# INSTALLATION RESTORATION PROGRAM

## RICKENBACKER AIR NATIONAL GUARD BASE
## COLUMBUS, OHIO

# SITE INSPECTION/REMEDIAL INVESTIGATION/ FEASIBILITY STUDY/REMEDIAL DESIGN

**WORK PLAN**
**FINAL**

**JUNE 1988**



**HAZWRAP SUPPORT CONTRACTOR OFFICE**
Oak Ridge, Tennessee 37831
Operated by MARTIN MARIETTA ENERGY SYSTEMS, INC.
For the U.S. DEPARTMENT OF ENERGY under contract DE-AC05-840R21400

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This work plan was prepared by Engineering Science for implementation of a Site Inspection/ Remedial Investigation/ Feasibility Study/ Remedial Design under the Installation Restoration Program at Rickenbacker Air National Guard Base, Columbus, Ohio. The purpose of the investigation is confirm or deny the presence or absence of contamination at 23 identified sites. Included in this document is the Quality Assurance/ Quality Control protocols, the Health and Safety Plan and the short term community relation plan.

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# INSTALLATION RESTORATION PROGRAM

## SITE INSPECTION/REMEDIAL INVESTIGATION/ FEASIBILITY STUDY/REMEDIAL DESIGN WORK PLAN FINAL

RICKENBACKER AIR NATIONAL GUARD BASE
Columbus, Ohio

JUNE 1988

Prepared By

ENGINEERING-SCIENCE
19101 Villaview Road - Suite 301
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Submitted By

HAZARDOUS WASTE REMEDIAL ACTIONS PROGRAM

Operated By

MARTIN MARIETTA ENERGY SYSTEMS, INC.
Oak Ridge, Tennessee

For The

U.S. DEPARTMENT OF ENERGY

Under Contract No.: DE-AC05-840R21400

Submitted To

NATIONAL GUARD BUREAU
ANGSC/DEV

Andrews AFB, Maryland





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# SECTION 1
# INTRODUCTION

This Work Plan has been prepared by Engineering-Science (ES) for Martin Marietta Energy Systems (Energy Systems) and the National Guard Bureau (NGB) for implementation of a Site Inspection/Remedial Investigation/Feasibility Study/Remedial Design (SI/RI/FS/RD) under the Installation Restoration Program (IRP) at Rickenbacker Air National Guard Base (ANGB), Columbus, Ohio. The preparation of this Work Plan was authorized by Energy Systems under General Order No. 18B-97387C through Task Order No. X-13, Advance Agreement AAX-13. The objectives of the SI/RI/FS/RD are: (1) to confirm the presence or absence of environmental contamination, and to quantify the levels of contaminants, if found, at past hazardous waste disposal and spill sites; (2) if contamination is found at a site, to determine the source and the extent of the contamination; (3) to determine whether or not the sites require remedial action; (4) to prepare a Remedial Action Plan (RAP); (5) if directed by the National Guard Bureau (NGB), to develop plans and specifications for implementation of remedial action (for those sites where such action is warranted because of environmental contamination); and (6) to provide technical support to the Base Contracting Officer during contractor selection and to the Base Project Officer during remediation activities.

Section 2 of this Work Plan presents the tasks required to meet the objectives described above. Sections 3 through 7 present the scope of the Site Inspection and Remedial Investigation, procedures and methods, and Quality Assurance/Quality Control (QA/QC) protocols. The schedule for implementation of the SI/RI is presented in Section 8. The Health and Safety Plan and Short-Term Community Relations Plan are included in the Work Plan as Appendices A and B, respectively. The remainder of this section provides a summary of the background information which forms the basis for the development of this Work Plan. Documents which were reviewed prior to preparation of these plans are as follows:

- Hazardous Materials Technical Center, Installation Restoration Program· Phase I, Records Search, Rickenbacker Air National Guard Base, Columbus, Ohio, June 1987.
- Schmidt, J.J., and Goldthwait, R.P., The Ground-Water Resources of Franklin County, Ohio: Bulletin 30, Ohio Department of Natural Resources, Division of Water, 1958.
- Pierce, L.J., 1959, The Climate of Ohio; in Climates of the States, Volume 1 - Eastern States; Water Information Center, Inc., 1974, pp. 300-317.
- Soil Conservation Service, 1976, Soil Survey of Franklin County, Ohio; USDA, Soil Conservation Service, 188 p. and 69 sheets.
- Ecology and Environment, Inc. 1986, Site Inspection Report, Lockbourne/ Rickenbacker ANG Base, Landfill Investigation, Draft Report.
- Martin Marietta Energy Systems, Inc., Statement of Work for Site Inspection, Remedial Investigation, Feasibility Study, and Remedial Design at Rickenbacker Air National Guard Base, Columbus, Ohio, August 31, 1987.

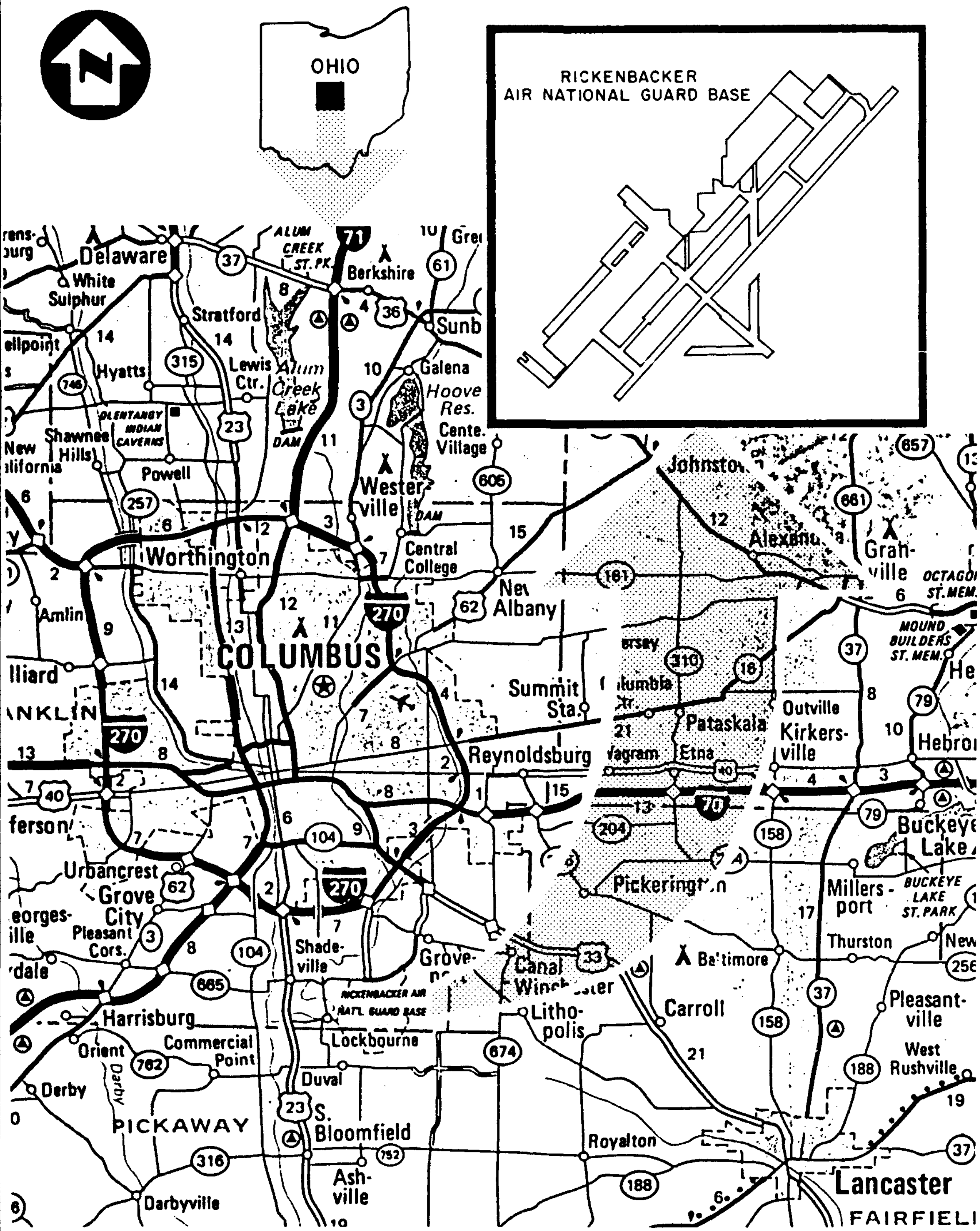
## INSTALLATION DESCRIPTION AND HISTORY

The Rickenbacker ANGB is located 12 miles southeast of Columbus and 0.5 miles east of the Village of Lockbourne, Ohio (Figure 1.1). The Base currently covers approximately 2,100 acres. Ownership of a portion of the Base was transferred from the U.S. Air Force to the Rickenbacker Port Authority (RPA) in 1982. The RPA property is used as an airstrip for private aircraft and as base of operations for Flying Tigers' air delivery service. The Base occupies a plateau separating the Big Walnut and Walnut Creek Drainage Basins. Approximate elevation of the Base is 740 feet (MSL).

Rickenbacker ANGB, known as Lockbourne Air Force Base until 1974, was officially activated as the Southeastern Training Center, Army Air Corps in 1942, and used as a training center for glider pilots. In 1943, glider training was discontinued and a school for B-17 pilots was established at the Base.

