42-1G	6	9.5	14-1WO	unk	unk
G42-2D	6	9.5	14-1HO	8	27
TF-3D	8	32	14-2HO	8	27
TF-4D	8	32	M9-1D	10	41
G27-1D	8	32	M9-2D	10	41
G27-2D	8	32	M9-3D	10	41
G27-3D	8	40	M9-4D	unk	unk
G24-1D	8	32	A1-1G	8	20
G24-2D	8	32	A1-2G	8	18.5
G81-1DA	10	20	G71-1	8	9.5
G81-1DB	10	20	M27-1G	8	10.5
			M56-1WO	unk	unk

Figure 3. Typical Cross-Section of a Cylindrical Underground Storage Tank at the GDSCC

SECTION III

ANTENNA SITES AND THEIR UNDERGROUND STORAGE TANKS AT THE GOLDSTONE COMPLEX

The following is a brief historical description of the six NASA/JPL antenna-sites at Goldstone (Figure 4). Four of these antenna-sites and the Goldstone Dry Lake Airport were involved in the NASA/JPL leak-detection and monitoring plan for the 27 underground storage tanks at the GDSCC. A list of the 27 USTs at the GDSCC and their characteristics is presented in Table 1.

A. OPERATIONAL DEEP SPACE STATIONS (DSSs)

1. Echo Site DSS 12 (Echo Station)

Originally built in 1959, the 26-meter (85-ft) antenna first was used in 1960 in support of the Echo Project, an experiment to transmit voice communications Coast-to-coast by bouncing radio signals off the reflective Mylar surface of a passive ballon-type satellite. In 1978, the antenna was extended to 34 meters (111.5 ft). Eleven USTs at the Echo Site were involved in the TDA leak-detection and monitoring plan.

2. Mars Site DSS 14 (Mars Station)

Built in 1966, the 64-meter (210 ft) antenna, standing more than 234 ft tall, permitted the DSN's transmitter power and reciever sensitivity to increase 6.5 times compared to that of a 26-meter antenna. It also extended the range of the DSN into deep space by 2.5 times. The 64-meter parabolic dish is to be extended to 70 meters (230 ft) in time to be ready for the Voyager 2 spacecraft's encounter with the planet Neptune in August 1989. Seven USTs were tested at the Mars Site.

3. Mars Site DSS 15 (Uranus Station)

Built in 1984, this latest antenna-addition at the Goldstone DSCC is a 34-meter (111.5-ft), high-efficiency (HEF) antenna that first was used to support the Voyager 2 spacecraft's encounter with the planet Uranus in January 1986.

4. Apollo Site DSS 16 (Apollo Station)

This 26-meter (85 ft) antenna, built in 1965 by the NASA Goddard Space Tracking and Data Network (STDN) to support the manned Apollo missions to the Moon, was transferred to the DSN in October 1984. The antenna is used to support satellites in both low- and high-Earth orbits as well as STS (Space Shuttle) missions. Two USTs were tested at the Apollo Site.

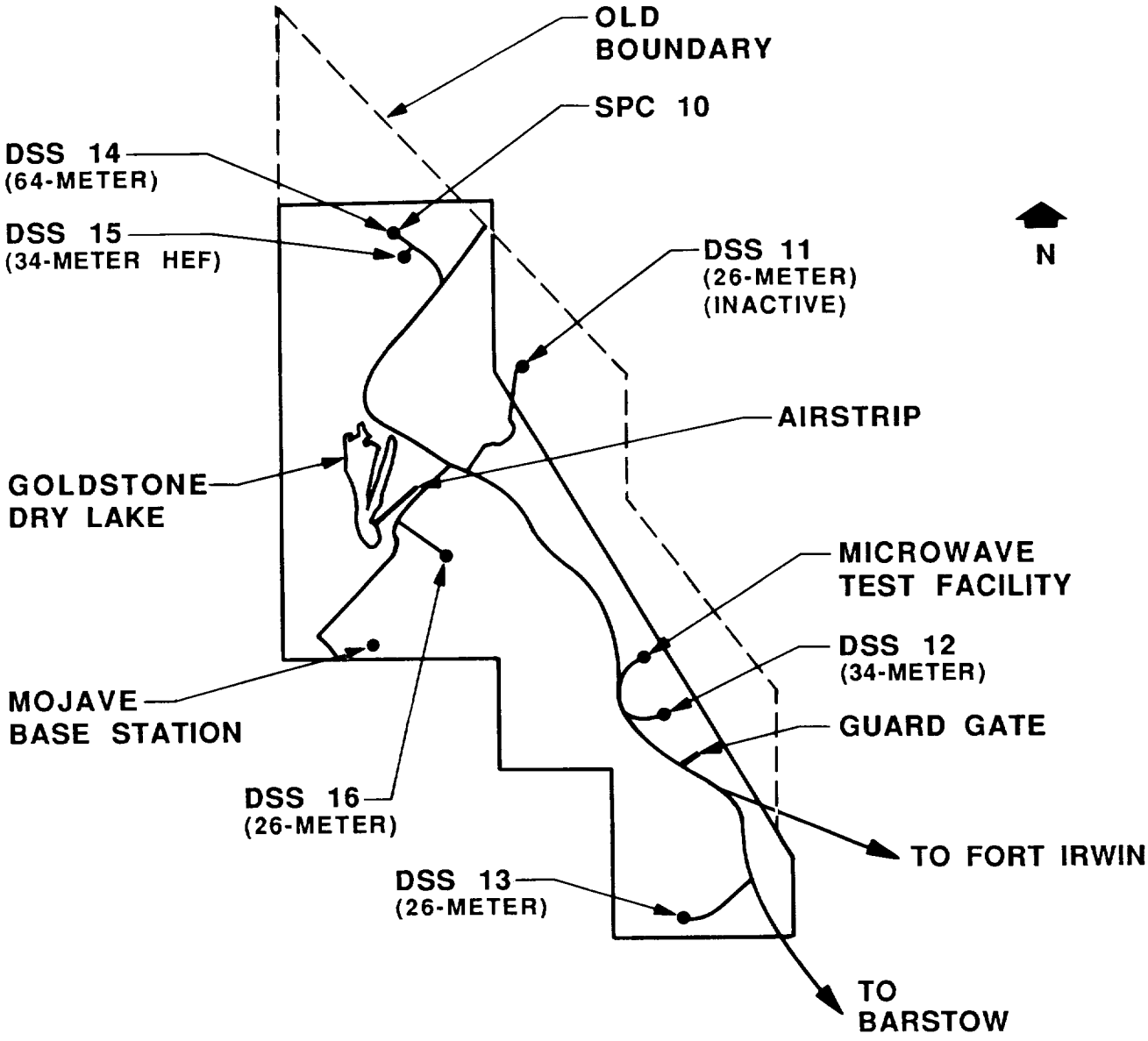


Figure 4. Schematic Map of the Goldstone DSCC Showing Locations of the Six NASA Deep Space Stations (DSSs)

B. RESEARCH AND DEVELOPMENT DEEP SPACE STATION

1. Venus Site DSS 13 (Venus Station)

The 26-meter (85-ft) antenna at the Venus Site, originally was located at the Echo Site, and was moved here in 1962. It first was used in a radar astronomy study of the planet Venus. New systems and equipment are thoroughly tested here for performance and reliability before they operationally are introduced into the DSN.

C. DEACTIVATED DEEP SPACE STATION

1. Pioneer Site DSS 11 (Pioneer Station)

Built in 1958, the 26-meter (85 ft) antenna first was used in support of the Pioneer 3 spacecraft mission. The antenna was deactivated in 1981, and in 1985, the Pioneer antenna-site was designated a National Historical Landmark by the U.S. Department of Interior. In 1986, the Pioneer antenna-site was returned to the U.S. Army and is no longer located within the Goldstone Complex.

D. NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA): MOJAVE BASE SITE

In addition to the six NASA/JPL DSSs the Goldstone Complex also has a 12-meter (40-ft) antenna station at the Mojave Base Site, located near DSS 16, the Apollo Site. This antenna now is operated by NOAA. Six USTs were tested at the Mojave Base Site.

E. GOLDSTONE DRY LAKE AIRPORT TERMINAL

One of the 27 USTs involved in the TDA leak-detection and monitoring plan is not located at an antenna site but at the now-closed Goldstone Dry Lake Airport Terminal.

Table 1. Characteristics of 27 Underground Tanks at the GDSCC[a]

Tank No.	Year Installed	Capacity (gallons)	Construc-tion	Tank Contents
ECHO SITE	(11 TANKS)			
G25-1G	1961	10,000	Carbon Steel (CS)	Unleaded Gasoline[b]
G25-2G	1969	10,000	CS	Unleaded Gasoline[c]
G42-1G	1969	2,000	CS	Unleaded Gasoline
G42-2D	1969	2,000	CS	Diesel[b]
TF-3D	1974	12,000	CS	Diesel[b]
TF-4D	1974	12,000	CS	Diesel[b]
G27-1D	1961	12,000	CS	Diesel
G27-2D	1961	12,000	CS	Diesel
G27-3D	1960	15,000	CS	Diesel
G24-1D	1973	12,000	CS	Diesel
G24-2D	1973	12,000	CS	Diesel
MARS SITE	(7 TANKS)			
G81-1DA	1965	12,000	CS	Diesel
G81-1DB	1965	12,000	CS	Diesel
G81-2D	1984	12,000	Carbon Steel/ Fiberglass (CS/FG)	Diesel

[a]Tanks at the GDSCC are presently not equipped with secondary containment, leak detection systems, or cathodic protection, other than surface coatings. Prior to the TDA testing program, no releases due to leaking tanks had been reported.

[b]Tank was cleaned, inerted and sealed for temporary closure.

[c]Tank was cleaned, inerted, and filled with concrete (abandoned in place).

Table 1. (Cont'd)

Tank No.	Year Installed	Capacity (gallons)	Construc-tion	Tank Contents
G81-3D	1984	12,000	CS/FG	Diesel
14-1WO	1973	940	CS	Waste Oil
14-1HO	1971	10,000	CS	Hydraulic Oil
14-2HO	1971	10,000	CS	Hydraulic Oil
MOJAVE BASE SITE	(6 TANKS)			
M9-1D	1964	24,000	CS	Diesel
M9-2D	1964	24,000	CS	Diesel[b]
M9-3D	1964	24,000	CS	Diesel[b]
M9-4D	1964	500	CS	Waste Oil[b]
M56-IWO	1964	7,500	CS	Waste Oil[b]
M27-1G	1960	4,000	CS	Unleaded Gasoline
APOLLO SITE	(2 TANKS)			
A1-1G	1964	4,000	CS	Unleaded Gasoline[b]
A1-2G	1964	7,500	CS	Unleaded Gasoline[b]
GOLDSTONE DRY LAKE AIRPORT TERMINAL AIRPORT			(1 TANK)	
G71-1	1966	2,000	CS	Aviation Gasoline[b]

SECTION IV

LOCAL REGULATIONS CONCERNING UNDERGROUND STORAGE TANKS THAT CONTAIN HAZARDOUS LIQUIDS

A. COUNTY LAWS CONCERNING UNDERGROUND STORAGE OF HAZARDOUS SUBSTANCES

In December 1983, laws concerning regulations for the permitting, testing and management of USTs were adopted by San Bernardino County (in which the Goldstone Complex is located). These regulations are listed in Division 8, Title 3, Underground Storage of Hazardous Substances, of the San Bernardino County Code. Immediately thereafter, becoming effective in January 1984, the State of California also adopted similar regulations as described in the State of California Health and Safety Code, Division 20, Chapter 6.7, Underground Storage of Hazardous Substances.

In January 1986, the Jet Propulsion Laboratory received various documents from the San Bernardino County/Department of Environmental Health Services/Hazardous Waste and Toxic Control Section (SBC/DEHS/HWTCS). The documents, based on Division 8, Title 3 (Underground Storage of Hazardous Substances of the San Bernardino County Code), stated in part:

"State law requires that the owner/operator of underground storage tanks containing hazardous substances installed prior to January 1, 1984 submit a monitoring proposal to the County of San Bernardino Department of Environmental Health Services. The proposal must be approved by this Department prior to implementation of the monitoring program. The County of San Bernardino developed an Underground Storage Tank ordinance prior to January 1, 1984. This gives the County the authority to adopt monitoring standards which meet the intent of the State standards.

"This mailing includes the Draft Standards for Monitoring Underground Storage Tanks in the County of San Bernardino. The County of San Bernardino Board of Supervisors will be considering these standards for adoption. Under these regulations a monitoring proposal must be submitted by May 31, 1986 and once approved, implemented by January 1, 1987."

The SBC/DEHS/HWTCS documents included a chart that outlined the 14 alternatives that could be used for the monitoring of USTs (Table 2). Although Table 2 is marked "Draft," it is an official, legally binding document issued by the SBC/DEHS/HWTCS. In addition, the documents contained a checklist that outlined the information that had to be included in a typical leak-detection plan for underground, hazardous-material, storage facilities (Table 3).

B. SELECTION OF AN ENGINEERING FIRM TO PREPARE AND SUBMIT AN UNDERGROUND TANK LEAK-DETECTION AND MONITORING PLAN FOR THE GDSCC AS REQUIRED BY DIVISION 8, TITLE 3, OF THE SAN BERNARDINO COUNTY CODE

In response to the SBC/DEHS/HWTCS regulations, the JPL Architects-Engineers Services Board (A-ESB) convened on January 22, 1986, and from a list of 5 engineering firms under consideration selected M.B. Gilbert Associates (MBGA, Long Beach, California) "to conduct an audit of the NASA Goldstone DSN

Table 2. Monitoring Alternatives for Underground Storage Tanks

DEHS
DEPARTMENT OF ENVIRONMENTAL HEALTH SERVICES
COUNTY OF SAN BERNARDINO
385 N ARROWHEAD AVENUE
SAN BERNARDINO, CA 92415

HAZARDOUS WASTE AND TOXIC
CONTROL SECTION
(714) 383-1356
(714) 383-3354

RICHARD L. ROBERTS, R.S., MPH
DIRECTOR

County of San Bernardino

ALTERNATIVES	DESCRIPTION/METHOD	VADOSE ZONE MONITORING	GROUNDWATER MONITORING	TANK PRECISION TESTING	RETROFIT WITH CONTAINMENT FILL BOX	SOIL SAMPLING ANALYSIS	RETROFIT LINE LEAK DETECTORS	INVENTORY CONTROL BY STICK/TAPE METHODS	COMMENTS AND ADDITIONAL REQUIREMENTS
1	REPLACE TANK(S)								CONTINUOUS MONITORING AND SECONDAR CONTAINMENT MUST BE PROVIDED. PRO VIDES SUPERIOR GROUNDWATER PROTECTIC
2	PERMANENT CLOSURE					ONE TIME			SEE SAN BERNARDINO COUNTY CLOSURE STANDARDS
3	TEMPORARY CLOSURE	VARIABLE	VARIABLE	VARIABLE					TANK TESTING VADOSE ZONE, GROUNDWATER, AND SOIL SAMP-LING MAY BE REQUIRED.
4	ALL TANKS DAILY VISUAL INSPECTIONS					VARIABLE			MUST BE PERFORMED WHERE APPLICABLE
5	ALL TANKS MONTHLY PRECISION TESTING			MONTHLY				REQUIRED	
6	ALL TANKS IN HIGH GROUNDWATER AREAS (0-30 FEET)		VARIABLE DEPENDING ON GROUNDWATER USE	ANNUAL	REQUIRED	ONE TIME	WHERE APPLICABLE	REQUIRED	FOR USE IN ENVIRONMENTALLY SENSI-TIVE GROUNDWATER AREAS, I.E., GW RECHARGE AREAS NEAR WATER SUPPLY WELLS REGARDLESS OF DEPTH TO GW.
7	ALL TANKS IN MODERATE DEPTH GROUNDWATER AREAS (30-100 FEET)	CONTINUOUS		ANNUAL	VARIABLE DEPENDING ON DEPTH AND USE OF GROUNDWATER	ONE TIME	VARIABLE, DEPENDING ON APPLICABILITY, DEPTH & USE OF GROUNDWATER	REQUIRED	
8	ALL TANKS IN DEEP GROUNDWATER AREAS (GREATER THAN 100 FEET)	DAILY TO WEEKLY		ANNUAL		ONE TIME		REQUIRED	VADOSE ZONE MONITORING, FREQUENCY DEPENDS ON SOIL CONDITIONS AND DEPTH TO GROUNDWATER
9	ALTERNATIVE MONITORING PLAN CASE BY CASE APPROVED BY DEHS								REQUIREMENTS TO BE DETERMINED BY MONITORING METHOD CHOSEN
10	ALL TANKS INTERIM MONITORING			ANNUAL				REQUIRED	
11	STANDBY FUEL TANKS AND WASTE OIL TANKS CAPACITY ≤ 1,000 GAL.		SEE COMMENTS	ANNUAL		SEE COMMENTS		REQUIRED	WEEKLY TANK GUAGING REQUIRED, GROUNDWATER MUST BE MORE THAN 50 FT. DEEP, OTHERWISE ALTER-NATIVE #6 IS APPLICABLE.

THE FOLLOWING ALTERNATIVES MAY BE USED FOR MOTOR VEHICLE FUELS ONLY.

12	MOTOR VEHICLE FUELS IN HIGH GROUNDWATER AREAS (0-30 FEET)		VARIABLE DEPENDING ON GROUNDWATER USE	ANNUAL	REQUIRED	ONE TIME	REQUIRED	REQUIRED	GROUNDWATER OR VADOSE ZONE MON-ITORING WILL BE REQUIRED IN EN-VIRONMENTALLY SENSITIVE AREAS, I.E., GROUNDWATER RECHARGE NEAR WATER SUPPLY WELLS REGARDLESS OF DEPTH TO GROUNDWATER. * PRECISION TEST REQUIRED ONCE EVERY FIVE YEARS IF IN TANK LEVEL SENSING DEVICE IS USED. SEE REQUIREMENTS FOR IN TANK LEVEL SENSING.
13	MOTOR VEHICLE FUELS IN MODERATE DEPTH GROUND-WATER AREAS (30-100 FT)	VARIABLE		ANNUAL*	VARIABLE	ONLY WHEN MONITORING WELLS ARE REQUIRED	REQUIRED	*REQUIRED	
14	MOTOR VEHICLE FUELS IN DEEP GROUNDWATER AREAS (GREATER THAN 100 FEET)			ANNUAL*			REQUIRED	*REQUIRED	

(TANKS WHICH STORE MOTOR VEHICLE FUELS MAY USE ALTERNATIVES 1 THROUGH 14)

sites for compliance with applicable EPA regulations and federal and state environmental laws and to prepare a written report of findings and recommendations."

On March 2, 1986, the A-ESB met again and approved an extension of the existing MBGA contract to permit MBGA to prepare and to submit to the SBC/DEHS/HWTCS a leak-detection and monitoring plan for the underground storage tanks at the Goldstone Deep Space Communications Complex.

Table 3. Checklist for Required Information to be Included in a Leak-Detection Plan for Underground Hazardous-Materials Storage Facilities

A. Name and address of facility.

B. Name and address of tank owner.

C. Description of tank facility including:[a]

1. Size, age, and materials of construction of tank(s) and piping.
2. Any secondary containment, leak detection system, and cathodic protection system that may be present.
3. Current and past materials stored in the tank(s).
4. Description of any leaks or product loss, date of loss, and extent of loss.
5. Any repairs made to tanks and piping.

D. Description of hydrology of the facility including:

1. Depth to groundwater, overage, and possible maximum and minimum;
2. Quality of groundwater, general direction, and flow.
3. Usage of groundwater including: location of nearest well; and surface water.
4. Soil types at facility.

E. Sketch of facility showing:

1. Tanks (existing and abandoned);
2. Piping (existing and abandoned);
3. Pumps (including: type, i.e., suction, pressure, etc.);
4. Secondary containment, if present;
5. Existing and proposed leak detection equipment, such as monitoring wells, vadose zone monitors, alarms, and control boxes;

Table 3. (Cont'd)

6. North Arrow (direction);

7. Property line;

8. Nearest intersection or road; and

9. Any on-site wells, surface water, or water recharge basins.

F. Description of proposed leak detection system including:

1. Identification of monitoring alternative.

2. List of proposed equipment.

3. Name of firm to install proposed equipment.

4. Inventory schedules and procedures.

5. Tank testing schedule and procedures.

6. Monitoring schedule.

7. Maintenance schedule.

8. Maintenance and monitoring of cathodic protection system, if applicable.

9. Name of person responsible for leak detection.

10. Reporting procedures, should a leak be detected.

11. Copy of agreement between owner and operator, outlining duties and responsibilities of each party, pertaining to leak detection and monitoring.

12. Schedule of compliance for implementation of leak detection system.

[a]This information may be found in the Hazardous Substance Statement filed with the State Water Resources Control Board, or in the current application for San Bernardino's County permit to operate underground storage tanks.

SECTION V

THE UNDERGROUND STORAGE TANK LEAK-DETECTION AND MONITORING PLAN FOR THE GDSCC

The leak-detection and monitoring plan for underground storage tanks, as prepared by MBGA, was submitted as required to the SBC/DEHS/HWTCS on May 30, 1986.

A meeting then was held on June 3, 1986 between NASA/JPL/Goldstone personnel and members of the SBC/DEHS/HWTCS staff. Because of questions raised during this meeting, a revised plan, dated July 7, 1986, was prepared by MBGA. The revised plan, incorporating the comments made by the SBC/DEHS/HWTCS staff at the June 3 meeting, was submitted at a second joint meeting held on July 31, 1986 and was approved.

At this July 31, 1986 meeting, NASA/JPL and MBGA personnel explained that Goldstone could not meet the January 1, 1987 deadline for full compliance with all the required regulations because of several factors, including the NASA/JPL budget-funding cycle, and the necessity to maintain operations of the antenna tracking stations. In their sympathetic response, the SBC/DEHS/HWTCS staff waived its demands for full compliance provided JPL/Goldstone would implement the following four actions before January 1, 1987:

(1) Precision testing of all underground storage tanks.

(2) Those underground storage tanks that no longer are to be used are to be steam-cleaned to remove any residual material in the tank. The cleaned tanks then are filled with an inert gas (carbon dioxide) to purge them of any flammable vapors to levels that preclude any fire or explosion hazard and then are sealed with a concrete cap. The process of filling an empty, cleaned tank with an inert gas is referred to as "inerting." The lower explosive-level (LEL) readings on inerted tanks are presented in Appendix C. These temporarily closed tanks must be excavated and removed no later than 1989, and must be disposed of in an environmentally acceptable manner.

(3) Those undergound storage tanks that are to remain in service, must be checked periodically with a dip stick, or any other SBC/DEHS/HWTCS-approved method, to determine possible loss of contents. The frequency of checking liquid levels in tanks, by Goldstone personnel, is as follows:

    (a) Tanks serving both vehicular gasoline and diesel fuel dispensing pumps and tanks of diesel oil serving electrical power generators must be checked daily (five days/week).

    (b) Hydraulic oil and waste oil tanks must be checked every week.

(4) After completion of the precision leak-testing and tank-closure activities, JPL agreed to comply with the SBC/DEHS/HWTCS requirements for the reporting of ongoing tank monitoring (Table 4).

On August 31, 1986, in addition to the previously submitted, revised, leak-detection and monitoring plan dated July 7, 1986, NASA/JPL also submitted additional planning and schedule information concerning 32 underground storage tanks at the Goldstone Complex (Table 5). This revised and amended plan and schedule, depicted in Table 5 and based upon the July 31, 1986, approved plan and schedule, is considered to be the original monitoring plan and schedule. For reasons described in Table 5, five USTs were eliminated from the testing program to leave a total of 27 USTs to be tested.

Two further supplements to these planning and schedule plans were submitted to the SBC/DEHS/HWTCS as follows:

(1) Supplement 1 to the original plan is presented in Table 6. This first supplemental plan was developed because work at the GDSCC did not proceed according to the original plan due to difficulties encountered in the precision leak-testing program. This first supplement plan was submitted to the SBC/DEHS/HWTCS inspector during his visit to the Goldstone Complex on January 8, 1987. This first supplementary plan indicated what NASA/JPL had done and what remained to be done during the extension of the UST-work deadline granted by the SBC/DEHS/HWTCS.

(2) Supplement 2 to the original plan is presented in Table 7. This second supplemental plan was submitted on February 11, 1987, by NASA/JPL personnel along with a letter informing SBC/DEHS/HWTCS of the completion of the UST testing and closure work. The letter submitted to SBC/DEHS/HWTCS is presented in Appendix E. This second supplementary plan indicated the completed UST work carried out by NASA/JPL at the Goldstone Complex.

Table 4. Underground Tank Reporting Requirements Applicable to the GDSCC as per San Bernardino County Draft Standards Under Division 8, Title 3, December 1983

Report Description	Conditions for Reporting
(1) Precision Testing Report	Within 30 days of completion of tests, the tank owner shall provide SBC/DEHS/HWTCS with a report which includes: - Procedures used for test. - Test results used in determining volumetric rate of product loss. - Volumetric rate of product loss. - Any other test results.
(2) Inventory Reconciliation (daily inventory methods)	On a quarterly basis, submit a statement to SBC/DEHS/HWTCS that either data are within allowable variations, or a listing of the dates and variations that exceed the allowable variations. If inventory reconciliation indicates a loss or gain of product/waste over the specified amount, SBC/DEHS/HWTCS shall be notified within one working day.
(3) Inventory Reconciliation using in-tank level-sensing devices	Printouts must be maintained with inventory records and be made available for inspection. Readings are taken and recorded automatically twice daily. Device operated in leak-detection mode at least monthly. All reports listed in Item 2 above, are required under Item 3. Also, SBC/DEHS/HWTCS must be notified within 1 working day of a detected leak as per SBC/DEHS/HWTCS definition.
(4) Soil Analyses	If analyses indicate that an unauthorized release has occurred, SBC/DEHS/HWTCS shall be notified within 5 days of receipt of lab results.

Table 5. Monitoring Plan and Schedule for Underground Storage Tanks (USTs) at Goldstone DSCC, as Approved by the San Bernardino Department of Environmental Health Services (July 31, 1986)[a]

Tank No.	Permit Type	Precision Test Schedule	Tank Gauging Schedule	Comments	Estimated Tank Removal Date	Estimated Replacement Date
	ECHO SITE					
G25-1G	Operating	A-86[b]	D-86[c]	Frequent withdrawals	1989	1989
G25-2G	Operating	A-86	D-86	Frequent withdrawals	1989	1989
G42-1G	Operating	A-86	D-86	Frequent withdrawals	1989	1989
G42-2G	Operating	A-86	D-86	Frequent withdrawals	1989	1989
TF-3D	Operating	N/A[d]	N/A	Application for temporary closure to be submitted. Request to waive testing requirements, since tank has never been used. Seal tank during temporary closure period	1989	None
TF-4D	Operating	N/A	N/A	Same as for TF-3D	1989	None

[a]This table lists 32 underground storage tanks. The final leak-detection and monitoring plan adopted by NASA/JPL/Goldstone and approved by SBC/DEHS/HWTCS involved only 27 tanks. The five fewer tanks in the plan, deleted from this Table, involve 3 concrete tanks that are excluded from underground storage tank regulations because they do not corrode (14-2WT and 14-3WT at the Mars Site, and G53-1 at the Venus Site), and two tanks that no longer are part of the Goldstone Complex (G3-1D and G10-1G at the Pioneer Site).

[b]A-86 means tanks to be precision tested annually, beginning in 1986.

[c]D-86 means daily gauging of tanks.

[d]N/A means not applicable.

Table 5. (Cont'd)

Tank No.	Permit Type	Precision Test Schedule	Tank Gauging Schedule	Comments	Estimated Tank Removal Date	Estimated Replacement Date
G27-1D	Operating	F-86[e]	N/A	Precision test in 1986. Inert and seal tank until used. If used, precision test prior to use and gauge weekly. If tank is used for more than a year, annual precision testing and weekly gauging will be required.	None[f]	None
G27-2D	Operating	F-86	N/A	Same as for G27-1D.	None	None
G27-3D	Operating	A-86	W-86[g]	Stand-by use.	1989	None
G24-1D	Operating	A-86	W-86	Stand-by use.	1989	1989
G24-2D	Operating	A-86	W-86	Stand-by use.	1989	1989
	MARS SITE					
G81-1DA	Interim	A-86	W-86	Stand-by use.	1989	1989
G81-1DB	Interim	A-86	W-86	Stand-by use.	1989	1989
G81-2D	Interim	A-86	W-86	Stand-by use.	1989	1989
G81-3D	Interim	A-86	W-86	Stand-by use.	1989	1989

[e]F-86 means tanks to be precision tested every five years, beginning in 1986.

[f]None means that current plans are to remove but not replace an existing tank.

[g]W-86 means weekly gauging of tanks.

Table 5. (Cont'd)

Tank No.	Permit Type	Precision Test Schedule	Tank Gauging Schedule	Comments	Estimated Tank Removal Date	Estimated Replacement Date
14-1WO	Interim	A-86	W-86	Infrequent use.	1989	None
14-2WT	Exempt	N/A	N/A	Intercepter.	None	None
14-3WT	Exempt	N/A	N/A	Intercepter.	None	None
14-1HO	Interim	A-86	W-86	Stand-by use.	1989	1989
14-2HO	Interim	A-86	W-86	Stand-by use.	1989	1989
	MOJAVE BASE SITE					
M9-1D	Operating	A-86	W-86	Stand-by use.	1989	None
M9-2D	Operating	A-86	W-86	Stand-by use.	1989	None
M9-3D	Operating	A-86	W-86	Stand-by use.	1989	None
M9-4D	Operating	1986[h]	N/A	Clean, inert, and seal tank pending removal. Application for temporary closure to be submitted.	1989	None
M56-1WO	Operating	1986	N/A	Same as M9-4D.	1989	None
M27-1G	Operating	A-86	D-86	Frequent use.	1989	1989

[h]1986 means tanks to be precision tested one time, in 1986 only.

