The conclusions and recommendations contained in this report are solely those of Law Environmental Incorporated and do not necessarily reflect the position of the United States Government or any of its departments or agencies.

FINAL REPORT

CONFIRMATION STUDY OF FORMER ATLAS MISSILE SITES FOR POTENTIAL TOXIC AND HAZARDOUS WASTE CONTAMINATION

FORMER ATLAS SITE S-8
CLAYBURG, NEW YORK

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LEGS Job No. 11-7002-02

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GLOSSARY OF ABBREVIATIONS

DOD - Department of Defense
DAA - Defense Appropriations Act
DERA - Defense Environmental Restoration Account
IRP - Installation and Restoration Program
SI - Site Inspection
NPL - National Priority List
RI - Remedial Investigation
PA - Preliminary Assessment
HRS - Hazardous Ranking System
EPA - Environmental Protection Agency
DERP - Defense Environmental Restoration Program
CONUS - Continental United States
CERCLA - Comprehensive Environmental Response Compensation and Liability Act
USACE - United States Army Corps of Engineers
USEPA - United States Environmental Protection Agency
GSA - General Services Administration
USGS - United States Geological Survey
RCRA - Resource Conservation and Recovery Act
RI/FS - Remedial Investigation Feasibility Study
MCL - Maximum Contaminant Level
MCLG - Maximum Contaminant Level Goal

EXECUTIVE SUMMARY

The Department of Defense (DOD) is investigating former ATLAS missile sites throughout the United States for potential toxic and hazardous waste contamination. This report documents the contamination evaluation investigation performed at ATLAS Missile Site S-8, located in Clayburg, New York. The field investigation consisted of installing and sampling three ground-water monitoring wells, sampling surface soils, and sampling water from the missile silo at the installation. The samples were analyzed for purgeable aromatics, purgeable halocarbons, total metals, petroleum hydrocarbons (water only), and base/neutral extractables (one soil sample and the soil rinsate only). The analytical data for this inventory study are summarized in Section 4.0 of the report and are fully presented in the Appendices.

Evaluation of the data gathered during the site investigation at ATLAS Site S-8 indicate the following results:

- Only the metals barium, chromium, and lead were present in the soil samples collected at the site. These metals were all present at concentrations within the range typical of naturally occurring soils.

- The metals barium, chromium, and lead were detected at low concentrations in both ground-water and silo water samples. The concentrations of each metal were below Maximum Contaminant Levels (MCLs) and therefore do not indicate ground water contamination at the site.

- The purgeable halocarbon trichloroethylene was detected at a level below the measurable detection limit in the silo water sample and duplicate. Trans-1,2-dichloroethylene was detected below the measurable detection limit in the ground-water sample from MW-803 and at 0.008 mg/l in the silo water sample and duplicate. Trichloroethylene is an industrial

solvent which is commonly used as a degreaser. Maintenance operations at the ATLAS facility may have used trichloroethylene. Additionally, research indicates that trans-1,2-trichloroethylene may be produced by the anaerobic decomposition of trichloroethylene (Cline and Viste, 1984). Although the presence of these two constituents may be related to previous DOD activities, the concentrations of both compounds are below regulatory criteria. The presence of trichloroethylene and trans-1,2-dichloroethylene may indicate traces of DOD-related contamination, but comparison with regulatory criteria indicate that the levels detected are not significant.

The following preliminary conclusions and recommendations have been made based to the results of this investigation.

(1) Metals concentrations in the silo and ground water are below regulatory criteria and metals in the soil are within natural background levels.

(2) Trichloroethylene and trans-1,2-dichloroethylene were detected in the silo and ground water. However, the concentrations of these compounds are below drinking water standards.

No ground water, silo water, or soil contamination was detected at the monitoring sites; therefore, ATLAS Site S-8 in Clayburg, New York, should not be referred to the Missouri River Division (MRD) for further study.

1.0 PROGRAM BACKGROUND

The U.S. Army Corps of Engineers (USACE) contracted with Law Environmental, Inc., Government Services Division (Contract No. DACW 41-86-D-0115) to perform a contamination evaluation investigation at former ATLAS Site S-8 in Clayburg, New York. This report documents the investigation that was performed at that site. The report is divided into six sections that discuss background information, existing site conditions, field investigation program, analytical results, data interpretation and preliminary determinations. The following material in this section of the report presents an overview of the ATLAS missile program and a comparison of this investigation program with other Federal investigation programs.

1.1 OVERVIEW OF THE ATLAS MISSILE SYSTEM

1.1.1 Background

The ATLAS Missile System was the foundation for the United States Intercontinental Ballistic Missile (ICBM) and space launch vehicle programs during the late 1950's and early 1960's. The ATLAS Missile Program began in 1946 under the code name Project MX774. The program evolved through several phases of improved engines, modified fuels, strategic missile deployment, varied launch configurations, and a space launch vehicle. The phase which influences the Defense Environmental Restoration Program involves the deployment of ATLAS Missiles at operational sites within the continental United States.

The Research and Development (R&D) phase of the ATLAS Missile Program was conducted at Cape Canaveral, Florida. The most memorable event associated with ATLAS during the R&D phase was the December 18, 1958, launch into orbit. During this mission, a recorded Christmas message was radioed back to earth from President Eisenhower. At that time ATLAS was on a high priority track to become an operational part of the ICBM Program. The

first two versions of the missile ATLAS A and ATLAS B were produced during this R&D phase.

ATLAS D was the first operational version of the missile; it was deployed at Vandenberg AFB, California; Warren AFB, Wyoming, and Offutt AFB, Nebraska. The subsequent E&F versions were also deployed at operational units in the U.S.

During the evolution of ATLAS versions D, E, and F, the launch mode for the missile was also evolving. The R&D versions of ATLAS had stationary launch facilities at Cape Canaveral and Vandenberg. However, the operational missile had to be deployed at remote sites, where it was not feasible to provide the stationary launch facilities. Therefore, ATLAS D was designed to be moved to the launch pad by a transporter, which subsequently erected the missile to its vertical launch position and then arched away from the missile at launch. The installations which deployed ATLAS D's were above ground facilities and provided no protection from attack.

The next improvement for ATLAS was the E version which was designed to survive a nearby nuclear explosion, which would produce up to 25 PSI overpressure to the launch facility. This criteria resulted in enclosing the missiles in "coffin like" vaults and redesigning the lifting truss to position the missile for launch. The missile vaults were partially buried, with protective doors that retracted from above the missile for launching. The launch operations were conducted from a buried control structure. ATLAS E sites were considered "semi-hard" sites.

The final improvement to the ATLAS Missiles System was to harden the facilities to provide protection for 100 PSI overpressure which would be produced by a nearby nuclear explosion. This resulted in emplacing the missile vertically in underground silos and isolating the missile from the silo within a spring mounted crib. The silo top was enclosed by heavy doors which were opened

for missile launch. The ATLAS F version was deployed at the hard sites. The launch mode was to elevate the missile above the silo door (top). Figure 1-1 shows a typical hardened ATLAS site with the missile in the launch position. Facilities at the surface of the hardened ATLAS sites included one or two quonset huts used for maintenance, and the launch control center entrance. Integrated ATLAS F facilities such as control rooms, crew quarters, and propellant storage were buried below ground. Figure 1-2 is an artist's sketch of a hardened ATLAS site showing the underground and surface facilities.

The ATLAS D, E and F versions were deployed at 13 squadrons located near 11 Air Force bases. The ATLAS deployments are summarized below:

Air Force Base	Location	Number of Missiles D Model	E Model	F Model
Vandenberg	Lompoc, CA	6		
Warren	Cheyenne, WY	6	9	9
Offutt	Omaha, NE	9		
Fairchild	Spokane, WA		9	
Forbes	Topeka, KS		9	
Schilling	Silina, KS			12
Lincoln	Lincoln, NE			12
Altus	Altus, OK			12
Dyess	Abilene, TX			12
Walker	Roswell, NM			12
Plattsburgh	Plattsburgh, NY (Includes ATLAS Site S-8 at Clayburg, New York)			12

FIGURE 1-1

TYPICAL ATLAS SITE

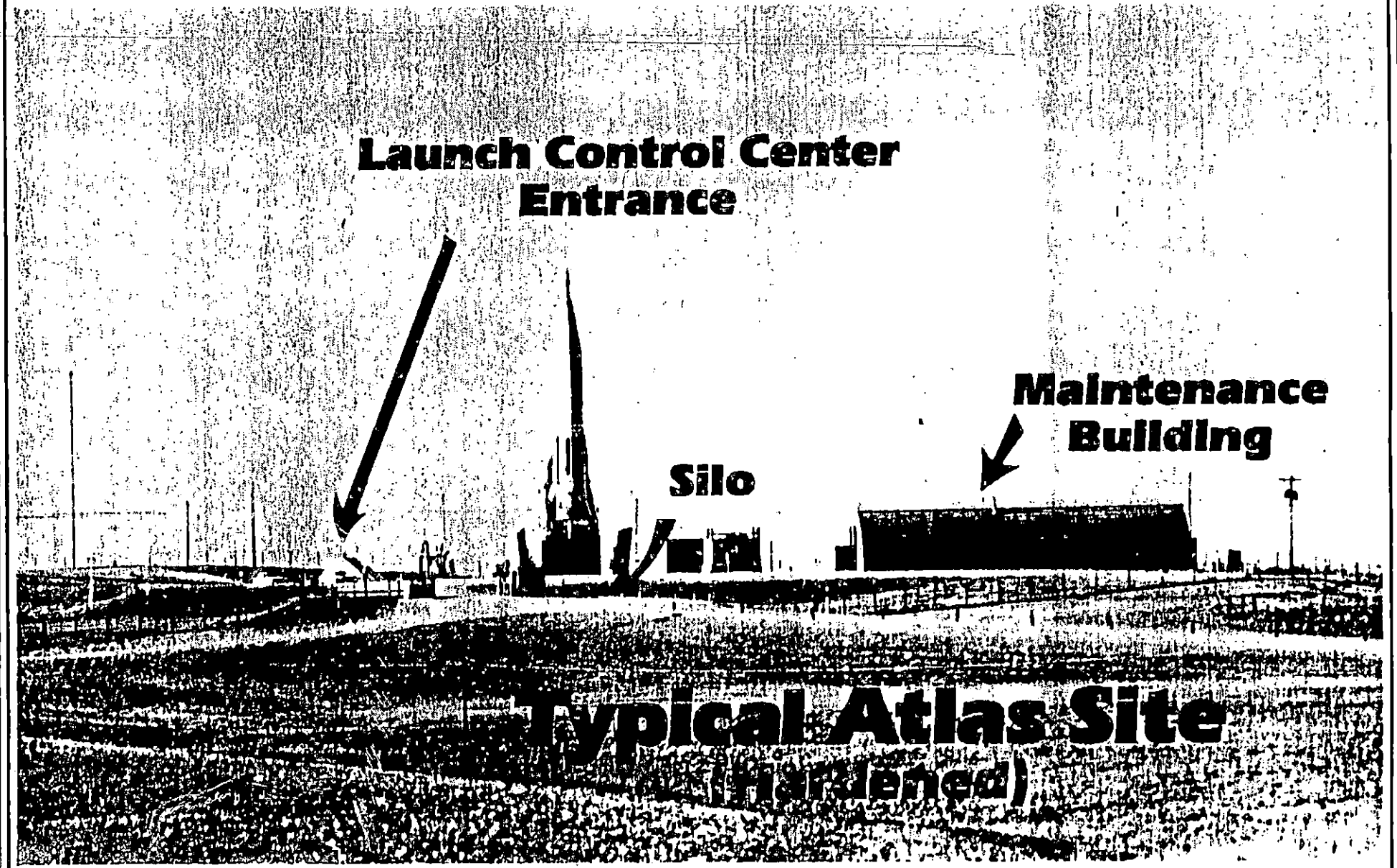

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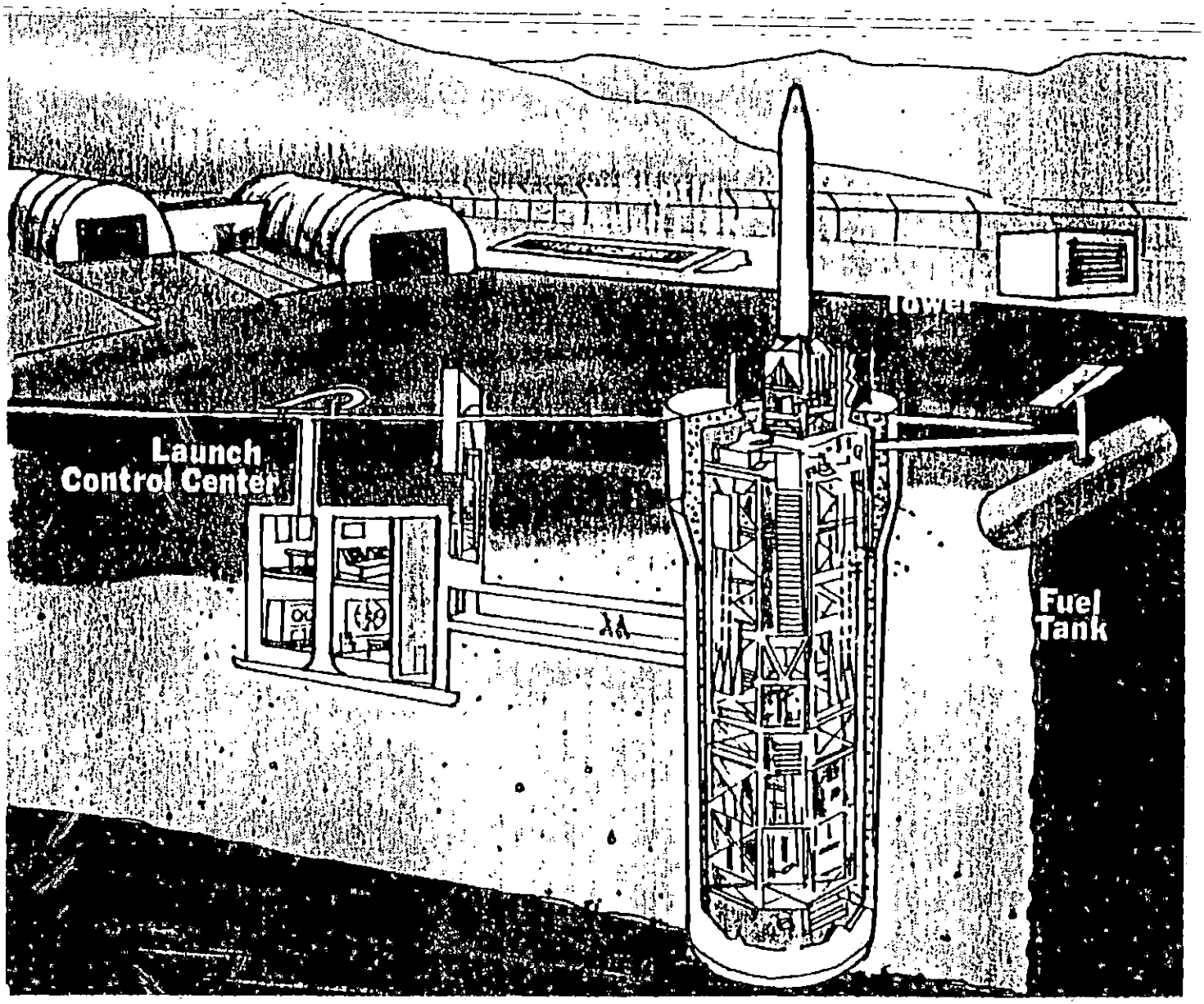
FIGURE 1-2

ATLAS GENERIC SITE



In addition to locating the ATLAS missile squadrons at selected Air Force bases, each squadron dispersed its missiles to improve system survivability; except for early "soft" operational units at Vandenberg AFB, and Warren AFB which were not dispersed. The non-dispersed sites allowed up to three missiles to be controlled by a single control room. Subsequent semi-dispersed sites also allowed multiple missile control from a single control room. Extensive communications systems were involved with the semi-dispersed sites. The Fairchild AFB communications system for ATLAS incorporated a microwave system that was hardened to withstand 25 PSI overpressure and linked nine sites dispersed over 8,000 square miles. The preponderance of ATLAS sites were ATLAS F's which were hardened and dispersed. These "hard" sites each had individual control functions.