In 1949, the Base was deactivated by the Air Force and used for 18 months as an Ohio ANG training base until 1951, when the Base was transferred to the Strategic Air Command (SAC) and reactivated as an Air Force Base in response to the Korean Conflict. In 1958, the 301st Bombardment Wing moved to the Base. In June 1964, the 301st Bombardment Wing was redesignated as the 301st Air Refueling Wing and began flying KC-135 Strato Tankers out of the Base. The SAC refueling mission of the 301st Air Refueling Wing is continued today at Rickenbacker by the 160th Air Refueling Group of the Ohio ANG, which moved to the Base in 1972. In July

FIGURE 1.1




## LOCATION MAP

## RICKENBACKER AIR NATIONAL GUARD BASE

SOURCE:
MAP OF OHIO
AMERICAN AUTOMOBILE ASSOCIATION

1965, the 840th Air Division of the Tactical Air Command moved to Rickenbacker with its C-130 Hercules Cargo Aircraft and took command of the Base. In 1971, command of the Base was again transferred to SAC under the 301st Air Refueling Wing. Also in 1971, the Air Force Reserve's (AFRES) 302nd Tactical Airlift Wing (TAW) moved to Rickenbacker from the Clinton County Air Base. The 302nd TAW flew C-130A cargo planes in support of their airlift mission. In 1981, the 302nd TAW vacated Rickenbacker ANGB, and its units were converted to the 907th Tactical Airlift Group (TAG) (AFRES), C-130A's and the aircraft currently being used by the 907th TAG. The 907th Aerial Spray Branch, under the 907th TAG, is responsible for aerial pesticide spraying missions at other bases around the country (pesticides used by the 907th Aerial Spray Branch are not stored or transported at Rickenbacker ANGB, but are supplied by the Base being sprayed). In 1977, SAC vacated the Base and turned control of the Base over to Detachment 1 Ohio ANG (121 COS), who presently serve as the Base host. In addition to the 160th Air Refueling Group (Ohio ANG) and the 907th TAG (AFRES), the 121st Tactical Fighter Wing (Ohio ANG) is also a current tenant at Rickenbacker. The 121st has been at Rickenbacker since 1949, previously flying F-100s and currently flying A-7Ds. As many as 5,000 people have worked on the Base in its history. Currently, 1,100 people are on the Base daily.

Land use adjacent to the Base is residential and agricultural. The houses and apartments in the northwest corner of the Base which were formerly occupied by Base personnel have been purchased by a private developer and are being rented. The Base and former Base housing use water supplied from Base water wells.

North of the Base lies open agricultural land with some residential development along Alum Creek Drive. East of the Base is agricultural land and residential development along the major roads. South of the Base is the former Base golf course which is now privately owned, trailer parks and widely spaced single-family homes. To the West is the Norfolk and Western and Chesapeake and Ohio railroad tracks, the abandoned Ohio Canal and the Village of Lockbourne with residential and light industrial development.

Future land use in adjacent areas will probably be residential and light industrial as the urban sprawl of Columbus extends to the southeast.

## ENVIRONMENTAL SETTING

The environmental setting of the Base is described in this subsection with an emphasis on the identification of natural features that may influence the movement of hazardous waste contaminants.

### Meteorology

The climate of Columbus, Ohio is characterized as continental (Pierce, 1959). The mean annual temperature is 52°F. The coldest month is January, while the warmest month is July with mean temperatures of 30°F and 74°F, respectively. Mean annual precipitation is 38 inches with October being the driest and June the wettest months. Net precipitation is calculated to be 2.71 inches per year (HMTC, 1987).

### Geology

The Base is located in the Glaciated Central Lowlands Province just west of the Appalachian Plateau Province. The geology of the area is characterized by 200 feet(±) of Pleistocene glacial outwash sand and gravel and silty and clayey till filling a preglacial bedrock valley (Smith and Goldthwaite, 1958). The bedrock types under the mixed drift fill are Devonian limestones and shales of the Columbus and Delaware Formations.

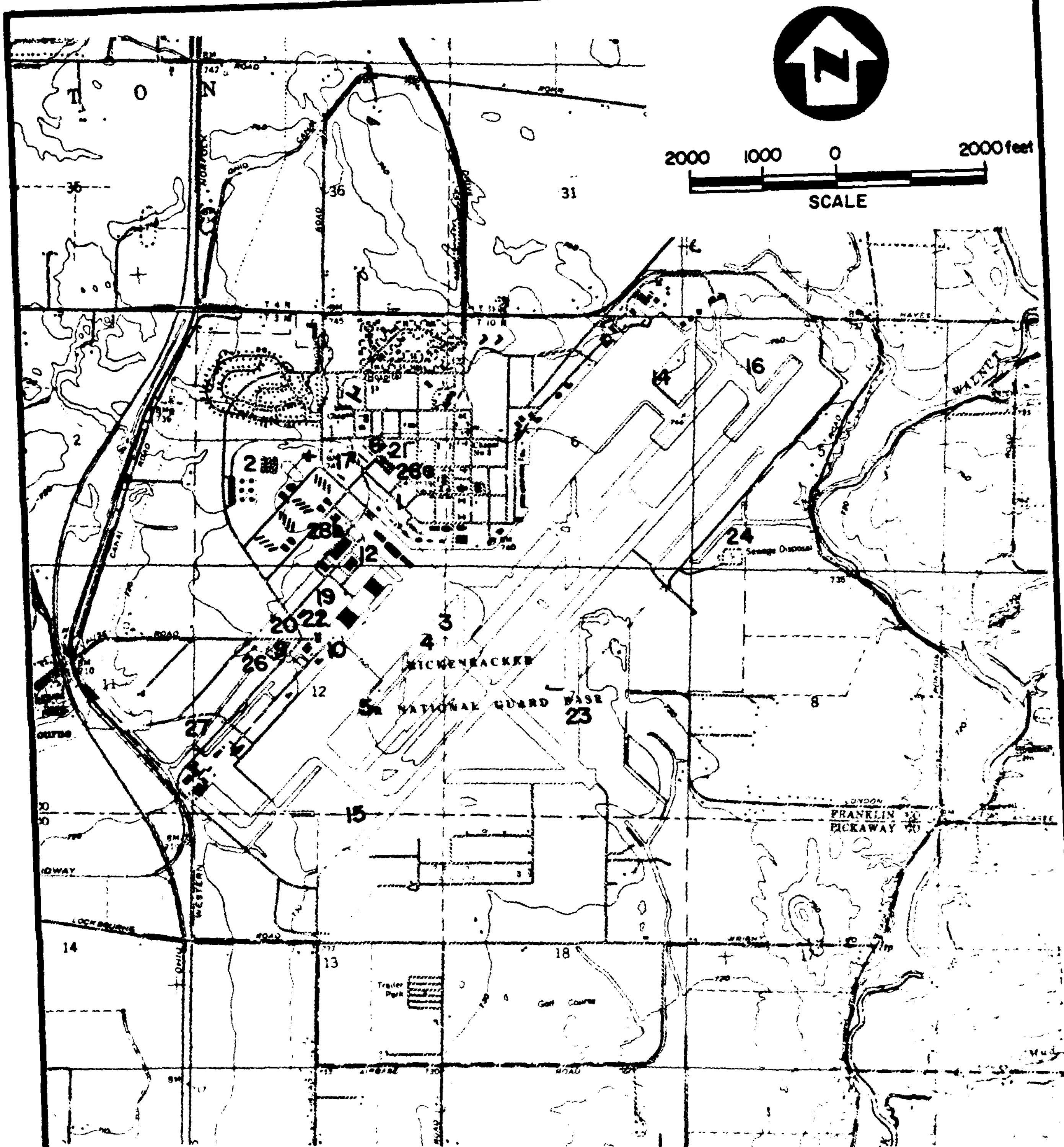
### Soils

Soils mapped at the Base are of the Kokomo and Crosby Series (Figure 1.2) (SCS, 1976). The soils are characterized as deep, very poorly drained, slowly to moderately slowly permeable soils formed in glacial tills on uplands. The Crosby series soils are formed on slopes up to 6 percent grade while the Kokomo series soils form on gentler 0-2 percent slopes on the higher landscape positions. The Crosby soils exhibit permeabilities of 0.06 to 0.6 in/hr in unleached horizons. The Kokomo soils have permeabilities of 0.2 to 2.0 in/hr.

### Surface Water Hydrology

Rickenbacker ANGB occupies the drainage divide between Big Walnut Creek and Walnut Creek. Surface drainage from the Base is through an extensive storm drain network which includes corrugated metal and concrete drainage pipes and open drainage ditches. All of the surface water is routed through oil-water separators before release into surrounding surface streams.