Table 5. (Cont'd)

Tank No.	Permit Type	Precision Test Schedule	Tank Gauging Schedule	Comments	Estimated Tank Removal Date	Estimated Replacement Date
	APOLLO SITE					
A1-1G	Operating	1986	N/A	Clean, inert, and seal tank pending removal. An application for temporary closure to be submitted.	1989	None
A1-2G	Operating	1986	N/A	Same as for A1-1G	1989	None
	VENUS SITE					
G53-1	Exempt	N/A	N/A	Intercepter.	None	None
	PIONEER SITE					
G3-1D	Operating	1986	N/A	Clean, inert, and seal pending closure. Application for temporary closure to be submitted.	1989	None
G10-1G	Operating	1986	N/A	Same as for G3-1D	1989	None
	GOLDSTONE DRY LAKE AIRPORT					
G71-1	Operating	1986	N/A	Clean, inert, and seal pending closure. Application for temporary closure to be submitted.	1989	None

Table 6. Supplement Number 1 to Original Plan and Schedule Presented in Table 5*. Monitoring Plan and S dule for Underground Storage Tanks (USTs) at Goldstone DSCC as Approved by the SBC/DEHS/HWTCS (July 31, 36)

Tank No.	Tank Installation (Year)	Tank Capacity (Gallons)	Stored Product	Date Tank Testing Complete	Re-testing Proposed	Tank Pass	Tank Fail	Piping Pass	Piping Fail	Total Number of Tests Performed	Test Inconclusive, Air in Tank	Temporary Closure Date-Steam Cleaned, Inerted & Seal Complete	Temporary Closure Date-Steam Cleaned, Inerted & Seal Proposed	Comments
ECHO SITE														
G25-1G	1961	10 K	Unleaded	12-19-86	-	P			F	2				tanks, abandon and fill in lace. Will build new gas dis- ensing station by 1/31/87**
G25-2G	1969	10 K	"	12-17-86	-	P			F	2	Yes**			
G42-1G	1969	2 K	"	12-11-86	-	P		P		1				omplete
G42-2D	1969	2 K	Diesel	12-02-86	-	P			F	1		12-17-86		omplete**
TF-3D	1974	12 K	"	12-03-86	-	P		P		1		12-17-86		omplete
TF-4D	1974	12 K	"	12-03-86	-	P		P		1		12-17-86		omplete
G27-1D	1961	12 K	"	12-04-86	-	P		P		2				omplete**
G27-2D	1961	12 K	"	12-04-86	-	P		P		2				omplete**
G27-3D	1960	15 K	"	12-04-86	-	P		P		1				omplete
G24-1D	1973	12 K	"	12-18-86	-	P		P		3				omplete
G24-2D	1973	12 K	"	12-18-86	-	P		P		3				omplete
MARS SITE														
G81-1DA	1965	12 K	Diesel	12-18-86	1-15 to 1-30-87	P			F	1	Yes			
G81-1DB	1965	12 K	"	12-18-86	1-15 to 1-30-87	P			F	1	Yes			
G81-2D	1984	12 K	"	12-16-86	-	P		P		1				omplete
G81-3D	1984	12 K	"	12-16-86	-	P		P		1				omplete
14-1WO	1973	940	Waste Oil	12-11-86	-	P		P		1				omplete
14-1HO	1971	10 K	Hydr. Oil	12-12-86	-	P		P		1				omplete
14-2HO	1971	10 K	"	12-12-86	-	P		P		1				omplete
MOJAVE BASE SITE														
M9-1D	1964	24 K	Diesel	12-20-86	-	P		P		1				omplete
M9-2D	1964	24 K	"	12-17-86	-	P			F	1			01-15 to 01-31-87**	
M9-3D	1964	24 K	"	12-17-86	-	P			F	1			"	
M9-4D	1964	500	Waste Oil	12-09-86	-	P		P		1		12-17-86		omplete
M56-1WO	1964	7.5 K	"	12-09-86	-	P		P		1		12-17-86		omplete
M27-1G	1960	4 K	Unleaded	12-19-86	-	P		P		2				omplete
APOLLO SITE														
A1-1G	1964	4 K	Unleaded	12-05-86	-	P		P		1		12-17-86		omplete
A1-2G	1964	7.5 K	"	12-05-86	-	P			F	1		12-17-86		omplete
GOLDSTONE DRY LAKE AIRPORT														
G71-1	1966	2 K	Av. Gas	12-09-86	-	P		P		1		12-17-86		omplete

*This Supplement No. 1 was submitted to an SBC/DEHS/HWTCS Inspector who was on-site at the Goldstone Complex on January 8, 1987.

**Denotes a change from original Table 5 that was submitted on July 31, 1986.

2 FOLDOUT FRAME

FOLDOUT FRAME

Table 7. Supplement Number 2 to Original Plan Presented in Table 5*. Monitoring Plan and Schedule for Underground Storage Tanks (USTs) at Goldstone DSCC as Approved by the SBC/DEHS/HWTCS (July 31, 1986)

Tank No.	Tank Installation (Year)	Tank Capacity (Gallons)	Stored Product	Date Tank Testing Complete	Re-testing Proposed	Tank Pass	Tank Fail	Piping Pass	Piping Fail	Total Number of Tests Performed	Temporary Closure Date-Steam Cleaned, Inerted & Seal Complete Proposed	Comments
ECHO SITE												
G25-1G	1961	10 K	Unleaded	12-19-86	-	P			F	2	01-23-87	Complete**
G25-2G	1969	10 K	"	12-17-86	-	P***			F	2	01-27-87	Abandoned and filled in place**
G42-1G	1969	2 K	"	12-11-86	-	P		P		1		Complete
G42-2D	1969	2 K	Diesel	12-02-86	-	P			F	1	12-17-86	Complete**
TF-3D	1974	12 K	"	12-03-86	-	P		P		1	12-17-86	Complete
TF-4D	1974	12 K	"	12-03-86	-	P		P		1	12-17-86	Complete
G27-1D	1961	12 K	"	12-04-86	-	P		P		2		Complete**
G27-2D	1961	12 K	"	12-04-86	-	P		P		2		Complete**
G27-3D	1960	15 K	"	12-04-86	-	P		P		1		Complete
G24-1D	1973	12 K	"	12-18-86	-	P		P		3		Complete
G24-2D	1973	12 K	"	12-18-86	-	P		P		3		Complete
MARS SITE												
G81-1DA	1965	12 K	Diesel	01-21-87		P		P		2		Complete
G81-1DB	1965	12 K	"	01-21-87		P		P		2		Complete
G81-2D	1984	12 K	"	12-16-86	-	P		P		1		Complete
G81-3D	1984	12 K	"	12-16-86	-	P		P		1		Complete
14-1WO	1973	940	Waste Oil	12-11-86	-	P		P		1		Complete
14-1HO	1971	10 K	Hydr.Oil	12-12-86	-	P		P		1		Complete
14-2HO	1971	10 K	"	12-12-86	-	P		P		1		Complete
MOJAVE BASE SITE												
M9-1D	1964	24 K	Diesel	12-20-86	-	P		P		1		Complete
M9-2D	1964	24 K	"	12-17-86	-	P			F	1	01-20-87	Complete**
M9-3D	1964	24 K	"	12-17-86	-	P			F	1	01-20-87	Complete**
M9-4D	1964	500	Waste Oil	12-09-86	-	P		P		1	12-17-86	Complete
M56-1WO	1964	7.5 K	"	12-09-86	-	P		P		1	12-17-86	Complete
M27-1G	1960	4 K	Unleaded	12-19-86	-	P		P		2		Complete
APOLLO SITE												
A1-1G	1964	4 K	Unleaded	12-05-86	-	P		P		1	12-17-86	Complete
A1-2G	1964	7.5 K	"	12-05-86	-	P			F	1	12-17-86	Complete
GOLDSTONE DRY LAKE AIRPORT												
G71-1	1966	2 K	Av. Gas	12-09-86	-	P		P		1	12-17-86	Complete

*This Supplement No. 2 was submitted by letter on February 11, 1987 to the SBC/DEHS/HWTCS, upon completion of the UST work.

**Denotes a change from original Table 5 that was submitted July 31, 1986.

***Test inconclusive. Air in tank.

SECTION VI

IMPLEMENTATION OF THE LEAK-DETECTION AND MONITORING PLAN FOR UNDERGROUND STORAGE TANKS AT THE GOLDSTONE COMPLEX

A. SELECTION OF THE CONTRACTOR

At the end of October 1986, following acceptance by the SBC/DEHS/HWTCS of the revised plans and schedules submitted by NASA/JPL, letters were sent to five contractors asking for bids for the job of both precision testing and temporary closure (steam cleaning/inerting/sealing) of 27 underground storage tanks at the Goldstone Complex. The deadline for submission of bids was November 10, 1986.

Five contractors were contacted to submit bids. Kern Environmental Service (KES), a division of Kern Backhoe Service, Inc., Bakersfield, California, was selected to carry out the UST work at the Goldstone Complex beginning on December 1, 1986. The work was completed on February 11, 1987 and resulted in the retention of 15 USTs now operative, temporary closure of 11 USTs, and the abandonment (in place) of one tank (Table 7). A letter from NASA/JPL informing SBC/DEHS/HWTCS of the completion of this work is presented in Appendix E. A chronology of the NASA/JPL Underground Storage Tank Precision Leak-Testing and Monitoring program carried out at the Goldstone Complex is presented in Table 8 and a Milestone Chart is presented in Figure 5.

B. PRECISION LEAK-TESTING OF USTs

1. Testing Procedures

There are three accepted and approved leak-test procedures to test the integrity of underground tanks. All three measure the rate of leakage by the detection of any change with time in a hydrostatic head of liquid in a full tank. Although these three different procedures use different methods to detect leaks, all of them can measure leakage rates of as little as 0.05 gallons per hour (equivalent to 1.2 gallons/day). In addition, these three test procedures also can detect the presence of vapor pockets within the tanks, the thermal expansion/contraction of stored liquids, temperature stratification of the stored liquids, evaporation, pressure variations within the tank, and any deflections (bulging) of the ends of a storage tank.

MBGA, after making a comparative analysis of the three test procedures to determine which was best suited for the underground tanks located at the Goldstone Complex, selected the test procedure known as the Horner Ezy-Chek Leak Detection System (H E-C). This test procedure uses a high- and low-liquid level test to differentiate whether a leak is from the tank itself or from its associated piping.

The high-level test, which involves overfilling a tank by an approximately 3-ft high head of liquid contained in a standing vertical tube, determines whether there are leaks in both the tank and its associated piping. The low-level test, which involves filling a tank only to its capacity, determines whether the tank itself leaks. Of course, if a high-level test indicates no leakage, then a low-level test is not conducted.

If a tank or its piping fails to pass the leak test, the result must be reported orally within 24 hr to the SBC/DEHS/HWTCS, and must be followed up with a written report within 5 days.

Final test results must be reported to the SBC/DEHS/HWTCS within 30 days after completion of the testing, and must include the following information:

(1) Procedures used for the leak-detection method.

(2) Observations used to determine the volumetric rate of liquid lost from the tank.

(3) Volumetric rate of liquid lost from the tank.

2. Problems Encountered in the Precision Leak-Testing

Precision testing of 27 GDSCC/USTs was begun by KES on December 1, 1986. Problems were encountered immediately as tank contents began to leak out of manhole covers, gaskets, valves, and other appurtenances associated with the tanks. These non-tank leaks orally had to be reported to the SBC/DEHS/HWTCS as tank failures within 24 hr of the test. A follow-up letter, confirming a leak, had to be submitted within 5 working days.

It became apparent that many of the 27 GDSCC tanks would fail the precision test unless their piping and appurtenances were excavated, the source of any potential leaks identified, and repairs made. This created an unexpected situation because KES had been contracted to test the tanks, not to repair leaks. Personnel from the O&M Contractor at the GDSCC, and from JPL's Section 332 (Ground Antenna and Facilities Engineering Section) then combined their efforts to carry out repairs on UST appurtenances, without interfering with the on-going KES testing.

Each morning, a meeting was held to plan that day's repair activities for each UST, with the repairs to be accomplished before the KES testing equipment was due to arrive at that specific UST site. Daily decisions had to be made concerning whether a tank would be temporarily closed if it were to fail an upcoming precision test, or whether its various appurtenances would then be excavated and repaired, and the UST undergo another precision test. KES cooperated with Goldstone and Section 332 personnel by having its testing personnel participate in these daily meetings, and by scheduling its testing activities and its fuel transports and transfers to accommodate the UST repair efforts.

3. USTs that Passed the Precision Leak-Test and Are Operating at the GDSCC

Of the 27 USTs considered in the final NASA/JPL plan (Table 7), 15 tanks have been retained as operating tanks. They are scheduled to be replaced in 1989.

Of these 15 operating USTs:

(a) Eight (8) USTs passed the precision leak-test the first time they were tested (G42-1G and G27-3D at Echo Site; G81-2D, G81-3D, 14-1WO, 14-1HO, and 14-2HO at Mars Site; and M9-1D at Mojave Base Site).

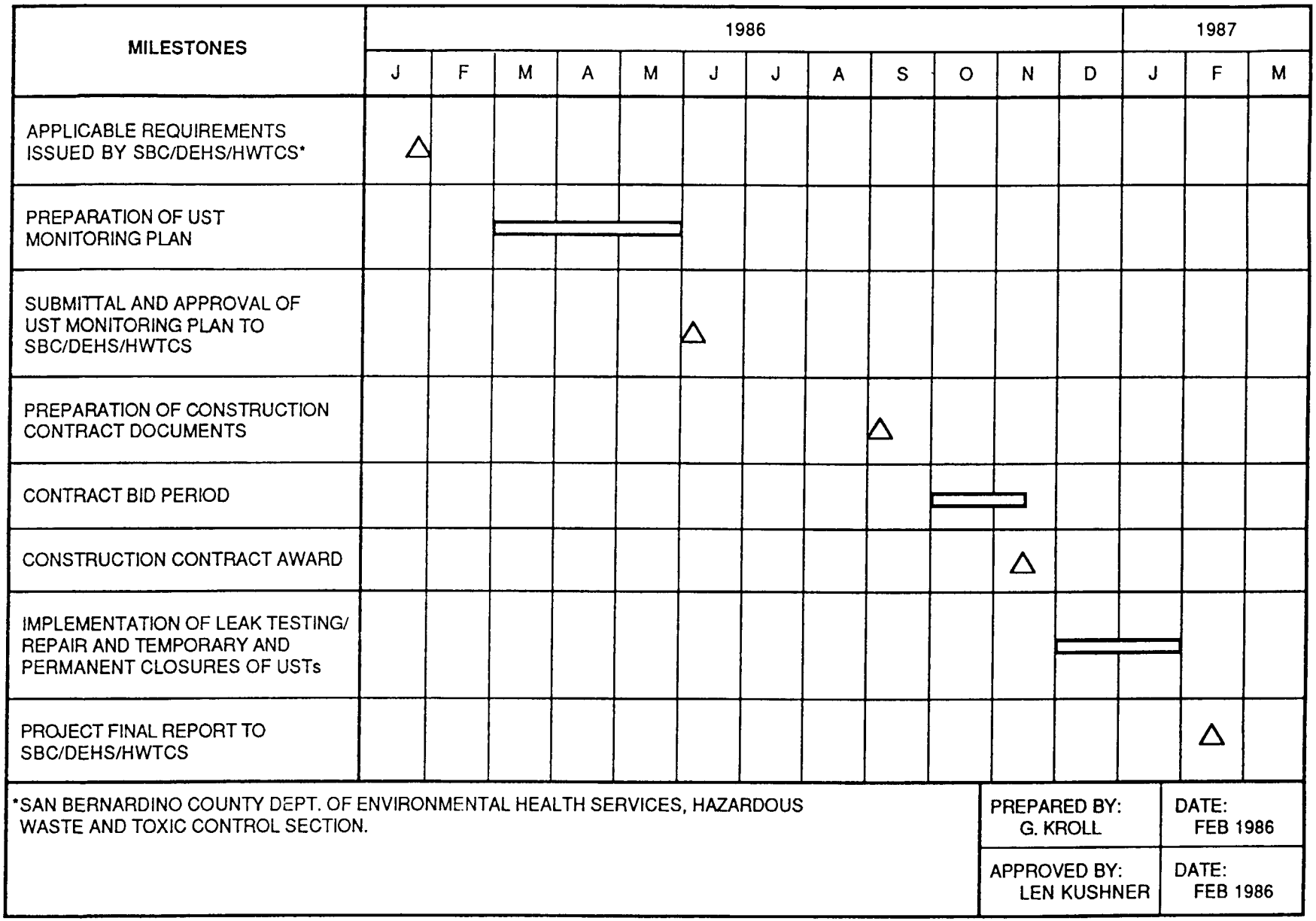


Figure 5. Milestone Chart for Underground Storage Tanks (USTs): Leak-Detection and Tank-Closure Program at the GDSCC

Table 8. Chronology of the Underground Storage Tank Program at the GDSCC

January 1, 1986	NASA/JPL/GDSCC is notified by the San Bernardino County, Department of Environmental Health Sciences, Hazardous Waste and Toxic Control Section (SBC/DEHS/HWTCS) that the GDSCC must submit a plan to describe how NASA/JPL/GDSCC intends to conform to new county regulations that require leak-testing and monitoring of underground storage tanks that contain hazardous materials and that were installed prior to January 1984. The plan must be submitted for approval by May 31, 1986, and once approved must be implemented by January 1, 1987 to avoid severe monetary penalties for non-compliance.
January 22, 1986	The JPL Architects-Engineers Services Board (A-ESB) approved the selection of M.B. Gilbert Associates, Long Beach California, to prepare an environmental audit for the GDSCC.
March 2, 1986	JPL Architects-Engineers Services Board approved an addition to the existing M.B. Gilbert and Associates' environmental audit contract to include MBGA's preparation of an underground storage tank leak-detection test and monitoring plan to be submitted to SBC/DEHS/HWTS.
May 30, 1986	JPL/MBGA submits leak-detection test and monitoring plan to SBC/DEHS/HWTCS.
June 3, 1986	A meeting is held between JPL/MBGA and SBC/DEHS/HWTCS to discuss the submitted leak-detection test and monitoring plan. NASA/JPL and MBGA personnel are asked to submit a revised plan, incorporating comments made by the SBC/DEHS/HWTCS concerning the original plan.
July 7, 1986	A revised leak-detection test, monitor plan and schedule, is prepared by MBGA.
July 31, 1986	In a further meeting between NASA/JPL/Goldstone personnel and the SBC/DEHS/HWTCS, the revised plan and schedule is submitted and is approved. JPL/Goldstone personnel point out, however, that they would not be able to meet the January 1, 1987 deadline to be in full compliance with all new underground tank regulations because of the NASA/JPL budget-funding cycle and the necessity to maintain operation of the Goldstone tracking stations. The SBC/DEHS/HWTCS was sympathetic to NASA/JPL restraints and granted relief to JPL/Goldstone providing the following three activities are implemented before December 31, 1986: (1) precision testing of tanks for leaks, (2) temporary closure of all tanks that no longer will be used, and (3) daily or weekly liquid-level monitoring of all tanks that are to remain in frequent use.

Table 8. (Cont'd)

August 31, 1986	NASA/JPL/Goldstone personnel submit additional planning and schedule information to SBC/DEHS/HWTCS.
September 3, 1986	JPL Architects-Engineers Services Board approved MBGA as engineer to prepare bid documents and to oversee the implementation of the JPL/Goldstone underground storage tank leak-testing and monitoring effort.
October 27, 1986	Letters of invitation to five contractors to bid on the implementation of the NASA/JPL/Goldstone underground storage tank leak-testing and monitoring effort.
October 31, 1986	A job-walk and pre-bid conference is held at the GDSCC for prospective bidders.
November 10, 1986	Contract-bid opening at JPL. Kern Environmental Service (KES), Bakersfield, California, was the successful bidder.
December 1, 1986	KES begins precision testing and temporary closure of underground tanks at the Goldstone Complex.
December 31, 1986	Original deadline for completion of UST work at the GDSCC.
January 6, 1987	Except for eight tanks that had failed the leakage test, all work to comply with the regulations of SBC/DEHS/HWTCS for underground tests were completed. A SBC/DEHS/HWTCS inspector came to Goldstone to survey the site and approved the requested time-extension to repair/retest the above eight tanks.
January 30, 1987	Completion of all work and final compliance with SBC/DEHS/HWTCS requirements.
February 11, 1987	NASA/JPL/Goldstone sent a letter informing SBC/DEHS/HWTCS that NASA/JPL had completed precision testing of 27 underground storage tanks at the GDSCC. In addition, NASA/JPL reported that the cleaning, inerting, sealing and temporary closure of eleven of these tanks and the permanent closure of one tank was completed.
June 15, 1987	Publication of the Final Report documenting the GDSCC Underground Storage Tank Program.

(b) Five (5) USTs passed the precision leak-test after repairs were made and a second test was conducted (G27-1D and G27-2D at Echo Site; G81-1DA and G81-1DB at Mars Site; and M27-1G at Mojave Base Site).

(c) Two (2) USTs passed the precision leak-test after repairs were made twice and a third test was conducted (G24-1D and G24-2D at Echo Site).

4. Transport and Transfer of Fluids Among USTs at the GDSCC

A UST was filled with an appropriate liquid before a test, tested, pumped out after a test, and the liquid then was transported and transferred to another UST for another test. Waste oil tanks were tested with diesel oil as the liquid. Thus, one of the more interesting aspects of the precision leak-testing of USTs by KES involved the transport and transfer from tank-to-tank within the Goldstone Complex of 202,000 gallons of diesel oil, 900 gallons of unleaded gasoline, and 300 gallons of hydraulic oil. In addition, 4,000 gallons of rinse water were recovered from USTs that had been steam-cleaned prior to their temporary or permanent closure.

C. TEMPORARY CLOSURE OF UNDERGROUND STORAGE TANKS

Of the 27 USTs considered in the NASA/JPL plan (Table 7), 11 were temporarily closed for eventual excavation, removal, and disposal in 1989. These temporary closures involved four (4) USTs at Echo Site (G25-1G, G42-2D, TF-3D and TF-4D); four (4) USTs at the Mojave Base Site (M9-2D, M9-3D, M9-4D and M56-1WO); and the single UST at the Goldstone Dry Lake Airport (G71-1). In addition, one UST at the Echo Site, G25-2G, was abandoned, sealed in place, and permanently closed (see Section V, E below). Before permanent closure of the G25-2G tank, soil sample cores were removed in a definite pattern from the vicinity of the tank (Figure 6). The cores then were sent to an EPA-approved laboratory to be analyzed to determine if the tank's contents had escaped into the soil at any time in the past.

Temporary or permanent closure of a UST required steam-cleaning of the tank to remove any residual sludge. Fifteen (15) pounds of "Dry Ice" carbon dioxide then are placed into the cleaned tank for each 1,000 gallons of the tank's volume (to purge it of any flammable vapors to levels that preclude any fire or explosion hazard) and the tank is sealed with a concrete cap. These temporarily closed and stored tanks will be excavated and removed by 1989 and be disposed of in an environmentally suitable manner.

D. INVENTORY CONTROL OF LIQUIDS IN OPERATING TANKS

Of the 27 USTs considered in the NASA/JPL plan (Table 7), 15 now are operating after passing the precision leak-test the first time, or doing so after failing the first test but passing the second or third test following repairs.

The 15 operating USTs involve 6 USTs at Echo Site, 7 USTs at Mars Site, and 2 USTs at Mojave Base Site. The contents of these tanks are inventoried according to the schedule described in Section IV, (3). Goldstone personnel use a stick gauge to determine the scheduled liquid-level measurements within these tanks.

Daily variations are recorded and compared to allowable variations as defined by the San Bernardino County Underground Storage Tank Standards, Section V, Subsection E4. Quarterly reports, submitted to SBC/DEHS/HWTCS, are to state whether observed variations fall within the allowable limits. If a reportable loss or gain of hazardous liquid contents is detected, SBC/DEH/HWTCS must be contacted within one working day of the detection.

E. PERMANENT CLOSURE (ABANDONMENT) OF GASOLINE TANK (G25-2G) AND TEMPORARY CLOSURE OF GASOLINE TANK (G25-1G). RELOCATION OF GASOLINE DISPENSING STATION TO VICINITY OF BUILDING G-27 (ECHO SITE)

The main gasoline station, dispensing fuel to motor vehicles at the Goldstone Complex, was served from two underground storage tanks (G25-1G and G25-2G), located near building G-25 at the Echo Site. Tank 25-2G failed to pass the precision leak-test because of leaky piping. Repairs to the tank's piping were difficult, because the tank is located underneath an existing, concrete retaining wall of a parking lot. Thus, after the tank site was inspected by the SBC/DEHS/HWTCS, and after soil cores bored from the ground surrounding the tank had indicated no leakage of gasoline from the tank itself, Tank 25-2G was filled with concrete and abandoned in place. When the piping of the companion gasoline tank, 25-1G, did not pass the precision leak-test, the tank was cleaned, inerted, and temporarily closed. Because this gasoline station site was abandoned, a new gasoline dispensing station then was built near Building G-27 at the Echo Site to replace the temporarily closed 25-1G and the permanently closed 25-2G USTs.

F. ANALYSIS OF CORES BORED FROM SOIL AROUND TANK TO BE ABANDONED (G25-2G)

Before Tank G25-2G could be permanently sealed and abandoned, it was verified there had been no leakage of gasoline into the soil surrounding the 10,000 gal-capacity, underground gasoline storage tank (G25-2G), at Echo Station. Core samples of the soil surrounding the tank were removed in a specific pattern from depths of 5, 10, 15, 20, and 25 ft (see Figure 6). The samples were sent for analysis of hydrocarbons to BSK & Associates, Geotechnical Consultants, Inc., in Fresno, California. A borehole log for core samples taken near the G25-2G tank is presented in Figure 7. Using a gas chromatograph and a flame ionization detector, the BSK analyst reported no detection of any volatile hydrocarbons (Figures 8a, b, c, and d).

PROJECT MGBA JPL
SUBJECT Borehole locations around G25-2G
Tank abandoned in place — Echo site

SHEET 1 OF 1
JOB NO. 17572,005.11
DATE 1-20-87
COMPUTED BY JCL
CHECKED BY _____

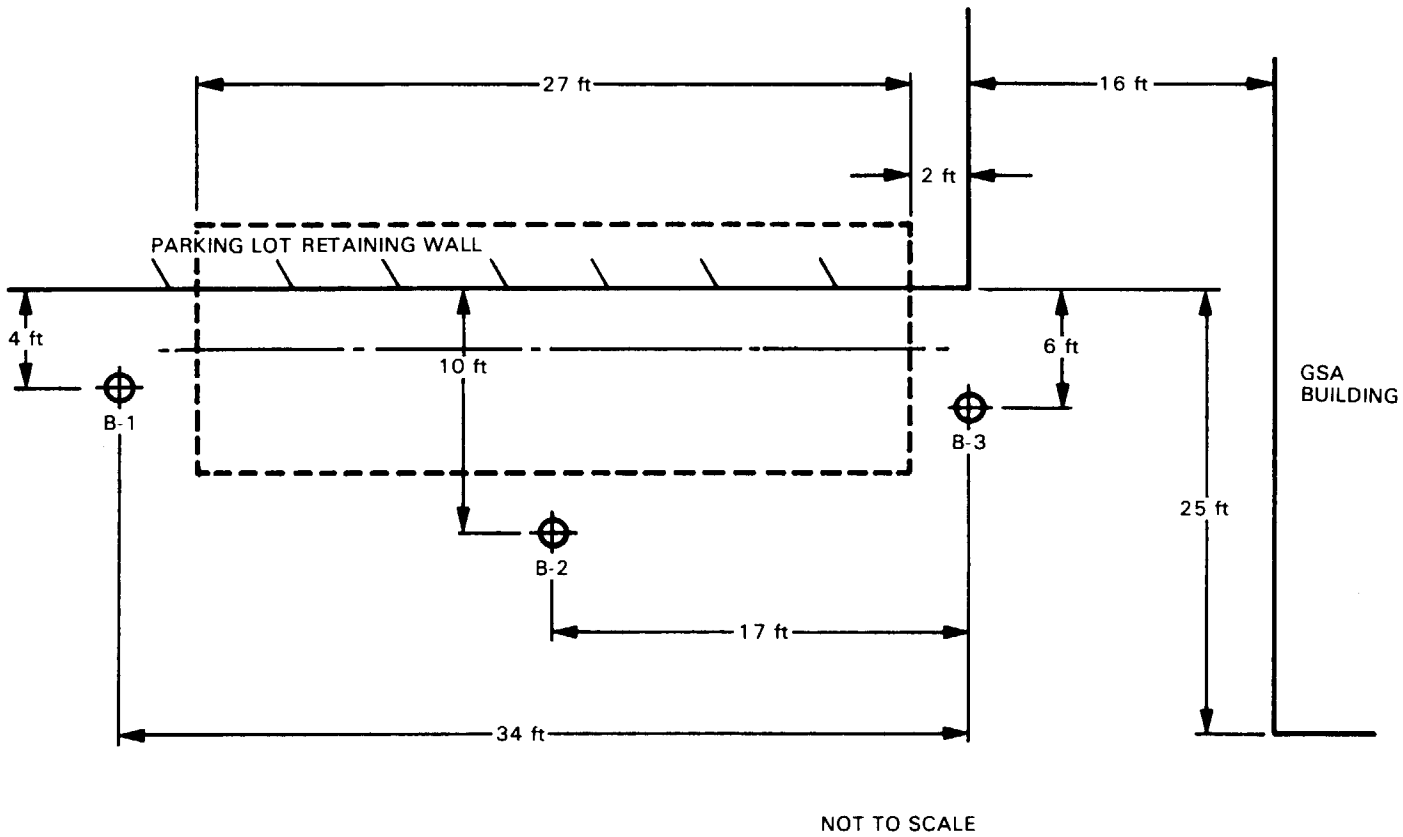


Figure 6. Echo Site: Field Sketch of Borehole Locations Around Underground Tank (G25-2G). Tank Abandoned in Place

KES
A Division of
Kern Backhoe Service, Inc.