The ATLAS used liquid propellant - kerosene and oxygen. These were generally stored in separate below ground tanks remote from the launcher or silo. The ATLAS F version utilized a unitary concept of deployment; that is the missile was equipped with on-board tanks and the propellant could be stored in its onboard tanks or transferred from adjacent storage in minimal time. The missile also required that a positive pressure be maintained interior of the missile to enhance structural rigidity both in prelaunch and during flight. This positive pressure was provided by helium which was stored in the ATLAS F silo and on-board the missile.

The ATLAS Missile Program provided an important element of the U.S. defense system during a period of rapid evolution in ICBM systems. However, this evolutionary period was short lived. The first operational ATLAS system was at Vandenberg in September 1959. The last operational squadron was at Plattsburgh in December 1962. By 1965, the Plattsburgh squadron was dismantling their silos and the records indicate the silo equipment was sold for salvage. By 1966, the ATLAS F's were obsolete and were returned to the USAF for use in the military space program.

Therefore, the missile system was in place for only 3 to 5 years. During operational status, the ATLAS sites could have contributed to environmental contamination from fuel storage or site maintenance activities.

1.1.2 ATLAS Missile System Operations

A typical ATLAS F site (Figure 1-3) generally consisted of about 10 acres within a security fence. The major facility at the site was the underground silo which was 174 feet deep x 69 feet diameter. The silo was constructed of thick reinforced concrete walls. Two hydraulically-operated doors sealed the top of the silo. These doors were made of steel reinforced concrete, designed to withstand a nearby nuclear blast. The silo doors remained closed (Figure 1-4) during normal operation but were opened (Figure 1-5) to raise the ATLAS missile into firing position.

The ATLAS missile was supported in a spring-mounted crib which was suspended in the silo. The missile was 82 1/2 feet long and 10 feet in diameter. The silo space below the missile was used for propellant storage, missile support and fuel loading equipment. The silo also contained seven operations levels adjacent to the missile: lifting system, hydraulic power and air handling, launch control electronics, HVAC, diesel generator/fuel day tank, diesel generator, propellant loading. The silo configured in this manner comprised a unitary concept where all critical elements were contained within the silo.

About 150 feet away from the silo, an ATLAS F site contained a below grade Launch Control Center (LCC). The LCC was a 2 story structure approximately 40 feet in diameter. It provided personnel quarters and communications to the missile and to command and control centers. A reinforced concrete enclosed stairway (Figure 1-6) led down to the LCC.

FIGURE 1-3

TYPICAL ATLAS SITE PLAN

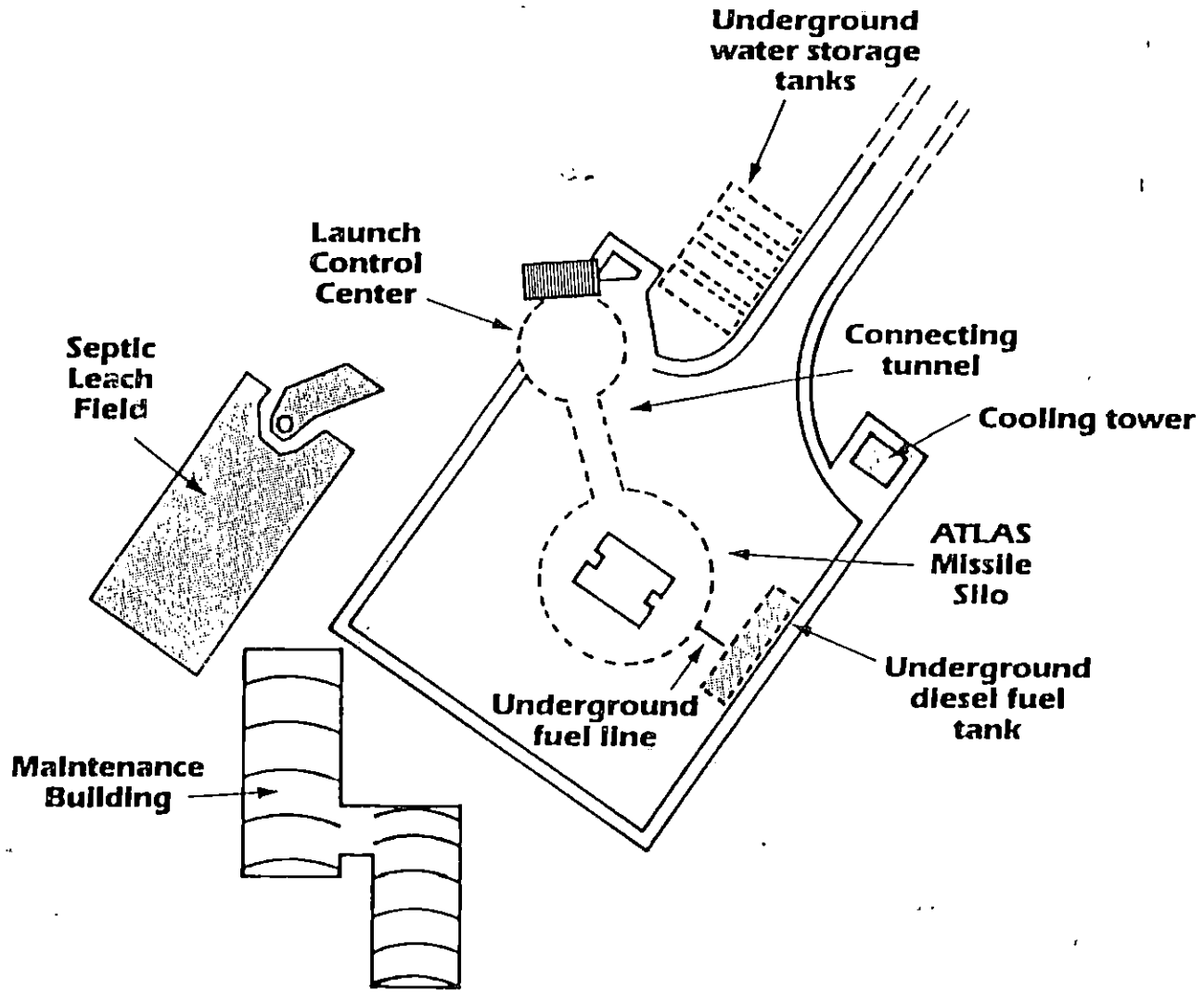


FIGURE 1-4

SILO DOORS (CLOSED)

FIGURE 1-5

SILO DOORS (OPEN) WITH BLAST SHIELD

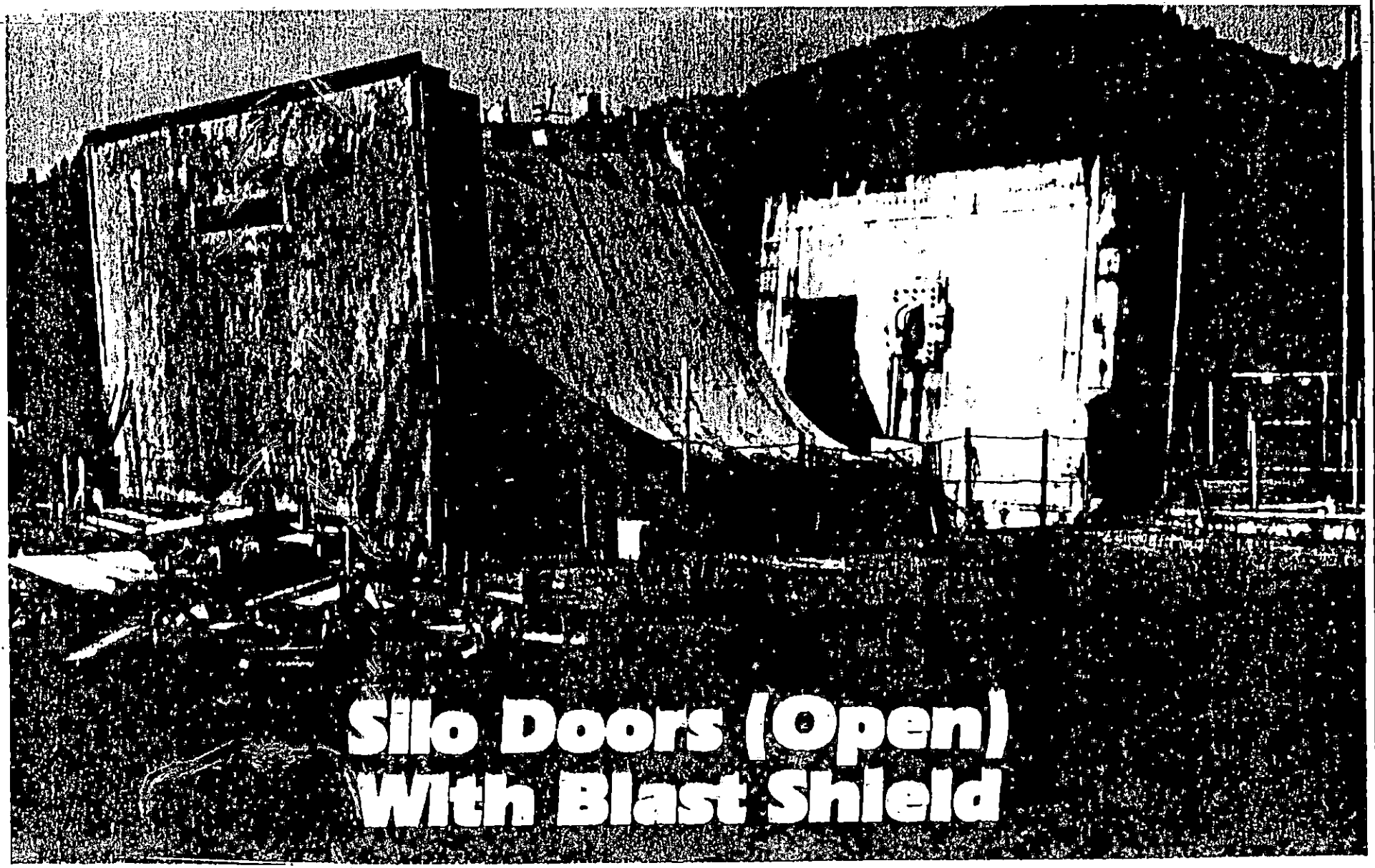


FIGURE 1-6

LAUNCH CONTROL ENTERANCE MAINTENANCE BUILDING

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The ATLAS F sites included facilities and equipment to maintain the missiles. The maintenance facility was a steel structure located at grade, near the silo (Figure 1-6). During site operations missile components could be removed from the silo and maintained within this facility. The maintenance building, security systems, and waste treatment facilities were the only above-grade facilities at a site.

The waste-water treatment and disposal practices were different at each site. Spray fields and percolation basins were used in areas where soil and climate was appropriate for sanitary waste treatment.

The unitary silo provided a means for fuel storage within the silo. However, there are indications that fuel may have also been stored in underground tanks remote from the silo at some sites. Another below grade tank was the diesel fuel storage for the diesel generators. Generally, steel tanks were provided within about 100 feet of the silo for this purpose.

1.1.3 Waste Generation

The ATLAS operational site activities which produced wastes or potential contaminants included:

propellant storage
diesel fuel storage
hydraulic systems
maintenance: petroleum, oil, lubricants, solvents, equipment operations, personnel, sanitary systems

The propellant storage included below grade tanks for kerosene and liquid oxygen. The duration of the ATLAS as an operational system was limited to three to five years. Therefore, underground tank leakage due to deterioration was unlikely. The most likely source of contamination from storage was spillage

during tank filling and possibly faulty connections in conveyance lines. The liquid oxygen was stored under cryogenic conditions and spillage or leakage was very improbable. Furthermore, loss of oxygen would not have produced a toxic condition. Propellants were also stored on board the ATLAS F's and in their silos. As such, spillage of kerosene inside the silo would have been discharged to the silo exterior through the silo discharge system.

Diesel fuel was stored in below grade tanks for all of the deployed ATLAS F sites. Diesel fuel was used in the on-site generator to supply power for control room and launch activities. At remote ATLAS F sites, where public electric power was not available, on-site generators supplied normal operating power as well as emergency power. Leakage from underground tanks, spillage during tank filling and escape of fuel during maintenance or repairs of generators could have produced contamination at the diesel storage tank location or adjacent to the silo.

Each ATLAS silo contained an enormous hydraulic lift system to move the missile from its cold storage position in the bottom of the silo, to the hot launch configuration at the surface. When the ATLAS system was decommissioned, some of the hydraulic fluid may have remained in the storage tanks, pressure lines, pumps and rams. Subsequent deterioration of the system may allow remnant hydraulic fluid to leak into the silo, and ultimately into the environment.

Maintenance of the missile and equipment at the launch sites was the most probable source for contamination. The sites contained hydraulic systems, pumps, generators, electronics, heating, ventilating, air conditioning, refrigeration, and other systems that required continuous maintenance to maintain operational reliability. Maintenance activities included the use of solvents, petroleum, oil, lubricants (POL). The release of these potential contaminants could have resulted from the discharge of

these materials when the floors were cleaned or from the silo sump discharge line. It is also possible that some POL accumulations which were retained for routine proper disposal were accidentally or intentionally spilled within the site boundaries.

The support crew for the remote sites involved about 20 people, producing sanitary waste that was treated on site. The ATLAS sites commonly had a spray field or aeration basin to treat and discharge sanitary sewage. Typically, sanitary sewage disposal fields do not result in hazardous or toxic materials that persist in the shallow subsurface zones. Therefore, it is unlikely that this waste stream produced contamination.