FIGURE 1.2




EXPLANATION:

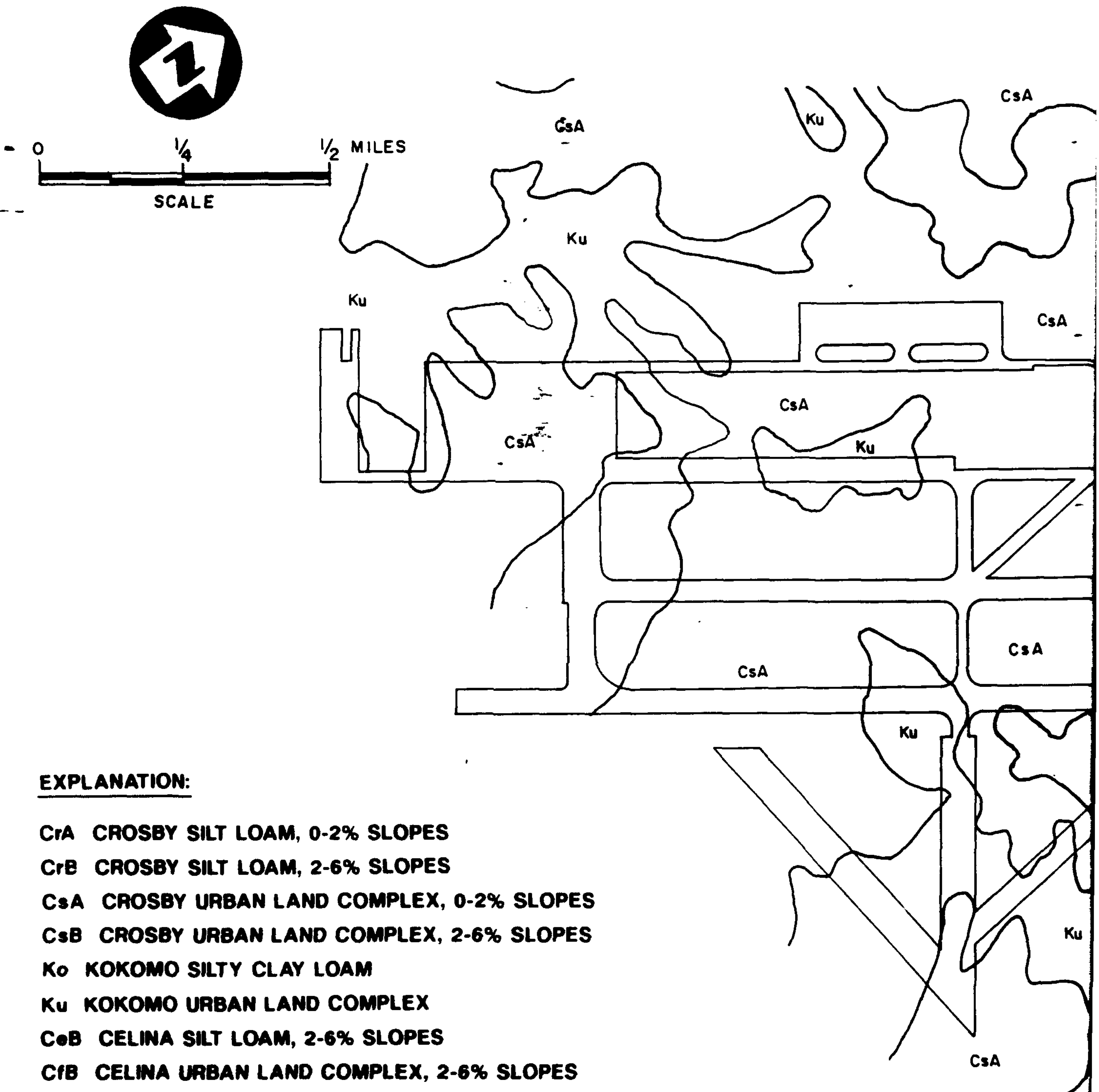
22 - SITE NUMBER

## IRP SITE LOCATIONS

## RICKENBACKER AIR NATIONAL GUARD BASE

SOURCE:
USGS, LOCKBOURNE, OHIO
7.5 MIN. QUADRANGLE

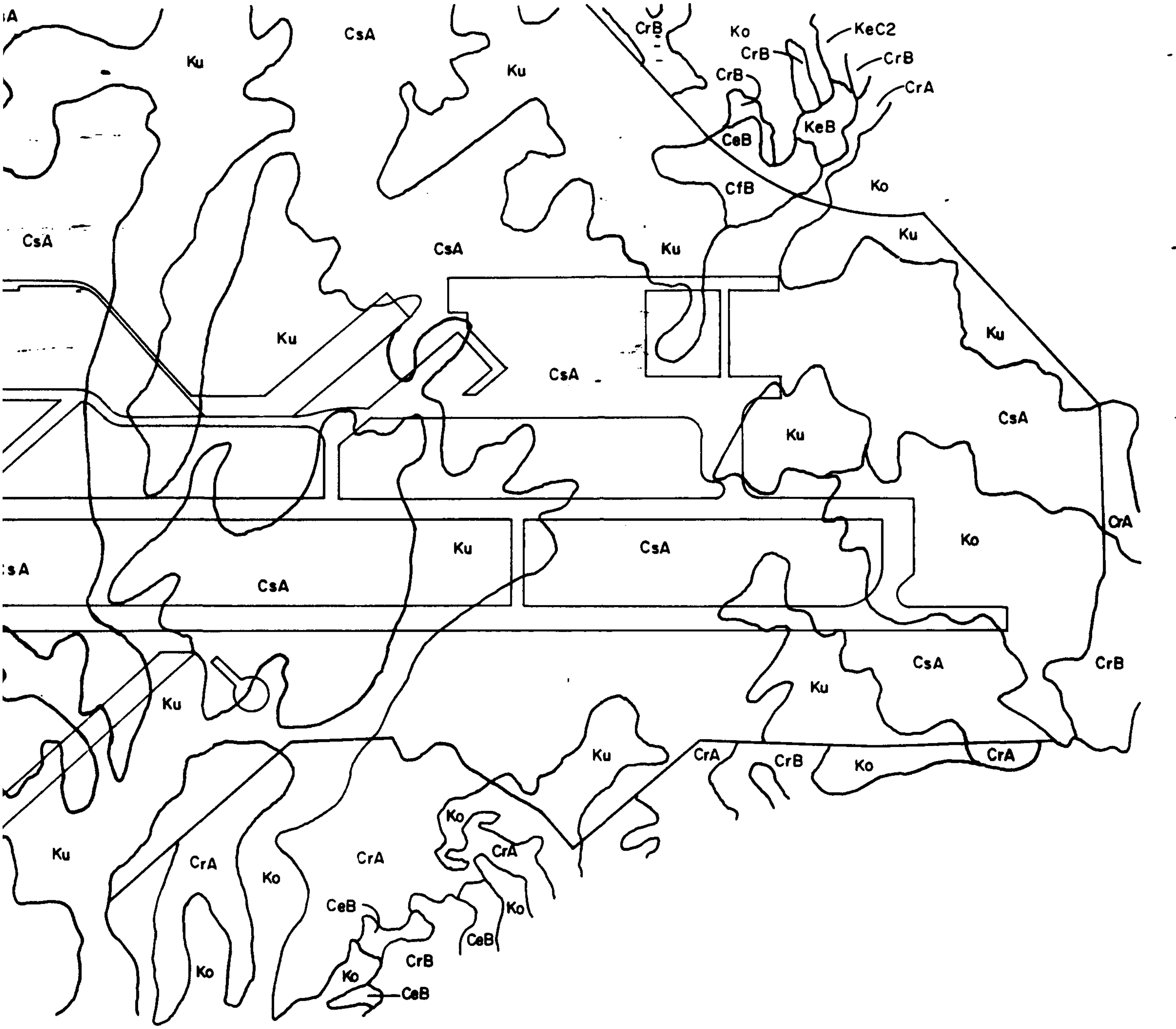
ES ENGINEERING-SCIENCE




EXPLANATION:

CrA CROSBY SILT LOAM, 0-2% SLOPES
CrB CROSBY SILT LOAM, 2-6% SLOPES
CsA CROSBY URBAN LAND COMPLEX, 0-2% SLOPES
CsB CROSBY URBAN LAND COMPLEX, 2-6% SLOPES
Ko KOKOMO SILTY CLAY LOAM
Ku KOKOMO URBAN LAND COMPLEX
CeB CELINA SILT LOAM, 2-6% SLOPES
CfB CELINA URBAN LAND COMPLEX, 2-6% SLOPES
KeB KENDALLVILLE SILT LOAM, 2-6% SLOPES
KeC2 KENDALLVILLE SILT LOAM, 6-12% SLOPES

SOURCE:
SOIL SURVEY OF FRANKLIN COUNTY,
USDA/SCS (1977)




## SOIL MAP
## RICKENBACKER AIR NATIONAL GUARD BASE

ES ENGINEERING—SCIENCE

## Groundwater

Groundwater is the primary source of drinking water for the Base and the Village of Lockbourne. According to driller's logs, the Base water-supply wells are completed in a coarse-sand and gravel aquifer directly on top of the bedrock at depths of 180 to 200 feet. Water from the five wells is treated by sand filtration and chlorination before distribution to Base water users, including the former Base housing and school. Recent testing of water from the wells for priority pollutants indicated no contamination. Homes in Lockbourne and along the rural roads surrounding the Base are served by individual domestic water wells. These wells are completed in sand and gravel aquifers between 20 and 100 feet deep. Concern for water quality in Lockbourne has increased recently following a study which indicated a higher than expected cancer rate and discovery of chlorinated methane compound contamination in some wells (Ecology and Environment, 1986). Consequently, the Village is preparing to tie into the Columbus City water system and several households are relying on trucked-in water.

Drillers' logs for nearby water wells, supplied by the Ohio Department of Natural Resources and foundation boring logs for the Base illustrate a very complex glacial stratigraphy. Drillers have logged a variety of sequences of sedimentary units ranging from alternating 5-10 foot thicknesses of sand and gravel with silts and clays to 140 feet of silty clay before penetrating the semi-continuous sand and gravel aquifer in which the Base wells are completed. Static water levels have been reported at depths of five to forty-six feet below land surface. Various Base foundation borings have encountered sands and clays of varying thicknesses in the shallow subsurface with reported depths to water of three to sixteen feet below land surface. The relationship of the shallow aquifers utilized by domestic wells and the major deep aquifer is not known.

## IRP SITE IDENTIFICATION AND DESCRIPTIONS

The Preliminary Assessment (PA) (Phase I Records Search) fina` report was prepared by the Hazardous Materials Technical Center (HMTC) in June 1987. The result of the PA study was identification of 27 sites with potential for contamination. Five of the sites were determined to be of no further concern because of past cleanup operations or because past and current operating procedures are not likely to contribute contamination.