KERN ENVIRONMENTAL SERVICE
P. O. BOX 5337 - BAKERSFIELD, CA 93388
(805) 589-5220

PROJ. NO. | PROJECT NAME: Goldstone Communication

SAMPLERS: (Signature) Chris O'Harra

STA. NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO OF CONTAINERS	Analysis Requested: TPH, Total Petroleum Hydrocarbons	REMARKS
W1A	1-20-87	11:52 Pm		/	Goldstone 5'	1	/	Hold until further notice
W2A	1-20	12:15 Pm		/	Goldstone 10'	1	/	
W3A	1-20	12:35 Pm		/	Goldstone 15'	1	/	
W4A	1-20	12:46 Pm		/	Goldstone 20'	1	/	
W5A	1-20	12:55 Pm		/	Goldstone 25'	1	/	
S1A	1-20	1:25 Pm		/	Goldstone 5'	1	/	Hold until further notice
S2A	1-20	1:38 Pm		/	Goldstone 10'	1	/	
S3A	1-20	1:45 Pm		/	Goldstone 15'	1	/	
S4A	1-20	1:55 Pm		/	Goldstone 20'	1	/	
S5A	1-20	2:00 Pm		/	Goldstone 25'	1	/	
E1A	1-20	2:25 Pm		/	Goldstone 5'	1	/	Hold until further notice
E2A	1-20	2:40		/	Goldstone 10'	1	/	
E3A	1-20	2:50		/	Goldstone 15'	1	/	
E4A	1-20	2:58		/	Goldstone 20'	1	/	
E5A	1-20	3:09		/	Goldstone 25'	1	/	

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Chris O'Harra	1-20-87 3:20			1/21/81 9:10 Pm	
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
		Tatiana R. Lowe			
Relinquished by: (Signature)	Date / Time	Received for Laboratory by (Signature)	Date / Time	Remarks	
		Tatiana R. Lowe	1-21-87 1400	Shipped via Greyhound B Fresno - Except samples marked a	

Figure 7. Echo Site: Borehole Log of Soil Cores at Tank G25-2G (Tank Abandoned in Place)

BSK & Associates
Geotechnical Consultants, Inc.

Wesley J. Braun, CE · John R. Hedley, CE · James G. Sutton, CE · John H. Kirk, CEG
Robert D. Skaggs, CE · John B. Moore, CE · Alex Y. Eskandari, CE · Thomas E. Vahlstrom, Ch
Hugo Kevorkian, CE · John M. Minney, CE

Kern Environmental Service
(B87010)

LOG NO: Ch870172
Received: 1/21/87
Reported: 1/27/87

Log No.	Sample Description (Soil)	Date Sampled
0172-2	W2A Goldstone 10' - 1215 hrs.	1/20
0172-3	W3A Goldstone 15' - 1225 hrs.	1/20
0172-4	W4A Goldstone 20' - 1240 hrs.	1/20

Analysis: Total Volatile Hydrocarbons

	0172-2	0172-3	0172-4	Detection Limit
Date Analyzed:	1/26	1/26	1/26	
Total Volatile Hydrocarbons, mg/Kg:	ND	ND	ND	1

ND=None Detected

Hydrocarbons by Headspace, GC/FID

Sophia Kusch
Analyst

Thomas E. Vahlstrom
Lab Director

Soil Engineering • Engineering Geology • Engineering Laboratories • Chemical Laboratories

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Visalia, California 93278 • 3901 So. Mooney Blvd., P.O. Box 3216 • (209) 732-8857
Bakersfield, California 93304 • 117 "V" Street • Telephone (805) 327-0671
Pleasanton, California 94566 • 5729-G Sonoma Drive • Telephone (415) 462-4000

Figure 8a. Echo Site: Results of Analysis of Borehole Cores from Soil around Tank G25-2G (Tank Abandoned in Place)

BSK & Associates
Geotechnical Consultants, Inc.

Wesley J. Braun, CE · John R. Hedley, CE · James G. Sutton, CE · John H. Kirk, CEG
Robert D. Skaggs, CE · John B. Moore, CE · Alex Y. Eskandari, CE · Thomas E. Vahlstrom, Ch
Hugo Kevorkian, CE · John M. Minney, CE

Kern Environmental Service
(B87010)

LOG NO: Ch870172
Received: 1/21/87
Reported: 1/27/87

Log No.	Sample Description (Soil)	Date Sampled
0172-5	W5A Goldstone 25' - 1255 hrs.	1/20
0172-7	S2A Goldstone 10' - 1338 hrs.	1/20
0172-8	S3A Goldstone 15' - 1345 hrs.	1/20

Analysis: Total Volatile Hydrocarbons

	0172-5	0172-7	0172-8	Detection Limit
Date Analyzed:	1/26	1/26	1/26	
Total Volatile Hydrocarbons, mg/Kg:	ND	ND	ND	1

ND=None Detected

Hydrocarbons by Headspace, GC/FID

Sophia Kresca
Analyst

Thomas E. Vahlstrom
Lab Director

Soil Engineering • Engineering Geology • Engineering Laboratories • Chemical Laboratories

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☐ Bakersfield, California 93304 • 117 "V" Street • Telephone (805) 327-0671
☐ Pleasanton, California 94566 • 5729-G Sonoma Drive • Telephone (415) 462-4000

Figure 8b. Echo Site: Results of Analysis of Borehole Cores from Soil around Tank G25-2G (Tank Abandoned in Place)

BSK & Associates
Geotechnical Consultants, Inc.

Wesley J. Braun, CE · John R. Hedley, CE · James G. Sutton, CE · John H. Kirk, CEG
Robert D. Skaggs, CE · John B. Moore, CE · Alex Y. Eskandari, CE · Thomas E. Vahlstrom, Ch
Hugo Kevorkian, CE · John M. Minney, CE

Kern Environmental Service
(B87010)

LOG NO: Ch870172
Received: 1/21/87
Reported: 1/27/87

Log No.	Sample Description (Soil)	Date Sampled
0172-9	S4A Goldstone 20' - 1355 hrs.	1/20
0172-10	S5A Goldstone 25' - 1400 hrs.	1/20
0172-12	E2A Goldstone 10' - 1440 hrs.	1/20

Analysis: Total Volatile Hydrocarbons

	0172-9	0172-10	0172-12	Detection Limit
Date Analyzed:	1/26	1/26	1/26	
Total Volatile Hydrocarbons, mg/Kg:	ND	ND	ND	1

ND=None Detected

Hydrocarbons by Headspace, GC/FID

Sophia Kuruc
Analyst

Thomas E. Vahlstrom
Lab Director

Soil Engineering • Engineering Geology • Engineering Laboratories • Chemical Laboratories

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Visalia, California 93278 • 3901 So. Mooney Blvd., P.O. Box 3236 • (209) 732-8857
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Pleasanton, California 94566 • 5729-G Sonoma Drive • Telephone (415) 462-4000

Figure 8c. Echo Site: Results of Analysis of Borehole Cores from Soil around Tank G25-2G (Tank Abandoned in Place)

BSK & Associates
Geotechnical Consultants, Inc.

Wesley J. Braun, CE · John R. Hedley, CE · James G. Sutton, CE · John H. Kirk, CEG
Robert D. Skaggs, CE · John B. Moore, CE · Alex Y. Eskandari, CE · Thomas E. Vahlstrom, Ch
Hugo Kevorkian, CE · John M. Minney, CE

Kern Environmental Service
(B87010)

LOG NO: Ch870172
Received: 1/21/87
Reported: 1/27/87

Log No.	Sample Description (Soil)	Date Sampled
0172-13	E3A Goldstone 15' - 1450 hrs.	1/20
0172-14	E4A Goldstone 20' - 1458 hrs.	1/20
0172-15	E5A Goldstone 25' - 1509 hrs.	1/20

Analysis: Total Volatile Hydrocarbons

	0172-13	0172-14	0172-15	Detection Limit
Date Analyzed:	1/26	1/26	1/26	
Total Volatile Hydrocarbons, mg/Kg:	ND	ND	ND	1

ND=None Detected

Hydrocarbons by Headspace, GC/FID

Sophia Kuss
Analyst

Thomas E. Vahlstrom
Lab Director

Soil Engineering • Engineering Geology • Engineering Laboratories • Chemical Laboratories

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☐ Visalia, California 93278 • 3901 So. Mooney Blvd., P.O. Box 3216 • (209) 732-8857
☐ Bakersfield, California 93304 • 117 "V" Street • Telephone (805) 327-0671
☐ Pleasanton, California 94566 • 5729-G Sonoma Drive • Telephone (415) 462-4000

Figure 8d. Echo Site: Results of Analysis of Borehole Cores from Soil around Tank G25-2G (Tank Abandoned in Place)

SECTION VII

FUTURE PLANS FOR UNDERGROUND STORAGE TANKS AT THE GDSCC

The leak-testing and closure phase of the Underground Storage Tank Compliance Program at the Goldstone Complex, involving 27 tanks, was completed on January 30, 1987. Of the 27 tested tanks, 15 tanks remain in operation, 11 tanks are closed temporarily, and 1 tank is closed permanently (abandoned in place). Between now (Fiscal Year 1987) and the start of Fiscal Year 1990, NASA/JPL/Goldstone personnel will resolve the long-term use of the 26 operating and temporarily closed USTs.

Preparation of both Environmental Assessment and Preliminary Engineering Reports will determine whether the 15 operating tanks should be retained and extensively modified, whether they should be replaced by above ground tanks, whether they should be replaced with new, double-walled, cathodically protected, underground tanks, or whether the eventual solution will involve some combination of these various options. Any new, double-walled underground tanks would be equipped with leak-detection sensors placed between the tank walls.

The Environmental Assessment and Preliminary Engineering Reports also will review how to excavate and remove the 11 temporarily closed tanks, and how to dispose of them in an environmentally acceptable manner.

In the interval from 1987 to 1989, the 15 tanks that now are operating at the GDSCC will be monitored, inventoried, and maintained in accordance with the underground tank requirements of the SBC/DEHS/HWTCS.

SECTION VIII

CERTIFICATION

I hereby certify that all work performed for the precision leak-testing, and the temporary and permanent closure of underground storage tanks within the Goldstone Complex of the Ft. Irwin military reservation, San Bernardino County, California, as described in this report, was performed in compliance with the requirements of the Environmental Protection Agency, the State of California Health and Safety Code, and the San Bernardino County Department of Environmental Health Services, Hazardous Waste and Toxic Control Section, and in accordance with good engineering practice.

Leonard H. Kushner
Registered Professional Engineer

Signature Leonard H Kushner

Date Signed: June 15, 1987

Registration NO. E9003, Electrical
SF1086, Safety

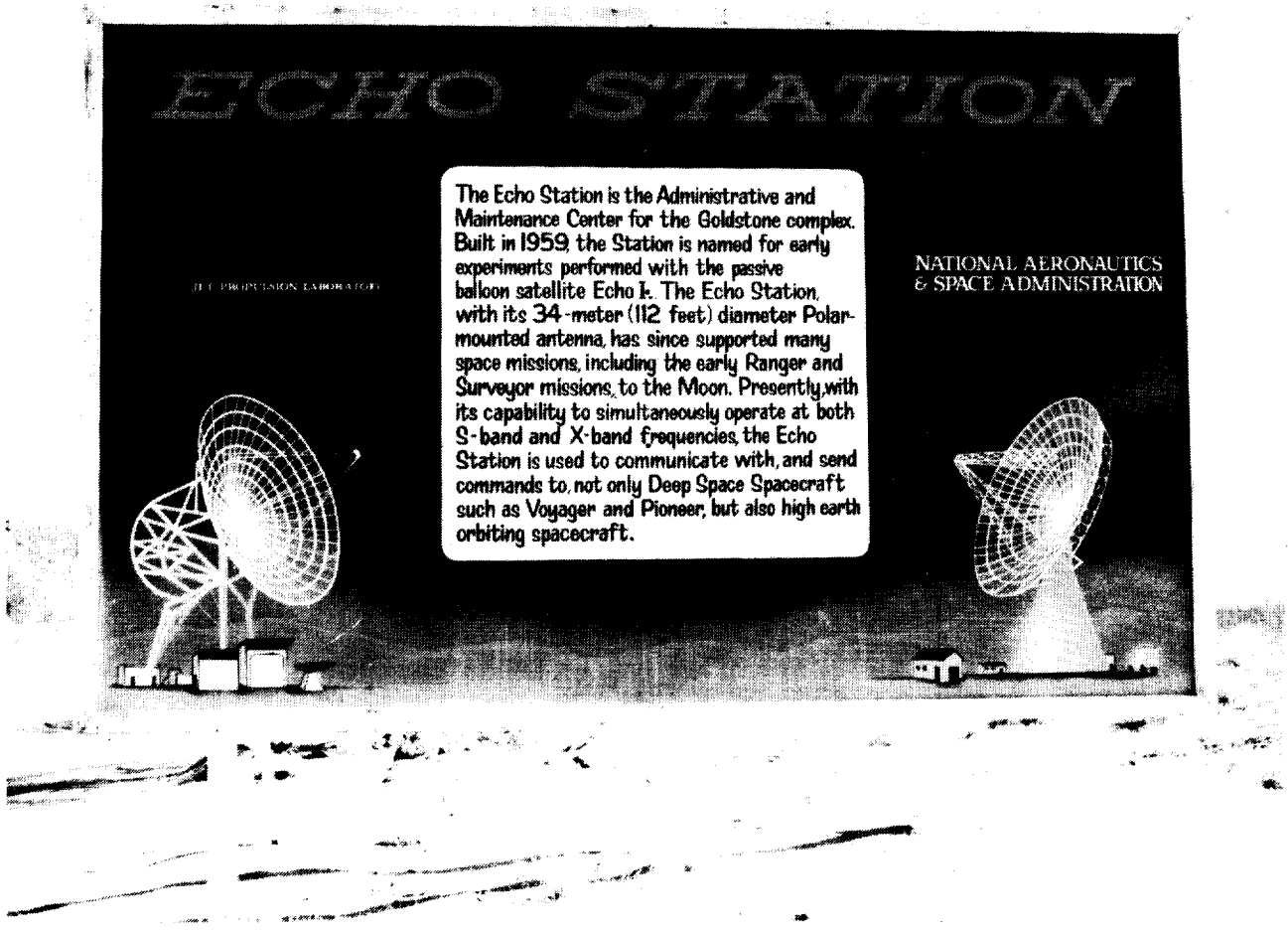
State: California
California

Stamp/Seal:

APPENDIX A

Locations of underground storage tanks at the Goldstone Complex and photographs depicting work in the implementation of the UST Compliance program. Tanks were tested for leaks and either were retained as operating tanks, or were closed temporarily or permanently.

ECHO STATION
DSS 12



Originally built in 1959, the 26-meter (85 ft) antenna first was used in 1960 in support of the Echo Project, an experiment to transmit voice communications Coast-to-coast by bouncing radio signals off the surface of a passive ballon-type satellite. In 1978, the antenna was extended to 34-meters (111.5 ft).

ECHO SITE: Summary of UST Work

GASOLINE TANKS

Tank G25-1G	Temporary closure (steam cleaned, inerted and sealed)
Tank G25-2G	Abandoned in place, filled with concrete
Tank G42-1G	Precision leak-tested - in service

DIESEL OIL TANKS

Tank G42-2D	Temporary closure (steam cleaned, inerted and sealed)
Tank TF-3D	Temporary closure (steam cleaned, inerted and sealed)
Tank TF-4D	Temporary closure (steam cleaned, inerted and sealed)
Tank G27-1D	Precision leak-tested - in service
Tank G27-2D	Precision leak-tested - in service
Tank G27-3D	Precision leak-tested - in service
Tank G24-1D	Precision leak-tested - in service
Tank G24-2D	Precision leak-tested - in service

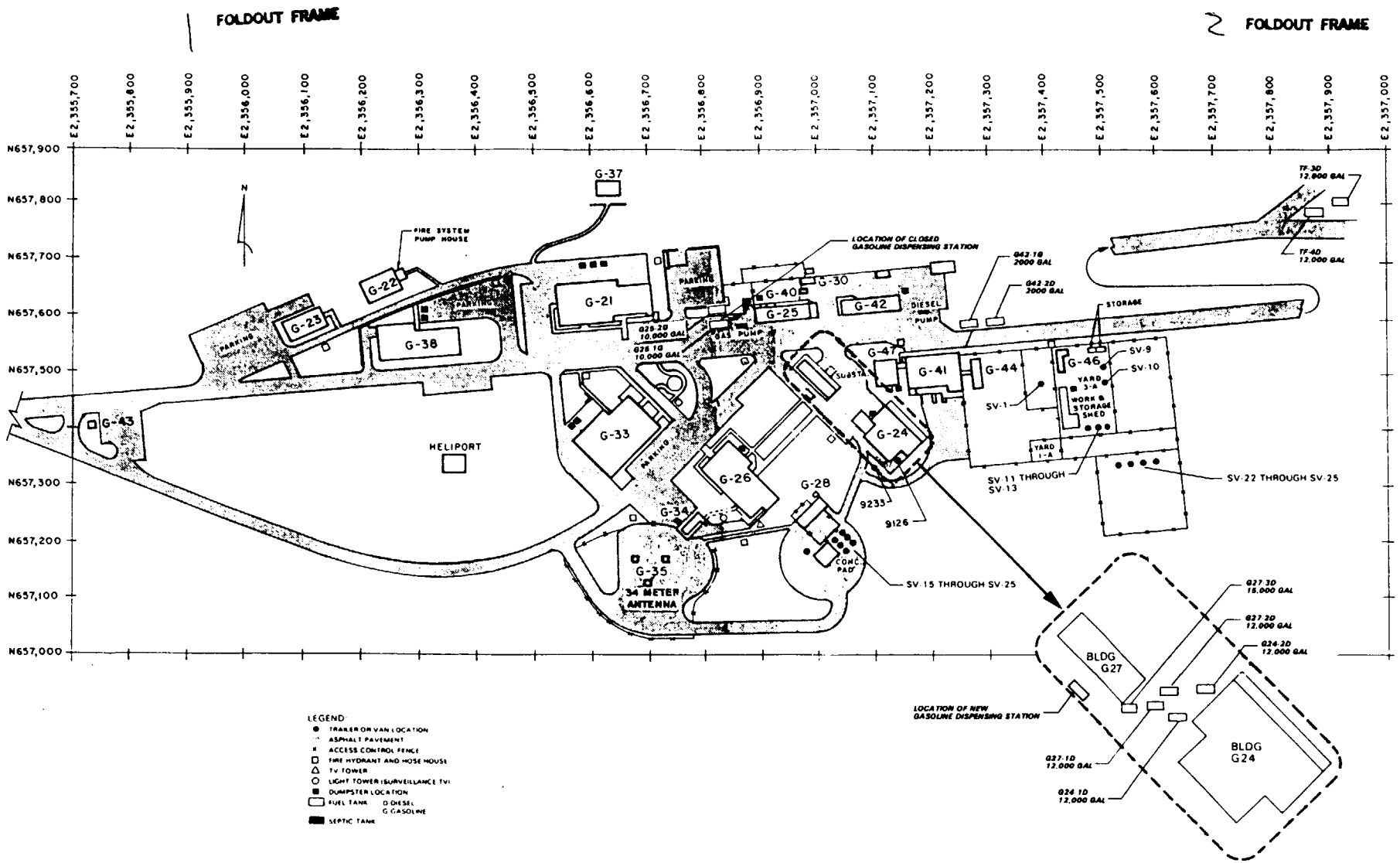


Figure A-1. Echo Site: Plot Plan

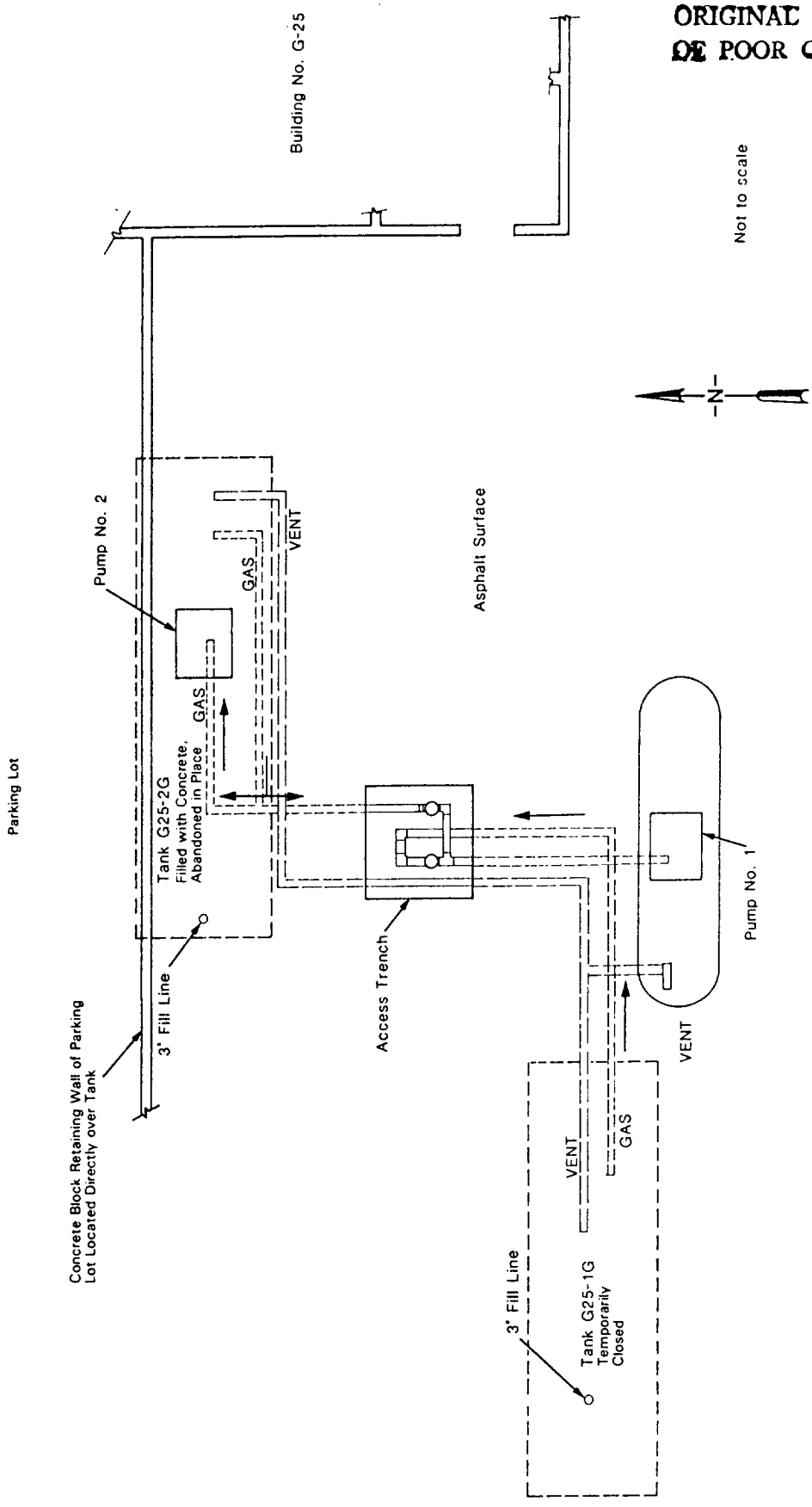


Figure A-2. Echo Site: Location of Abandoned Gasoline Dispensing Station Including Tanks G25-1G and G25-2G

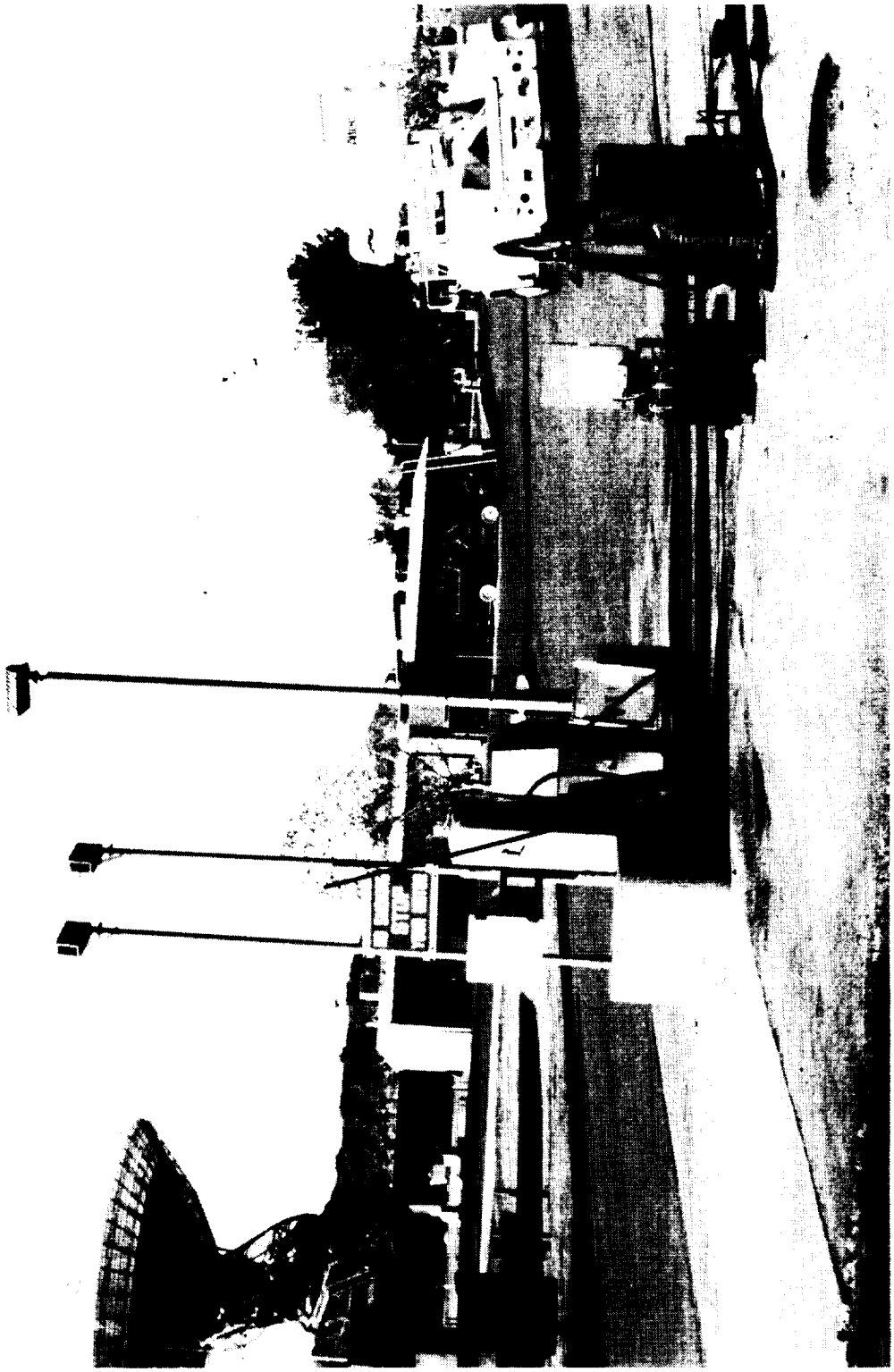


Figure A-3. Echo Site: Precision Testing for Leaks at Now Abandoned Gasoline Dispensing Station (Tanks G25-1G and G25-2G)

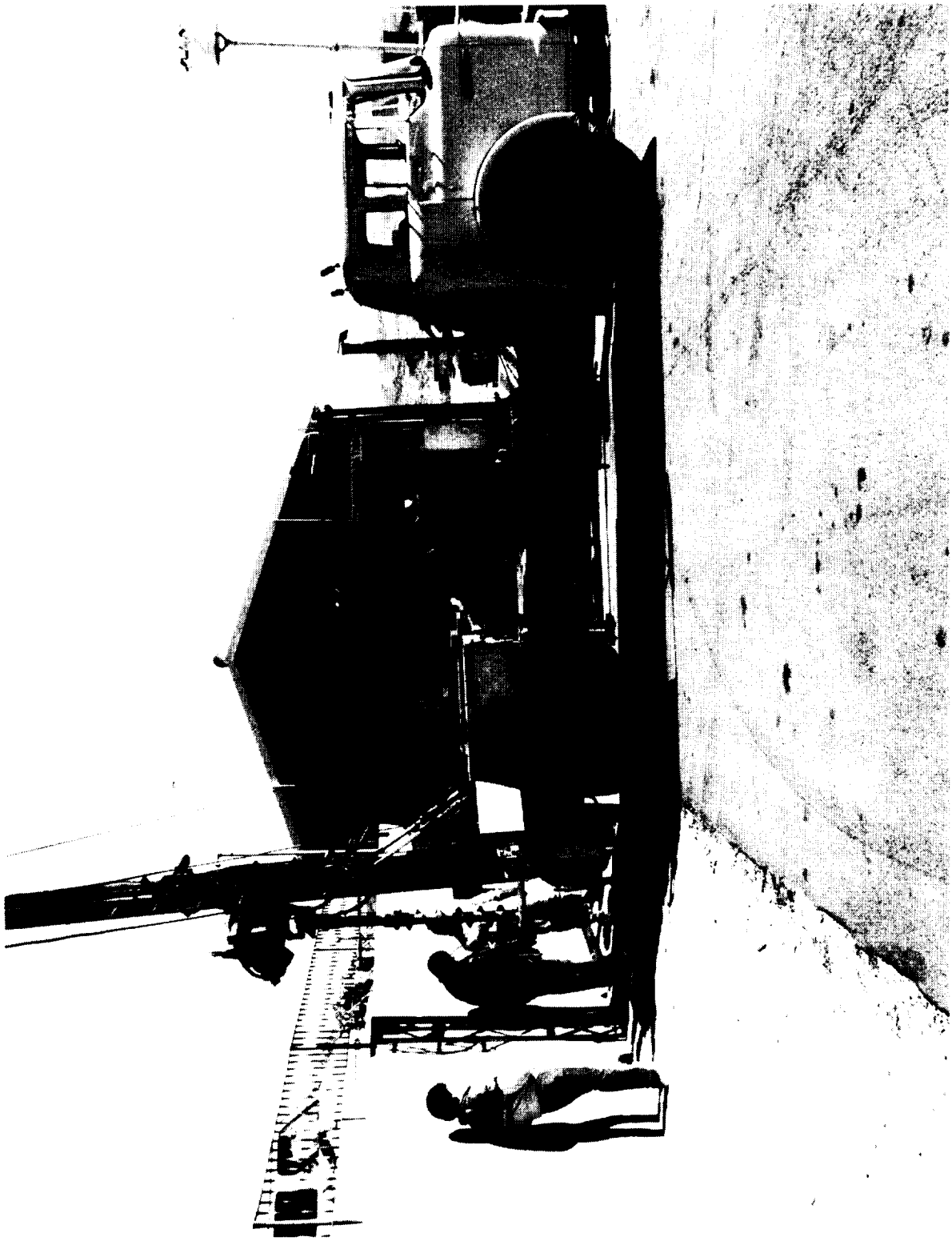


Figure A-4a. Echo Site: Borehole Drilling at Tank G25-2G to Obtain Soil Samples to Test for Possible Hydrocarbon Contamination Prior to Abandonment of this Tank in Place