The lowest level in the ATLAS F silo was the "Sump Level." Two automatically actuated 100 GPM capacity sump pumps located at this location remove liquids from the silo. The liquids were pumped through pipes that were routed up the silo wall and exited through the silo wall at level 2. The ultimate disposition of the silo effluent appears to have been to a drainage ditch, which was located far enough away from the silo to avoid interaction with the silo backfill and the launch control center. The USAF Operational Readiness Training Manual designates the ATLAS F complex into four quadrants, quadrant I contains the cooling tower and water plant, quadrant II contains the launch control center, quadrant III contains the electrical and communication stub-ups and quadrant IV contains the sump discharge areas. Quadrants II and IV are diagonally opposite each other. Therefore, it appears that the sump discharge usually occurs on the silo quadrant opposite the launch control center. This discharge may have been integrated with the area storm water management system and carried off-site by surface channels.

1.2 PROGRAM COMPARISON

The Department of Defense (DOD) conducts a number of industrial processes and manufacturing operations that are similar to those of private industry. In the late 1970's, DOD became aware of the negative impacts of what were previously considered acceptable disposal practices of waste materials associated with these processes and operations. In response to that knowledge, programs were developed between 1975 and 1978 by each service component to identify and assess potential contamination on active military installations. Authority to address problems of other than active installations was lacking since funds could not be spent on sites not owned by DOD.

The passage of the 1984 Defense Appropriations Act changed this situation. Specific language in the Act directed DOD to extend its efforts to include sites formerly used by DOD. The Act also broadened the definition of "hazard" to include structures and debris which were to be abandoned or had been abandoned upon termination of the site's military use.

The Act directed that the Secretary of Defense to assume overall management of the program to assure consistent approach and adequate resource allocation. A Defense Environmental Restoration Account (DERA) was established which provides the resources for the evaluation and characterization of potential chemical contamination at former DOD Sites.

Sites located on active DOD installations are being investigated under the Installation and Restoration Program (IRP). Sites either previously or presently owned by DOD not located on active DOD installations are handled separately from the IRP effort. In order to present a perspective of the formerly used (non-IRP) site investigation program, it is necessary to compare such efforts to the EPA's Superfund program and the DOD's IRP.

Figure 1-7 presents a block diagram illustration of the following investigative programs presently being conducted by various Federal agencies.

- EPA Superfund
- DOD/IRP
- DOD Non-IRP

Under Superfund, a Preliminary Assessment (PA) is conducted; it consists of a desk-top study and site visit which leads to a Site Inspection (SI). The SI usually includes limited sampling activities. After completion of the SI, a Hazard Ranking is performed and if the site scores above a certain number, it becomes a candidate for the National Priority List (NPL). Additional site investigations are conducted during the Remedial Investigation (RI), which is a comprehensive study to determine the extent of contaminants and their rate of movement.

The DOD's IRP study consists of a records search and site visit to establish a potential list of sites possibly contaminated at an active installation. A Hazard Ranking System (HRS) is utilized to determine which sites will be investigated in order of environmental and/or public health importance.

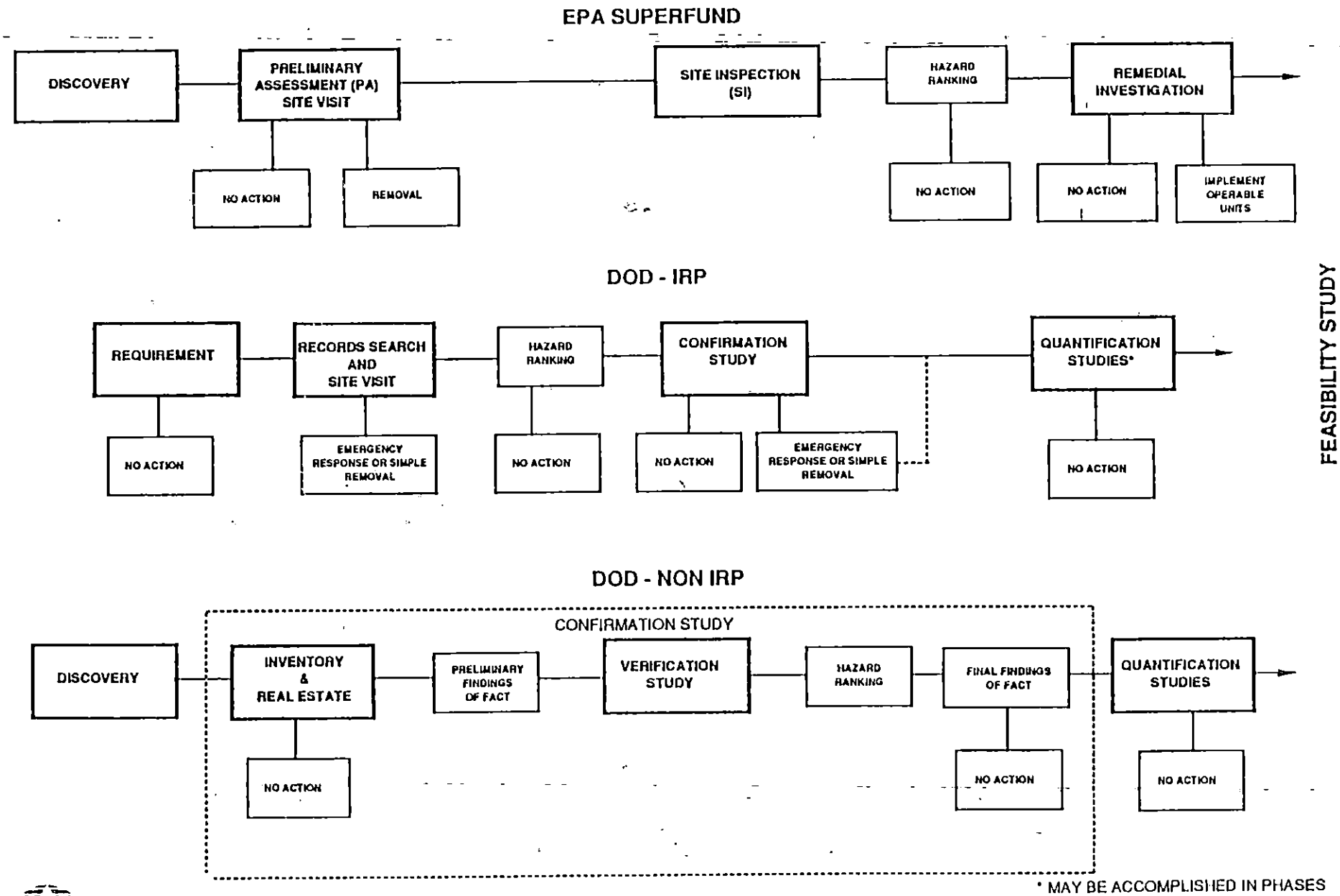
The Non-IRP effort, under which the NIKE Sites are categorized, also has an Inventory Study. Unlike the IRP and Superfund programs, it is a real estate oriented effort to determine ownership of the site. In addition, certain studies are performed dealing with demolition of structures previously used by the DOD.

A similar task is evident for each phase of the three programs; that is, the Site Inspection (EPA); the Confirmation Study (IRP) and the Confirmation Study (NON-IRP). Each of these studies are similar in terms of investigative depth. Some soil and water sampling is accomplished and a few monitoring wells may be installed. The principle purposes for each study, however, may

FIGURE 1 - 7

GOVERNMENT ENVIRONMENTAL PROGRAMS

ATLAS SITE S-8 - CLAYBURG, NEW YORK



* MAY BE ACCOMPLISHED IN PHASES

be somewhat different from the others. For example, the purpose of a Non-IRP Confirmation Study is to make a preliminary determination of whether contamination exists and if it was caused by DOD operations.

The Remedial Investigation (RI) under the Superfund Program is the most complex field investigation effort. It correlates with the Quantification Studies under IRP and Non-IRP efforts.

In summary, the scope of effort for a Confirmation Study of a Non-IRP Site is shown on Figure 1-7 surrounded by the dotted lines. It can easily be seen that this type of study is very preliminary and cannot be compared with the project requirements for an RI, especially one with an NPL rating.

*****

2.0 SITE CONDITIONS

2.1 PROJECT OBJECTIVES

The text of the Scope of Work (SOW) for this confirmation study, dated May 20, 1987, is contained in Appendix L of this report. Item 2.0 of the SOW describes the purpose of this evaluation as follows: "to provide a preliminary determination of the presence or absence of chemical contamination which may have resulted from Department of Defense activities at the site." To fulfill this purpose, Law Environmental, Inc., performed these work elements:

- conducted site visit to collect background information;
- prepared work plan and safety plan;
- installed ground-water monitoring wells;
- collected and analyzed ground-water, silo water and soil samples;
- evaluated physical and chemical data;
- prepared an engineering report including a hazard ranking system (HRS) report.

Details of the work performed in each of these elements are described in the following sections of this report. Work Plans with detailed descriptions of field and laboratory procedures are presented in in Appendix H and Appendix I, respectively. This section of the report describes pertinent background information including a write-up of the site visit, site location information, site physiography, land use, and current and past ownership and use of the site.

2.2 SITE VISIT SUMMARY

A site visit in accordance with Task 2 of the ATLAS contamination evaluation SOW was performed by Mr. Louis S. Karably of Law Environmental, Inc. in June, 1987. The site visit involved a meeting with USACE personnel from the Kansas City District and a

visual inspection of the ATLAS site. The following information was collected during the site visit.

- Former ATLAS Missile Site S-8 is located on the north side of State Route 3 near the Town of Clayburg, in the western portion of Clinton County, New York. From Plattsburgh, access to the site is southwest on State Route 3 about 17 miles to Clayburg, and north on Route 1 (Standish Road) about one mile (Figure 2-1).

- The surficial geology at the site consists of glacial till. These overlay granitic and gneissic basement rock ("Geologic Map of New York, Adirondack Sheet", 1970). Ground water was anticipated to be about 35 feet below the surface. Regional ground-water flow was anticipated to be northward based on topographic elevations in the area.

- The topography of the site slopes gently from the southeast to the northwest. Surface water drainage in the immediate vicinity of the site appears to follow the surface topography. Regional surface water flow is to the North Branch Saranac River south of the site.

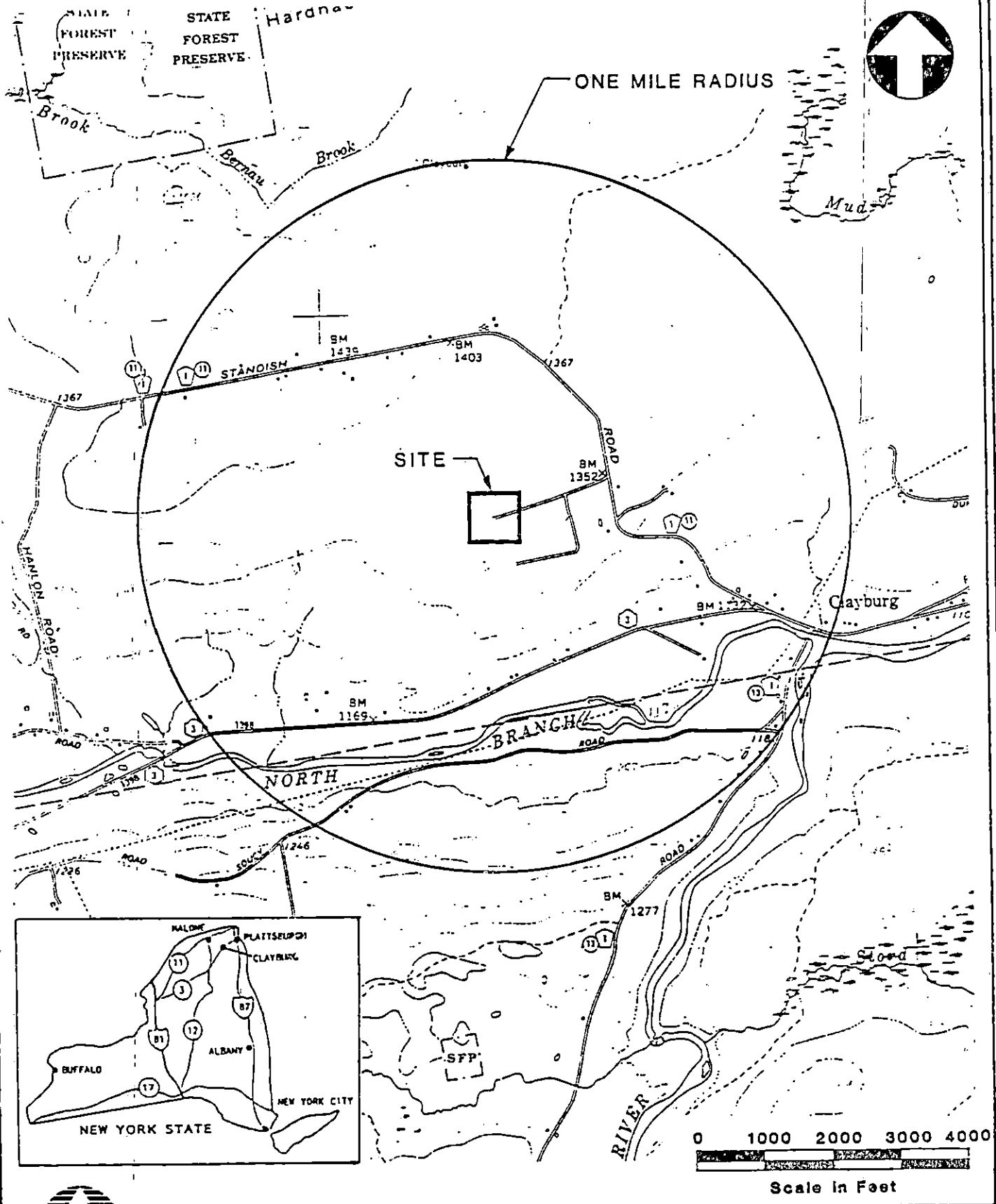
- Structures and buildings still present on the site include the following: the silo, a buried concrete Launch Control Center (LCC), foundations from the two quonset huts, septic system and disposal units and a borrow pit adjacent to the LCC (Figure 2-2).

- Currently (1988), one 70 ft. diameter subsurface concrete and steel missile silo, 187 ft. deep with approximately 12 ft. thick walls, exists on the site. The silo is closed and flooded. Pavement covers the area around the missile silo concrete pad. Figure 2-3 shows the silo doors and paved area around the silo. The entrance to the launch control center is visible in the background.