The 22 remaining sites were rated using the Hazard Assessment Rating Methodology (HARM). The resulting Hazard Assessment Scores (HAS) for each site are summarized in Table 1.1.

Investigation of abandoned underground storage tanks was added as Site 28 after completion of the PA Report. Figure 1.3A shows the location of each site by site number. Figures 1.3B and C are Base map enlargements of the Base office and shop area. Figures 1.4 through 1.23 are detailed site plans which include the locations of utilities in the vicinity of each site. Table 1.2 is a legend explaining the utility symbols on the drawings. This level of detail is required to insure that the proposed well and boring locations are not over buried utilities and to identify utility routes that could act as contaminant pathways.

The following descriptions of the 23 sites are based on the PA Report, site visits and information supplied by RANGB personnel.

Site 1: Hazardous Waste Storage Area (Figure 1.4)

The HAS for this site is 56, ranking 10th of the 22 rated sites. Total contaminants released at this site are estimated at less than 1,000 gallons. The site includes Building 560, two 25,000 gallon underground storage tanks (USTs) and a drum storage area adjacent to Building 560. The USTs have been used since 1950 to store waste oils (dielectric, hydraulic and lubricating), solvents and other unspecified chemical wastes. The drum storage area, adjacent to Building 560, had been used to store drums containing solvents, paint strippers and other unknown liquids, and is included in this site.

No leaks from the USTs or spills in the drum storage areas have been documented. However, the standpipe on one of the USTs was broken and some loss of contents occurred in 1982.

Adjacent to the Building 560 area are several additional known and suspected USTs. Two aircraft de-icing fluid tanks and a waste oil tank are southeast of the building, and two or three abandoned tanks of unknown use may remain in the ground under the existing roadway.

Site 2: JP-4 Bulk Storage Tank Farm (Figure 1.5)

The HAS for this site is 66, ranking 2nd of the 22 rated sites.

The site consists of a diked area enclosing six one million gallon capacity, above-grade, fuel storage tanks. Three of these tanks (Nos. 824, 825 and 826) are owned by RANGB, the other three tanks have been the

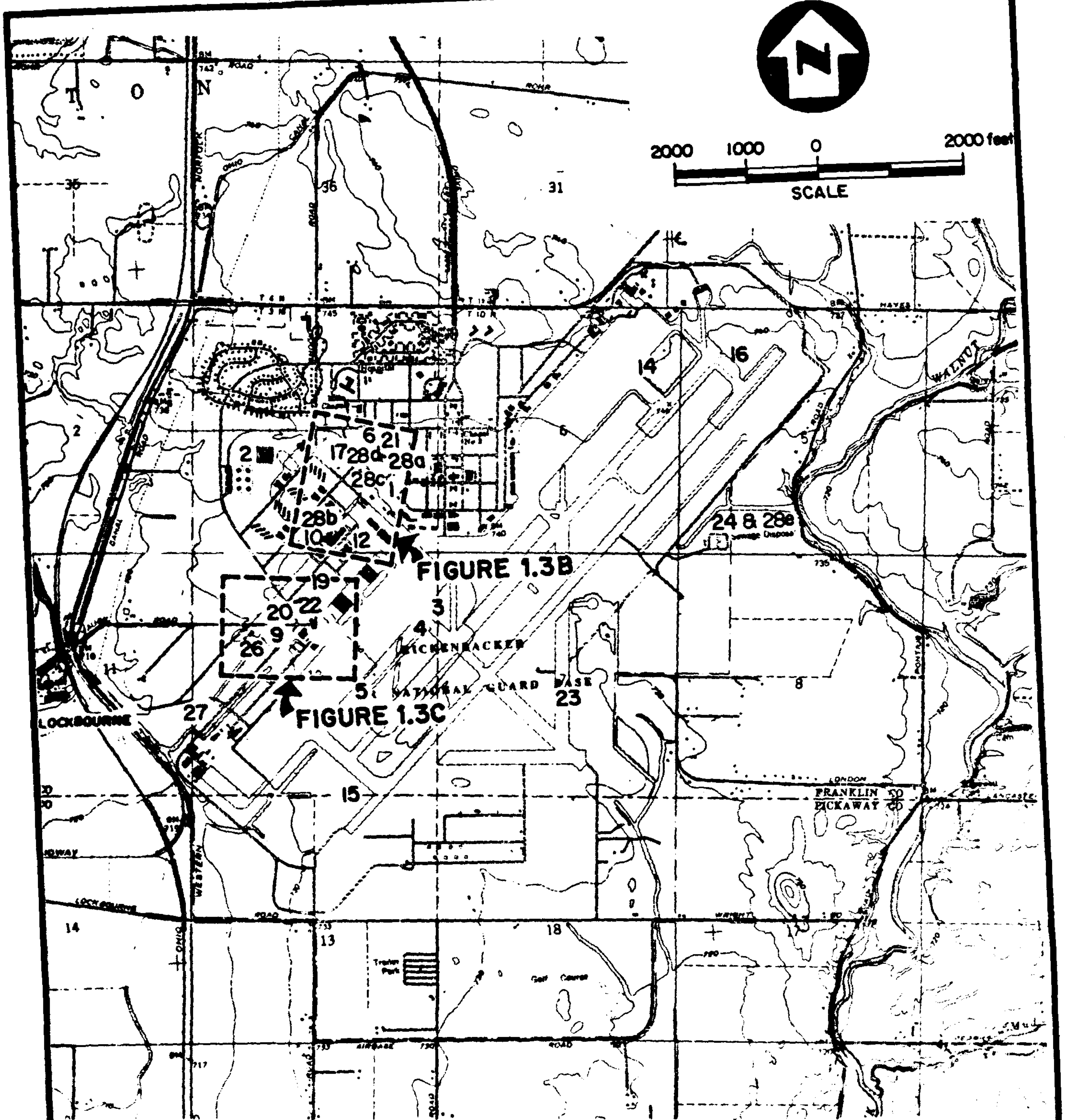
## TABLE 1.1

## SITE HAZARD ASSESSMENT SCORES: RICKENBACKER ANGB, COLUMBUS, OH

| Priority HMTC | Site* No. | Site Description | Receptor | Waste Charac. | Path-way | Waste Mgmt. Pract. | Overall Score |
|---|---|---|---|---|---|---|---|
| 1 | 25 | The Storm Drainage Ditch System | 68 | 100 | 41 | 1.0 | 70 |
| 2 | 2 | JP-4 Bulk Storage Tank Farm | 68 | 90 | 41 | .95 | 66 |
| 3 | 3 | JP-4 Pumping Station No. 4 | 63 | 90 | 41 | 1.0 | 65 |
| 4 | 19 | North Coal Pile | 68 | 45 | 80 | 1.0 | 64 |
| 5 | 20 | South Coal Pile | 68 | 45 | 80 | 1.0 | 64 |
| 6 | 23 | Fire Training Area | 57 | 90 | 41 | 1.0 | 63 |
| 7 | 5 | Lateral Safety Zone Spill | 59 | 90 | 41 | 1.0 | 63 |
| 8 | 14 | KC-135 Crash Site | 57 | 90 | 41 | 1.0 | 63 |
| 9 | 27 | Drainage Ditch Near Landfill | 57 | 40 | 80 | 1.0 | 59 |
| 10 | 1 | Hazardous Waste Storage Area, Building 560 | 68 | 60 | 41 | 1.0 | 56 |
| 11 | 10 | JP-4 Fuel Line Rupture | 65 | 63 | 41 | 1.0 | 56 |
| 12 | 17 | Old Entomology Lab | 68 | 60 | 41 | 1.0 | 56 |
| 13 | 9 | Salvage Yard, Facility No. 906 | 63 | 60 | 41 | 1.0 | 55 |
| 14 | 6 | Underground Storage Tank at Base Filling Station | 68 | 54 | 41 | 1.0 | 54 |
| 15 | 4 | JP-4 Pumping Station No. 5 | 68 | 54 | 41 | 1.0 | 54 |
| 16 | 21 | Leaking Drum & Oil Change Area @ Water Treatment Plant | 68 | 54 | 41 | 1.0 | 54 |
| 17 | 15 | Fuel Dump Pit @ Southwest End of Runway | 54 | 63 | 41 | 1.0 | 53 |
| 18 | 16 | Fuel Dump Pit @ Northeast End of Runway | 54 | 63 | 41 | 1.0 | 53 |
| 19 | 22 | Heating Plant Lube Oil Drum Storage Area | 68 | 45 | 41 | 1.0 | 51 |
| 20 | 24 | Sanitary Sewage Treatment Sludge Beds | 57 | 53 | 41 | 1.0 | 50 |
| 21 | 26 | Electrical Transformer Storage Area | 63 | 40 | 41 | 1.0 | 48 |
| 22 | 12 | Old Drum Storage Area | 68 | 30 | 41 | 1.0 | 46 |

* Sites 7, 8, 11, 13 and 18 were eliminated during the Preliminary Assessment.