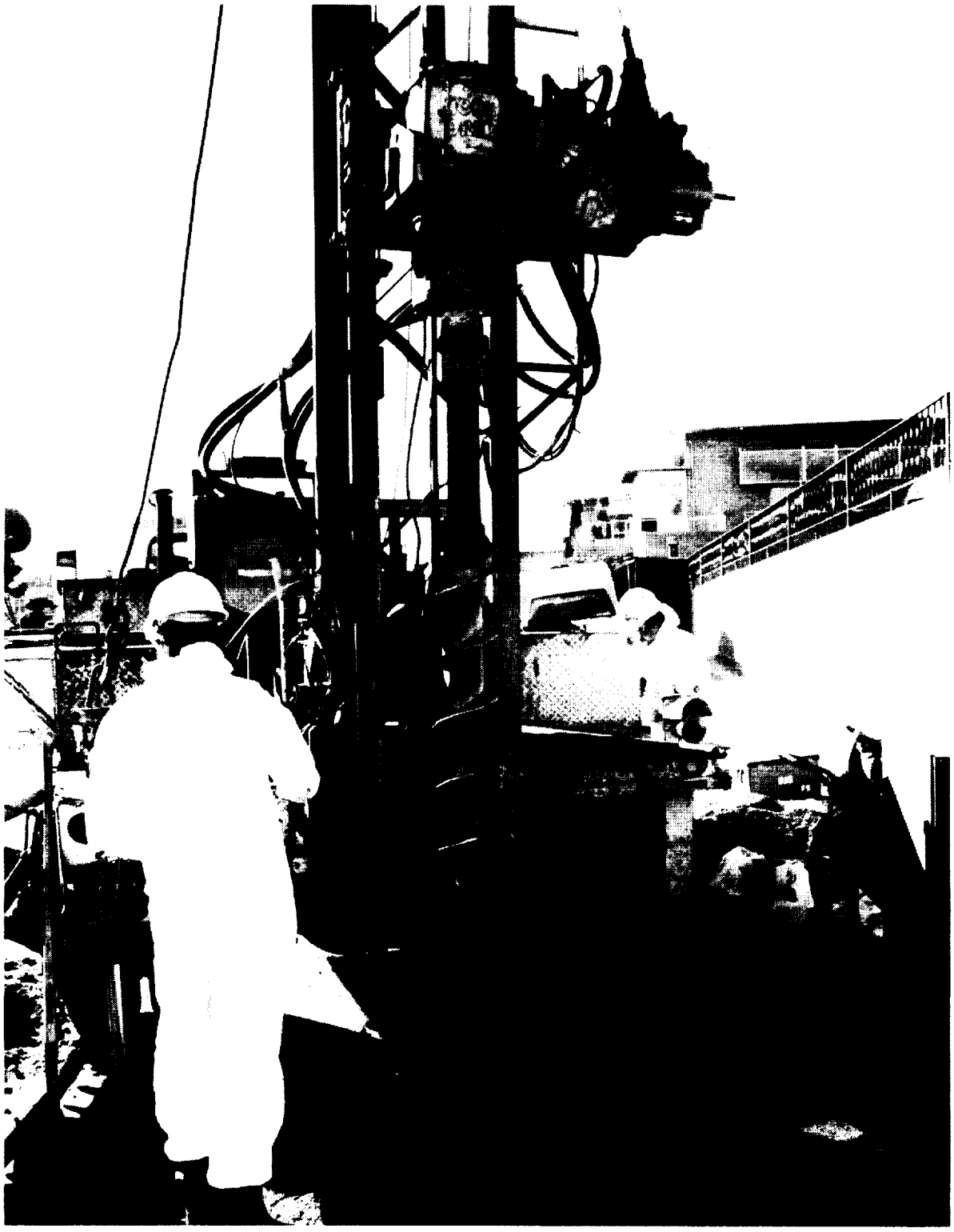


Figure A-4b. Echo Site: Borehole Drilling at Tank G25-2G to Obtain Soil Samples to Test for Possible Hydrocarbon Contamination Prior to Abandonment of this Tank in Place

Figure A-5. Echo Site: Use of Dry Ice to Inert Tanks G25-1G and G25-2G Before Their Closures

Figure A-6. Close-up View of Use of Dry Ice to Inert Tanks G25-1G and G25-2G Before Their Closures

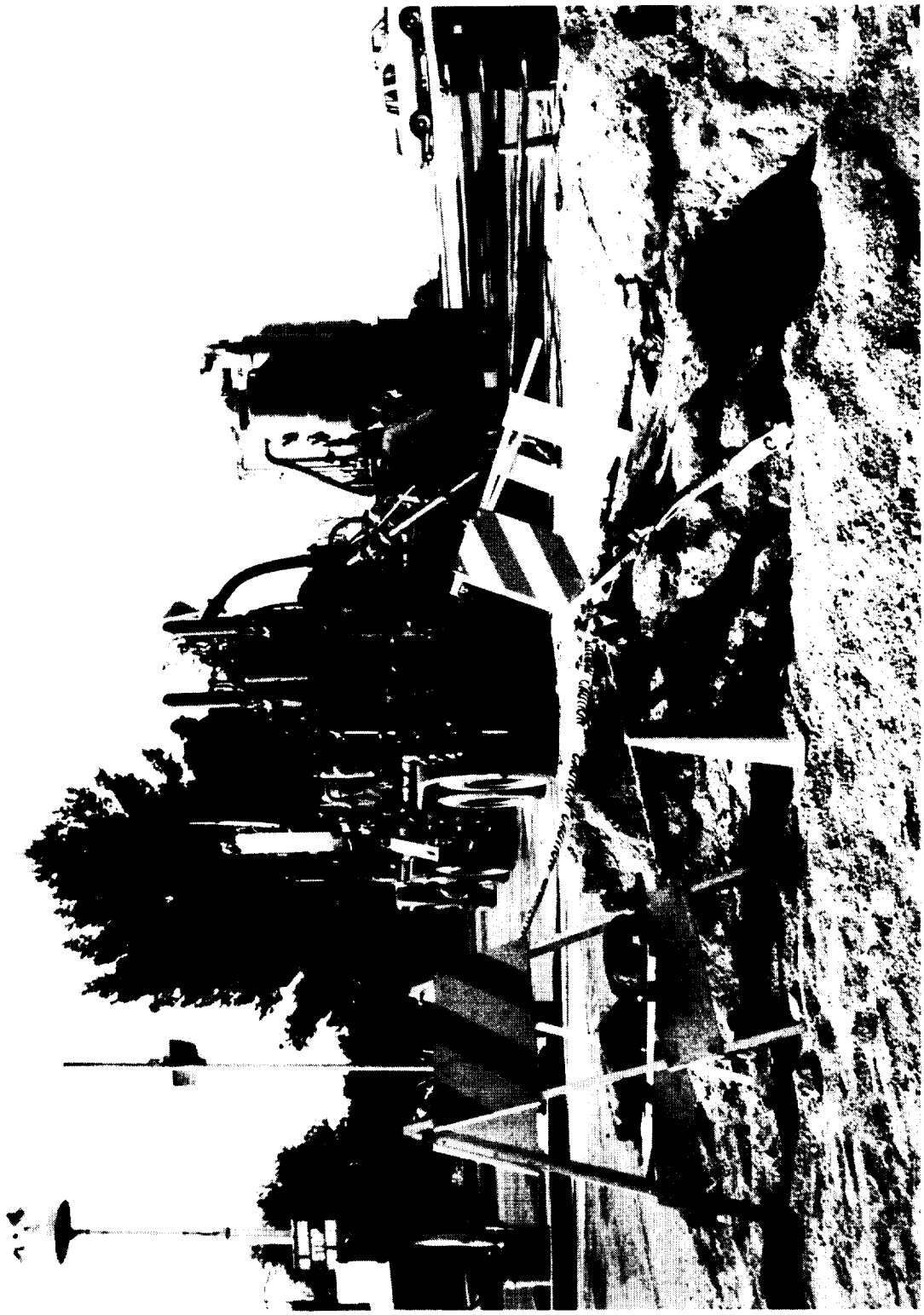


Figure A-7a. Echo Site: Preparation for Filling Gasoline Tank G25-2G with Concrete Prior to Abandonment of Tank in Place

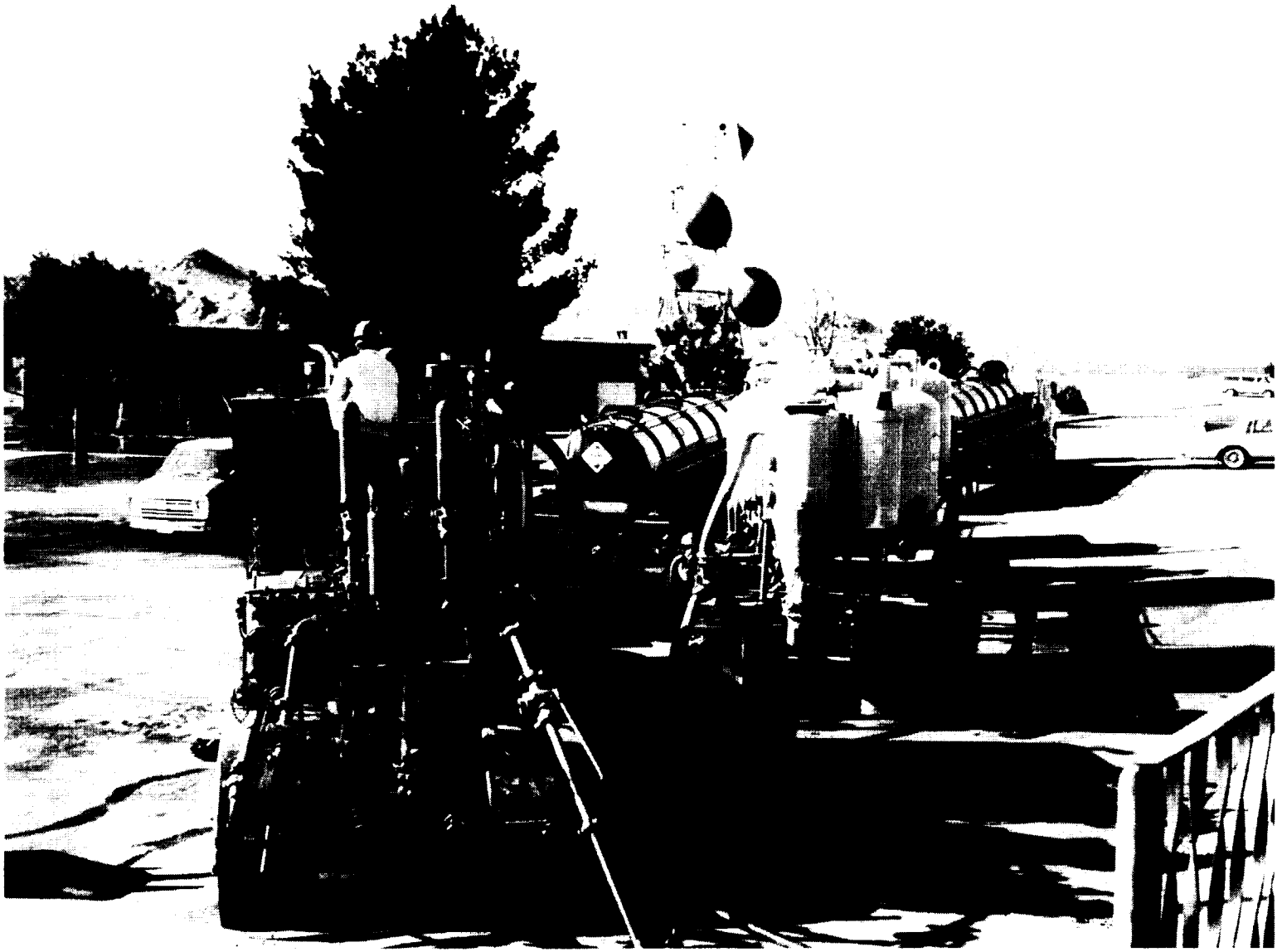


Figure A-7b. Echo Site: Preparation for Filling Gasoline Tank G25-2G with Concrete Prior to Abandonment of Tank in Place

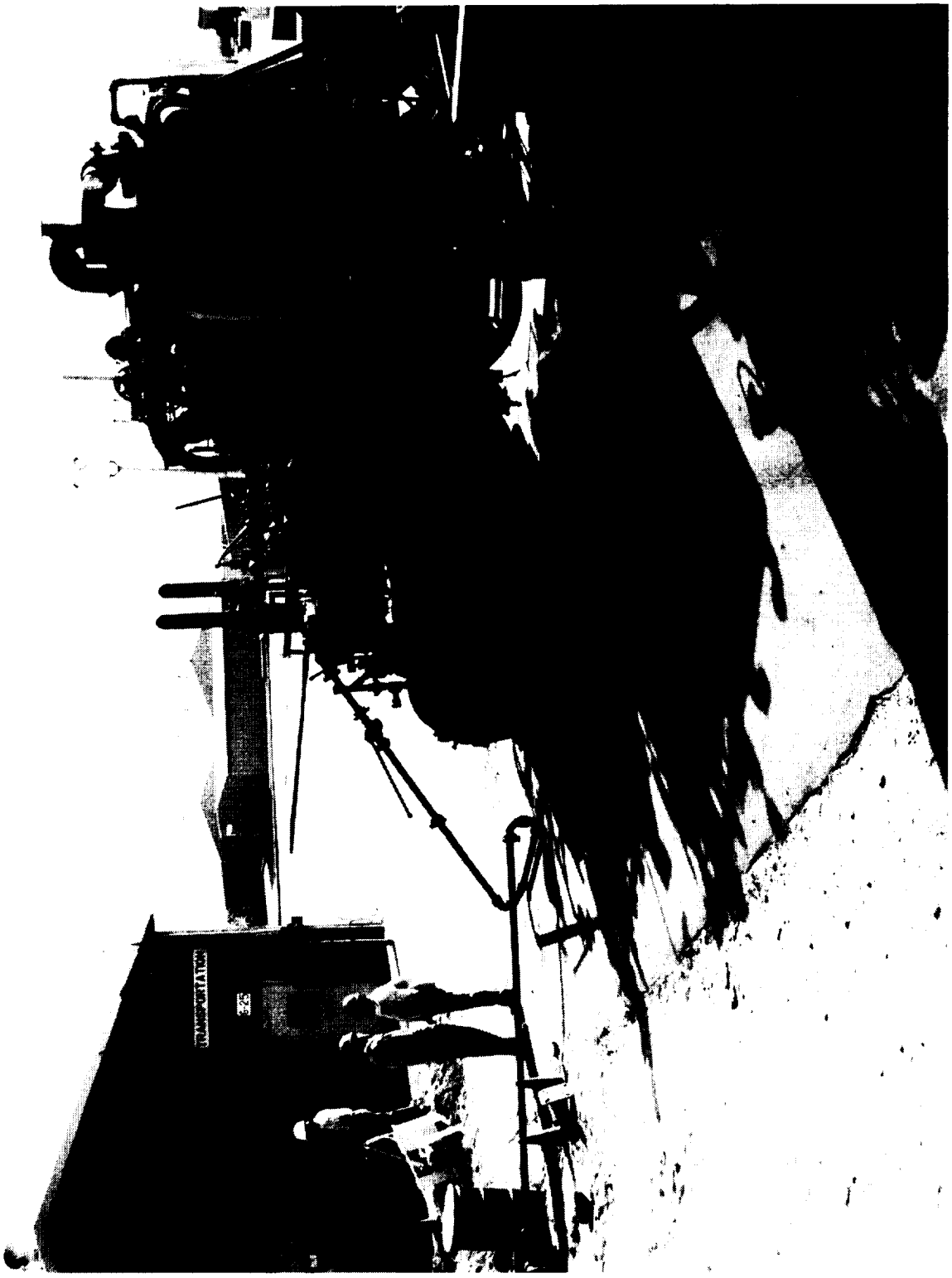


Figure A-7c. Echo Site: Preparation for Filling Gasoline Tank G25-2G with Concrete Prior to Abandonment of Tank in Place

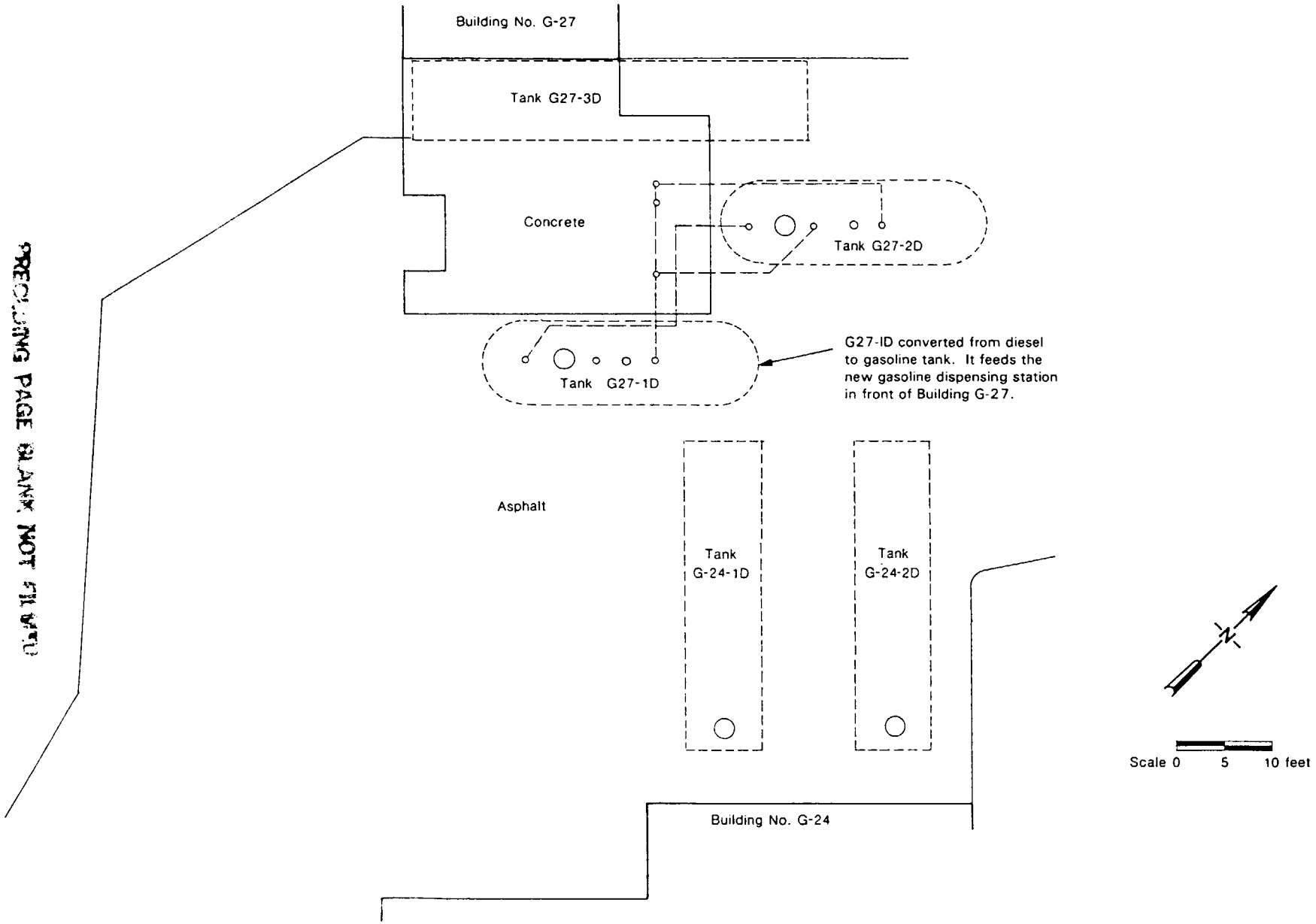


Figure A-8. Echo Site: Details of Building G-27 Area. Building G-24 at Bottom

Figure A-9a. Echo Site: Construction of New Gasoline Dispensing Station near Building G-27

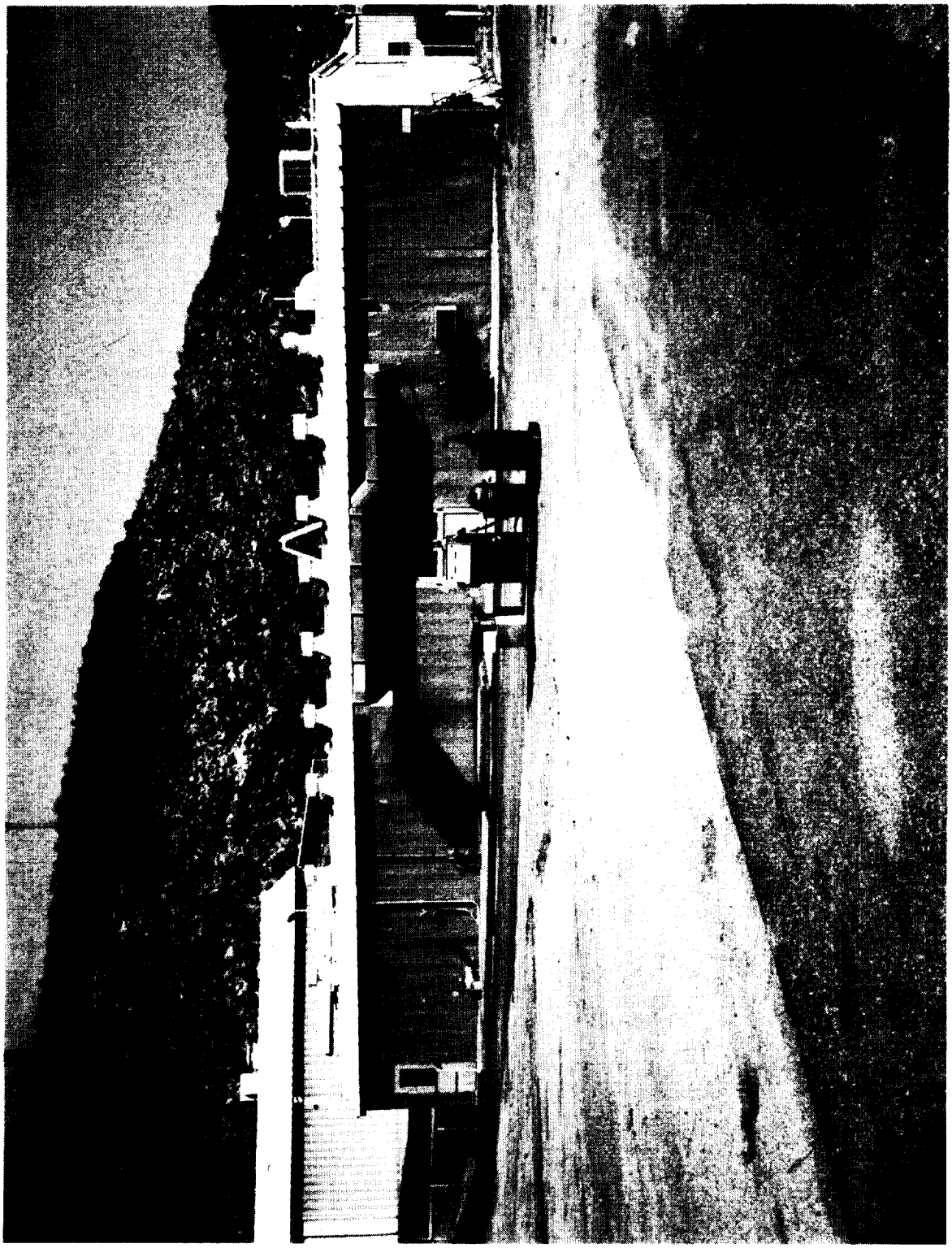


Figure A-9b. Echo Site: Completed New Gasoline Dispensing Station near Building G-27

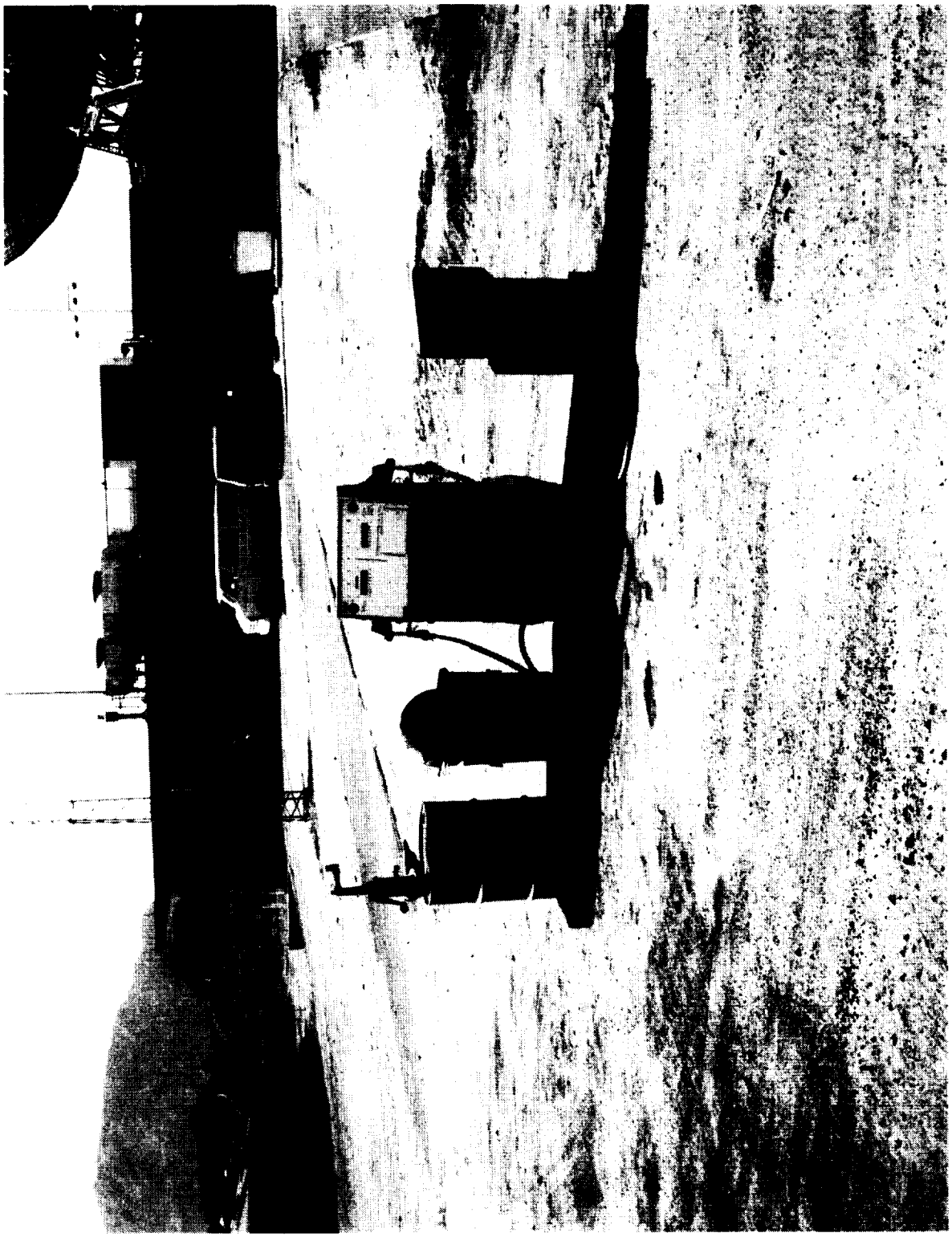


Figure A-9c. Echo Site: Completed New Gasoline Dispensing Station near Building G-27

Figure A-10. Echo Site: Typical Precision Leak-Test Set-up at Diesel Oil Storage Tanks G24-1D and G24-2D Near Building G-24

Figure A-11a. Echo Site: Excavation to Locate Piping Leaks at Diesel Oil Storage Tanks G24-1D and G24-2D Near Building G-24

Figure A-11b. Echo Site: Excavation to Locate Piping Leaks at Diesel Oil Storage Tanks G24-1D and G24-2D Near Building G-24

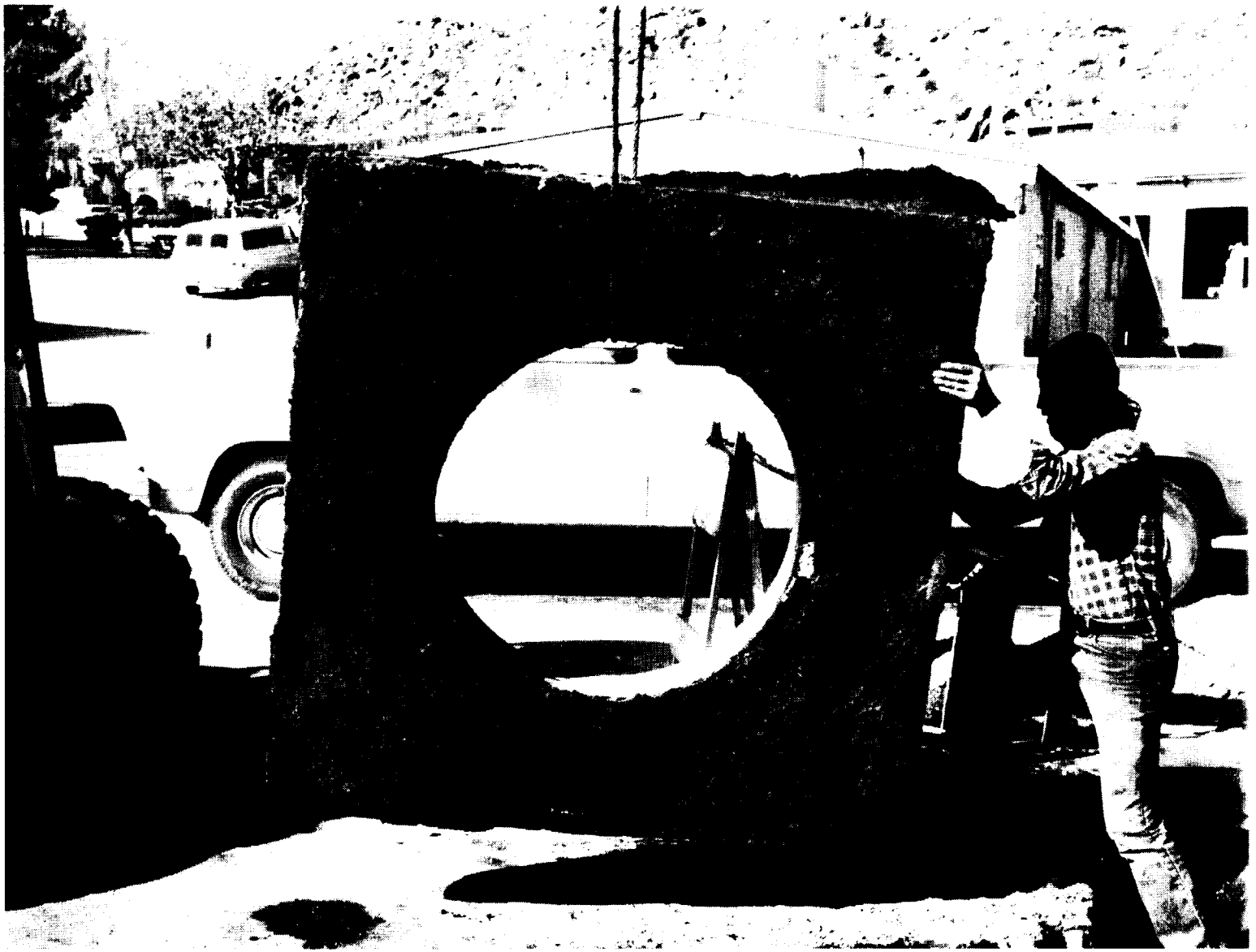


Figure A-11c. Echo Site: Excavation to Locate Piping Leaks at Diesel Oil Storage Tanks G24-1D and G24-2D Near Building G-24