FIGURE 2-1

SITE LOCATION MAP

ATLAS SITE-8 CLAYBURG, NEW YORK



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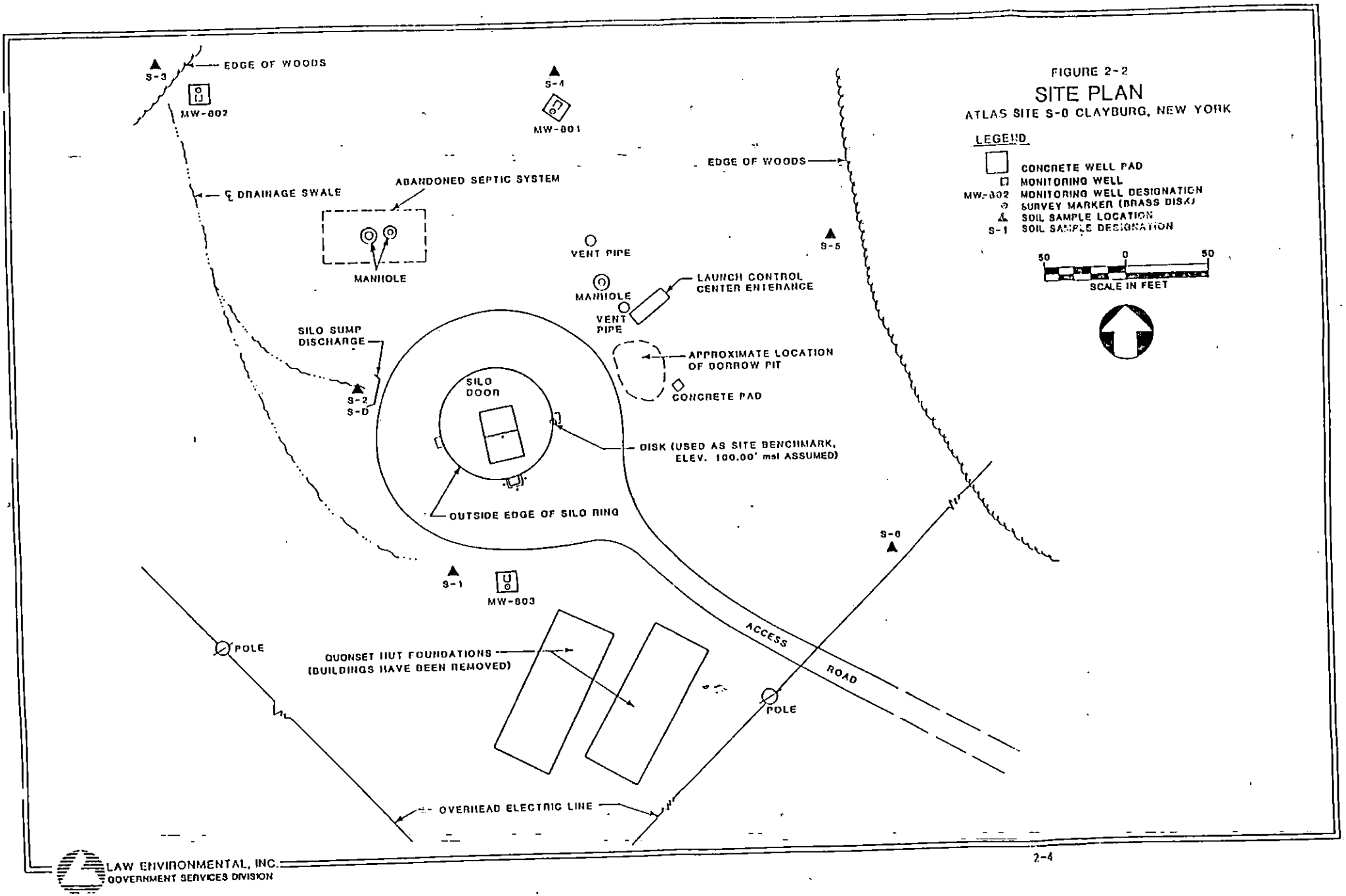

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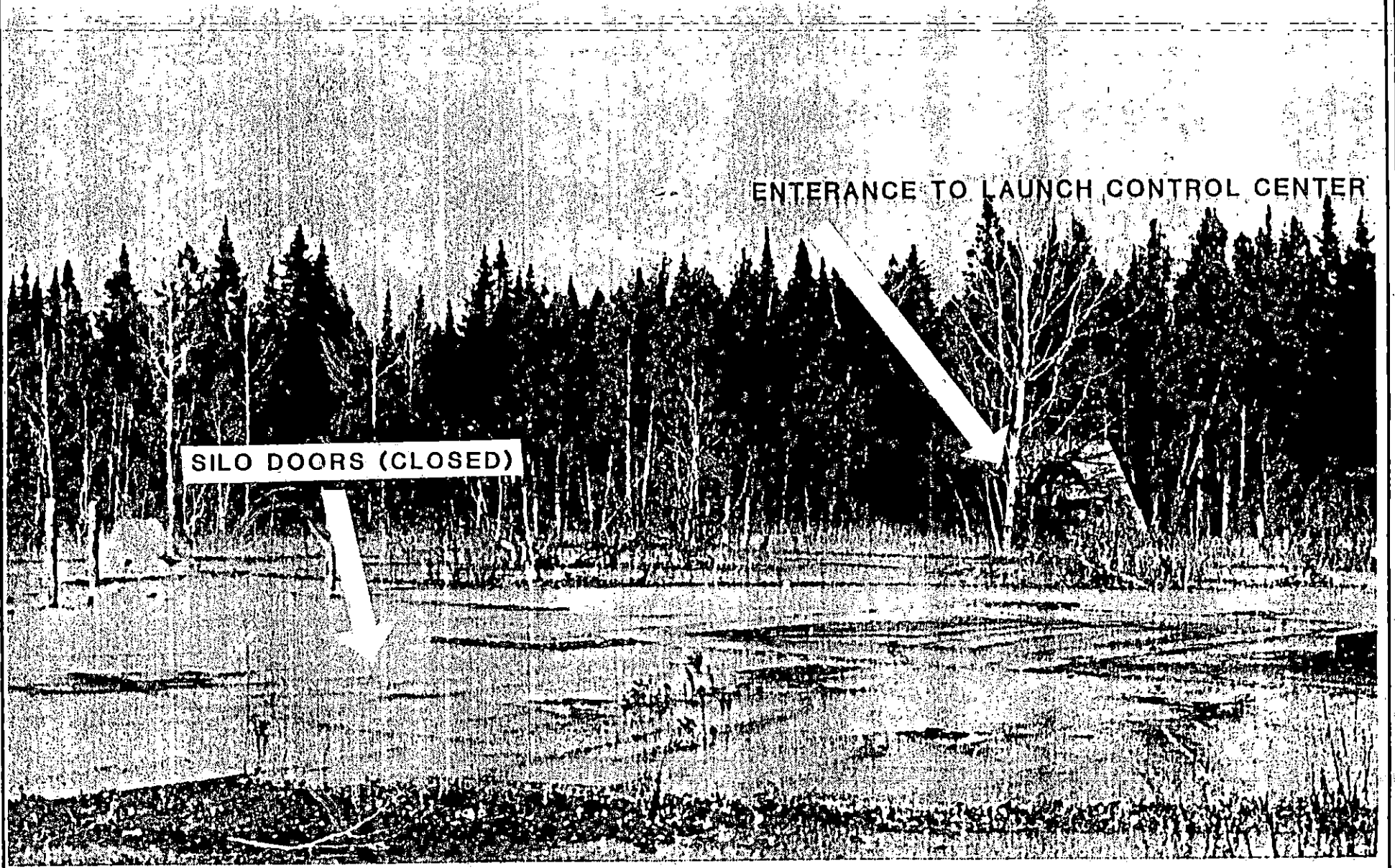
FIGURE 2-3

SILO DOORS AND ENTRANCE TO LAUNCH CONTROL CENTER

ATLAS SITE S-8 CLAYBURG, NEW YORK



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- The sump discharge line from the silo was located west of the silo and the LCC entrance (see Figure 2-2). Figure 2-4 shows the discharge pipe from the silo sump system where it discharges to the surface. A drainage field northwest of the silo and septic system structures north of the silo were also located (see Figure 2-2). Figure 2-5 shows the abandoned septic system distribution manholes.

2.3 SITE LOCATION AND ENVIRONMENTAL FEATURES

ATLAS Site S-8 is located in western Clinton County north of State Highway 3 off Standish Road (County Road 1) (see Figure 2-1). The site lies entirely within the township of Saranac. The nearest population center is the village of Clayburg, which is southeast of the site. Other villages near the site include Redford, Moffittsville, Pichetts Corners, and Cadyville. The nearest incorporated city is Dannemora about 10 miles northeast of the site.

In this section of the Adirondack region, uplands and mountains of Precambrian crystalline and metamorphic rocks are bordered by foothills of Paleozoic sedimentary rock that descend northward to the St. Lawrence Lowlands and eastward to the Champlain Valley. Glacial deposits cover valley floors and lower mountain slopes. (Denny, 1974).

The Precambrian rocks form broad valleys, dome shaped hills, and low mountains. Granite, gneiss, and anorthosite each constitute about 30 percent of the area of uplands and mountains. The rest of the area is underlain by gneisses, metagabbro, and metasedimentary rocks.

A foothills belt borders the uplands and mountains on the northeast and north. It includes both isolated hills and dissected plateaus underlain by the Potsdam Sandstone.

FIGURE 2-5

ABANDONED SEPTIC SYSTEM STRUCTURES

ATLAS SITE S-8 CLAYBURG, NEW YORK

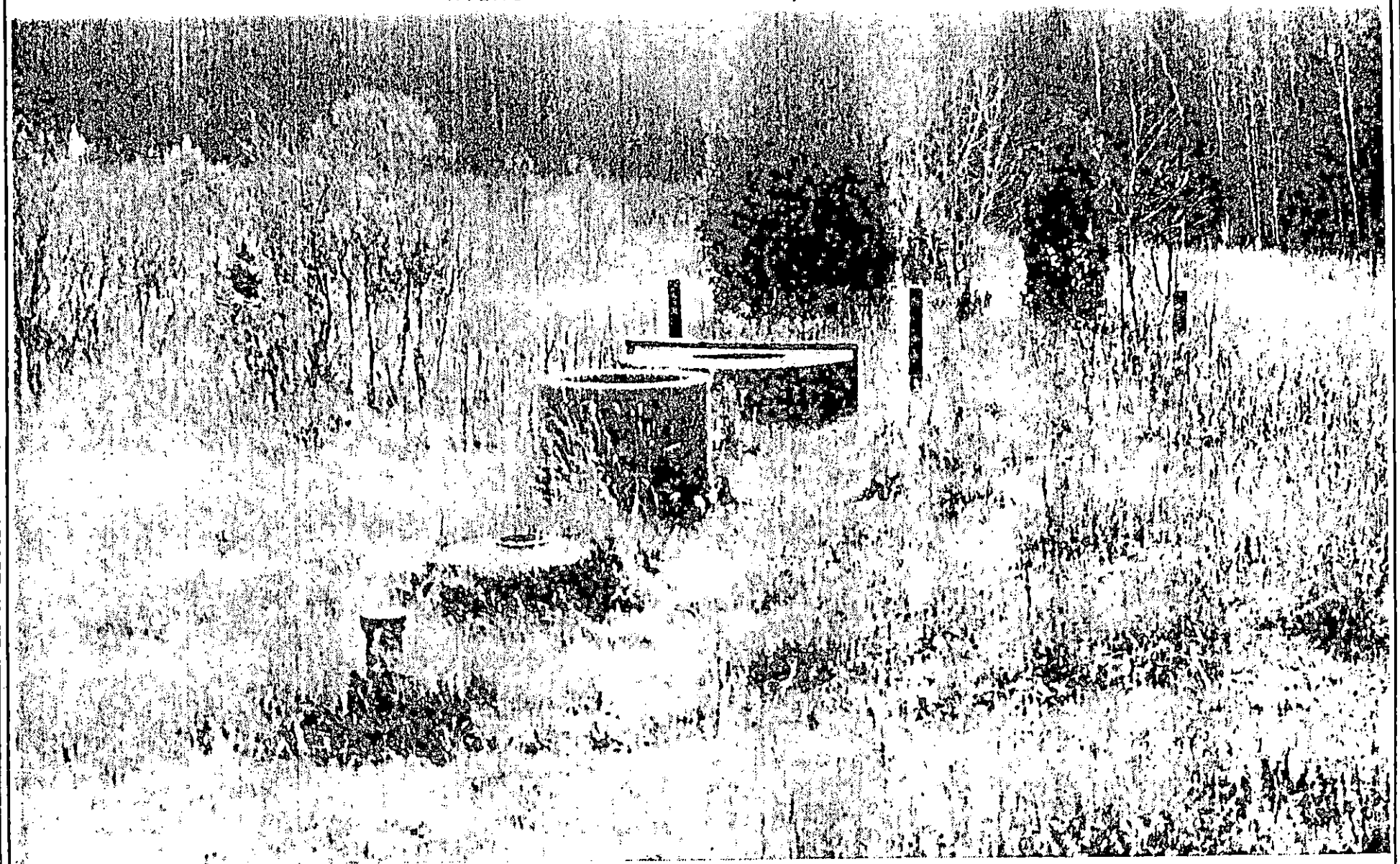
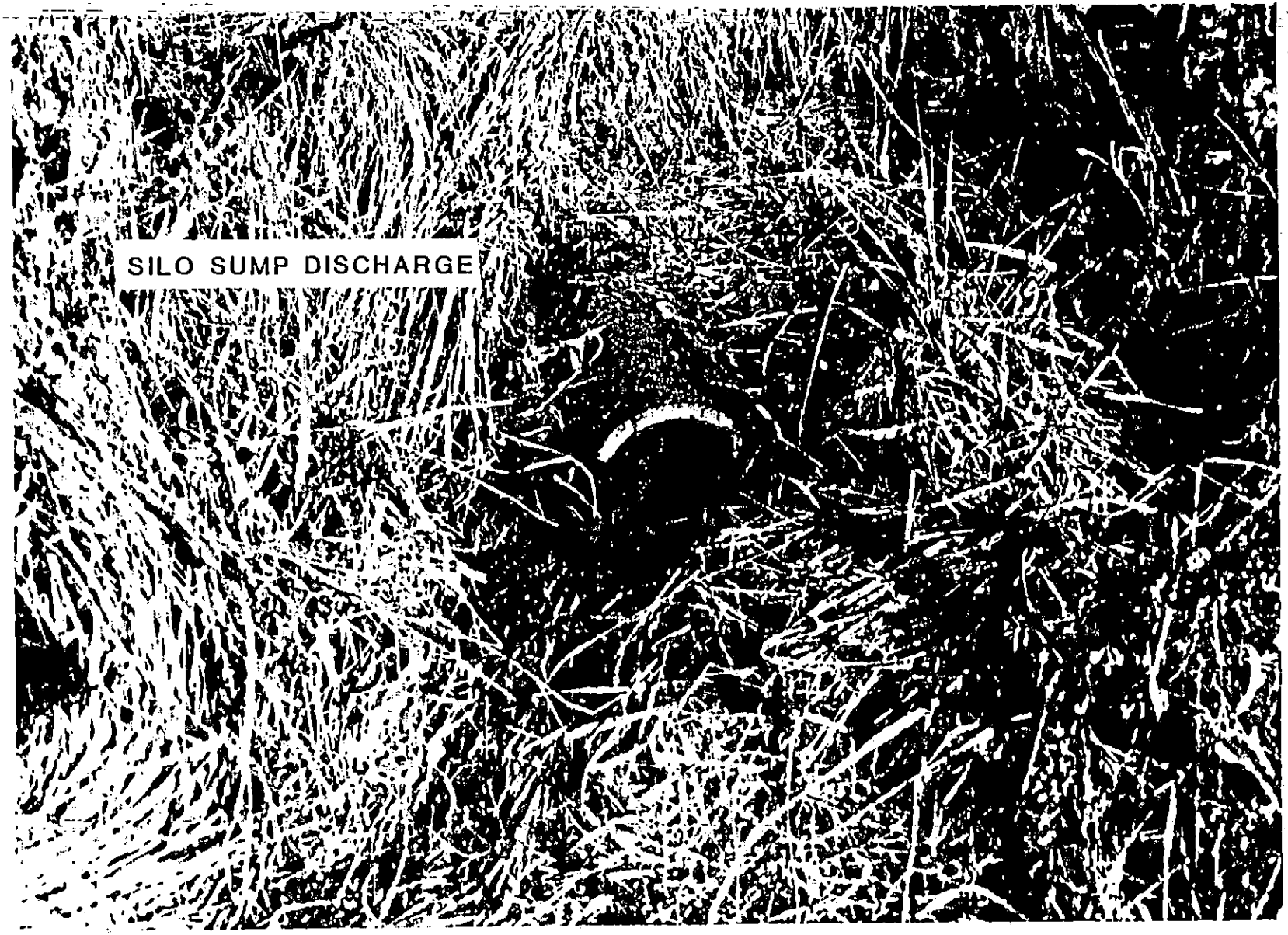