SOURCE: Preliminary Assessment (Phase I Report - HMTC, 1987)



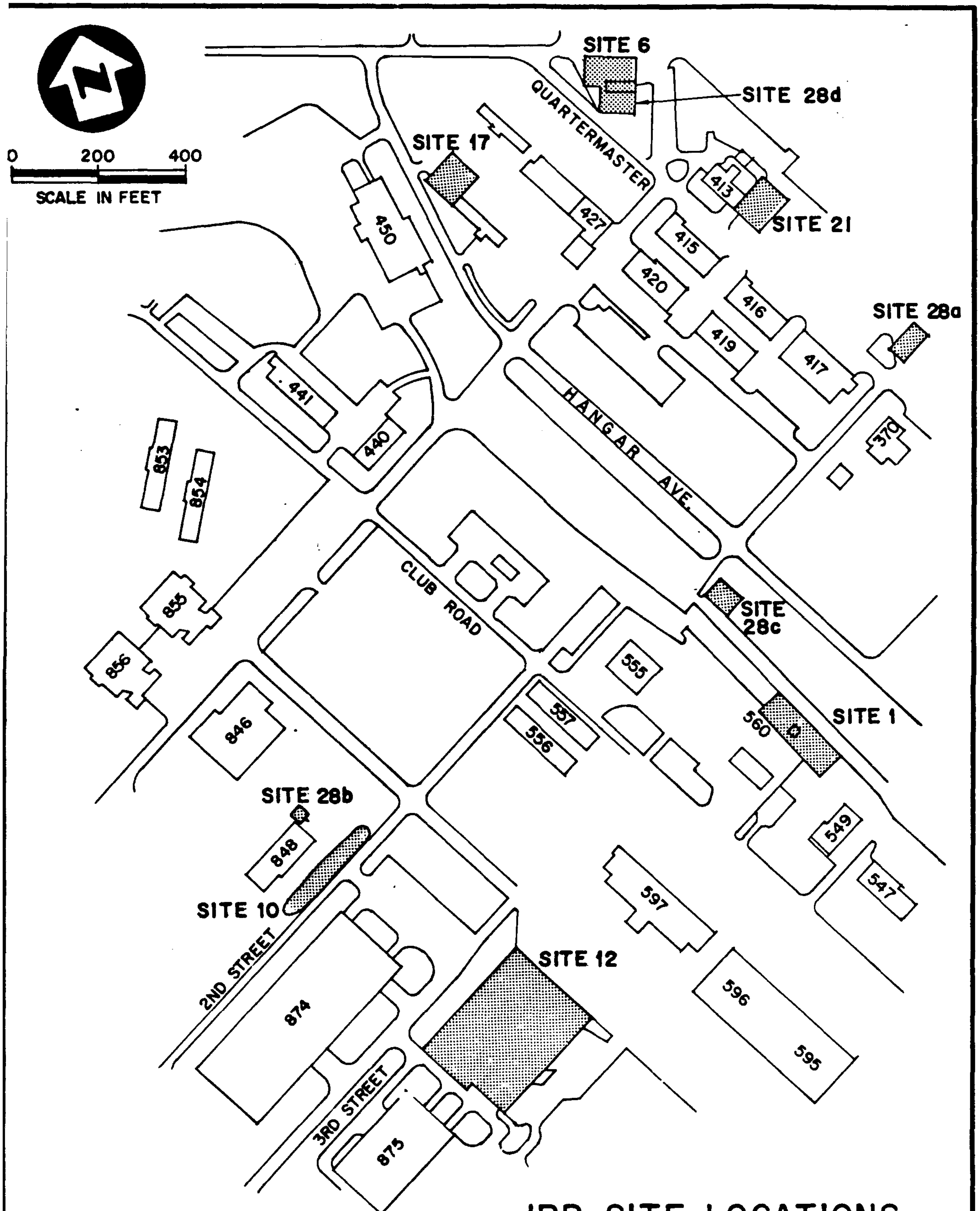

EXPLANATION:

22 - SITE LOCATION

## IRP SITE LOCATIONS

## RICKENBACKER AIR NATIONAL GUARD BASE

SOURCE:
USGS, LOCKBOURNE, OHIO
7.5 MIN. QUADRANGLE

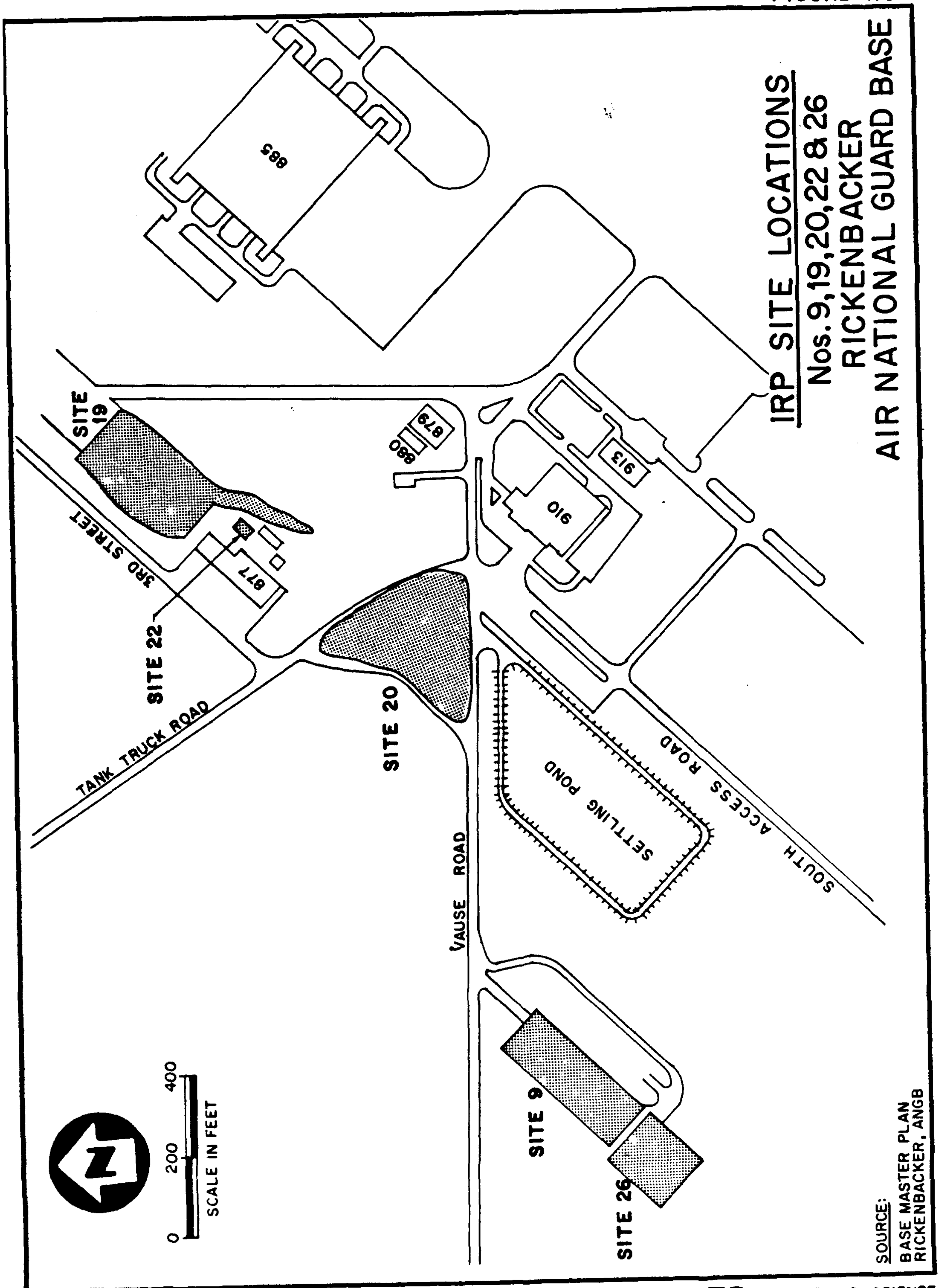



# IRP SITE LOCATIONS

## Nos. 1,6,10,12,17,21 & 28 RICKENBACKER AIR NATIONAL GUARD BASE

SOURCE:
BASE MASTER PLAN
RICKENBACKER, ANGB

FIGURE 1.3C






ES ENGINEERING—SCIENCE

TABLE 1.2

# UTILITY LEGEND FOR SITE PLANS

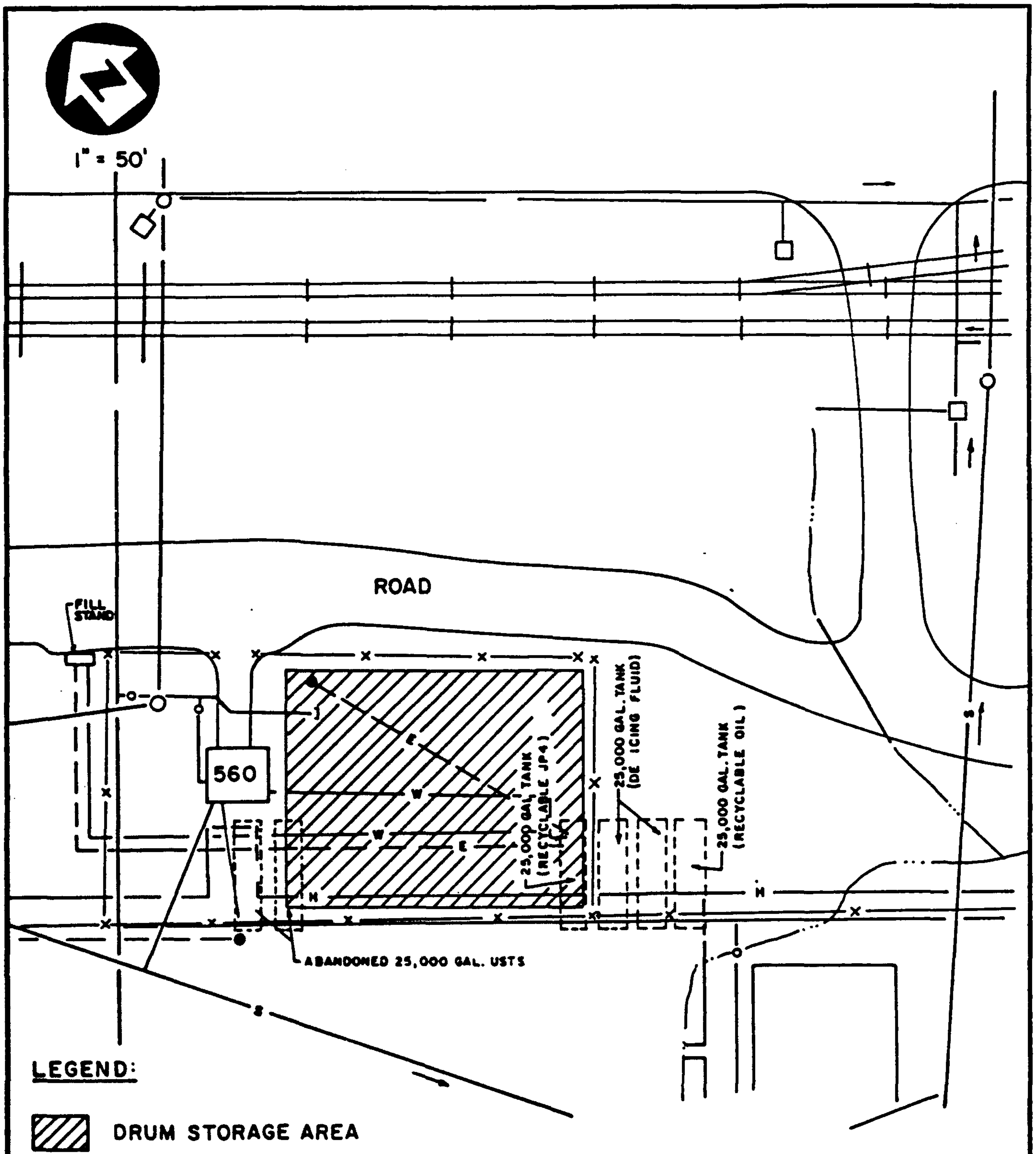
## RICKENBACKER AIR NATIONAL GUARD BASE
## COLUMBUS, OHIO

### ABOVE GROUND UTILITIES AND FEATURES:

| Symbol | Feature |
|---|---|
| ╪═╪═╪ | RAILROAD |
| O | MANHOLE |
| o | VALVE |
| —x— | FENCE |
| ● | RUNWAY / TAXIWAY LIGHT |
| Ω | FIRE HYDRANT |
| —H— | HEAT LINE |
| —JF— | JET FUEL LINE |
| △ | ELECTRICAL TRANSFORMER |

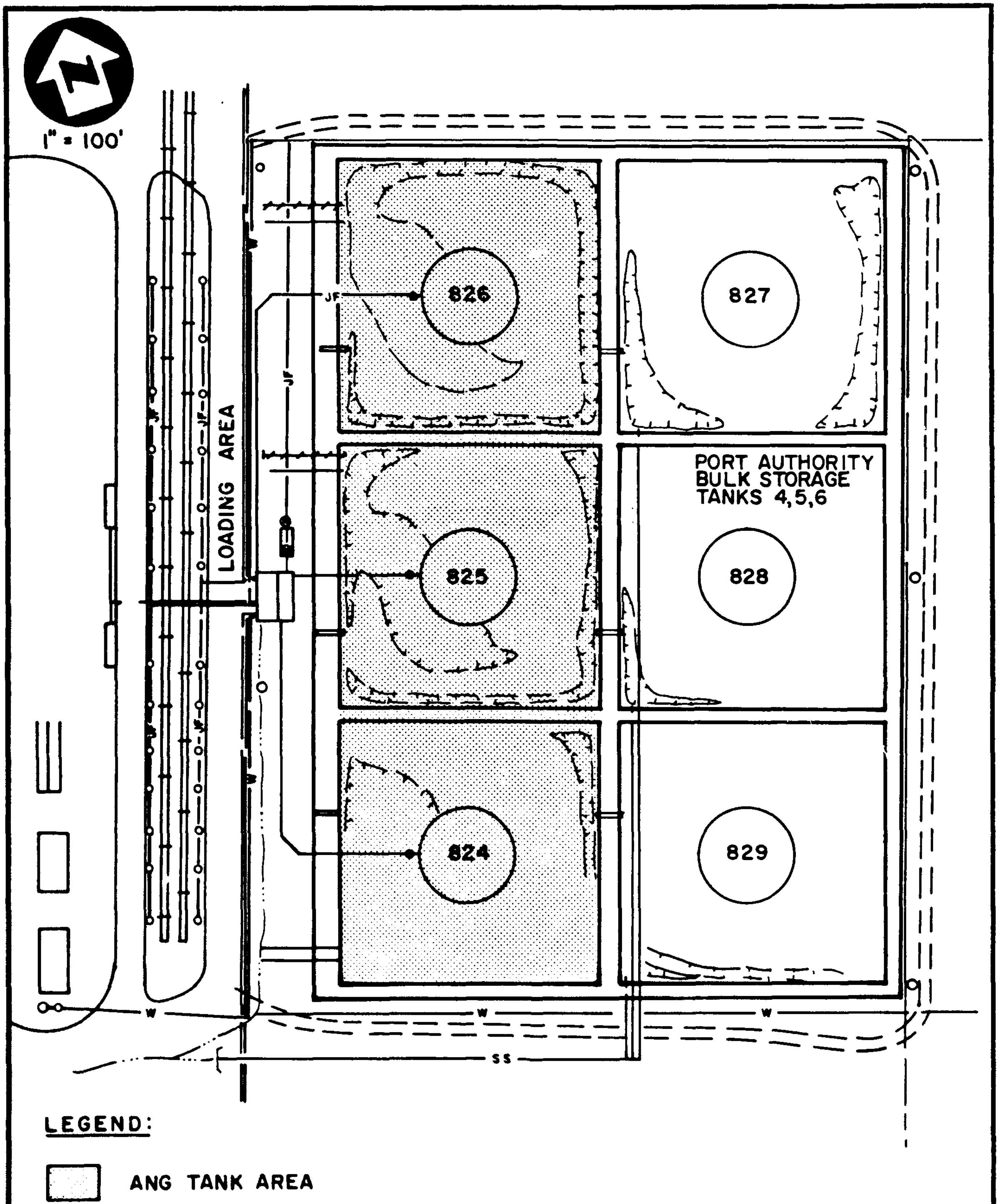
### UNDERGROUND UTILITIES:

| Symbol | Utility |
|---|---|
| — —H— — | HEAT LINE |
| — —JF— — | JET FUEL LINE |
| — —E— — | ELECTRIC LINE |
| — —T— — | TELEPHONE LINE |
| —W— | WATER LINE |
| —S— | SANITARY SEWER |
| —SS— | STORM SEWER |
| □ | JUNCTION BOX |




SITE 1
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER
AIR NATIONAL GUARD BASE

SOURCE:
BASE DETAILED
SECTIONAL MAPS




SITE 2
BULK STORAGE TANK FARM
RICKENBACKER
AIR NATIONAL GUARD BASE

SOURCE:
BASE DETAILED
SECTIONAL MAPS

property of the Rickenbacker Port Authority since March, 1986. Since 1979, three spills ranging in size from 1,000 to 60,000 gallons have occurred (HMTC, 1987). Most of the fuel was recovered as ponded liquid or during excavation of fuel-saturated soils. For purposes of determining a HAS, a quantity of more than 4,000 gallons of spilled fuel was estimated.

Site 3: JP-4 Pumping Station No. 4 (Figure 1.6)

The HAS for this site is 65, ranking 3rd of the 22 rated sites.

A 25,000 gallon spill of JP-4 (Jet Fuel) occurred at this site in 1976, as a result of a ruptured pipeline. Approximately 1,000 gallons of fuel were recovered. The remaining fuel evaporated, infiltrated the soils or entered the Base storm-drain network. Once in the Base storm-drain network, the fuel would have eventually been contained in separator No. 3102 or overflowed and entered a tributary of Big Walnut Creek.

Site 4: JP-4 Pumping Station No. 5 (Figure 1.7)

The HAS for this site is 54, ranking 15th of the 22 rated sites.

This site includes the area around Pumping Station No. 5 where a 200 gallon JP-4 spill occurred in 1985. None of the spill was recovered. The fuel evaporated, infiltrated the soil or entered the storm-drain network. The pumping station includes four 50,000 gallon underground storage tanks for jet fuel.

Site 5: Lateral Safety Zone Spill Area (Figure 1.8)

The HAS for this site is 63, ranking 7th of the 22 rated sites.