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Figure A-11d. Echo Site: Excavation to Locate Piping Leaks at Diesel Oil Storage Tanks G24-1D and G24-2D Near Building G-24

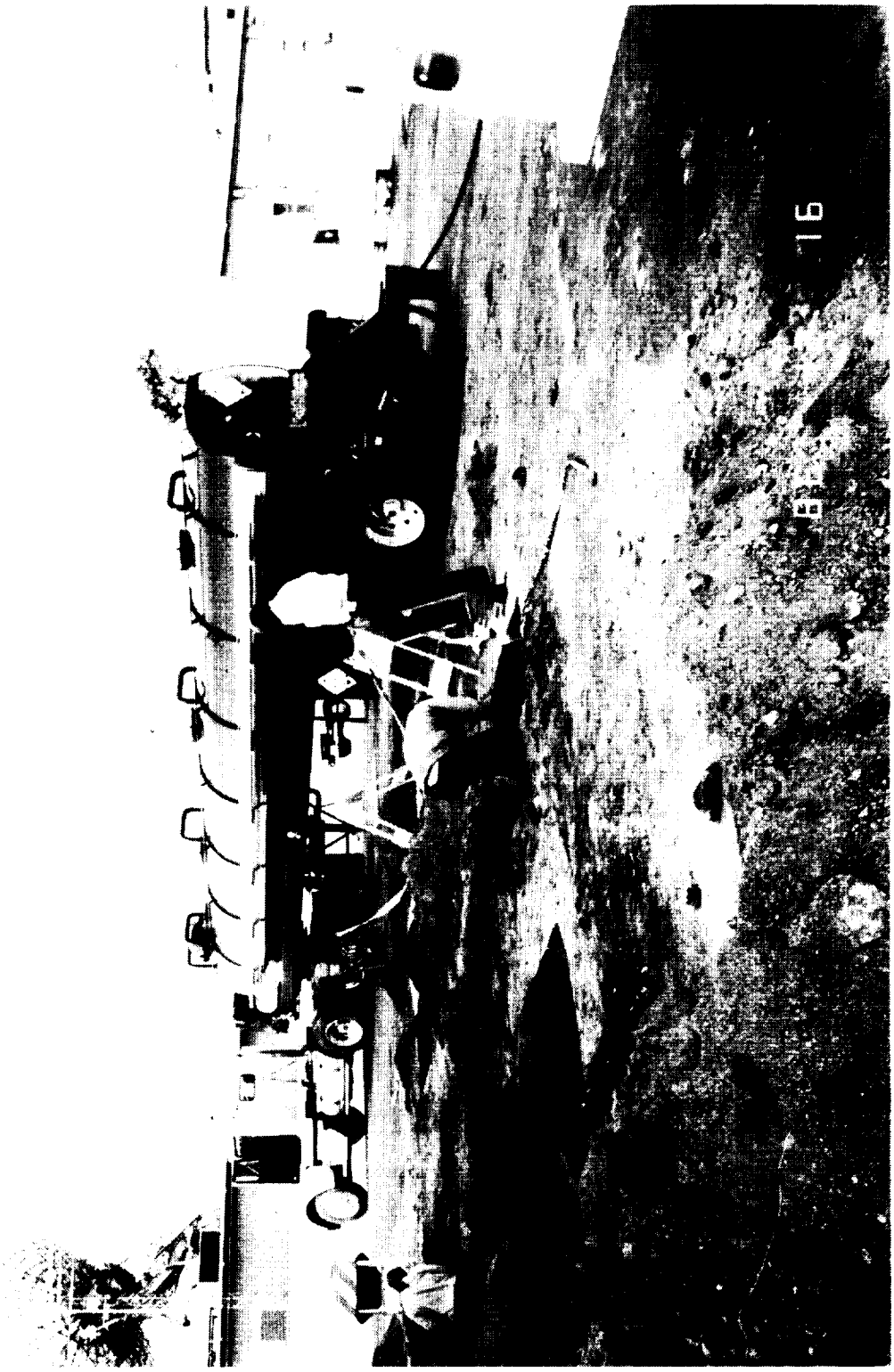


Figure A-12. Echo Site: Transfer of Diesel Fuel from Truck to Re-Test Diesel Oil Storage Tanks G24-1D and G24-2D near Building G-24

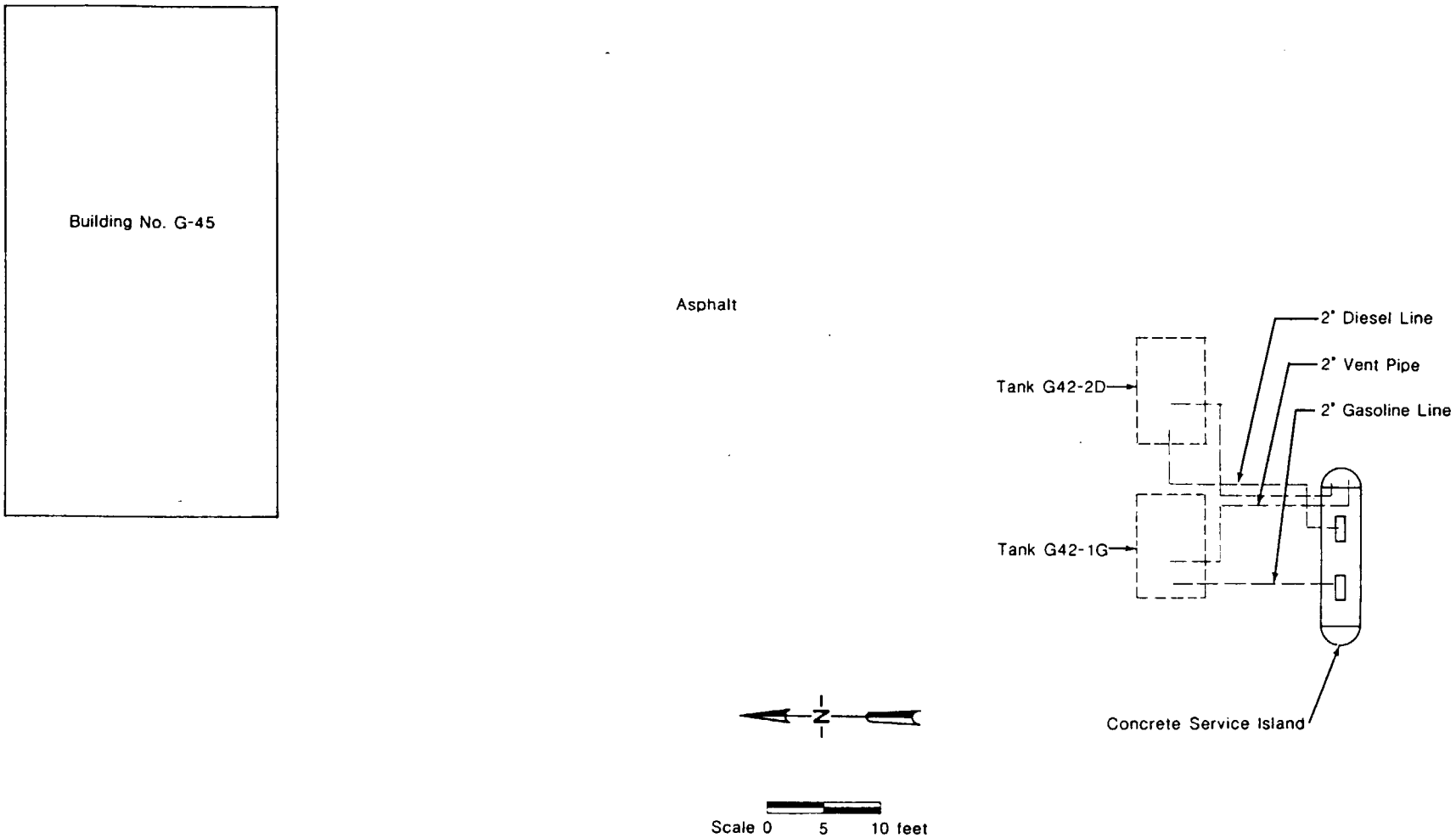
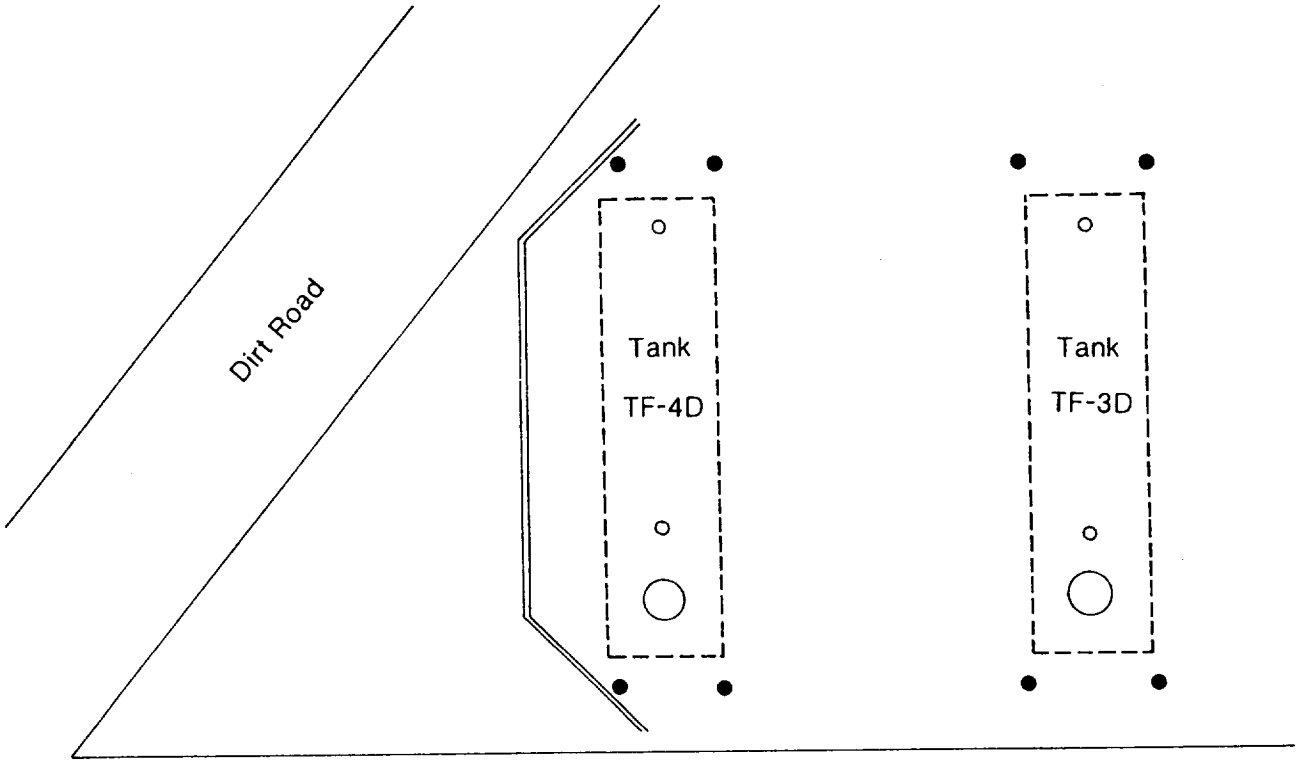


Figure A-13. Echo Site: Location of Tanks G42-16 and G42-2D near Building G-45 Area



EXPLANATION

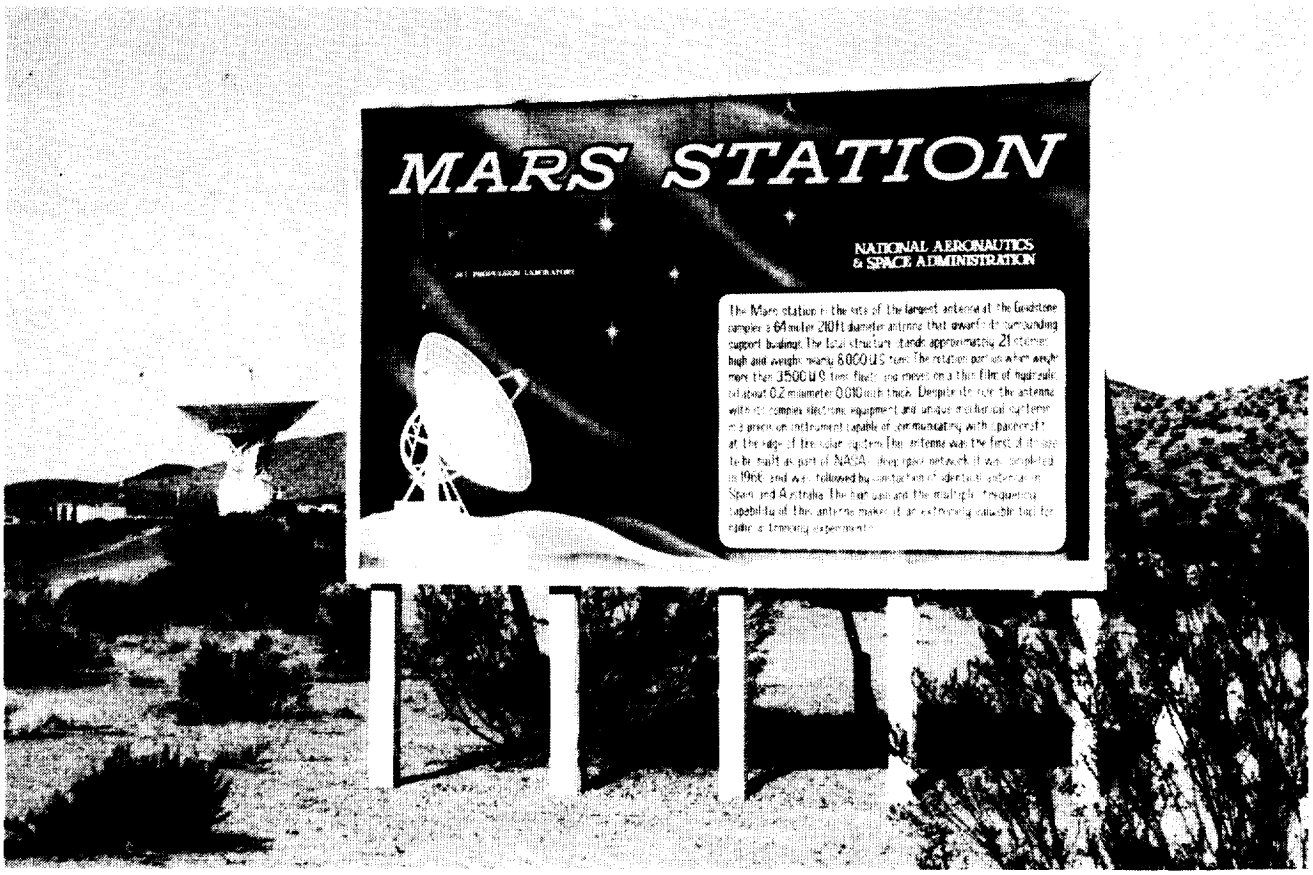
- Fill pipe or vent pipe
- Manhole cover
- Wooden guard posts
- Guard rail

-N-

Scale 0 15 feet

Figure A-14. Echo Site: Location of Diesel Tanks TF-3D and TF-4D

MARS STATION
DSS 14



Built in 1966, the 64-meter (210 ft) antenna, standing more than 234 ft tall, permitted the DSN's transmitter power and receiver sensitivity to increase 6.5 times compared to that of a 26-meter antenna. It also extended the range of the DSN into deep space by 2.5 times. The 64-meter parabolic dish is to be extended to 70 meters (230 ft) in time to be ready for the Voyager 2 spacecrafts encounter with the planet Neptune in 1989.

MARS SITE: Summary of UST Work

DIESEL OIL TANKS

Tank G81-1DA	Precision leak-tested - in service
Tank G81-1DB	Precision leak-tested - in service
Tank G81-2D	Precision leak-tested - in service
Tank G81-3D	Precision leak-tested - in service

HYDRAULIC OIL TANKS

Tank 14-1 HO	Precision leak-tested - in service
Tank 14-2 HO	Precision leak-tested - in service

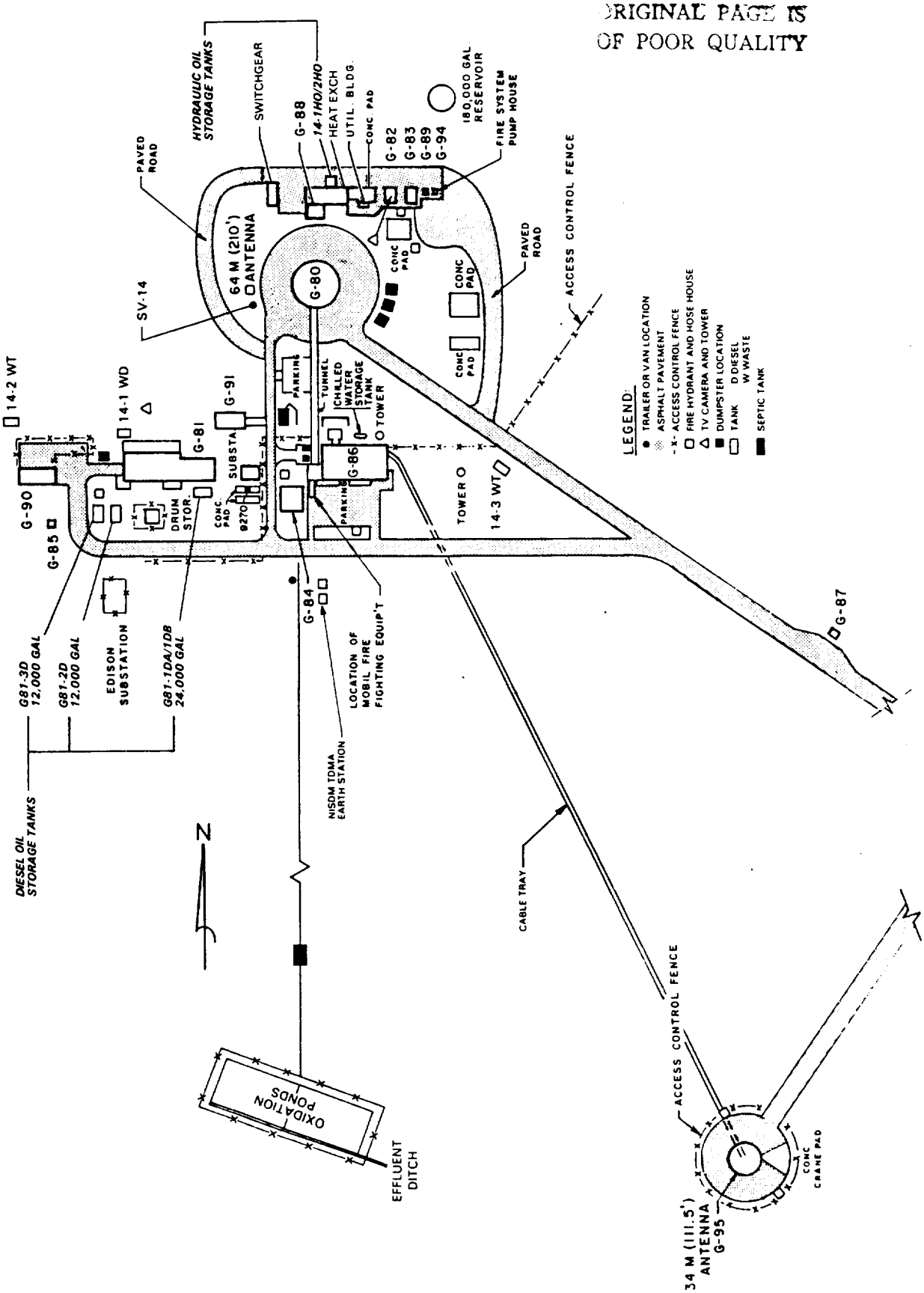


Figure A-15. Mars Site: Plot Plan

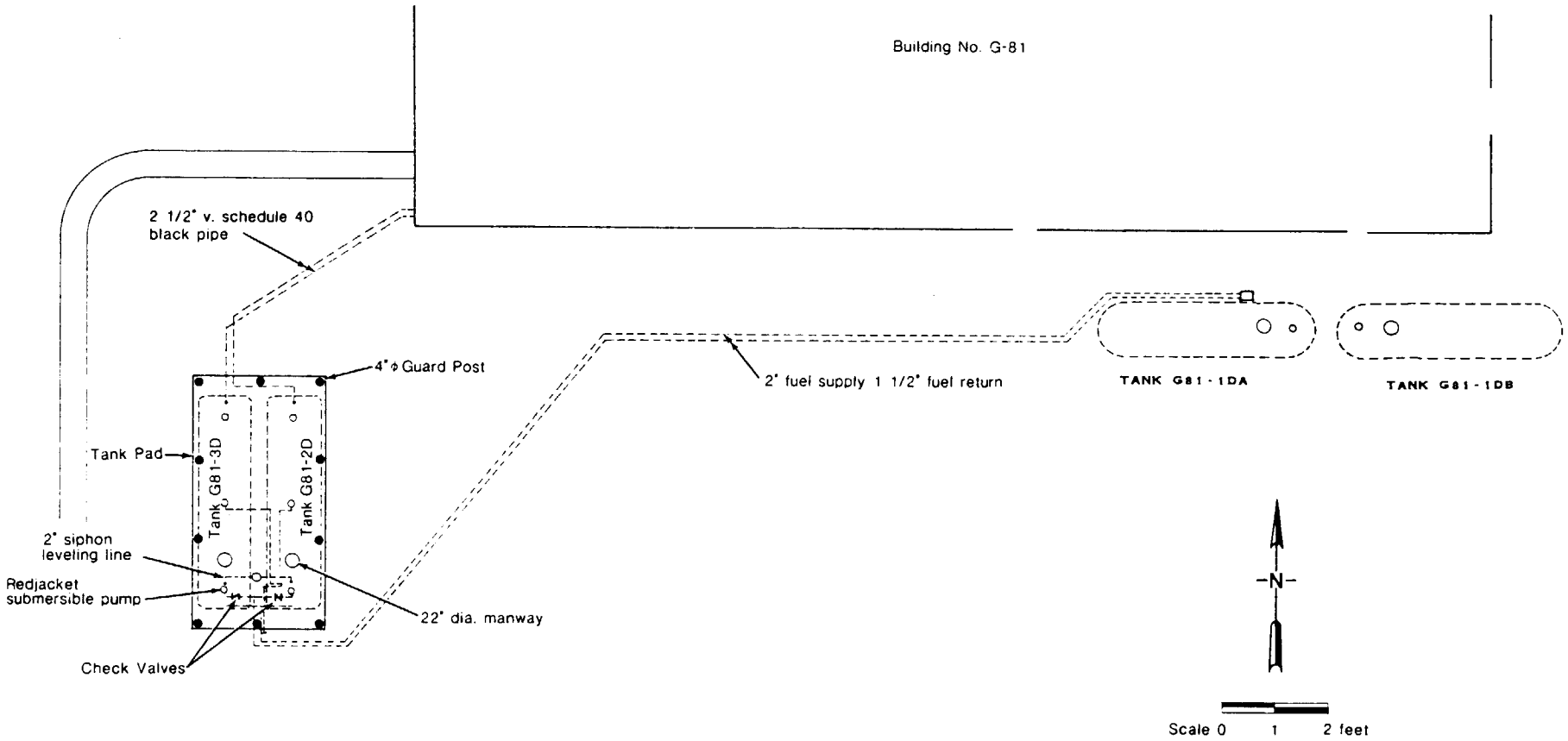


Figure A-16. Mars Site: Diesel Oil Storage Tanks near Building G-81

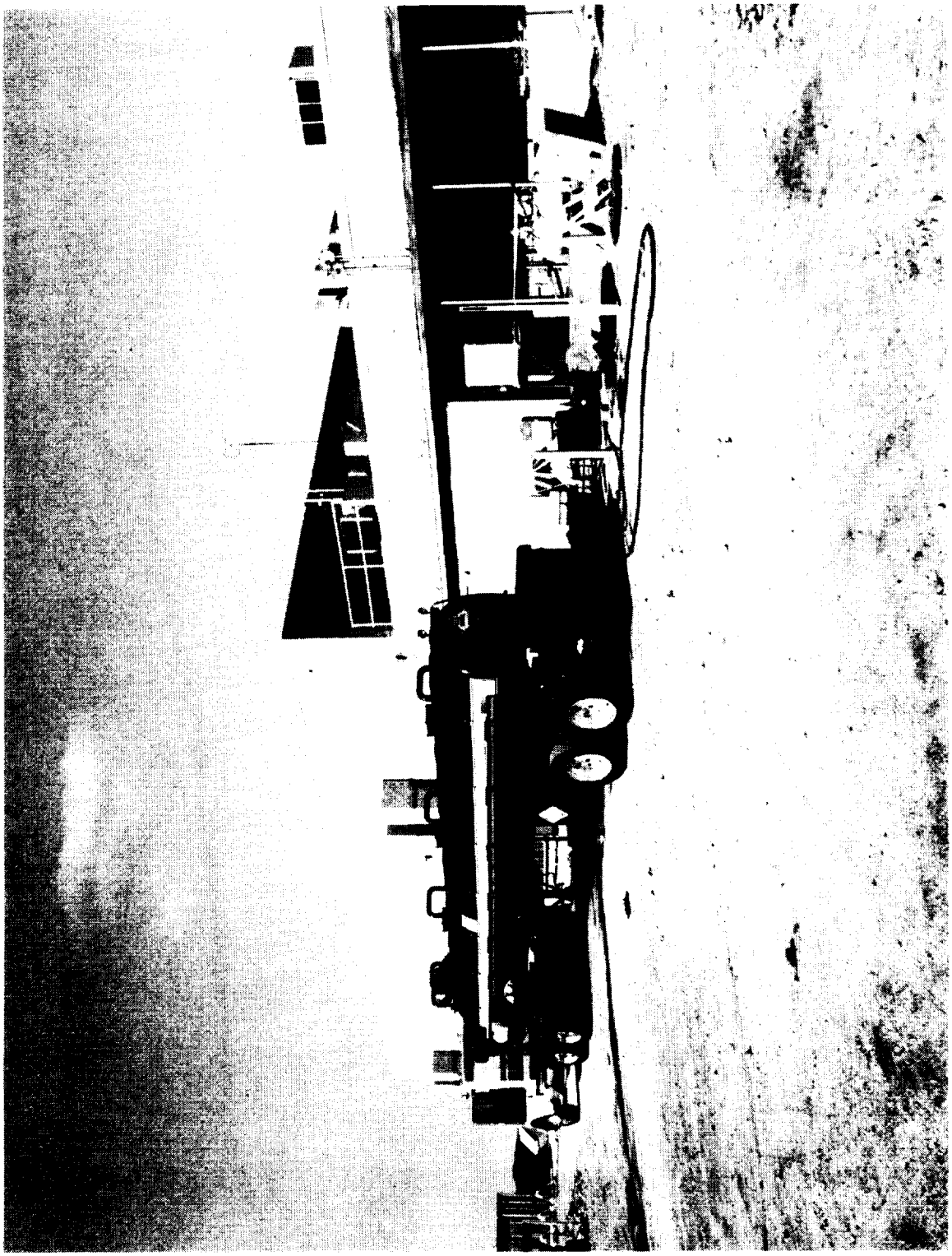


Figure A-17. Mars Site: Diesel Oil Transfer in Preparation for Precision Leak-Testing of Diesel Oil Storage Tanks G81-1DA and G81-1DB near Building G-81

Figure A-18a. Mars Site: Precision Leak-Testing at Diesel Oil Storage Tanks G81-1DA and G81-1DB near Building G-81

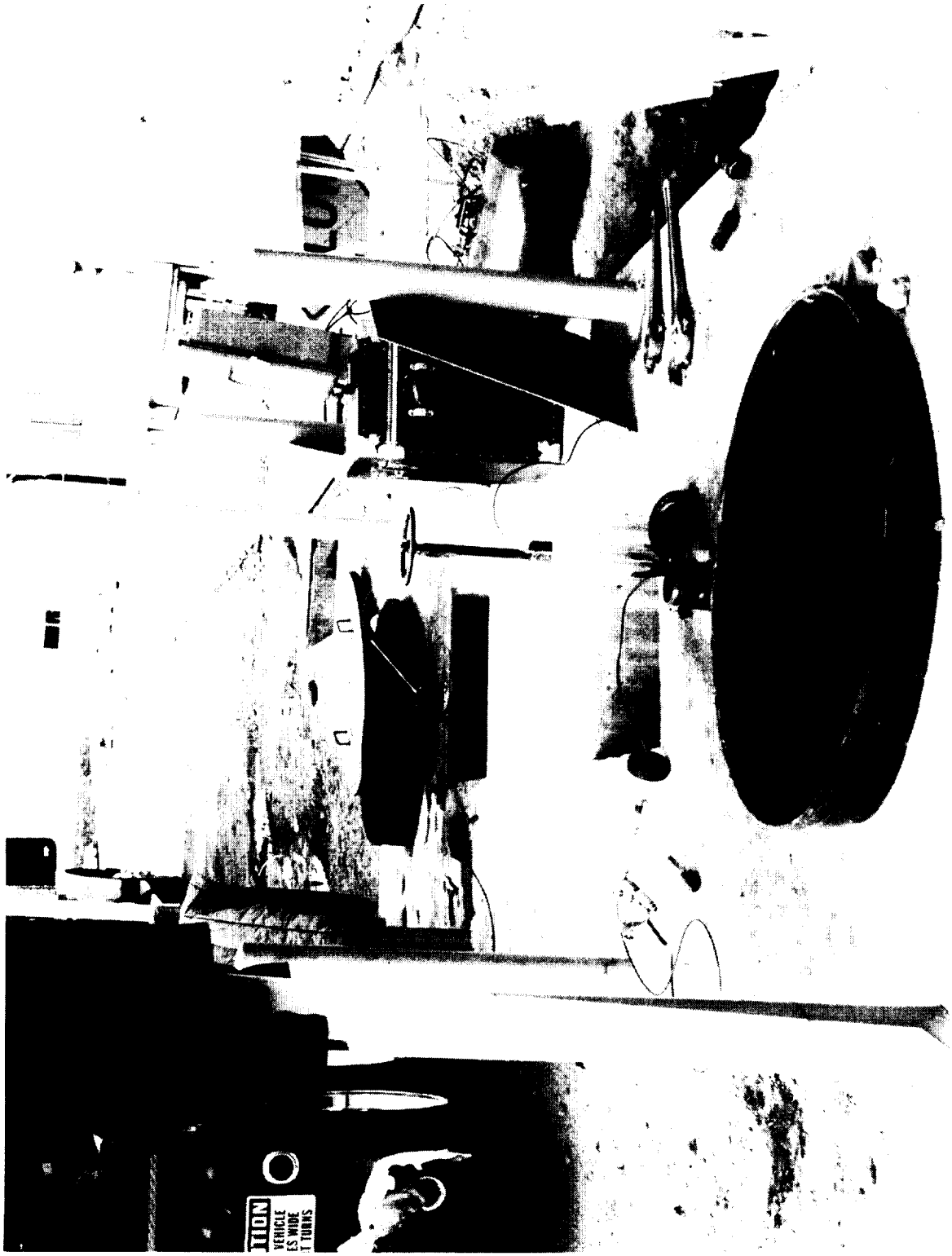


Figure A-18b. Mars Site: Precision Leak-Testing at Diesel Oil Storage Tanks G81-1DA and G81-1DB near Building G-81