FIGURE 2-4

SILO DUMP DISCHARGE

ATLAS SITE S-8 CLAYBURG, NEW YORK



Glacial till covers valleys and lower slopes on hills and mountains. Outcrops of bedrock are abundant along some larger streams and on upper slopes and mountain summits. The till composition and texture reflect the kind of bedrock. In areas underlain by crystalline rocks of Precambrian age, the till is commonly a sandy loam or loamy sand containing pebbles and boulders of crystalline rocks and of Potsdam Sandstone. In the foothills underlain by the Potsdam Sandstone, the till is stonier and has a finer grained matrix. Pebbles and boulders of Potsdam Sandstone may compose a fifth of the volume of the drift; the matrix is sandy loam or loam (Denny, 1974).

Ground water in the study area occurs in both the unconsolidated glacial deposits and the consolidated older rocks. The yield of wells drilled in glacial material is highly variable and depends predominantly on lithology. Wells drilled in poorly sorted till tend to have low yield, but way still provide adequate domestic supplies. Wells set in sandy glacial drift material tend to be more productive. Ground water in the crystalline bedrock is present only in secondary joints and fractures. The yield of wells set in bedrock depends primarily on the number of joints which the well intercepts. Ground-water quality in the study area is generally good. Water from the glacial deposits tends to be mineralized and may contain significant concentrations of dissolved iron. The crystalline bedrock produces water of potable quality (Giese and Hobba, 1970).

Site S-8 is situated in the uplands portion of the Adirondack region. From geologic reports it appears that the site is underlain by Precambrian crystalline rocks. No outcrops of bedrock were evident on the site, but southwest of the site many large crystalline rock boulders were observed on the surface. As part of the site investigation, three ground-water monitoring wells were installed at the site. Site stratigraphy and shallow ground-water conditions encountered are discussed in Section 5.1 of this report.

The land surface at the site (based on the Redford, New York 7.5 minute series USGS quadrangle) slopes toward the northwest at a gradient of less than five percent. The highest elevation in the vicinity is just north of the site at about 1400 feet mean sea level (msl). The lowest elevation in the vicinity is due south of the site at the North Branch Saranac River where the elevation is about 1150 ft. msl.

Surface runoff from the site is controlled by a series of small drainage ditches around the silo (see Figure 2-2). A small ditch west of the silo directs flow around the western part of the silo toward the northwest and ultimately into a south flowing tributary of the North Branch Saranac River. The sump discharge system emptied into this drainage ditch. Another drainage swale directs flow toward the west. The two ditches merge west of the silo. The confluence of these two ditches is the lowest point on the site with an elevation of about 1340 feet msl.

The climate of the Adirondack region is characterized by cold, harsh winters and relatively mild summers. According to climatological data from a station approximately 15 miles south of the site, the mean annual temperature for the region is 44° F. Annual precipitation is approximately 33 inches with an additional 81 inches of snowfall per year. The rainfall is evenly distributed throughout the year but most occurs between June and October.

2.4 LAND USE

Site S-8 lies entirely within the Adirondack Forest Preserve, therefore, land use is very strictly controlled. Open space comprises the predominant land use around the site. The next major land use is residential. Residences are located along Standish Road, which passes in front of the site, on State Highway 3, on Silver Lake Road, and Soucy Road south of the river. There are approximately 100 people within a distance of one mile from the site (based on 2.3 persons/dwelling). About

35 to 40 people reside toward the south and southwest, down gradient of the site, and north of the river.

2.5 OWNERSHIP AND PRIOR USE

ATLAS Site S-8 was constructed as a part of the Plattsburgh ICBM complex of 12 squadrons. The site consisted of a total of 13.7 acres located off Standish Road in the township of Saranac. The site was acquired for DOD use between 1960 and 1964. In 1967, the site was conveyed to Bernard A. Roy by quitclaim deed. Subsequently, in 1976 the site was deeded to the Cherry Patch Realty Company who owns the site today.

The present (1988) site condition is similar to that when DOD occupied it. The quonset huts and pump houses have been demolished. Structures and buildings still present at the site include one deep missile silo, a launch control center (underground), two foundations where quonset hut/maintenance buildings were erected, and septic system treatment facilities. No apparent use has been made of the site by owners subsequent to DOD.

SECTION 3.0 - SITE INVESTIGATION

3.1 INTRODUCTION

Prior to initiating any field activities, a site visit was performed by personnel from Law Environmental, Inc. Monitoring well and other sampling locations were selected during the site visit. These locations are shown in Figure 2-2. The locations of the monitoring wells, shown in Figure 2-2, are slightly different from those shown in the Monitoring Well Installation Plan (MWIP). Revisions to the MWIP figure were made in the field and Figure 2-2 reflects actual site conditions and actual monitoring well locations. These locations were selected with the concurrence of the Kansas City District Corps of Engineers whose representative was present at the site during the field work.

3.2 WORK PLANS

After the site visit and selection of proposed sampling stations, work plans were developed to describe planned site investigation procedures. Specific work plans developed for ATLAS Site S-8 were:

- Monitoring Well Installation Plan,
- Sampling and Analysis Plan, and
- Site Specific Health and Safety Plan.

These plans constitute the working documents that provided guidance for the field investigation procedures. The Work Plans were sent to the Kansas City District Corps of Engineers (COE) for review and approval. Following COE approval, the notice to proceed with field work was received in October, 1987 and the field investigation program began October 19, 1987. The approved plans are presented in the Appendices H, I and J, respectively, to this report.

For convenience, a brief outline of field techniques are presented in the following paragraphs along with field data gathered during the monitoring well installation activities, and the sampling program.

3.3 MONITORING WELL INSTALLATION

Three shallow ground-water monitoring wells were installed to investigate specific subsurface areas at ATLAS Site S-8. Soil samples for geotechnical analysis were taken during the installation of each monitoring well. The wells were installed and completed according to the approved Monitoring Well Installation Plan (contained in Appendix H). The following sections briefly discuss monitoring well drilling, construction, development and permeability testing.

3.3.1 Monitoring Well Locations

The location of monitoring wells installed at Site S-8 are shown in Figure 2-2. Each location is discussed below:

- Monitoring Well MW-801

  MW-801 was installed north of the missile silo (Figure 2-2). This location was selected because the land surface at Site S-8 slopes toward the north. The surficial groundwater at the site follows the surface topography and therefore, flows toward the north. MW-801 was intended to monitor groundwater conditions downgradient from the silo complex.

- Monitoring Well MW-802

  MW-802 is northwest of the missile silo near a drainage ditch (Figure 2-2). The ditch receives flow from the missile silo sump discharge system. Potential contaminants could have been discharged through the sump system, therefore MW-802 was installed at this down gradient

location to monitor ground water conditions from the sump discharge.

- Monitoring Well MW-803

  MW-803 is south of the missile silo in a small surface drainage swale between the quonset hut foundations (former maintenance buildings) and the silo pad (Figure 2-2). Based on work performed at other ATLAS sites, this location is believed to be in the vicinity of the underground diesel storage tank. MW-803 was intended to monitor ground water conditions possibly associated with the diesel storage tank and the maintenance buildings.

3.3.2 Monitoring Well Construction

The Monitoring Well Installation Plan for ATLAS Site S-8 states that the soil test boring should be terminated after penetrating about 10 feet into the water table or at auger refusal. Each well was constructed after drilling the borehole to the specified depth. The monitoring well was constructed of: 2-inch inner diameter (ID) Polyvinyl Chloride (PVC) (threaded, flush-joint) casing, No. 10 slot (0.010 inch) pre-manufactured PVC screen; riser pipe; non-carbonate silica sand; bentonite pellets; grout mixture (cement, bentonite, and water); steel security cap with lock; and protective steel posts. A concrete pad (4 inches x 3 feet x 3 feet) was constructed around each well.

A Failing 1500 and an Acker "Soil Max" rig were used to install the monitoring wells at Site S-8. The rigs were equipped with 6.5-inch ID, 12-inch outer diameter (OD), hollow stem augers. No unusual circumstances occurred during the drilling program that necessitated changes to the basic program described in the Monitoring Well Installation Plan (see Appendix H). Each well was installed as follows: complete the boring with hollow stem augers to a depth of 10 feet into the first water zone encountered, sampling with a split spoon sampler continuously for

the first 10 feet of the boring, then every five feet to the termination depth; assemble the 2-inch PVC screen and riser inside the hollow stem augers; add the sand pack and bentonite seal through the annular space between the augers and the PVC casing well; remove the augers from the borehole; wet the bentonite pellets and allow swelling for 30 minutes; mix and add cement-bentonite grout; and construct surface protection system (pad, steel casing, protective posts, etc.). Table 3-1 lists pertinent information on well construction details.

A copy of the daily log of activities at Site S-8 is contained in Appendix A, along with the final test boring records, field boring logs, and geotechnical analytical data. The daily logs contain information regarding quantities and types of material used at the site; the test boring records show relevant stratigraphic data on each well and well construction information; the field boring logs are copies of the actual log completed by the field geologist; and the geotechnical analytical results contain grain size analyses, moisture content and Atterberg limits (where applicable) for two samples from each boring. These data are discussed in detail in Section 4.0.

3.4 MONITORING WELL DEVELOPMENT

Well development was accomplished during the week of October 26, 1987. The purpose of well development is two-fold: to remove fine particles (silt and clay) that were introduced into the well during the drilling process and to improve the hydraulic connection between the aquifer and the well. After allowing the grout seal and pad to cure, each well at ATLAS Site S-8 was developed by surging with a piston, by bailing, and by pumping with a 1.7-inch hand pump. Development generally occurred no sooner than 24 hours after installation. Well development data are summarized in Tables 3-2 and 3-3. Forms completed in the field during well development are presented in Appendix C. Data recorded in the field included: date, static water level,

TABLE 3-1

WELL CONSTRUCTION DATA
ATLAS SITE S-8
CLAYBURG, NEW YORK

Well Number	Depth[1]	Screened Interval[1]	Sand Pack[2]	Bentonite Layer[2]	Grout Layer[2]	Date Installed
MW-801	24.0	13.0 - 23.0	12.7	2.1	9.2	10/23/87
MW-802	18.0	8.0 - 18.0	12.3	2.7	3.0	10/22/87
MW-803	16.0	5.4 - 15.4	11.9	2.1	2.0	10/22/87

NOTES:

(1) Approximate depth below ground surface
(2) Approximate thickness of material in well column

All measurements in feet

TABLE 3-2

WELL DEVELOPMENT DATA
ATLAS SITE S-8
CLAYBURG, NEW YORK

Well No.	Development Process[1]	Quantity of Water in Well[2] (gallons)	Quantity of Water Removed (gallons)	Time for Removal[3] (hours/minutes)	Date
MW 801	Surging, bailing, pumping	6.7	34.0	3/0	10/27/87
MW 802	Surging, bailing, pumping	8.5	43.0	2/30	10/28/87
MW 803	Surging, bailing, pumping	8.7	44.0	4/0	10/28/87

Notes:

(1) All of the monitoring wells were developed using three separate techniques: surging with a 1.5 inch PVC surge block; bailing with a 1" x 5' PVC bailer; and, pumping with a 1.7 inch PVC hand pump.

(2) Quantity of water in well casing and annulus.

(3) Times shown in this column do not reflect rest/recovery periods but only actual surging, bailing and pumping times.

TABLE 3-3

GROUND-WATER QUALITY MEASUREMENTS
ATLAS SITE S-8
CLAYBURG, NEW YORK

Well Number	pH	Specific Conductance umhos/cm	Temperature °C	Date
MW-801	6.9	415	11.5	10/27/87
MW-802	6.3	150	10.0	10/28/87
MW-803	6.3	300	11.5	10/28/87

NOTE:

All measurements reflect readings at the end of well development.

quantity of water standing in well (including the sand pack), water quality data, physical characteristics of water, development equipment, surge techniques and water quantity removed. The wells were allowed to stabilize for at least 24 hours before collecting water quality samples. Field measurements of pH, specific conductance, and temperature taken at the end of well development are summarized in Table 3-3. No major variations in these parameters were observed during well development.

3.4.1 Water Levels

Static water level measurements were made during permeability testing. These data, along with the surveyed reference point - the top of casing - are summarized in Table 3-4. The water levels in the monitoring wells at the site ranged between 5.98 feet and 16.26 feet below the top of the PVC casings. These water level measurements represent relative elevations ranging from 92.73 feet at MW-803 to 80.02 feet at MW-802 (based on an assumed arbitrary benchmark of 100 feet msl). These data and ground-water flow are discussed in Section 5.0.

3.4.2 Site Survey

Well-head elevations at ATLAS Site S-8 were surveyed during December, 1987, by Laberge Engineering and Consulting Group, LTD. The surveying firm is located in Plattsburgh, New York. An assumed datum elevation of 100 feet was established at a disk located adjacent to the silo. Well elevations and coordinates are relative to this arbitrary benchmark. Appendix K contains the survey field notes and the site survey.