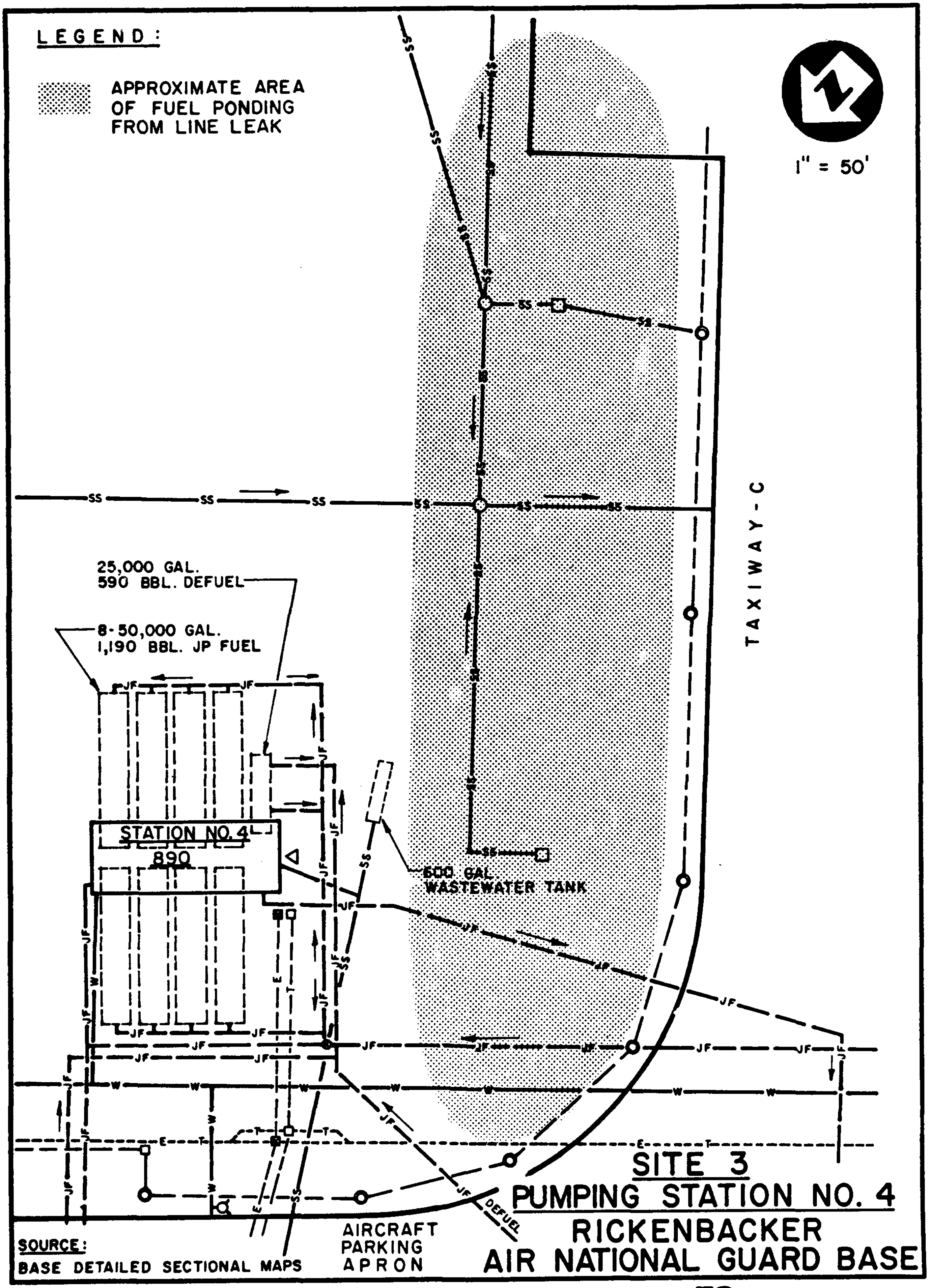
The area outlined in Figure 1.8 was covered with JP-4 following an 80,000 gallon spill from Pumping Station No. 7 in 1972. A 600 gallon spill in 1985 also occurred at this site. A drain-tile system underlies this area and probably carried most of the spill into the storm-drain network. The remainder of the spill either infiltrated the soils surrounding the drain tiles or volatilized.

Site 6: Underground Storage Tanks at Base Filling Station (Figure 1.9)

The HAS for this site is 54, ranking 14th of the 22 rated sites.

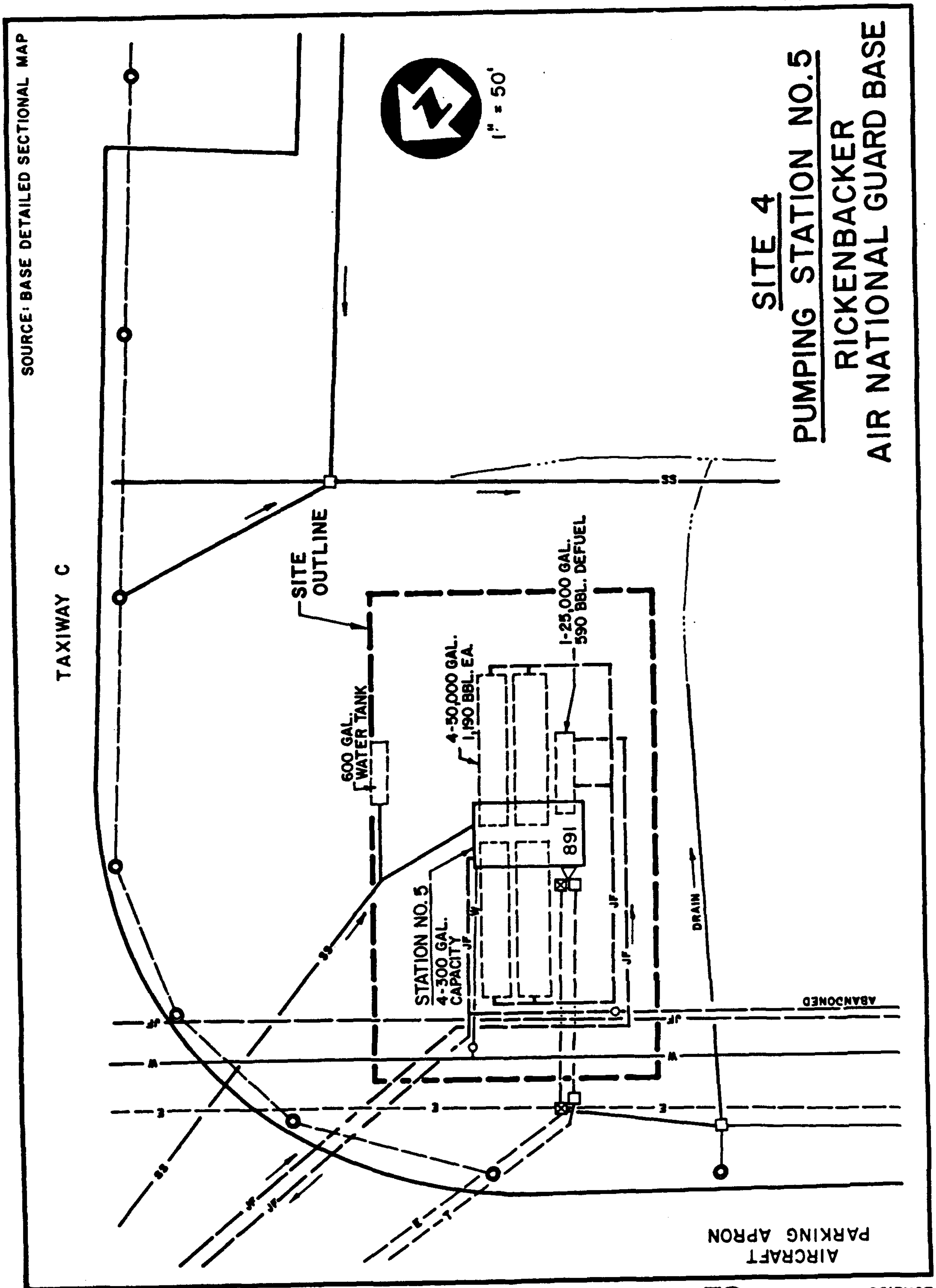
In 1985, approximately 100 gallons of unleaded fuel leaked from an underground storage tank at this site when a line connection ruptured. Since preparation of the Preliminary Assessment (Phase I) Report, ANGB personnel determined that the eastern, fiberglass tank was leaking. The tanks were removed in September 1987. Gasoline was observed floating on the water in the excavated tank pit on 24 September. The two steel and one