Figure A-19. Mars Site: Excavation to Locate Piping Leaks from Diesel Oil Storage Tanks G81-1DA and G81-1DB near Building G-81

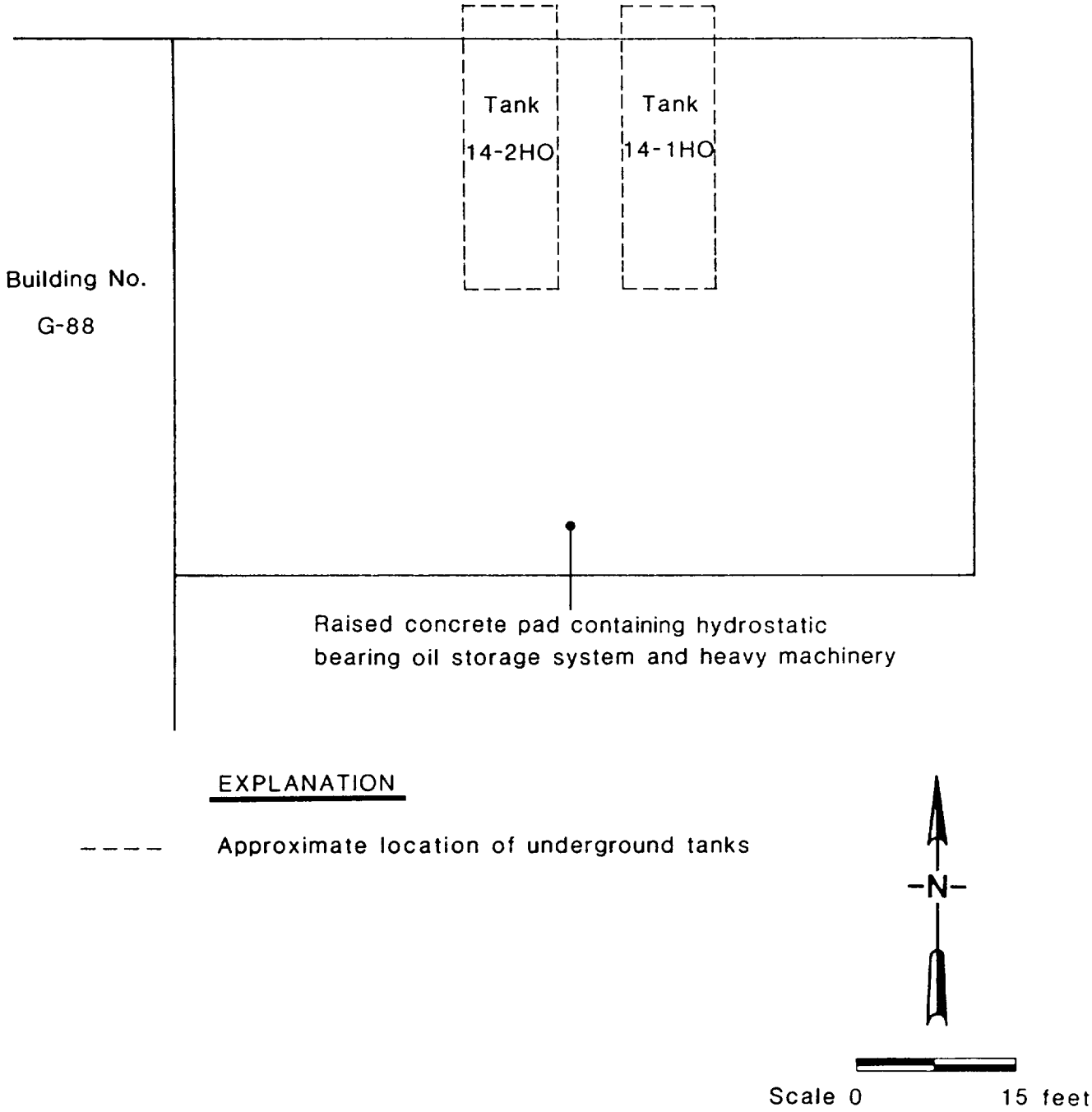
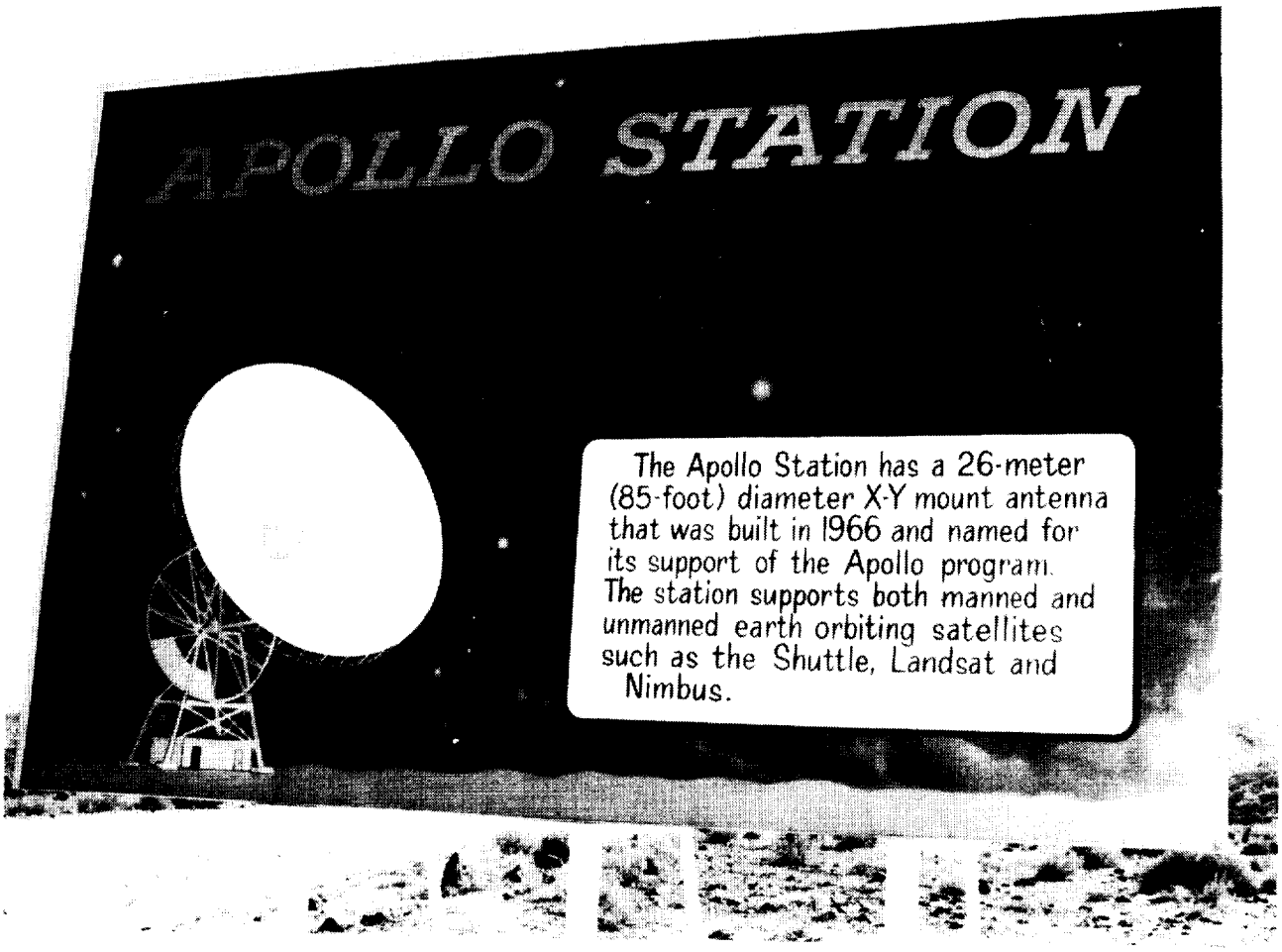


Figure A-20. Mars Site: Hydraulic Oil Tanks 14-1HO and 14-2HO near Building G-88

Figure A-21. Mars Site: Transfer of Hydraulic Oil from Truck to Tanks in Preparation for Precision Leak-Testing of Tanks 14-1HO and 14-2HO

APOLLO STATION
DSS 16



This 26-meter (85 ft) antenna, built in 1965 by the NASA Goddard Space Tracking and Data Network (STDN) to support the manned Apollo missions to the Moon, was transferred to the DSN in October 1984. The antenna is used to support satellites in both low- and high-Earth orbits as well as STS (Space Shuttle) missions.

APOLLO SITE: Summary of UST Work

GASOLINE TANKS

Tank A1-1G	Temporary closure (steam cleaned, inerted and sealed)
Tank A1-2G	Temporary closure (steam cleaned, inerted and sealed)

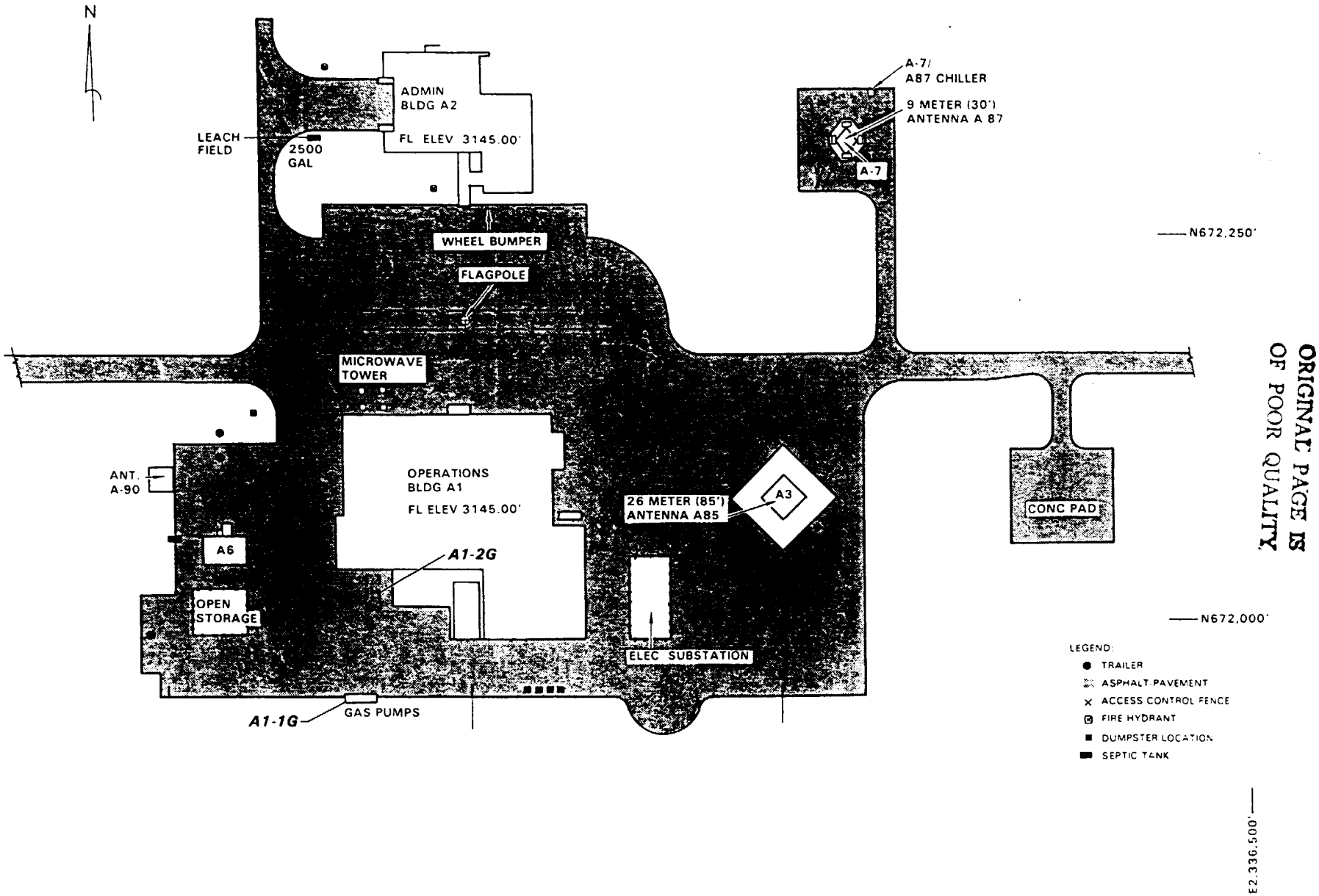


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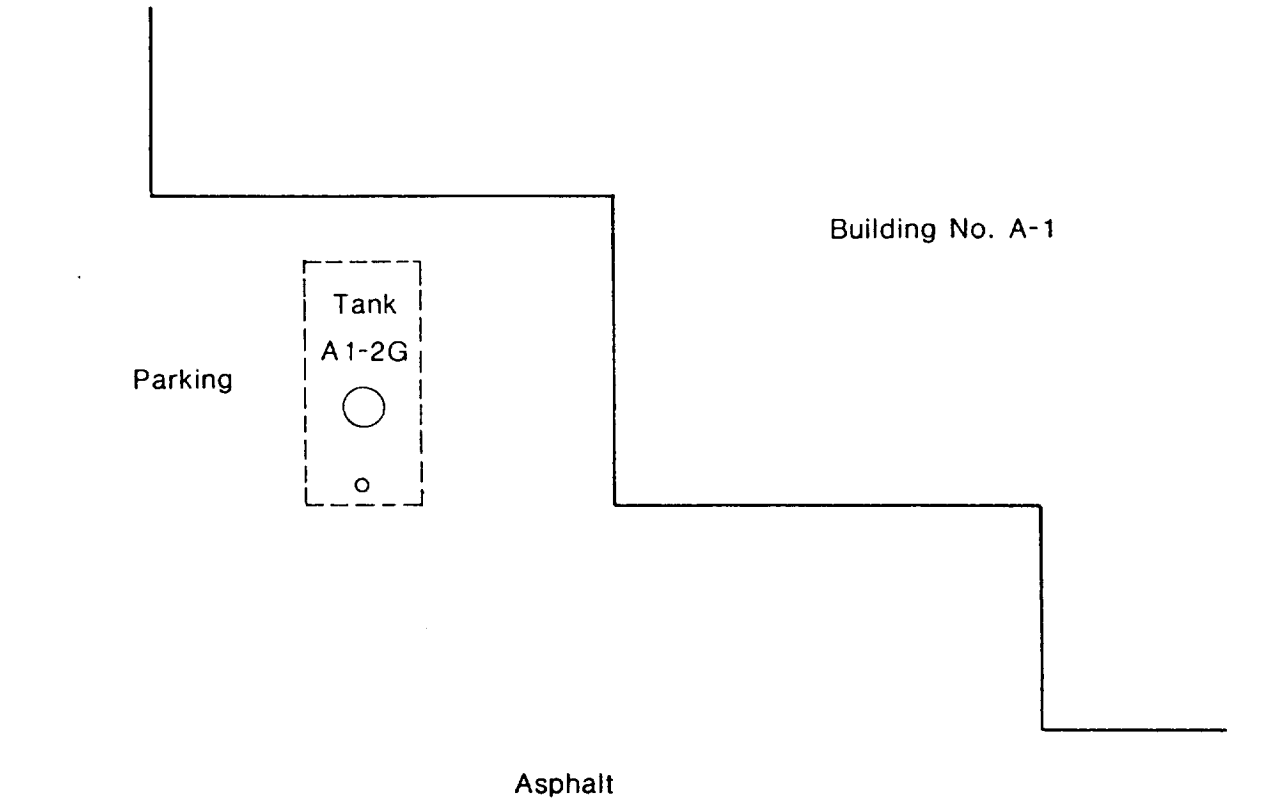
Figure A-22. Apollo Site: Plot Plan



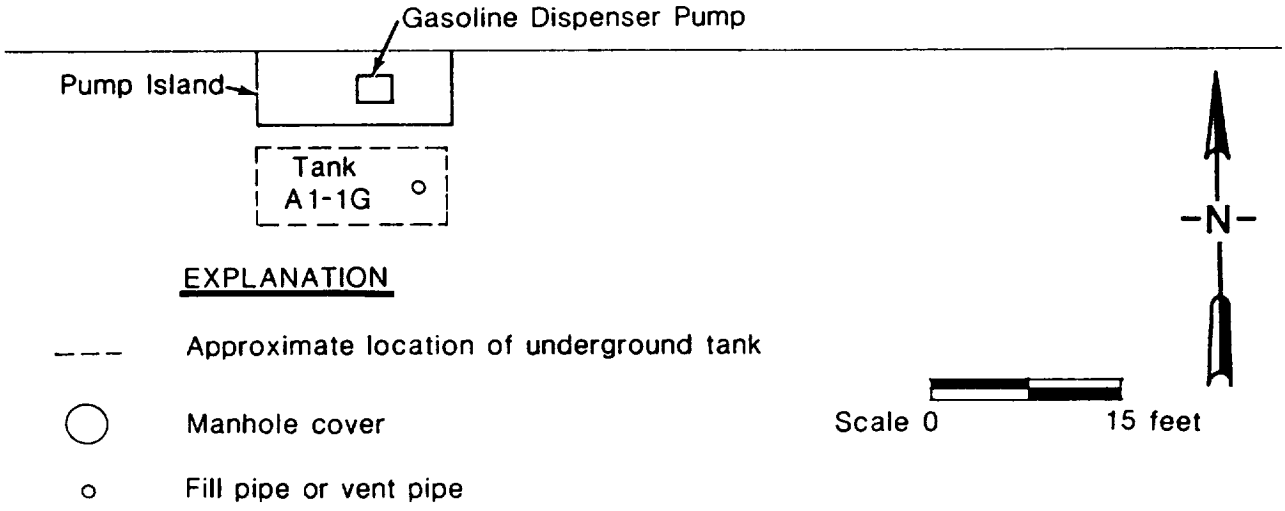


Figure A-23. Apollo Site: Details of Building A-1 Area

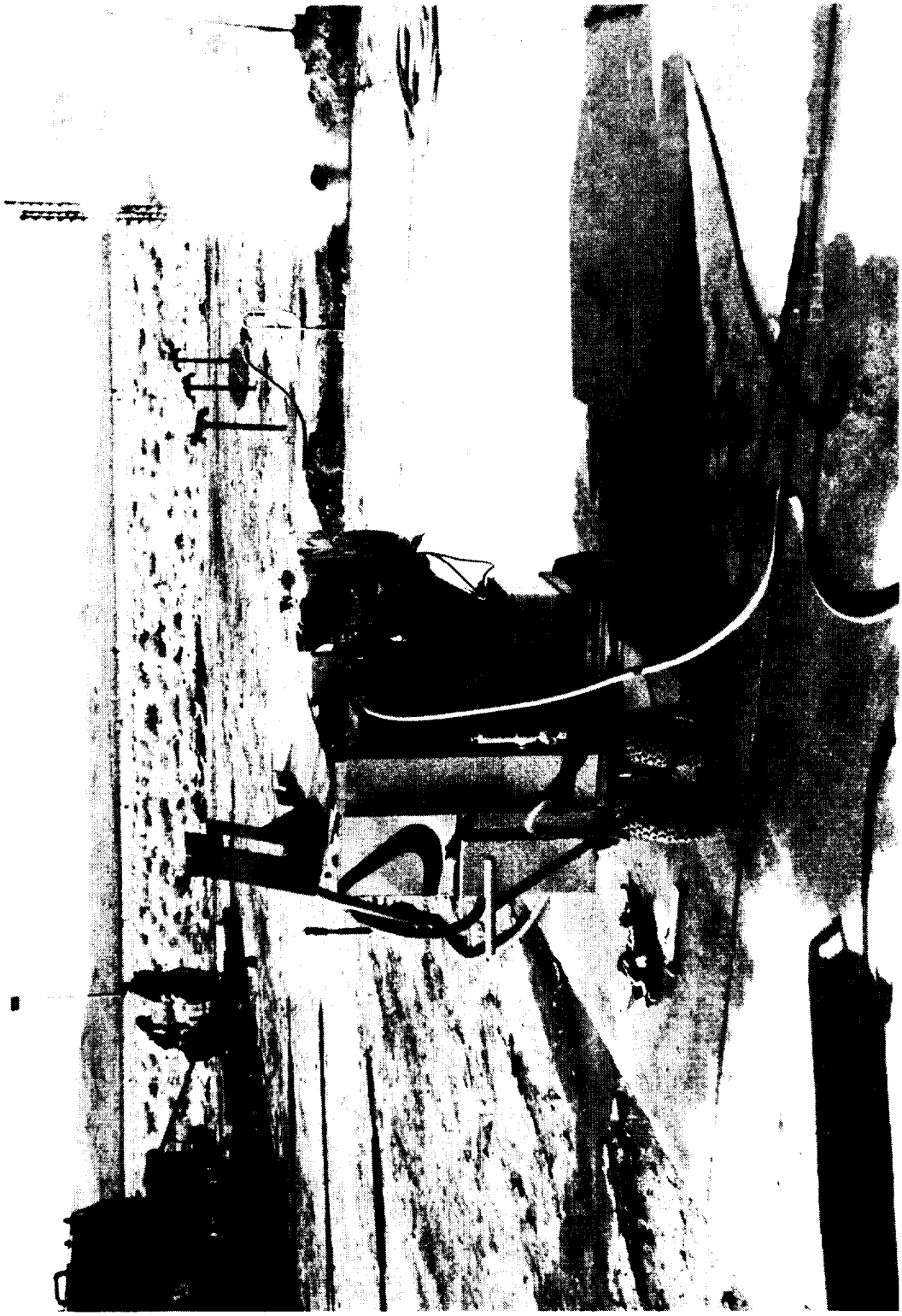


Figure A-24. Apollo Site: Typical Steam Cleaning Equipment Used for Cleaning of Tank Before Tank is Inerted and Sealed

MOJAVE BASE STATION

In addition to the six NASA/JPL DSSs the Goldstone Complex also has a 12-meter (40 ft) antenna at the Mojave Base Station, located near DSS 16, the Apollo Station. This antenna now is operated by NOAA.

C-2

MOJAVE BASE SITE: Summary of UST Work

DIESEL OIL TANKS

Tank M9-1D	Precision leak-tested - in service
Tank M9-2D	Temporary closure (steam cleaned, inerted and sealed)
Tank M9-3D	Temporary closure (steam cleaned, inerted and sealed)

WASTE OIL TANKS

Tank M9-4D	Temporary closure (steam cleaned, inerted and sealed)
Tank M56-1WO	Temporary closure (steam cleaned, inerted and sealed)