3.5 HYDRAULIC CONDUCTIVITY TESTING

A hydraulic conductivity test known as a slug test was performed on each well after well development and before sampling. The test consists of inserting a slug (solid PVC rod) into the water

TABLE 3-4

GROUND-WATER ELEVATION SUMMARY
ATLAS SITE S-8
CLAYBURG, NEW YORK

Well No.	TOC [1] (feet)	Water Surface (feet below TOC)	Date	Water Elevation (feet)	Coordinates [2]	
					X	Y
MW-801	98.91 [3]	16.26	11/14/87	82.65	8,502.702	7,557.077
MW-802	88.65	8.63	11/14/87	80.02	8,520.197	7,343.895
MW-803	98.71	5.98	11/14/87	92.73	8,216.249	7,518.621

Notes:

(1) TOC - Top of well casing elevation based on bench mark established on site and referenced on the site survey in Appendix L. Datum assumed to be 100 feet mean sea level (msl).

(2) Coordinates based on local grid system established on site and referenced in the site survey in Appendix L.

(3) Surveyors were unable to open steel casing. TOC elevation for MW-801 is estimated from the elevation of the top of the steel casing.

column in the well to raise the water level (slug-in test) or removing a slug of water from the water column to lower the water level (slug-out test). The recovery to static water level is recorded over time. Monitoring wells which did not have fully saturated screen lengths were tested by the slug-out test only. Test results were measured using an Enviro-Labs EL-200 Data Logger hydrologic monitoring device. Data was evaluated using the Bouwer and Rice (1976) technique to calculate the hydraulic conductivity for each well. Data and hydraulic conductivity computations for each well test are presented in Appendix D.

Table 3-5 summarizes the range of hydraulic conductivity measured in monitoring wells at ATLAS Site S-8. Values range from 6 x 10^{-5} centimeters/second (cm/s) to 10^{-2} cm/s. The range of values is typical of the wide range of grain sizes (silt size to cobbles and boulders) found in the glacial material.

3.6 SAMPLING PROGRAM

Sampling at ATLAS Site S-8 was performed in three episodes. Geotechnical sampling was performed during the drilling program which occurred on October 22 and 23, 1987. Soil samples for chemical analysis were collected on November 10, 1987. Groundwater and silo water samples were collected on December 8, 1987. Specific sampling protocol are contained in Appendix I - the Sampling and Analysis Plan. Information relative to field drilling and sampling activities is presented here.

3.6.1 Geotechnical Data

Drilling at ATLAS Site S-8 was initiated during the week of October 19, 1987. The wells were drilled with Failing and Acker truck mounted drilling rigs. Overburden samples were obtained with a split-spoon sampler at various depths. Two samples from each boring were analyzed for grain size distribution, moisture

TABLE 3-5

HYDRAULIC CONDUCTIVITY DATA SUMMARY
ATLAS SITE S-8
CLAYBURG, NEW YORK

Well No	SWL[1] (from TOC)	Type Test	Hydraulic Conductivity[2] (cm/s)	Date Test Performed
MW-801	16.26	Slug out	1.35×10^{-2}	11/14/87
MW-802	8.63	Slug in	1.12×10^{-4}	11/14/87
		Slug out	5.96×10^{-5}	
MW-803	5.98	Slug in	2.19×10^{-4}	11/14/87
		Slug out	1.94×10^{-4}	

NOTES:

(1) SWL - Static Water Level from TOC (Top of Casing)
(2) From Bouwer and Rice (1976) calculation. Data and complete results are contained in Appendix D.
(3) Date of slug test

content, and Atterberg limits. The data are presented in Table 3-6. Grain size curves and test results are contained in Appendix A.

3.6.2 Ground-Water Sampling

Prior to collecting samples, monitoring wells were purged with a 1.5" x 3' Teflon bailer. Work plan specifications required that a minimum of five well casing volumes of water be removed from each well. Table 3-7 shows purging data for the Site.

Ground-water samplers were collected from each of the three monitoring wells. A Field Sampling Report, for each well is included in Appendix F. Ground-water samples that were collected from each of the monitoring wells included the following: field samples, a duplicate field sample from well MW-801 (Quality Control), and a Quality Assurance sample for the USACE. In addition, a rinsate sample was collected to test field cleaning procedure. Table 3-8 lists the numbers and types of water samples taken at ATLAS Site S-8 and the parameters for analysis. Analytical results for the ground water samples are contained in Section 4.2.

3.6.3 Silo Water Samples

To access the underground silo, a hole was drilled through the silo door. Water in the silo was sampled with a 1.5" x 3' teflon bailer. Samples collected from the silo included a field sample, a QC duplicate sample, a QA duplicate, and a sample equipment rinsate. Table 3-9 lists the silo samples collected and the analytical parameters. Analytical results for the silo water samples are presented in Section 4.3.

3.6.4 Shallow Soil Sample Locations S-1 through S-6

Shallow soil samples were collected at six locations using a stainless steel hand auger. The sampling depth ranged between

TABLE 3-6

SOIL LABORATORY DATA SUMMARY
ATLAS SITE S-8
CLAYBURG, NEW YORK

I.D. Number	Sample Interval(ft)	Percentage Sand/Gravel	Percentage Silt/Clay	Unified Soil Classification	Percentage Moisture	Atterberg Limits LL	PL	PI
MW 801 #4	6.0 - 8.0	71.4	28.6	SM	9.1	NONPLASTIC		
MW 801 #9	19.0 - 21.0	75.8	24.2	SM	9.3	NONPLASTIC		
MW 802 #3	4.0 - 6.0	72.3	27.7	SM	9.4	NONPLASTIC		
MW 802 #8	14.0 - 16.0	76.6	23.4	SM	9.6	NONPLASTIC		
MW 803 #4	6.0 - 8.0	88.5	11.5	SP-SM	11.8	NONPLASTIC		
MW 803 #6	10.0 - 12.0	97.3	2.7	SW	10.9	NONPLASTIC		
MW 803 #7	12.0 - 14.0	78.1	21.9	SM	8.2	NONPLASTIC		

NOTES:

LL - Liquid Limit
PL - Plastic Limit
PI - Plasticity Index

Classification	Percentage Silt/Clay
SP or SW	<5
SP-SM	5-12
SP-SC	5-12
SM	>12
SC	>12
ML or CL	>50
MH	>50

TABLE 3-7

WELL PURGING DATA SUMMARY
ATLAS SITE S-8
CLAYBURG, NEW YORK

Well No.	SWL[1] (feet)	Well Depth Below TOC (feet)	Quantity in Well[2] (gals)	Quantity Purged (gals)	Well Volumes Purged	Date
MW-801	12.95	25.29	1.9	9.7	5.0	12/08/87
MW-802	5.29	20.00	2.4	12.2	5.2	12/08/87
MW-803	2.15	17.90	2.5	12.5	5.0	12/08/87

NOTES:

(1) SWL - Depth in feet from Top of Casing (TOC) to Static Water Level (SWL) measured 12/8/87.
(2) Quantity in well casing. Once casing volume = (Total depth of well - SWL) x 0.16 gal/ft.

TABLE 3-8

GROUND-WATER
SAMPLES AND PARAMETERS FOR ANALYSIS
ATLAS SITE S-8
CLAYBURG, NEW YORK

Sample Type	Number of Samples	Parameters		
		Purgeable Aromatics and Halocarbons	Base/Neutral Extractables	Total Metals
Field Sample	3	x	x	x
Quality Control (AE)				
Duplicate	1	x	x	x
Sampling blank	1	x	x	x
Trip blank	1	x	-	-
Quality Assurance (USACE)				
Duplicate	1	x	x	x
Sampling blank	1	x	x	x
Trip blank	1	x	-	-

NOTES:

AE - Law Environmental, Inc.
USACE - United States Army Corps of Engineers
x - Indicates sample was collected for chemical analysis.
- - Indicates no sample was collected.

TABLE 3-9

SILO WATER
SAMPLES AND PARAMETERS FOR ANALYSIS
ATLAS SITE S-8
CLAYBURG, NEW YORK

Sample Type	Number of Samples	Parameters		
		Purgeable Aromatics and Halocarbons	Base/Neutral Extractables	Total Metals
Field Sample	1	x	x	x
Quality Control (A-E)				
Duplicate	1	x	x	x
Sampling blank	1	x	x	x
Trip blank	1[(a)]	x	-	-
Quality Assurance (USACE)				
Duplicate	1	x	x	x
Sampling blank	1	x	x	x
Trip blank	1[(a)]	x	-	-

NOTES:

A-E Law Environmental, Inc.

USACE United States Army Corps of Engineers

x Indicates sample was collected for chemical analysis.

- Indicates no sample was collected.

(a) One trip blank was analyzed for both ground and silo water samples.

0.5 and 1.0 feet for each soil sample. Analytical results for these samples are presented in Section 4.4. Table 3-10 lists numbers and types of soil samples collected and the parameters for analysis. Below is a description of the location and the purpose for each location.

- Soil sample S-1 was taken adjacent to MW-803, north of the quonset huts. - This location was selected to monitor soil conditions near MW-803.

- Soil sample S-2 was collected downgradient of the silo sump discharge. Any contamination due to silo sump activities should be monitored by this sample. The duplicate soil sample was also collected at this location.

- S-3 is located slightly west of MW-802 in a small drainage ditch. This location was intended to monitor soil conditions in the vicinity of well MW-802 and the drainage ditch.

- S-4 is located north (downgradient) of well MW-801. Soil conditions in the vicinity of MW-801 will be monitored by this sample.

- S-5 is downgradient of the launch control center and the liquid nitrogen storage tank. This sample is intended to monitor releases from the launch control center.

- Soil sample S-6 is the background sample. Results from the background sample are the basis for comparison of soil analytical results. The sample was taken on the west side of the site near the entrance road, on high ground.

3.6.4.1 Sampling Procedure

Soils for chemical analysis were collected with a stainless steel hand auger. The auger portion itself was about a foot long and three inches wide. At approximately one to two foot depth, the

TABLE 3-10

SOIL SAMPLES AND
PARAMETERS FOR ANALYSIS
ATLAS SITE S-8
CLAYBURG, NEW YORK

Sample Type	Number of Samples	Parameters		
		Purgeable Aromatics and Halocarbons	Base/Neutral Extractables	Total Metals
Field Sample	6	x	x	x
Quality Control (AE)				
Duplicate	1	x	x	x
Sampling blank	1	x	x	x
Trip blank	1	x	-	-
Quality Assurance (USACE)				
Duplicate	1	x	x	x
Sampling blank	1	x	x	x
Trip blank	1	x	-	-

NOTES:

AE Law Environmental, Inc.
USACE United States Army Corps of Engineers
x Indicates sample was collected for chemical analysis.
- Indicates no sample was collected.

filled auger was put in a stainless steel bowl. Using a stainless steel spoon, the 40-ml vials for purgeable aromatics and purgeable halocarbons (volatile organics) were filled directly from the hand auger. There was no mixing of the soil at this point. After all samples for volatile organics were taken, the rest of the auger was emptied into the bowl. At sampling locations which were chosen for duplicate samples, a second auger-full of soil was acquired. This sample was mixed with the remains of the first auger in the stainless steel bowl using a stainless steel spoon. Samples for total metals and base neutral extractables were taken from this mixed sample. Specific sampling procedures are outlined in the Sampling and Analysis Plan (Appendix I).

Soil samples collected included the following: field samples, a duplicate field sample at S-2 for Quality Control, and Quality Assurance samples for the USACE. A rinsate sample of the hard auger was also taken to test field cleaning procedures. The equipment was cleaned prior to collecting each sample to aid in preventing cross-contamination between sampling locations.

*****

4.0 TEST RESULTS

Samples for chemical analysis were collected from the silo water, ground water, and soil at ATLAS Site S-8. The analytical program used and the results of the analyses performed on samples collected from the site are presented in the following section. Interpretation of the data is presented in Section 5.0.

4.1 GROUND WATER ANALYTICAL RESULTS

Three monitoring wells were sampled in accordance with the Work Plan specifications (Appendix I). Table 4-1 lists the analytical methods used for ground-water samples and the detection limits for these methods. Samples from the wells were analyzed for purgeable aromatics, purgeable halocarbons, base/neutral extractables, and metals. Table 4-2 lists the analytical results for ground-water samples, including the rinsate, the duplicate and the travel blanks. Appendix E contains the complete analytical laboratory results.

The ground-water results in Table 4-2 show that the purgeable organic compound methylene chloride was detected in samples at concentrations ranging from below the measurable detection limit to 0.007 mg/l. Methylene chloride was also present at concentrations less than the measurable detection limit in the rinsate, trip blank, and method blank. Trans-1,2-dichloroethylene was present below the detection limit in sample MW-803. The purgeable organic chloroform was present below the detection limit of 0.005 mg/l in the ground-water rinsate, but not in any field samples. Two base/neutral extractable compounds, di-n-butyl phthalate and di-n-octyl phthalate were present below measurable detection limits in samples from MW-802 and MW-803. Di-n-butyl phthalate was also found, at a concentration below the measurable detection limit, in the ground-water rinsate and method blank. The metals barium, chromium, and lead were present at low levels in the ground-water

Table 4-1
Analytical Methods for Water Samples
ATLAS Site S-8
CLAYBURG, NEW YORK

Parameter	Method[1]	Detection Limit (mg/L)[2]
Purgeable Aromatics	8240 (GC/MS)	0.005
Purgeable Halocarbons	8240 (GC/MS)	0.005 - 0.01
Base/Neutral Extractables	8270 (GC/MS)	0.01 - 0.05
Metals:		
Arsenic (As)	7060 (Furnace AA)	0.005
Barium (Ba)	6010 (ICP)	0.010
Cadmium (Cd)	6010 (ICP)	0.005
Chromium (Cr)	6010 (ICP)	0.010
Lead (Pb)	6010 (ICP)	0.005
Mercury (Hg)	7470 (Cold Vapor)	0.0002
Selenium (Se)	7741 (Furnace AA)	0.010
Silver (Ag)	6010 (ICP)	0.010

NOTES:

(1) Source: EPA September, 1986

(2) For Ecology and Environment, Inc., laboratory equipment and analytical procedures.

TABLE 4-2
SUMMARY OF POSITIVE ANALYTICAL RESULTS FOR GROUND WATER
ATLAS SITE S-8
CLAYBURG, NEW YORK
ALL RESULTS IN Mg/l
SAMPLED DECEMBER 8, 1987

Parameter	Sample Designation						
	MW-801	MW-802	MW-800[1]	MW-803	MWR Rinsate	Trip Blank	Method Blank
Purgeable Aromatics and Halocarbons							
Methylene chloride	0.007	<0.005[2]	<0.005	<0.005	<0.005	<0.005	<0.005
Trans-1,2-dichloroethylene	ND[3]	ND	ND	<0.005	ND	ND	ND
Chloroform	ND	ND	ND	ND	<0.005	ND	ND
Base/Neutral Extractables							
Di-n-butyl phthalate	ND	<0.010	ND	<0.010	<0.010	NT[4]	<0.010
Di-n-octyl phthalate	ND	<0.010	ND	<0.010	ND	NT	ND
Metals (Total)							
Barium (Ba)	0.113	0.188	0.202	0.132	ND	NT	NT
Chromium (Cr)	ND	0.014	0.020	0.011	ND	NT	NT
Lead (Pb)	ND	0.007	0.007	0.008	ND	NT	NT

NOTES:

(1) Ground water duplicate sample from MW-802.
(2) < indicates compound present below listed measurable detection limit.
(3) ND = Constituent not detected in sample.
(4) NT = Sample not analyzed for constituent.

samples. All other organic compounds and metals were not detected in the ground-water samples collected at the site. These analytical results are evaluated in Section 5.2. QA/QC results are discussed in Section 4.4.