GASOLINE TANK

Tank M27-1G	Precision leak-tested - in service

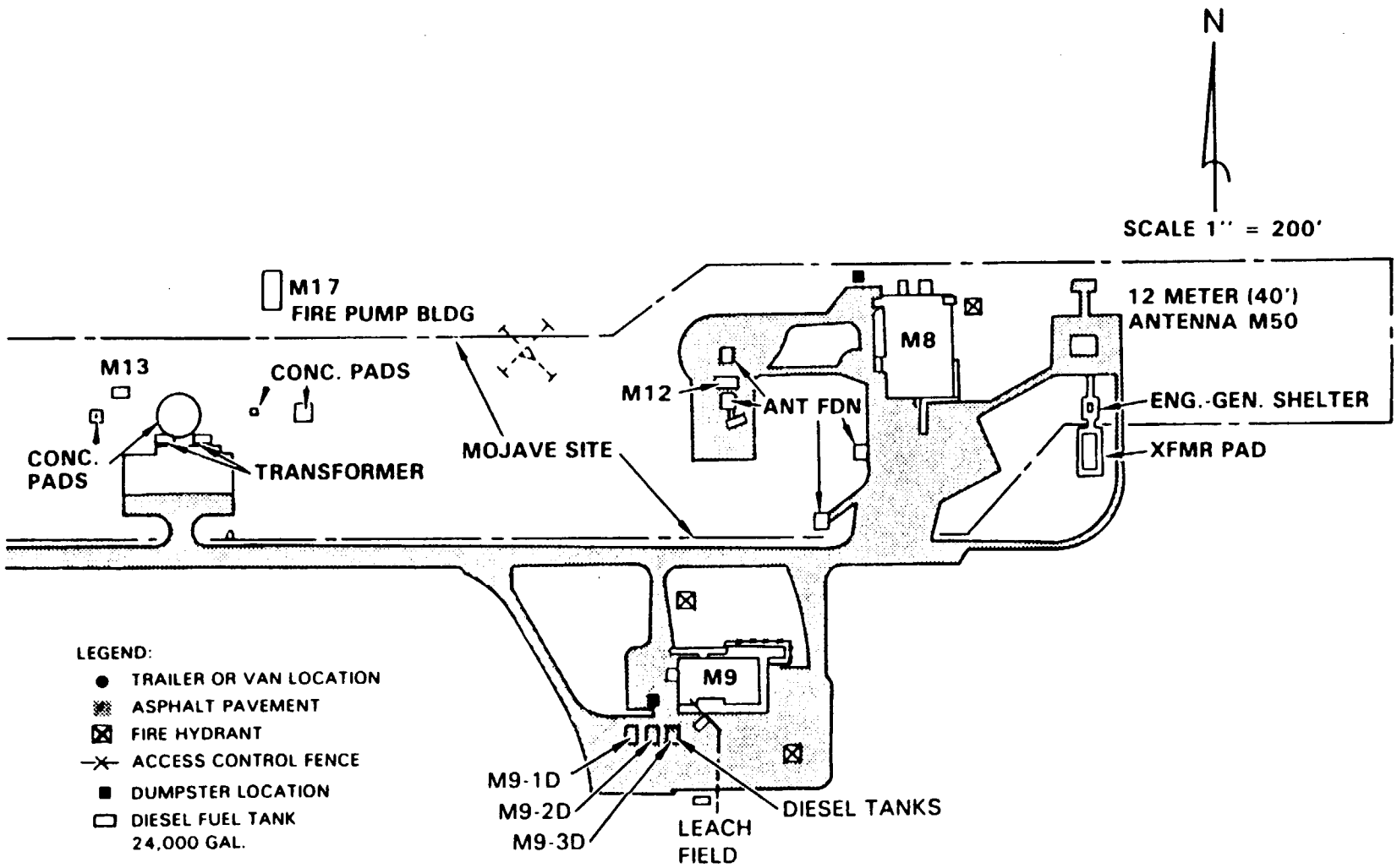


Figure A-25. Mojave Base Site: Partial Plot Plan

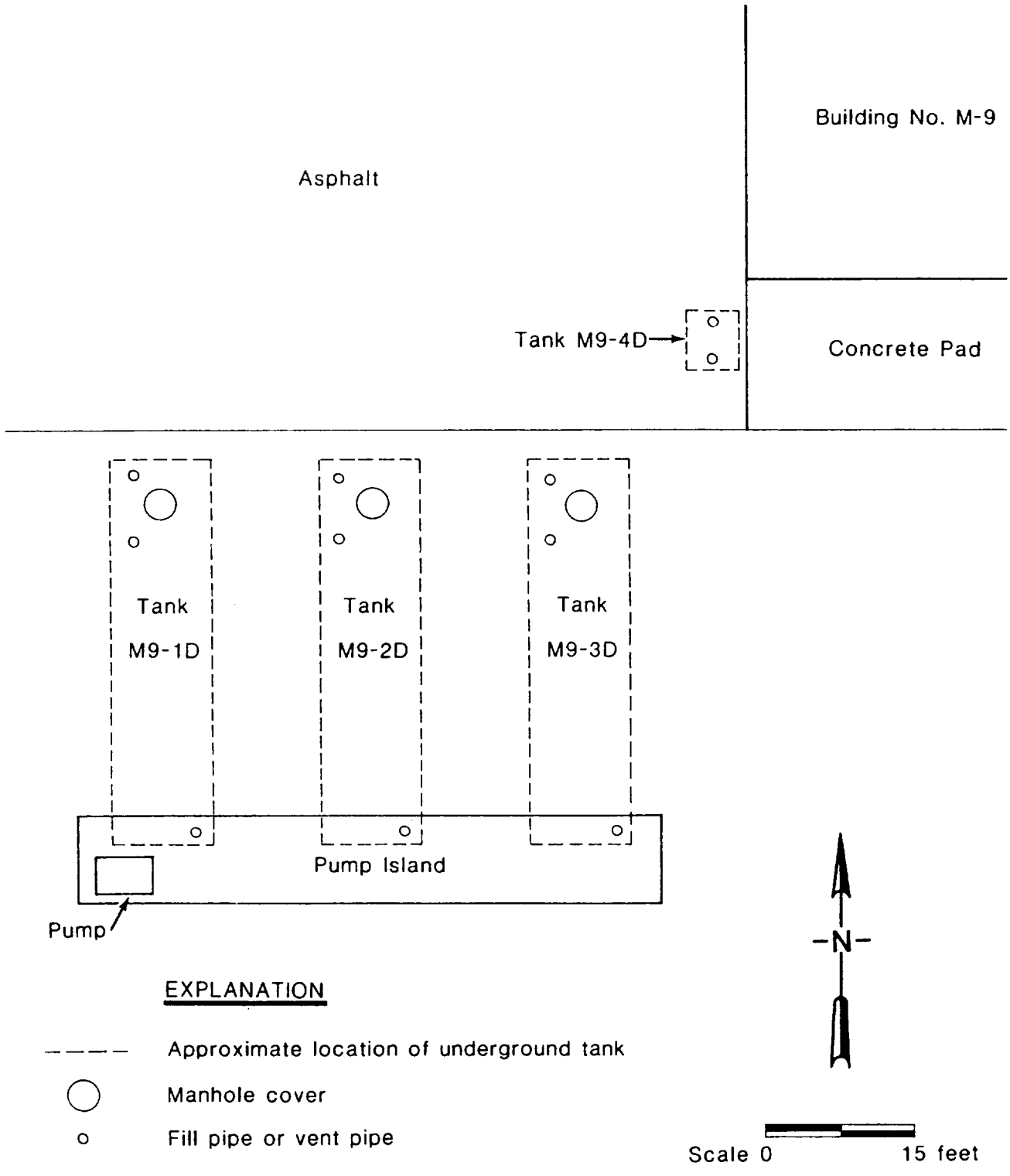


Figure A-26. Mojave Base Site: Details of Area Near Building M-9

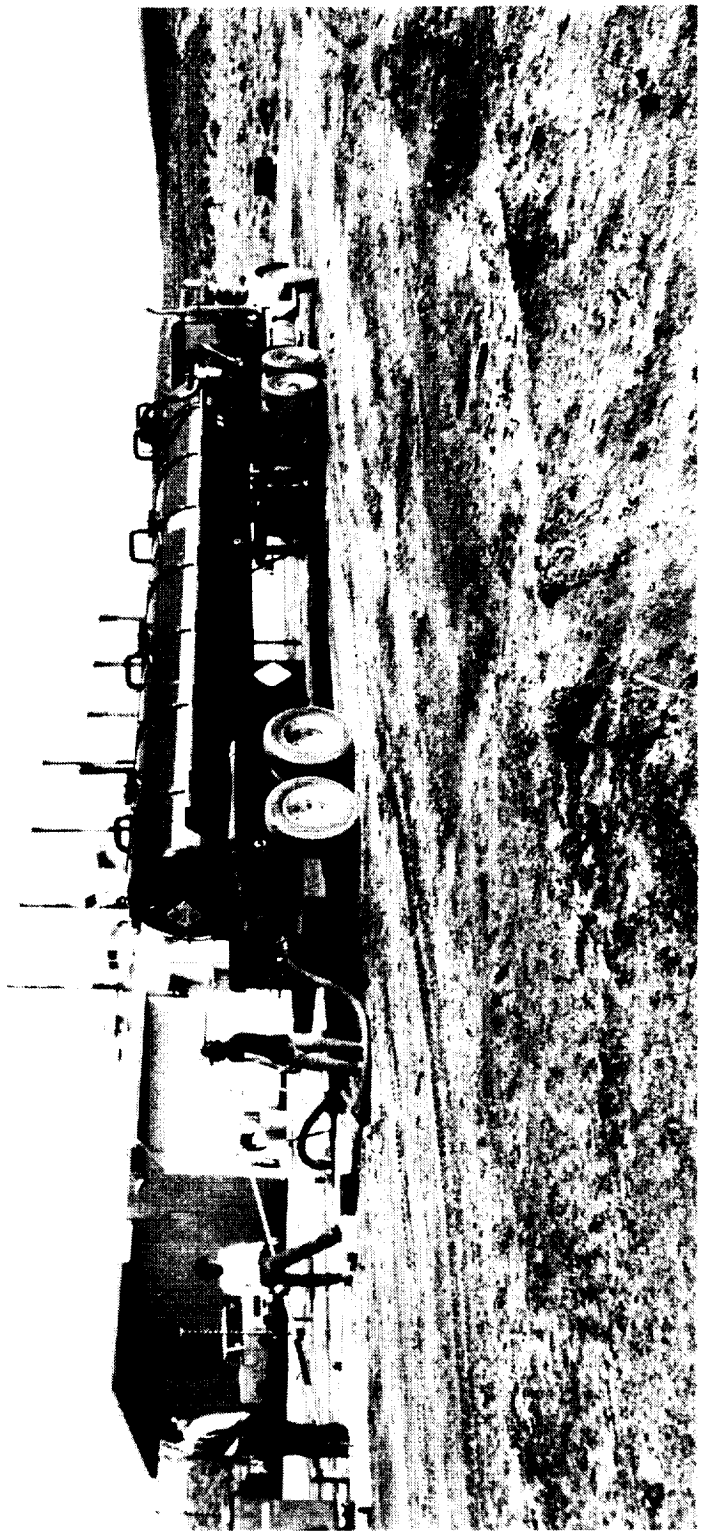


Figure A-27. Mojave Base Site: Transfer of Diesel Fuel Oil from Truck to Tank in Preparation for Leak-Testing of Tanks M9-1D, M9-2D and M9-3D near Building M-9

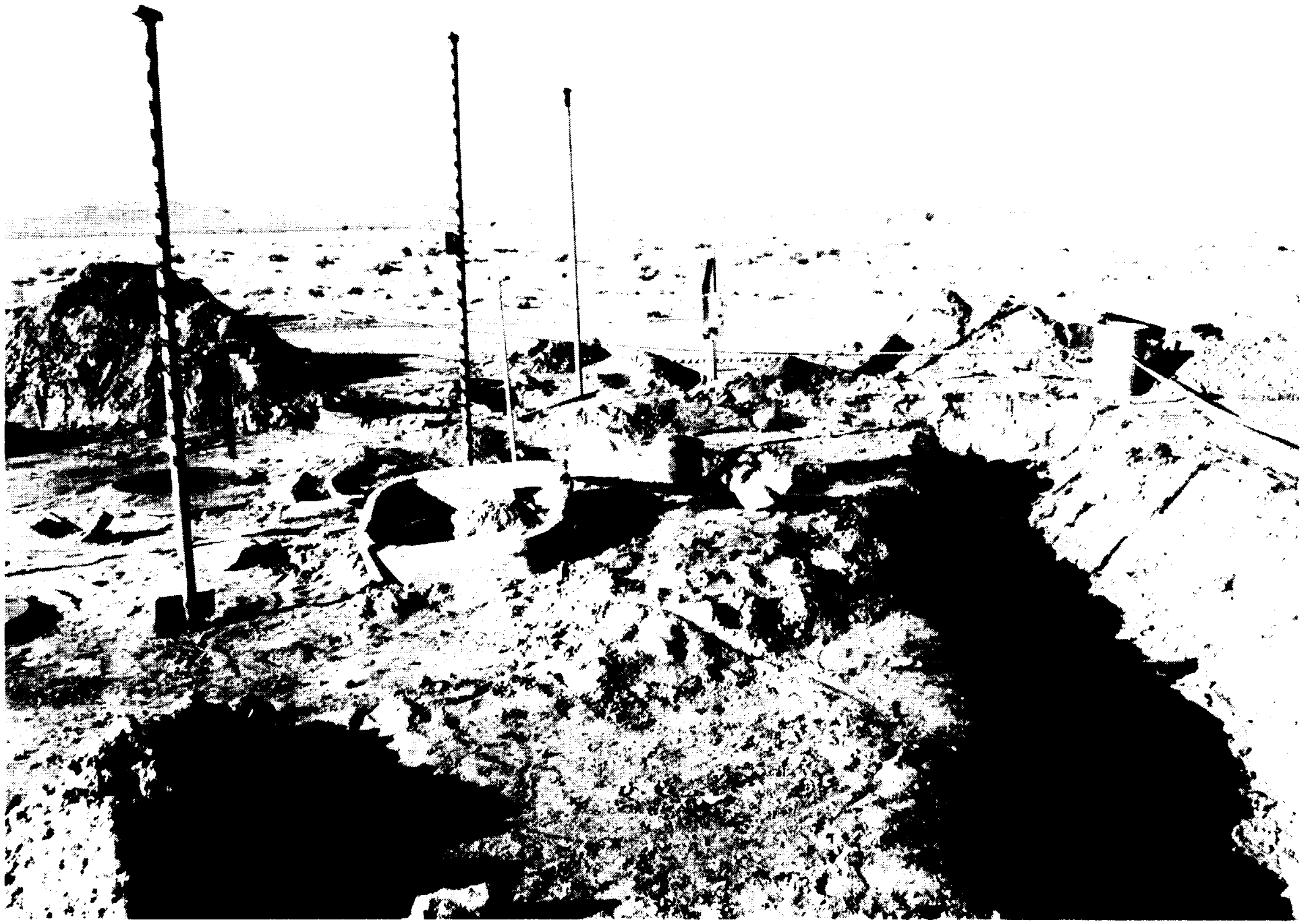


Figure A-28a. Mojave Base Site: Excavation to Locate Piping Leaks at Diesel Oil Storage Tanks M9-1D, M9-2D and M9-3D near Building M-9

Figure A-28b. Mojave Base Site: Excavation to Locate Piping Leaks at Diesel Oil Storage Tanks M9-1D, M9-2D and M9-3D near Building M-9

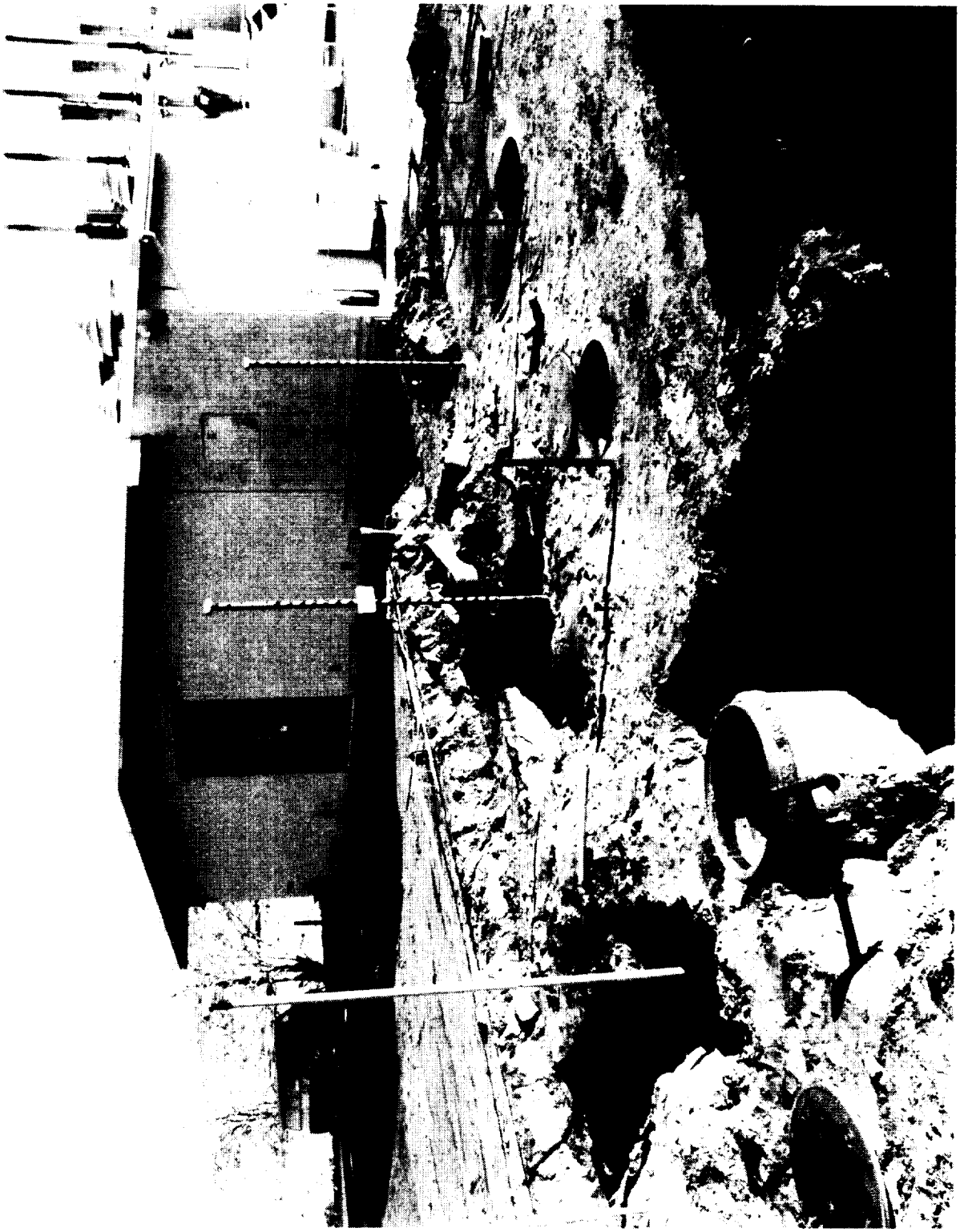


Figure A-28c. Mojave Base Site: Excavation to Locate Piping Leaks at Diesel Oil Storage Tanks M9-1D, M9-2D and M9-3D near Building M-9

Figure A-28d. Mojave Base Site: Excavation to Locate Piping Leaks at Diesel Oil Storage Tanks M9-1D, M9-2D and M9-3D near Building M-9

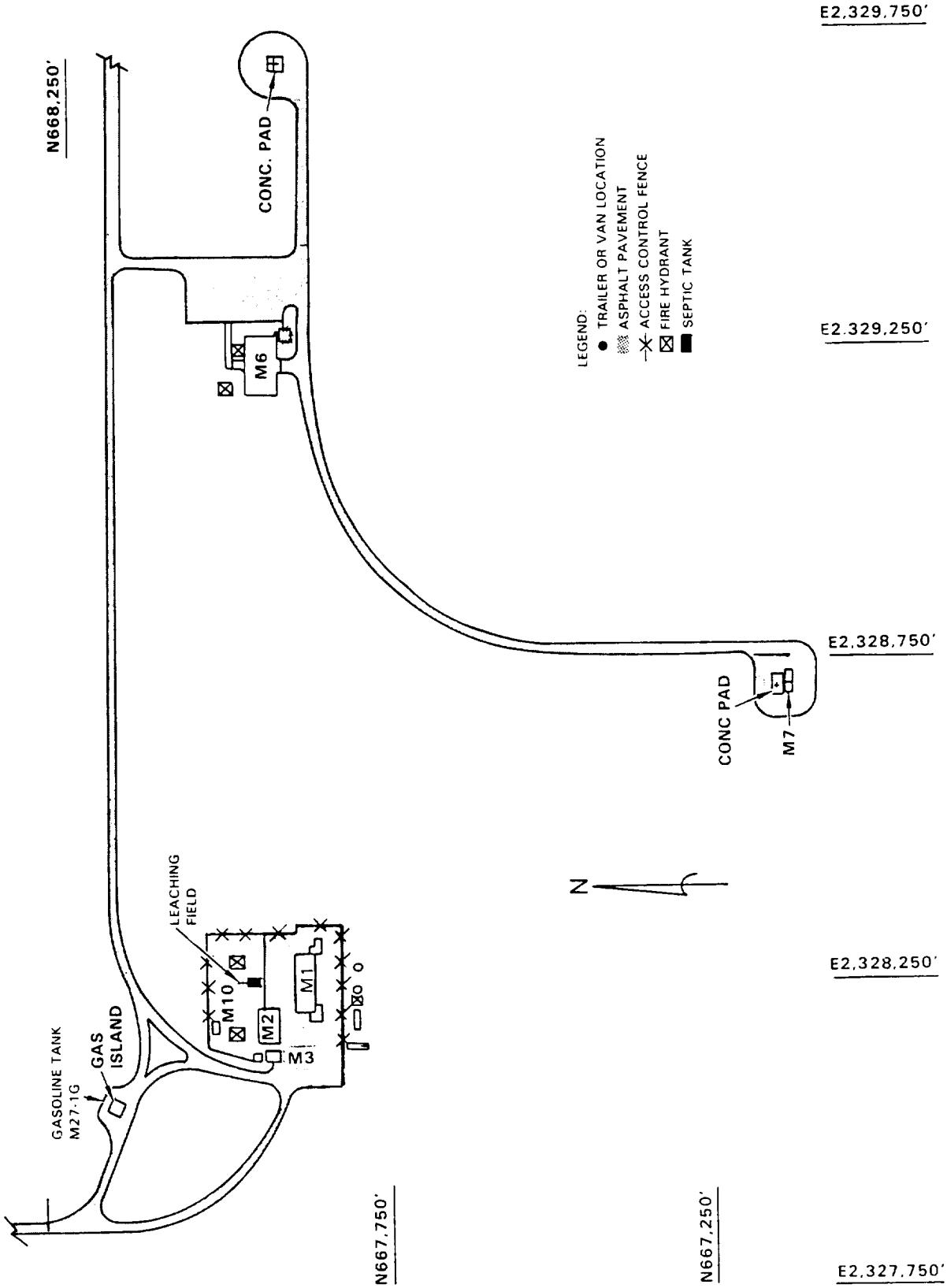
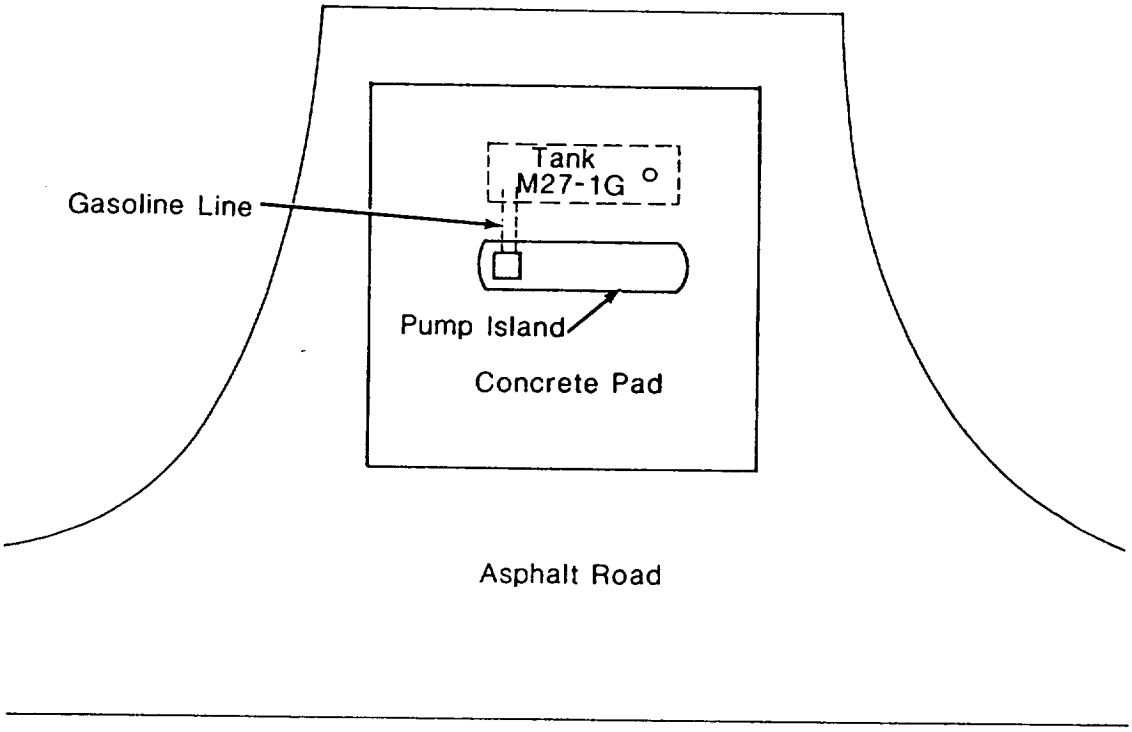


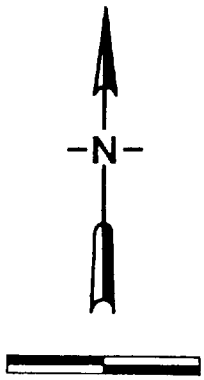
Figure A-29. Mojave Base Site: Partial Plot Plan



EXPLANATION

Approximate location of underground tank

Gasoline dispenser pump



Scale 0 15 feet

Figure A-30. Mojave Base Site: Gasoline Tank M27-1G

GOLDSTONE DRY LAKE AIRPORT: Summary of UST Work

AVIATION GASOLINE TANK

G71-1	Temporary closure (steam cleaned, inerted and sealed)

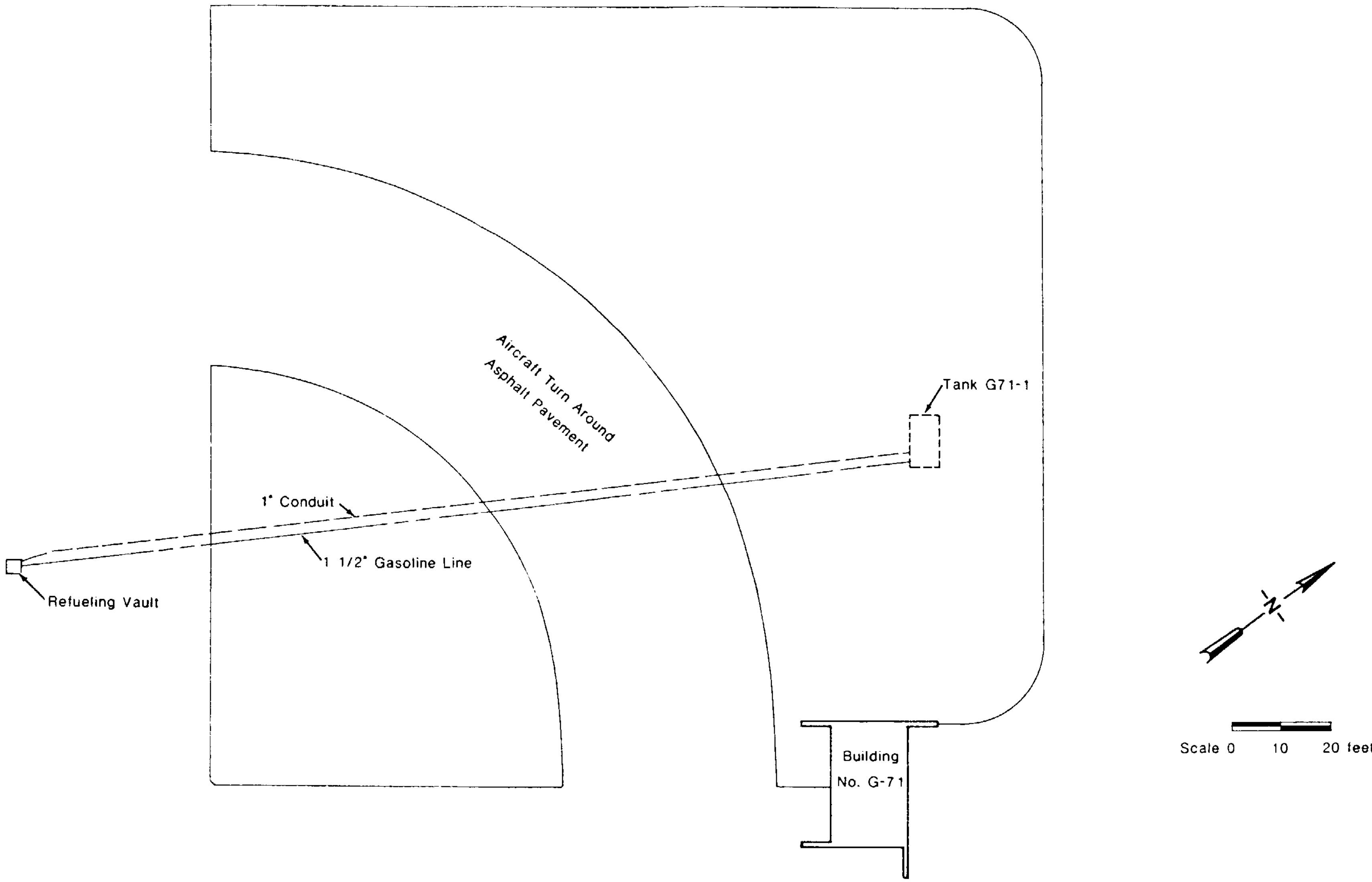


Figure A-31. Details of Goldstone Dry Lake Airport Terminal

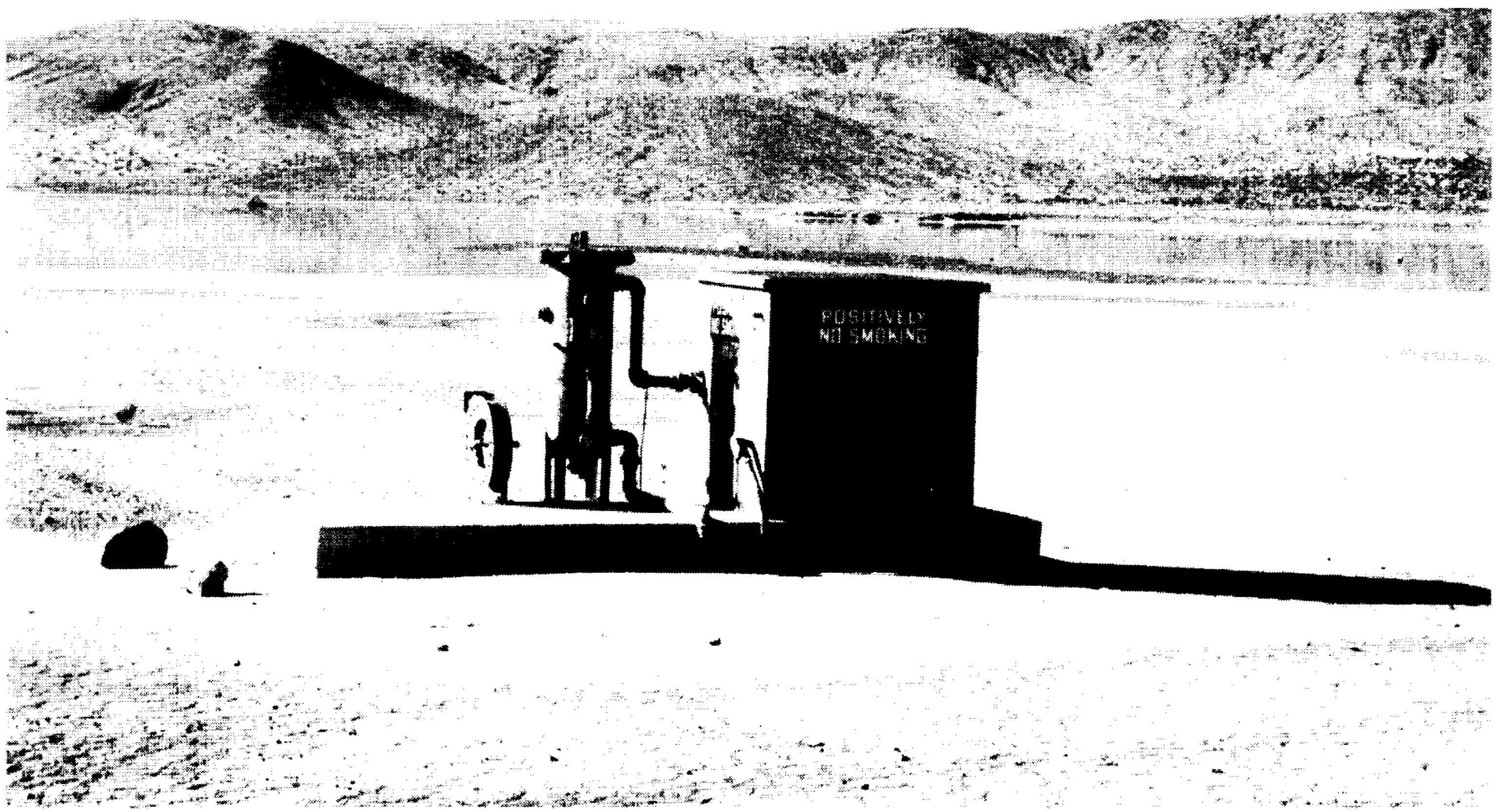


Figure A-32. Goldstone Dry Lake Airport: Aviation Gas Dispensing Station that had not been used for Several Years

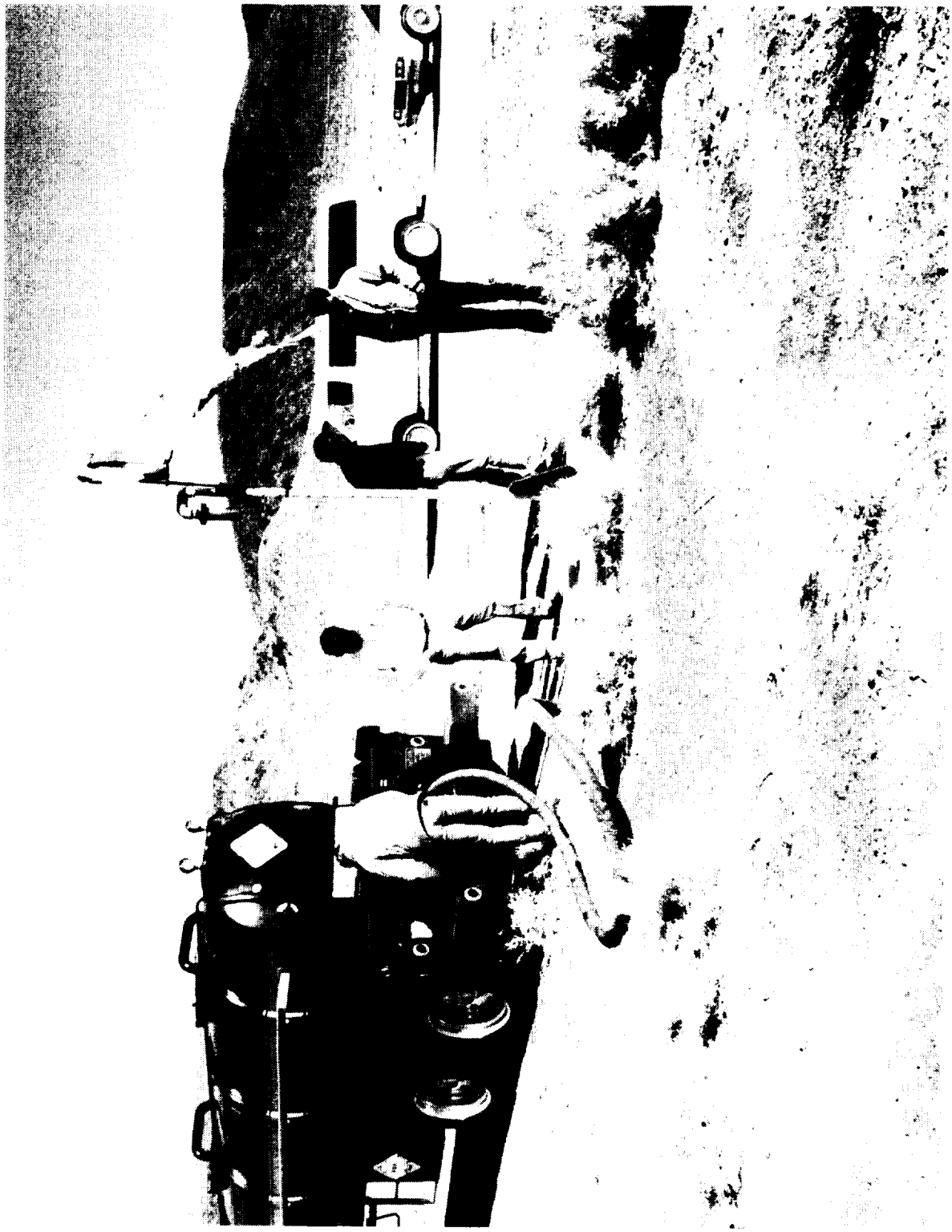


Figure A-33. Goldstone Dry Lake Airport: Temporary Closure of Unused Aviation Gasoline Tank G71-1

APPENDIX B

Documentation of Testing Results for
Underground Storage Tanks at the Goldstone Complex.