4.2 SILO WATER RESULTS

The underground missile silo at the site contained water at a depth of 7.9 feet below the surface. Analytical methods utilized for the ground-water samples were the same used for the silo water samples. Table 4-3 presents the analytical results for the silo samples. Appendix E contains the complete analytical laboratory results.

Table 4-3 shows that four purgeable aromatics and halocarbons, methylene chloride, chloroform, trans-1,2-dichloroethylene, and trichloroethylene, were detected in the silo water samples collected. Only trans-1,2-dichloroethylene was found in concentrations greater than the measurable detection limit. Methylene chloride was detected in the field sample, the duplicate, the rinsate, and the method blank, but at concentrations below the measurable detection limit. Trichloroethylene was found below the measurable detection limit in the field sample and duplicate. Chloroform was detected, but below the measurable detection limit in the rinsate sample only. The base/neutral extractable di-n-butyl phthalate was present below the measurable detection limit in the silo sample duplicate and the method blank.

Low concentrations of the metals barium and lead were also detected in the silo water sample and duplicate. No other organic compounds or metals were detected in the silo water sample collected at the site. These analytical results are evaluated in Section 5.2.

TABLE 4-3
SUMMARY OF POSITIVE ANALYTICAL RESULTS FOR SILO WATER
ATLAS SITE S-8
CLAYBURG, NEW YORK
ALL RESULTS IN MG/L (PPM)
SAMPLED DECEMBER 8, 1987

Parameter	Sample Designation			
	SW	SWD[1]	SWR Rinsate	Method Blank
Purgeable Aromatics and Halocarbons				
Methylene chloride	<0.005[2]	<0.005	<0.005	<0.005
Chloroform	ND[3]	ND	<0.005	ND
Trans-1,2-dichloroethylene	0.008	0.008	ND	ND
Trichloroethylene	<0.005	<0.005	ND	ND
Base/Neutral Extractables				
Di-n-butyl phthalate	ND	<0.010	ND	<0.010
Metals (Total)				
Barium (Ba)	0.077	0.076	ND	NT[4]
Lead (Pb)	0.021	0.019	ND	NT

NOTES:

(1) Silo duplicate sample.
(2) < indicates compound detected but below the listed measurable detection limit.
(3) ND = Constituent not detected in the sample.
(4) NT = Sample not analyzed for constituent.

4.3 SOIL ANALYTICAL RESULTS

Six shallow soil samples were collected at ATLAS Site S-8 and analyzed for purgeable aromatics, purgeable halocarbons, base neutral extractables, and metals. The analytical methods used are shown in Table 4-4.

Test results in Table 4-5 show that the purgeable organic methylene chloride was detected at concentrations between 1.6 mg/kg and 3.2 mg/kg in all six field samples, the duplicate, and the method blank. The method blank contained the highest methylene chloride concentration measured. Low methylene chloride concentrations were also detected in the rinsate and trip blank. The purgeable organic toluene was present below the measurable detection limit in the rinsate, the trip blank, and the method blank. The purgeable organic compounds di-n-butyl phthalate and bis (2-ethyl hexyl) phthalate were present in measurable concentrations in all the soil samples but S-1. Concentrations of these compounds were also present in the method blank and rinsate. The metals barium, chromium, and lead were present in relatively low concentrations in all the soil samples. No other organic compounds or metals were detected in the soil samples collected. The results of the soil analysis are evaluated in Section 5.0.

4.4 QUALITY ASSURANCE/QUALITY CONTROL RESULTS

Quality Assurance/ Quality Control (QA/QC) for criteria this site was defined in the Work Plans contained in Appendix H and I of this report. These criteria include sampling methods and testing procedures, as well as documentation of control, such as chain-of-custody.

Five types of QA/QC samples for ATLAS Site S-8 were analyzed by the laboratory. These samples consisted of duplicates, replicates, spikes, travel blanks and sampler rinsates. In addition to these samples, the laboratory has established

Table 4-4
Analytical Methods for Soil
ATLAS SITE S-8
CLAYBURG, NEW YORK

Parameter	Method[1]	Detection Limit (mg/kg)[2]
Purgeable Aromatics	8240 (GC/MS)	0.5 - 1.0
Purgeable Halocarbons	8240 (GC/MS)	0.5 - 1.0
Base/Neutral Extractables	8270 (GC/MS)	0.33 - 4.0
Metals:		
Arsenic (As)	7060 (Furnace aa)	1.0
Barium (Ba)	6010 (ICP)	1.0
Cadmium (Cd)	6010 (ICP)	1.0
Chromium (Cr)	6010 (ICP)	1.0
Lead (Pb)	6010 (ICP)	0.5
Mercury (Hg)	7471 (Cold Vapor)	0.1
Selenium (Se)	7740 (Furnace AA)	1.0
Silver (Ag)	6010 (ICP)	2.0

NOTES:

(1) Source: EPA, September, 1986.

(2) For Ecology & Environment, Inc., laboratory equipment and analytical procedures.

TABLE 4-5
POSITIVE ANALYTICAL RESULTS FOR SOIL
ATLAS SITE S-8
CLAYBURG, NEW YORK
ALL RESULTS IN MG/KG
SAMPLED NOVEMBER 10, 1987

Parameter	Sample Designation									
	S-1	S-2	S-D[1]	S-3	S-4	S-5	S-6[2]	Rinsate	Trip Blank	Method Blank
Purgeable Aromatics and Halocarbons										
Toluene	ND[4]	ND	ND	ND	ND	ND	ND	<0.005[3]	<0.005	<0.005
Methylene chloride	2.3	2.3	1.6	1.6	1.6	1.8	1.8	<0.005	0.007	3.2
Base/Neutral Extractables										
Di-n-butyl phthalate	ND	0.46	0.68	0.59	0.57	0.49	0.52	<0.01	NT[5]	0.53
Bis(2-ethyl hexyl) phthalate	ND	0.88	1.70	0.83	1.40	1.30	0.92	0.016	NT	0.70
Metals										
Barium (Ba)	16.9	18.1	14.9	38.2	16.6	17.4	13.7	ND	NT	NT
Chromium (Cr)	3.41	5.59	5.03	7.75	3.74	3.45	4.21	ND	NT	NT
Lead (Pb)	1.41	18.3	26.5	28.1	1.77	1.98	4.65	ND	NT	NT

NOTES:

(1) Duplicate sample from S-2.
(2) Background soil sample.
(3) < indicates compound present below measurable detection limit.
(4) ND - Constituent not detected in sample.
(5) NT - Sample not analyzed for constituent.

internal QA samples which are used to analyze method controls, instrument calibration and internal QA procedures.

Duplicates of a ground-water sample, the silo water sample, and a soil sample were collected at the site. Duplicate samples are collected to establish the reproducibility of sampling and analytical techniques. The ground-water sample duplicate was taken at Monitoring Well MW-802. No purgeable aromatics, purgeable halocarbons, or base/neutral extractables were present above the measurable detection limit in the ground-water duplicate. Metals analysis results from the ground-water duplicate are consistent with the field sample. The chromium analyses showed a 30 percent difference, but this range is common when low concentrations of a constituent are present. The following results were obtained for ground-water parameters present above the detection limits in MW-802 and the duplicate.

Parameter	MW-802		MW-80D (duplicate)	
Barium	0.188	mg/l	0.202	mg/l
Chromium	0.014	mg/l	0.020	mg/l
Lead	0.007	mg/l	0.007	mg/l

A silo water duplicate was collected. Good comparison of analytical results was evident between the field sample and the duplicate sample. The maximum difference between the field and duplicate results was only 5 percent. The following results were obtained for parameters present above the detection limit in the silo sample and duplicate.

Parameter	SW		SWD (duplicate)	
Trans-1,2-dichloroethylene	0.008	mg/l	0.008	mg/l
Barium	0.077	mg/l	0.076	mg/l
Lead	0.021	mg/l	0.019	mg/l

The soil sample duplicate was collected from the S-2 field sample. The consistency between duplicate and field samples were acceptable for all parameters. The heterogeneous nature of soil typically causes a wide range in results between the field sample and duplicate. Results for constituents which were present above the measurable detection limit in S-2 and the duplicate are noted as follows:

Parameter	S-2		S-D (duplicate)	
Methylene Chloride	2.3	mg/kg	1.6	mg/kg
Di-n-butyl phthalate	0.46	mg/kg	0.68	mg/kg
Bis (2-ethyl hexyl) phthalate	0.88	mg/kg	1.70	mg/kg
Barium	18.1	mg/kg	14.9	mg/kg
Chromium	5.59	mg/kg	5.03	mg/kg
Lead	18.3	mg/kg	26.5	mg/kg

Replicate samples are aliquots of a single sample that is split on arrival at the laboratory or when analyzed. Replicates are analyzed as separate samples and compared to the original samples, yielding a relative percent difference. Two water samples (MWR and MW-802) were replicated; all relative percent differences were zero. Two soil samples (S-1 and S-D, the duplicate of S-2) were replicated for organic analysis. The relative percent differences range from zero to 20. These values are within EPA QC advisory limits (EPA, September, 1986).

Sample and matrix spikes are known amounts of analyte that are added to a field sample. Both the sample and the spiked sample are analyzed and the results compared. Percent recoveries are calculated to determine the amount of analyte added. If the spike analyses is accurate, the percent recovery should equal the

amount of analyte actually added. The spike technique is routinely used in the laboratory to calibrate equipment. For total metals in water, percent recovery for sample spikes ranged from 78 - 128 percent. Percent recovery for total metals in soil ranged from 69 - 118 percent. One soil spike and one water spike were outside EPA QC advisory limits (EPA, January 20, 1984). Matrix spike results for organics in water ranged from 53 - 98 with one spike at 200 percent recovery. This high recovery was due to a chromatography problem. A high end baseline shift occurred between pyrene and its internal standard. Table 4-6 shows the results of the spike analyses. EPA Quality Control Advisory Limits (EPA, November 24, 1986) have been established to determine acceptable matrix spike percent recoveries for various parameters. All matrix spike samples analyzed, except for the pyrene matrix spike, were within the EPA QC advisory limits.

Surrogate spikes are compounds which are similar to the analyte in chemical composition, extraction and chromatography, but which are not normally found in the field sample (EPA, September, 1986). A common tracer element used in surrogate spikes is deuterium. The surrogate spike sample is analyzed and the percent recovery of the added chemical is computed. Table 4-7 shows the results of the surrogate spike analyses. Percent recoveries for base/neutral organics in water ranged from 49 - 178 percent. Other organics in water percent recoveries range from 33 - 110 percent. Some recoveries were higher or lower than the criteria established by EPA protocols, however, the EPA allows one surrogate per sample fraction analyzed to be outside established windows. Base/neutral and acid extractable organics in soil range from 76 - 107 percent. Percent recoveries for purgeable organics (aromatics and halocarbons) in soil range from 71 - 116 percent. Therefore, surrogate spike recoveries for soil and water samples were within acceptable limits.

TABLE 4-6
QUALITY CONTROL: PERCENT RECOVERY
FOR SPIKE SAMPLES
ATLAS SITE S-8
CLAYBURG, NEW YORK

Parameter	Medium	Percent Recovery (range)	EPA QC Limits (1) (range)
SAMPLE SPIKE			
Total Metals	Water	78 - 128	75 - 125
Total Metals	Soil	61 - 118	75 - 125
MATRIX SPIKE			
ORGANICS			
Semi Volatile	Water	50 - 200	61 - 145
Volatile	Water	70 - 98	61 - 145

NOTES:

(1) EPA advisory limits expressed as a percentage.
Source: Inorganics - EPA, January 20, 1984
Organics - EPA, November 24, 1986

TABLE 4-7
QUALITY CONTROL: PERCENT RECOVERY
FOR SURROGATE SPIKE SAMPLES
ATLAS SITE S-8
CLAYBURG, NEW YORK

Parameter	Medium	Percent Recovery (range)	EPA QC Limits (1) (range)
PURGEABLE ORGANICS	Water	33 - 110	76 - 115
	Soil	71 - 116	70 - 121
BASE/NEUTRAL EXTRACTABLES	Water	49 - 178	33 - 141
	Soil	71 - 112	18 - 137

NOTES:

(1) EPA advisory limits expressed as a percentage.
Source: Organics - EPA, November 24, 1986

A travel or trip blank consisting of de-ionized water was analyzed for purgeable organic compounds (purgeable aromatics and halocarbons) in ground water and soils. Tables 4-2, 4-3, and 4-4 contain results of trip blank analyses. Methylene chloride was present below the measurable detection limit in the ground and silo water trip blank. The soil trip blank contained 0.007 mg/l methylene chloride. Methylene chloride was found at 3.2 mg/l in the laboratory method blank and throughout the soil samples. Thus, it is unlikely that contamination was introduced during sample collection and shipment, but is due rather to laboratory contamination. Toluene was found below the measurable detection limit in the soil trip blank also. Analytical data for the travel blanks and method blanks is included in Appendix E of this report.

A rinsate was sample collected from the ground-water (Teflon bailer) and soil samplers (stainless steel hand auger) to monitor field cleaning techniques. Sampler rinsates consisted of de-ionized water was collected after being passed through the sampler and subsequently analyzed for the same parameters as the field samples. Tables 4-2, 4-3, and 4-4 contain results of the rinsate sample analyses. The ground-water and silo water rinsates contained methylene chloride, chloroform, and di-n-butyl phthalate at concentrations below the measurable detection limit. Methylene chloride, toluene, and di-n-butyl phthalate were found in the soil rinsate, but at concentrations below the measurable detection limit. Bis (2-ethyl hexyl) phthalate was detected in the soil rinsate at 0.016 mg/l. Methylene chloride, di-n-butyl phthalate, and bis(2-ethyl hexyl) phthalate were found in most other samples and the method blank. Toluene and chloroform were found only in the rinsate samples and not in the field samples.

Document control was used in this investigation to provide QA/QC for sampling protocol and sample Chain-Of-Custody. Documents were completed and signed in the field by the sampling personnel to adhere to QA/QC guidelines.

Field Sampling Reports were completed at each sampling location. These documents included sample identification, number and type of sample containers, and preservation method. The Field Sampling Reports also indicate the personnel, the sampling method, and specific sampling protocol. The Field Sampling Reports for ATLAS Site S-8, contained in Appendix F, document the QA/QC data for sampling.

Chain-of-Custody Reports were maintained for each of the sample shipment containers used to transport samples to the laboratory. The reports were completed by field personnel and the technician who received the samples at the laboratory. These reports indicate that all the samples were received by the laboratory in satisfactory condition for the designated tests. Chain-of-Custody Reports are contained in Appendix F.

A sample tracking record is shown in Table 4-8. All samples were analyzed within the holding times specified by the Work Plans.

4.5 FACTORS INFLUENCING RESULTS

Low levels of methylene chloride, di-n-butyl phthalate, di-n-octyl phthalate, and bis (2-ethyl hexyl) phthalate were detected in many of the ground water, silo water, and soil samples collected at Site S-8. These constituents were also present in the rinsate samples, trip blanks, and method blanks for each media. Toluene was detected in the rinsate sample, trip blank, and method blank for soil analyses. Chloroform was found in the ground water and silo water rinsates, but not in any field samples or the method blanks. It is likely that chloroform contamination detected in silo water and ground-water rinsates is due to contaminated de-ionized water used during the water sampling event. The results of the Quality Control analyses and communication with the analytical laboratory indicate that the presence of methylene chloride, the phthalate compounds and toluene at ATLAS Site S-8 does not reflect contamination at the site but may indicate contamination arising in the laboratory. A

TABLE 4-8
SAMPLE TRACKING RECORD
ATLAS SITE S-8
CLAYBURG, NEW YORK

ANALYSIS	MEDIA	DATE SAMPLED	LAB RECEIPT	DATE ANALYZED	MAXIMUM HOLDING TIMES: SPECIFIED BY METHOD[1]	MAXIMUM HOLDING TIMES: ACTUAL
METALS	Soil	11/10[2]	11/11	11/13 - 16	6 months	6 days
	Ground water	12/08	12/9	12/14 - 17	6 months	9 days
	Silo water	12/08	12/9	12/14 - 17	6 months	9 days
EXTRACTABLES	Soil	11/10	11/11	11/13 (ext),12/1[3]	7 days until extrac-	3 (ext), 11 days
	Ground water	12/8	12/9	12/14 (ext),12/31-1/1	tion & 40 days after	6 (ext), 24 days
	Silo water	12/8	12/9	12/14 (ext),12/31-1/1	extraction	6 (ext), 24 days
PURGEABLE ORGANICS	Soil	11/10	11/11	11/13 - 20	14 days	10 days
	Ground water	12/8	12/9	12/21	14 days	12 days
	Silo water	12/8	12/9	12/21	14 days	12 days

NOTES:

(1) Mercury specified maximum holding time 28 days.
(2) All samples collected and analyzed in 1987.
(3) Date of extraction (ext) and date of analysis.

letter from Ecology and Environment, Inc., outlining the potential sources of laboratory contamination is contained in Appendix F.

Methylene chloride is a solvent commonly used in analytical laboratories. Volatilized methylene chloride may be absorbed by the samples from the ambient laboratory atmosphere or may be present in trace quantities in methanol used during the extraction process. Methylene chloride was detected in the method blanks for soil and water samples. According to information provided by Ecology and Environment, compounds present in the method blank indicate a laboratory source.

Phthalate occur in plastics, rubber, and PVC. Ecology and Environment, Inc., attributes the phthalate contamination detected in the samples to the use of plastic gloves during solvent rinsing in the extraction laboratory. Phthalates were detected in a majority of the samples collected at the site, including the method blanks.

Toluene was detected in the soil rinsate, the trip blank, and the method blank. Communication with the laboratory indicates that the toluene detected in these quality assurance samples is an artifact of the methanol used in the laboratory during sample preparation.

Chloroform was only detected in the rinsate for silo and ground water samples. No field samples or method blanks were shown to contain chloroform. The presence of chloroform may be a result of the use of deionized water contaminated with chloroform to collect the rinsate sample. However, the chloroform detected in the samples does not indicate contamination at the site.

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5.0 INTERPRETATION OF TEST RESULTS

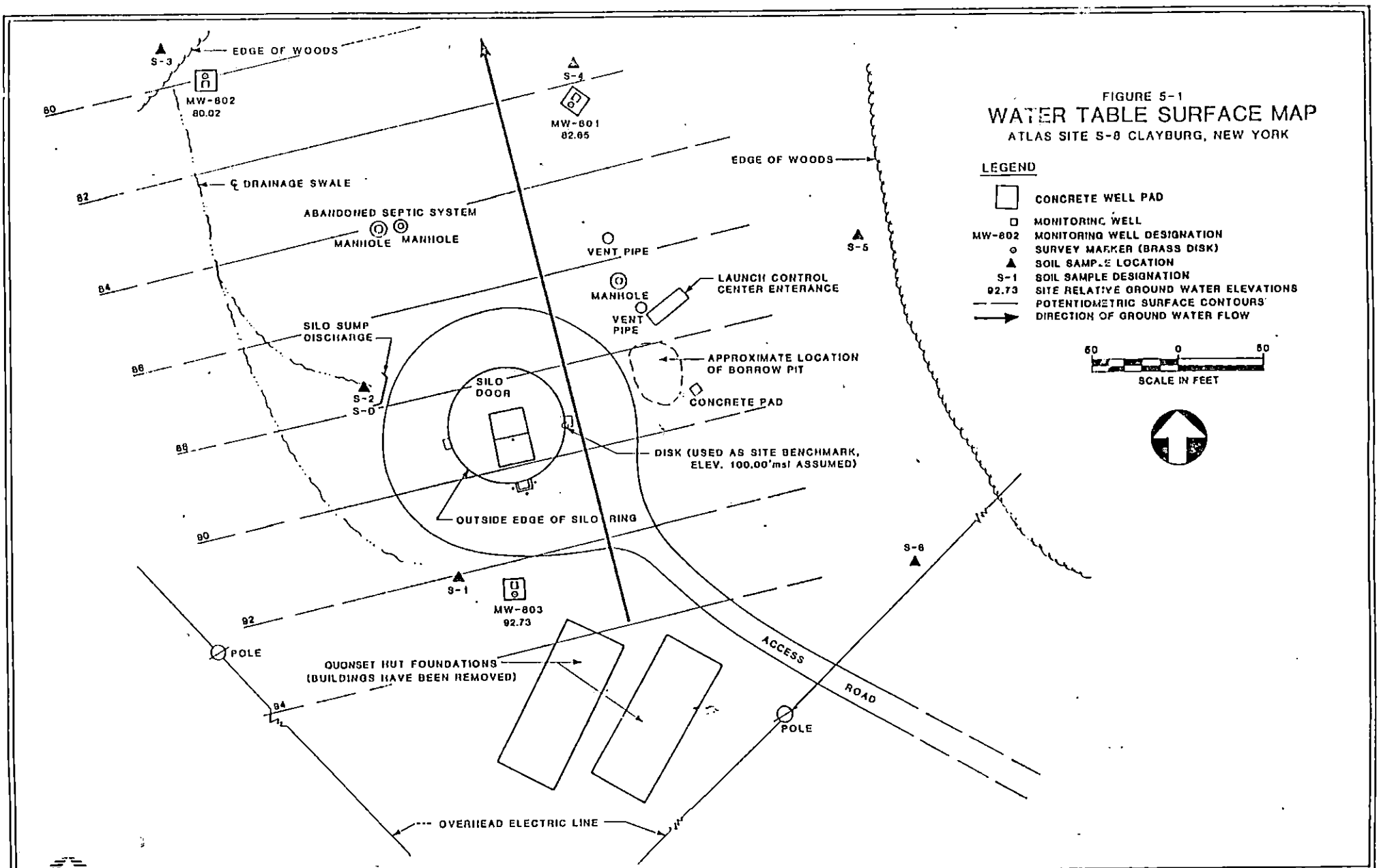
5.1 EVALUATION OF SITE CHARACTERISTICS

ATLAS Site S-8 is located in the Adirondack region of northern New York State. The area is characterized by broad, rugged mountains and rounded hills with numerous rivers and small lakes. Glacial deposits cover most of the region. In the study area, glacial till overlies the Precambrian igneous and metamorphic rocks which form the rugged Adirondack terrain.

The site is contained within the Adirondack Forest Preserve. Land use and development within the preserve are strictly controlled. Open space comprises the predominant land use around the site, although a number of residences are also located in the vicinity. The unincorporated village of Clayburg is located one mile southeast of the site. However, the estimated population within a one mile radius of the site is only 100 people. Except for a few resort areas, the rugged terrain and forest preserve status of the Adirondack region make the area relatively sparsely populated.

The ground surface at the site slopes north and northwest at a very gentle grade. Maximum topographic relief within the former ATLAS site is approximately 10 feet. Surface runoff follows a northwest trending swale which was constructed to facilitate drainage of the sump discharge system. Surface drainage originating on the site appears to be directed northwest, then south to the North Branch of the Saranac River.

Ground water at Site S-8 occurs between 5 and 14 feet below the ground surface. Based on data from the three monitoring wells, ground water flow is directed to the north, northwest. The potentiometric contours of the water table are shown in Figure 5-1. Monitoring Wells MW-801 and MW-802 are immediately down gradient of all the major site features such as the silo, the



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sump discharge system, and the launch control center. Monitoring Well MW-803 is down gradient of the quonset buildings. Ground water flowing off the site would most likely follow regional topographic features and like the surface water discharge into the Saranac River.

The ground water which was sampled at the site was contained in the surficial glacial material. This material consisted of poorly sorted silts, sands, and gravel, which had an average hydraulic conductivity of approximately 2.7×10^{-3} cm/sec. The ground water in this surficial material would most likely contain releases from any potential contamination sources at the ATLAS facility.

5.2 EVALUATION OF ANALYTICAL DATA

The analytical results for this investigation are summarized in Tables 4-2, 4-3 and 4-5 of this report. Appendix E contains the complete laboratory results. Tables 5-1 and 5-2 list the maximum silo water, ground water, and soil concentrations of the parameters detected at ATLAS Site S-8. For comparison, the table containing ground and silo water results also lists Federal regulatory criteria. The table containing the soil analytical results lists typical ranges for those parameters in soils in the continental United States.

5.2.1 Ground Water Results

Barium, chromium, and lead were detected in the ground water at concentrations below the Maximum Contaminant Levels (MCL). The metal concentrations most likely represent natural background levels of dissolved metals in the water.

The purgeable organic trans-1,2-dichloroethylene was detected at a concentration below the measurable detection limit of 0.005 mg/l in Monitoring Well MW-803. This concentration may represent

TABLE 5-1

SUMMARY OF GROUND AND SILO WATER CONSTITUENT CONCENTRATIONS
COMPARED TO CURRENT STANDARDS AND CRITERIA
ATLAS SITE S-8
CLAYBURG, NEW YORK
All results in Mg/l

Parameter	Maximum Concentration Detected (mg/l)	Regulatory Criteria[1] (mg/l)
Purgeable Halocarbons		
Trans-1,2-dichloroethylene	0.008	0.07[3]
Trichloroethylene	<0.005[2]	0.005[4]
Metals (Totals)		
Barium (Ba)	0.202	1.00
Chromium (Cr)	0.02	0.05
Lead (Pb)	0.021	0.05

NOTES:

(1) Maximum Contaminant Level (MCL) from EPA, National Primary Drinking Water Regulations, 1985.
(2) "<" signifies that constituent was detected but at a concentration below the measurable detection limit.
(3) Proposed Maximum Contaminant Level Goal (MCLG), EPA, Federal Register, November 13, 1985.
(4) Maximum Contaminant Level (MCL), EPA, Federal Register, July 8, 1987.

TABLE 5-2

SUMMARY OF SOIL CONSTITUENT CONCENTRATIONS
COMPARED TO AVERAGE BACKGROUND CONCENTRATIONS
ATLAS SITE S-8
CLAYBURG, NEW YORK
All Results in Mg/Kg

Parameter	Maximum Soil Concentration (Mg/Kg)	Average Background Level[1] Avg. (Range) (Mg/Kg)
Metals (Total)		
Barium	88.22	500 (100-3000)
Chromium	7.75	100 (5-3000)
Lead	28.1	10 (2-200)

NOTES:

(1) Source: Trace Elements in Biochemistry, H. Bowen, 1966.

traces of contamination present at the site, but at a level below the Maximum Contaminant Level Goal (MCLG) of 0.07 mg/l.

5.2.2 Silo Water Results

Barium and lead were the only metals detected in the silo water above the method detection limit. The concentration of these metals were below the MCL and most likely reflect natural background levels.

Trans-1,2-dichloroethylene was detected at 0.008 mg/l in both the silo water sample and the duplicate sample. Trichloroethylene was detected in the silo water sample and duplicate at concentrations below the measurable detection limit of 0.005 mg/l. The Maximum Contaminant Level Goal (MCLG) proposed by the EPA for trans-1,2-dichloroethylene is 0.07 mg/l. The MCL for trichloroethylene is 0.005 mg/l. Therefore, concentrations of trichloroethylene and trans-1,2-dichloroethylene detected in the silo are below regulatory criteria and are not indicative of contamination in the silo water.

5.2.3 Soil Results

Based on the samples collected at the ATLAS Site S-8, the soil contain concentrations of metals which are generally within the average range of soils reported by Bowen (1966). Only low concentrations of the metals barium, chromium, and lead were detected in the soil samples. Metals concentrations of soil at the site are most likely a reflection of natural soil composition and not indicative of contamination.

6.0 PRELIMINARY CONCLUSIONS AND RECOMMENDATION

The objective of this investigation was to perform an inventory of the ground water, silo water, and soils at ATLAS Site S-8 to determine if contamination exists that might be related to former DOD activities. Evaluation of the test results from ATLAS Site S-8 indicate the following conclusions:

- Only the metals barium, chromium, and lead were present in the soil samples collected at the site. These metals were all present at concentrations within the range typical for naturally occurring soils. Therefore, no metals contamination was detected in the soil samples.

- The metals barium, chromium, and lead were detected at low concentrations in both ground-water and silo water samples. The concentrations of each metal were below MCLs and therefore do not indicate contamination at the site.

- The purgeable halocarbon trichloroethylene was detected at a level below the measurable detection limit in the silo water sample and duplicate. Trans-1,2-dichloroethylene was detected below the measurable detection limit in the ground-water sample from MW-803 and at 0.008 mg/l in the silo water sample and duplicate. Trichloroethylene is an industrial solvent which is commonly used as a degreaser. Maintenance operations at the ATLAS facility may have used trichloroethylene. Additionally, research indicates that trans-1,2-trichloroethylene may be produced by the anaerobic decomposition of trichloroethylene (Cline and Viste, 1984). Although the presence of these two constituents may be related to previous DOD activities, the concentrations of both compounds are below regulatory criteria. The presence of trichloroethylene and trans-1,2-dichloroethylene may indicate traces of DOD-related contamination, but comparison with regulatory criteria indicate that the levels detected are not significant.

The following preliminary conclusions and recommendation are based on the preceding data and conclusions.

No contamination is present at the sampled locations at ATLAS Site S-8. Metals concentrations in the silo and ground water are below regulatory standards and metals in the soil are within natural background levels. Trichloroethylene and trans-1,2-dichloroethylene were detected in the silo and ground water. However, the concentrations of these compounds are negligible.

Based on these results and conclusions, it is recommended that ATLAS Site S-8 in Clayburg, New York, should not be referred to the Missouri River Division (MRD) for further study.

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