Harding Lawson Associates
Engineers, Geologists
& Geophysicists

SHEET 1 OF
JOB NO. 17572, 005-11
DATE
COMPUTED BY JCL
CHECKED BY

PROJECT MBGA JPL
SUBJECT Tank Test Results and Summary

Echo TF-3D, TF-4D (Pass)
Tank were empty
Tanks filled on 12-1-86 with diesel fuel
Tanks tested 12-2-86 9:00 - 12:00, tanks failed because of leak in each manhole cover.

Manholes repaired 12-2-86
Tanks retested 12-3-86
8:30 - 11:30, top off tanks, set up test equip, stabilize
11:30 - 1:00 test tanks, (at the same time)
TF-3D +.0091 Pass
TF-4D -.0008 Pass

Echo G42-2D (Fail)
Filled with diesel 12-1-86
Tested 12-2-86
12:00 - 2:00 Tanks topped off, set up equip, stabilize
2:00 - 4:00 Test tank full system fails -.136
15 min low level tank test pass, (no charge for extra test), leak appears to be in product lines or vent.
Tank steam cleaned, inerted and sealed

Echo G27-3D (Pass)
Filled with diesel 12-1-86
Tested 12-4-86
11:30 - 12:30, Top off, set up equip, stabilize
12:35 - 1:50 Test Passes ±.0000

Echo G27-1D & G27-2D (Manifolded) (Pass)
Filled with diesel 12-1-86
Tanks tested 12-3-86; Failed because of leaky manhole 1:30-3
Retest 12-4-86 2:15 to 3:30
Pass +.0023

Apollo A1-2G (Fail)
Tank Filled with diesel on 12-2-86
Tested 12-5-86
8:30-10:00 Prepare tank fill pipe, set up equip, stabilize
10:00 - 11:30 Test fails unable to hold product in stand pipe for calibration
11:30 - 12:00 15 min Low level test (Pass) Cleak in lines.
Tank steam cleaned, inerted, and sealed

Apollo A1-1G (Pass)
Filled with diesel 12-2-86
Tested 12-5-86
12:30 - 1:15 Top off tank, set up equip, stabilize
1:25 - 2:25 Test (Pass) t. 0027
Tank steam cleaned, inerted, and sealed

Harding Lawson Associates
Engineers, Geologists
& Geophysicists

SHEET 3 OF
JOB NO. 17572, 005-11
DATE
PROJECT MBGA JPL
COMPUTED BY JCL
SUBJECT Tank Test Results and Summary
CHECKED BY

Mohave MS6-1WO (Pass)
Filled with diesel 12-5-86
Tested 12-9-86
8:00 - 10:00 Top off tank, set up equip, stabilize
10:00 - 11:00 Test tank passes - .0063
full system test, no product lines
Tank steam cleaned, inerted and sealed

Mohave M9-4D (Pass)
Filled with diesel 12-5-86
Tested 12-9-86
11:00 - 12:00 Top off tank, set up equip, stabilize
12:00 - 1:00 Test Passes +.0069
full system test, no product lines.
Tank steam cleaned, inerted, and sealed

Airport G71-1 (Pass)
Tank filled with diesel 12-5-86
Tested 12-9-86
1:00 - 2:30 Top off tank, set up equip, stabilize
2:30 - 3:30 Test Passes +.0111
full system test, no lines
Tank steam cleaned, inerted and sealed

Echo G24-1D and G24-2D manifolded (Failed)
Filled with diesel 12-9-86
Tested 12-10-86
8:00 - 12:00 Top off tank, set up equip, tank will not stabilize
12:00 Tank test Fails, unable to hold product in stand pipe to calibrate
12:15 - 12:30 Low level tank test pass, leak in product lines
1:00 - 2:30 Possible air pocket trapped under manhole cover may have caused failure, drill hole in manhole cover, bleed air from system, retest

2:30 Retest fails same as previous test

Retest on 12-18-86, Test passes.

Echo G42-1G (Pass)
Filled with unleaded 12-10-86
Tested 12-11-86
8:00 - 9:15 Top off tank, set up equipment, stabilize
9:15 - 10:30 Test passes t. 0255

Mars 14-2H.O. (south) (Pass)
Filled 12-10-86 with diesel
Tested 12-11-86
11:00 - 11:40 Top off tank, set up equip, stabalize
11:40 - 12:40 Test passes t. 0209
full system test, no product lines

Mars 14-1WO (Pass)
Filled 12-8-86 diesel
Tested 12-11-86
1:30 - 2:30 Top off tank, set up equip, stabilize
2:30 - 3:30 Test passes -.0257

Mars 14-1HO (Pass)
Filled 12-11-86 diesel
Tested 12-12-86
8:00 - 9:00 Top off tank, set up equip stabilize
9:00 - 10:00 Test Passes t. 0008
full system test, no lines

Harding Lawson Associates
Engineers, Geologists
& Geophysicists

SHEET 5 OF
JOB NO. 17572.005-11
DATE
COMPUTED BY JCL
CHECKED BY

PROJECT MBGA JPL
SUBJECT Tank test summary

Echo G25-1G & G25-2G (manifolded vent line)
Filled with unleaded gas 12-15-86
Tested 12-16-86, incomplete test because tank would not stabilize because of trapped air pocket in system. Repair work done by Bendix to isolate tanks and test seperately.

G25-2G
Retest 12-17-86, incomplete test air pocket
15 minute low level test pass.

G25-1G
Retest 12-19-86, Failed
15 min Low level tank test pass

Mars G81-2D & 3D
Tested 12-16-86 test passes.

Mohave M9-2D
Tested 12-17-86 Test Failed, 15 Low Level Pass.

Mohave M9-3D
Tested 12-17-86 Test Failed, 15 Low Level Pass

Mars G81-1DA, 1DB (Manifolded)
Tested 12-18-86, Incomplete test, air pocket in system, tank will not stabilize for calibration on chart graph recording. Bendix will decide to repair or abandon at later date.

Mohave M27-1G
Tested 12-12-86
Test Fails, low level test passes.
Repair piping
Retest 12-19-86 Test passes.

Mohave M9-1D
Tested 12-20-86 Test passes

APPENDIX C

Documentation Concerning Precision Leak Testing of Underground Storage Tanks at the Goldstone Complex.

(1) Horner Easy Testing Work Sheets

(2) Chart Recordings for Leak Tests

#1 of 3

AAA TESTING, INC.
Phone 209-627-4400
326-A S. Divisadero (Office in Rear)
1526 W. Mineral King (Mailing Address)
Visalia, Ca. 93291

HORNER EASY TESTING METHOD WORK SHEET

98 — 81 = 17
22 — 5 = 22
53 — 34 = 17

Syphon System

A - #1-G-81-1DA
TANK No. 2 - #2 G-81-1DB TEST LEVEL High PRODUCT Diesel Fuel Oil CAPACITY 12,500 CHART CAL 18 inch ÷ 19 = .01392 (A)
MEASURED GRAVITY #1 31 #2 31 PRODUCT TEMP #1 57° #2 57° COEFFICIENT .00044055 TEMP CAL .00044055 × 12,500 = 5.511 (B)

TEST NO.	LEVEL START	LEVEL END	GAIN + LOSS −	× (A)	LEVEL RESULT
1	95	62	−33	× .0013	= .0429
2	62	37	−25	× .0013	= .0325
3	37	21	−16	× .0013	= .0208
4	100	93	−7	× .0013	= .0091

	TEMP. START	TEMP. END	GAIN + LOSS −	× (B)	TEMP. RESULT	FINAL RESULT	TIME
A	.772	.778	+.006	× 5.51	= +.0330		10:30 AM
B	.002	.999	−.003	× 5.51	(+.0165) = −.0165	= .0374	10:45
A	.778	.789	+.011	× 5.51	= .0606		
B	.999	.989	−.010	× 5.51	(+.0055) = .0551	= .0380	10:45
A	.789	.790	+.001	× 5.51	= +.0055		
B	.989	.991	+.002	× 5.51	(+.0110) = +.0165	= .0318	11:00
A	.790	.798	+.008	× 5.51	= .0440		
B	.991	.984	−.007	× 5.51	(+.0055) = −.0385	= .0116	11:15

STATION LOCATION JPL Goldstone - DSCC
ADDRESS
CITY Barstow STATE CA
DATE 1-21-87

CERTIFIED TIGHT station
LEAK RATE PER HOUR
OPERATOR
SIGNATURE

OVER FOR REMARKS

OWNER OF SITE
ADDRESS
CITY - STATE - ZIP CODE
OWNER OF TANKS
ADDRESS
CITY - STATE - ZIP CODE
OPERATORS NAME AT SITE
TYPE OF SYSTEM ☑ SUBMERGE ☐ SUCTION
LENGTH OF FILL PIPE #1 - 65" #2 - 64"
COLOR CODE OF PRODUCT ☐ CLEAR ☐ ORANGE ☐ RED
DIAMETER OF TANK 96"
☑ METAL ☐ FIBERGLASS
TYPE OF RECOVERY SYSTEM ☐ BALANCE ☐ RED JACKET ☐ HEALEY
WATER LEVEL IN TANK 3"
DEPTH OF GROUND WATER (IF KNOWN)
DATE / TIME STORAGE SYSTEM FILLED DATE 1-20-86 TIME
AGE OF TANKS
AGE OF LINES
TESTING FLUID, IF DIFFERENT THAN STORED MATERIAL

Typical Work Sheet for the Testing of a UST at the CDSCC

#2 of -

AAA TESTING, INC.
Phone 209-627-4400
326-A S. Divisadero (Office in Rear)
1526 W. Mineral King (Mailing Address)
Visalia, Ca. 93291

HORNER EASY TESTING METHOD

WORK SHEET

OWNER OF SITE
ADDRESS
CITY - STATE - ZIP CODE
OWNER OF TANKS
ADDRESS
CITY - STATE - ZIP CODE
OPERATORS NAME AT SITE
TYPE OF SYSTEM ☐ SUBMERGE ☐ SUCTION
LENGTH OF FILL PIPE
COLOR CODE OF PRODUCT CLEAR ORANGE RED
DIAMETER OF TANK ☐ METAL ☐ FIBERGLASS
TYPE OF RECOVERY SYSTEM ☐ BALANCE ☐ RED JACKET ☐ HEALEY
WATER LEVEL IN TANK
DEPTH OF GROUND WATER (IF KNOWN)
DATE / TIME STORAGE SYSTEM FILLED DATE TIME
AGE OF TANKS
AGE OF LINES
TESTING FLUID, IF DIFFERENT THAN STORED MATERIAL

TANK No. A-#1 B-#2 TEST LEVEL High PRODUCT Fuel Oil CAPACITY A-12500 B-12500 CHART CAL 100 ÷ 19 = .001372 (A)

MEASURED GRAVITY #1 = 31 #2 = 31 PRODUCT TEMP #1 58° #2 58° COEFFICIENT .000440 85 TEMP CAL 12500 = .0824 5.51 (B)

TEST NO.	LEVEL START	LEVEL END	GAIN + LOSS −	× (A)	LEVEL RESULT		TEMP. START	TEMP. END	GAIN + LOSS −	× (B)	TEMP. RESULT	FINAL RESULT	TIME
						A	.798	.804	+.006	× 5.51	+.0330	= .0297	11:30
	13	90	−3	× .0013	= .0039	B	.984	.984	0	× 5.51	(+.0330) 0	-	
						A	.804	.808	+.004	× 5.51	+.0220	= .0100	11:45
	90	95	+5	× .00137	.0065	B	.784	.983	−.001	× 5.51	(+.0165) −.0055	-	
						A	.808	.812	+.004	× 5.51	+.0220	-	12:00
	62	69	+7	× .0013	+.0091	B	.983	.982	−.001	× 5.51	(+.0165) −.0055	= .0074	
						A	.812	.816	+.004	× 5.51	+.0220	-	12:15
	69	73	+11	× .00137	.0143	B	.982	.980	−.002	× 5.51	(+.0110) −.0110	= .0033	

LOCATION LOCATION
ADDRESS
CITY STATE
STATE

CERTIFIED TIGHT
LEAK RATE PER HOUR
OPERATOR
SIGNATURE

OVER FOR REMARKS

C-4

Typical Work Sheet for the Testing of a UST at the GDSCC

#3 of 3

AAA TESTING, INC.
Phone 209-627-4400
326-A S. Divisadero (Office in Rear)
1526 W. Mineral King (Mailing Address)
Visalia, Ca. 93291

HORNER EASY TESTING METHOD

WORK SHEET

TANK No. ____ TEST LEVEL High PRODUCT ____ CAPACITY ____ CHART CAL ____ ÷ ____ = ____ (A)

MEASURED GRAVITY ____ PRODUCT TEMP ____ COEFFICIENT ____ TEMP CAL ____ × ____ = ____ (B)

TEST NO.	LEVEL START	LEVEL END	GAIN + LOSS −	× (A)	LEVEL RESULT
9	73	83	+10	× .0013	= .0130
10	83	92	+9	× .0013	= .0117
				× .0013	=
				× .0013	=

	TEMP. START	TEMP. END	GAIN + LOSS −	× (B)	TEMP. RESULT	FINAL RESULT	TIME
A	.816	.819	+.003	× 5.51	= .0165	=	12:30
B	.980	.981	+.001	× 5.51	(+.0220) +.0055	= .0090	
A	.819	.824	+.005	× 5.51	= .0275	=	12:45
B	.981	.981	0	× 5.51	(+.0275) 0	= .0158	
A				× 5.51	=	=	1:00 PM
B				× 5.51	=	=	
A				× 5.51	=	=	
B				× 5.51	=	=	

STATION LOCATION JPL Goldstone Complex

ADDRESS [illegible]

CITY [illegible] STATE CA

DATE 1-21-97

CERTIFIED TIGHT YES

LEAK RATE PER HOUR = .0289

OPERATOR Eddie Cotter

SIGNATURE Eddie Cotter

OVER FOR REMARKS

OWNER OF SITE NASA

ADDRESS

CITY - STATE - ZIP CODE

OWNER OF TANKS

ADDRESS

CITY - STATE - ZIP CODE

OPERATORS NAME AT SITE

TYPE OF SYSTEM ☑ SUBMERGE ☐ SUCTION

LENGTH OF FILL PIPE

COLOR CODE OF PRODUCT CLEAR ORANGE RED

DIAMETER OF TANK 12"

☐ METAL ☐ FIBERGLASS

TYPE OF RECOVERY SYSTEM ☐ BALANCE ☐ RED JACKET ☐ HEALEY

WATER LEVEL IN TANK

DEPTH OF GROUND WATER (IF KNOWN)

DATE / TIME STORAGE SYSTEM FILLED DATE TIME

AGE OF TANKS

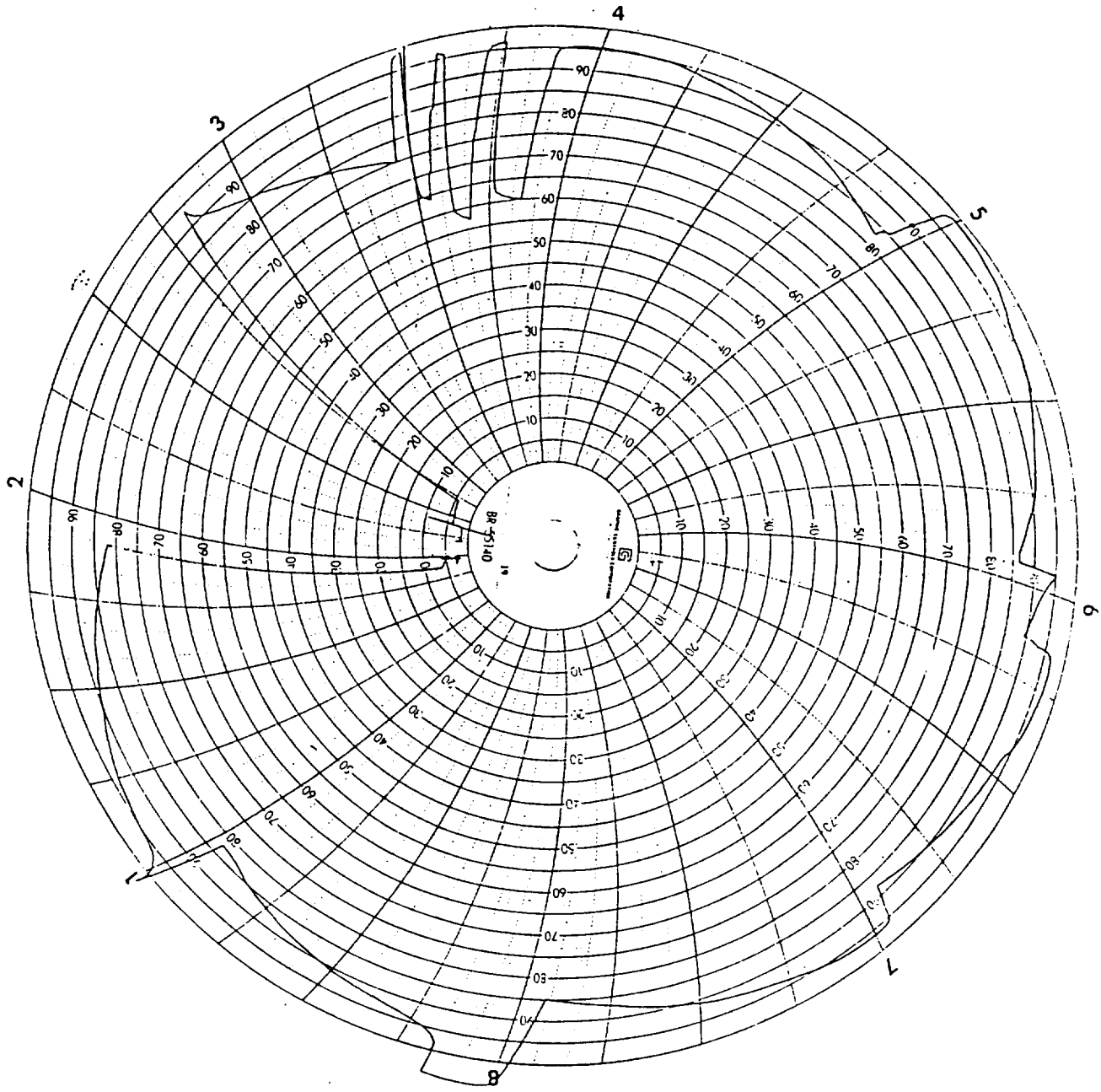
AGE OF LINES

TESTING FLUID, IF DIFFERENT THAN STORED MATERIAL

ORIGINAL PAGE IS OF POOR QUALITY

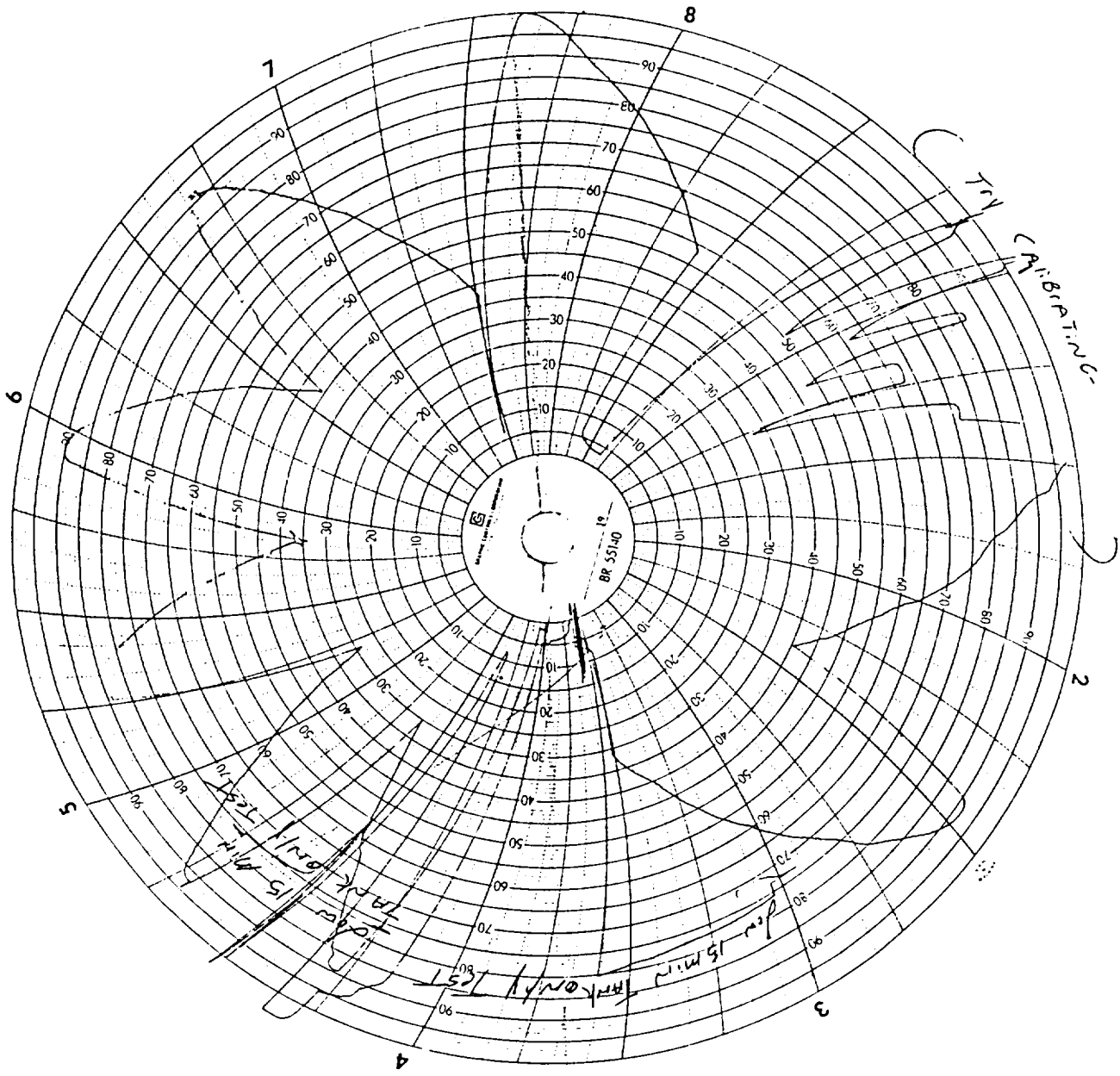
C-5

Typical Work Sheet for the Testing of a UST at the GDSCC



Typical Chart Recording for a Tank That "Passed" the Leak Test

The fact that the pen trace remains essentially at the outer edge of the perimeter of the chart indicates that the tank being tested has "passed" the precision leak test.



Typical Chart Recording for a Tank That "Failed" the Leak Test
The fact that the pen trace does not remain at the outer rim of the chart but oscillates greatly between the chart's rim and its center indicates that the tank being tested has "failed" the leak test.

APPENDIX D

Lower Explosive Level Readings on Tanks
That were Inerted Prior to their Closures.

SHEET 1 OF 1
JOB NO. 17572 QCS-11
DATE 12-17-86
COMPUTED BY JCL
CHECKED BY

PROJECT MBGA JPL Phase II
SUBJECT

Lower Explosive Level Readings on Inerted Tanks.
Units of Readings = % LEL
Reading taken 24 hrs. after the tanks were inerted with dry ice (CO_2) 15 lbs ice per 1000 gallons tank volume

Date of Reading	Tank Number	LEL Reading by John Lucey (JPL)	LEL Reading KES (Brannon)
2-16-86	Echo TF-3D	4	4
2-16-86	Echo TF-4D	4	4
2-17-86	Echo G42-2D	4	4
"	Apollo A1-1G	4	1
"	Apollo A1-2G	0	3
"	Mohave M9-4D	1	2
"	Mohave MS6-1WC	0	4
"	Airport AG71-1	1	1
1-26-87	Mohave M9-2D	0	0
1-26-87	Mohave M9-3D	0	0
1-28-87	Echo G25-1G	0	0
1-29-87	Echo G25-2G	0	2

An explosive-level meter is inserted into an inerted tank to "sniff" and measure the gas or vapor concentration in air (percent by volume), to determine whether that concentration would burn or explode if an ignition source is present.

APPENDIX E

Typical Uniform Hazardous Waste Manifest for the Removal and Transport of Liquid Residues from Steam-Cleaned USTs

of California—Health and Welfare Agency

Department of Health Services
Toxic Substances Control Division
Sacramento, California

se print or type. (Form designed for use on elite (12-pitch) typewriter.)

UNIFORM HAZARDOUS WASTE MANIFEST CA 1. Generator's US EPA ID No. 1 3 0 0 0 2 0 3 9 1 | Manifest Document No. | 2. Page 1 of | Information in the shaded areas is not required by Federal law

3. Generator's Name and Mailing Address
Navy/JTPL Goldstone Tracking Facility
P.O. Box 997
Barstow, CA. 92311
4. Generator's Phone (619) 256 - 3330

A. State Manifest Document Number: 84991436
B. State Generator's ID:

5. Transporter 1 Company Name: Ken Linnum Service
6. US EPA ID Number: CAD-052-849-711
C. State Transporter's ID: 702803
D. Transporter's Phone: 805-529-5220

7. Transporter 2 Company Name:
8. US EPA ID Number:
E. State Transporter's ID:
F. Transporter's Phone:

9. Designated Facility Name and Site Address
DeMenno/Kerdoon
3100 N Alameda St.
Compton, Ca.
10. US EPA ID Number: CAT 080013352
G. State Facility's ID: CAT 080013352
H. Facility's Phone: 213-537-7100

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. Flammable liquid N.O.S. UN-1993	001	TT	4200	G	223
b.					
c.					
d.					

J. Additional Descriptions for Materials Listed Above

K. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information
Gloves + Goggles, Ground Cable.

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

Printed/Typed Name	Signature	Date (Month Day Year)
Hilton McPherson		1 2 1 0 8 5

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date (Month Day Year)
Keith C. Brown		1 2 1 0 8 5

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date (Month Day Year)

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Date (Month Day Year)

IS F022 A (11-84)
PA 8710.22

[illegible] SENDS THIS COPY TO DOHS WITHIN 30 DAYS
[illegible] Box 3006 Sacramento, CA 95812

84 99641

APPENDIX F

Certificates of Training for Tank Testers

Horner Creative Products, Inc.

Award of Certification

This is to certify that

EDDIE COTTER

has sucessfully completed training on the operation
of the Ezy-Chek Leak Detector

Given this 20TH. day of FEBRUARY, 19 86

Jack Horner

Horner Creative Products, Inc.

Award of Certification

This is to certify that

JAMES GIBLISH

has sucessfully completed training on the operation
of the Ezy-Chek Leak Detector

Given this 25TH. day of SEPTEMBER, 19 86

Jack Holm

APPENDIX G

Letter from NASA/JPL Informing SBC/DEHS/HWTCS of the Completion of the Precision Testing of All Underground Storage Tanks, and the Cleaning, Inerting, Sealing and Closure of some USTs at the GDSCC

Jet Propulsion Laboratory
California Institute of Technology
4800 Oak Grove Drive
Pasadena, California 91109
(818) 354-4321

JPL

Reply: Goldstone Deep Space Communications Complex
P.O. Box 489, Barstow, California 92311
(619) 336-8222

February 11, 1987

Mr. Ron Ripley, R.S.
San Bernardino County
Department of Enivonmental Health Services
385 North Arrowhead Avenue
San Bernardino, California 92415-0160

Subject: Completion of Phase II Underground Tank (UGT) Leak Detection Program

Dear Mr. Ripley:

NASA/JPL has completed Phase II of its UGT Leak Detection Program. This phase included precision testing, cleaning, inerting, sealing, and the closure of some tanks located at the Goldstone Deep Space Communications Complex (GDSCC). A summary of the activities on each tank is provided in Attachment 1. All procedures were in accordance with applicable federal, state, and local regulations and guidelines; and were approved by SBDEHS prior to GDSCC's initiating any procedure.

Attachment 1 of this correspondence includes the following documentation:

- Table 1 - Supplement 2 to Table 8 of Monitoring Plan and Schedule for Underground Tanks at GDSCC, showing status of each tank.
- Certificates of training for tank testing contractors.
- Tank testing results.
- Listing of Lower Explosive Level (LEL)readings on tanks that were cleaned, inerted, and sealed.
- Location map for the tank that was abandoned in place (i.e., tank G25-2G).
- Drawing showing location of soil boring drilled in the backfill of tank G25-2G.
- Chain-of-Custody for soil borings sent to laboratory for analysis. (Note: results of chemical testing have been mailed to SBDEHS under separate cover).

Your cooperation and assistance in helping us to complete this project is very much appreciated. If you require additional documentation, please do not hesitate to contact Mr. Harold Alderson at (619) 386-8330

Sincerely,

Louis E. Butcher

L. E. Butcher
Goldstone Operations Manager

Attachments: (1)

cc: H. R. Alderson (w/o attachment)
J. E. McPartland (w/o attachment)
File