FIGURE 1.6

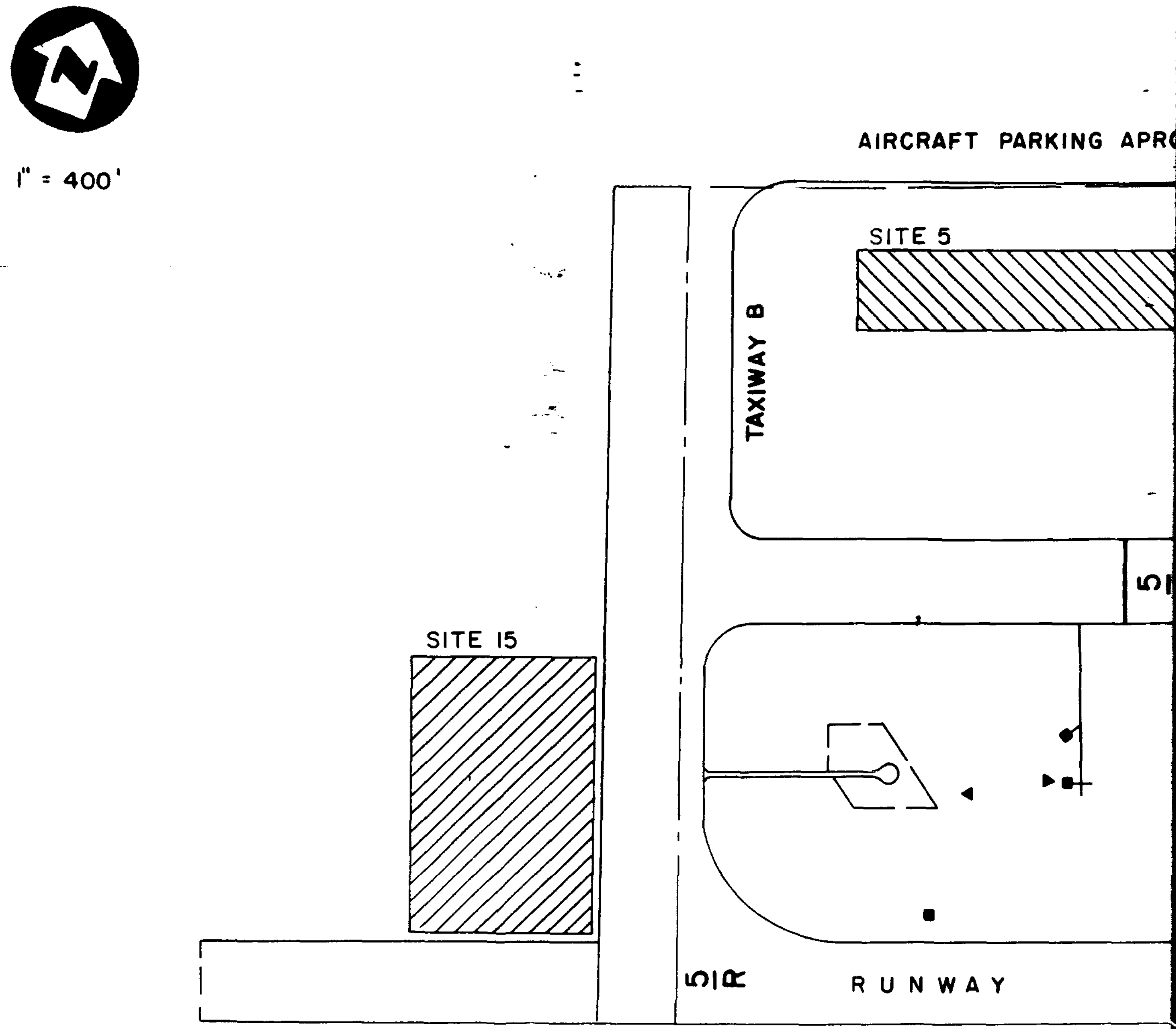



SITE 3
PUMPING STATION NO. 4
RICKENBACKER
AIR NATIONAL GUARD BASE

FIGURE 1.7




## SITE 4
## PUMPING STATION NO. 5
RICKENBACKER
AIR NATIONAL GUARD BASE

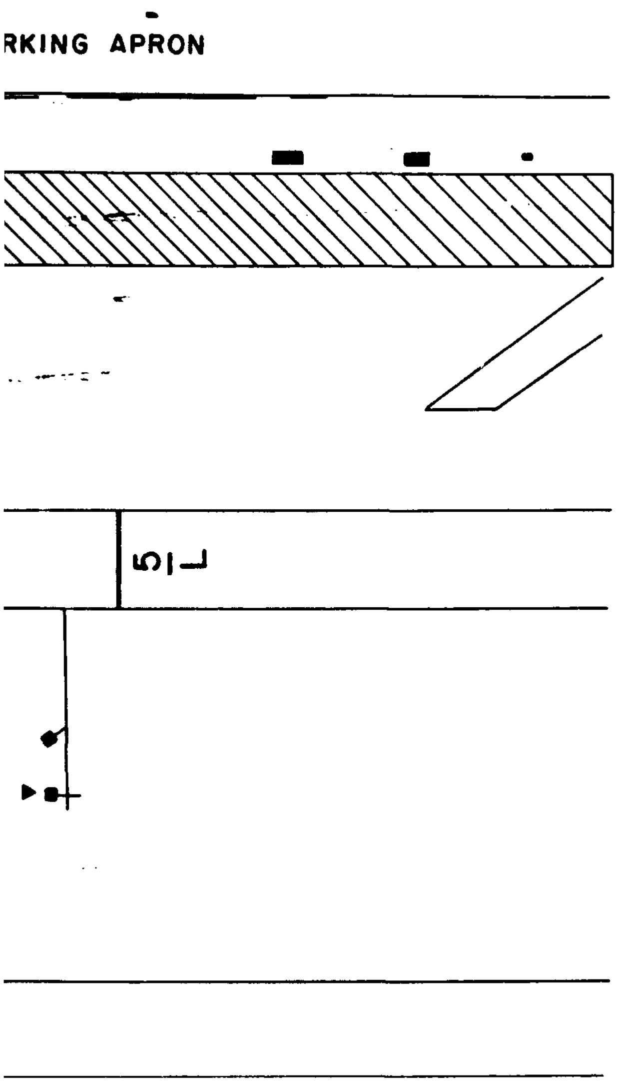



LEGEND:

APPROXIMATE AREA OF LATERAL SAFETY ZONE S

SOUTHWEST FUEL DUMP PIT (SITE 15)

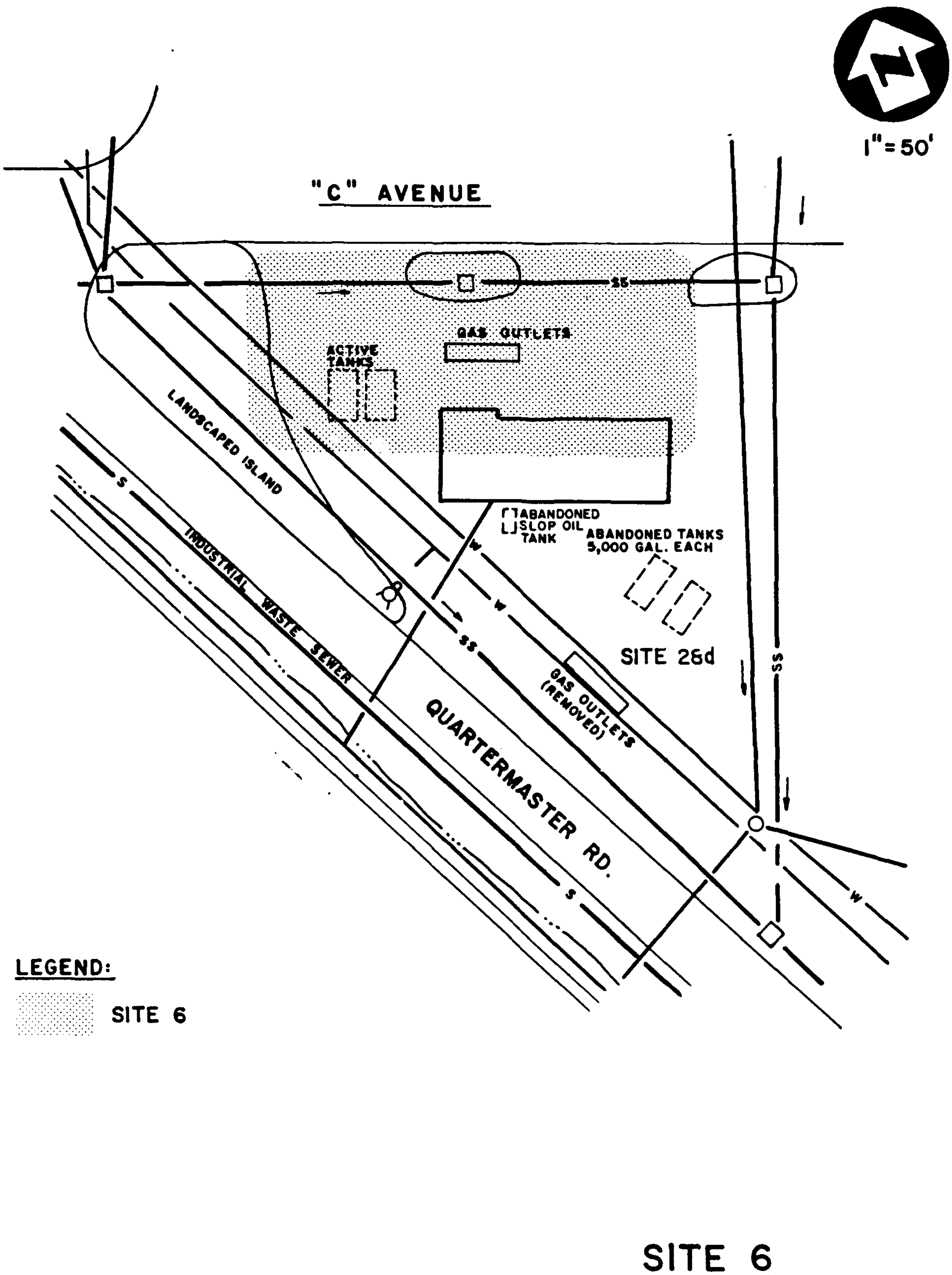
SOURCE:
BASE STORM DRAINAGE SYSTEM PLAN




TY ZONE SPILL (SITE 5)

**SITES 5 AND 15**
**LATERAL SAFETY ZONE SPILL AND SOUTHWEST FUEL DUMP PIT**
**RICKENBACKER AIR NATIONAL GUARD BASE**

FIGURE 1.9




SOURCE: BASE DETAILED SECTIONAL MAPS.

SITE 6

BASE FILLING STATION

RICKENBACKER AIR NATIONAL GUARD BASE

fiberglass tanks were replaced with two new fiberglass tanks and the contaminated soils were removed. A tank pit monitoring well was installed in the backfill.

Two gasoline storage tanks and one slop oil tank located in the rear of the station will be investigated as part of the abandoned USTs investigation (Site 28).

Site 9: Salvage Yard, Facility No. 906 (Figure 1.10)

The HAS for this site is 55, ranking 13th of the 22 rated sites.

This site consists of a paved area with a small office shack adjacent to quonset hut foundations. The Salvage Yard is now inactive but had been used for storage of equipment, scrap material and drums. The drums reportedly contained a wide range of pesticides, herbicides and solvents including dieldrin, malathion, diazinon and chlordane. The only reported leakage at this site occurred in 1983 when pesticide drums caught fire and some of the contents were spilled while extinguishing the blaze. The quantity of contaminant released during the fire is estimated at less than two drums. However, the potential for previous and subsequent unreported releases at this site is high.

Site 10: JP-4 Fuel Line Rupture (Figure 1.11)

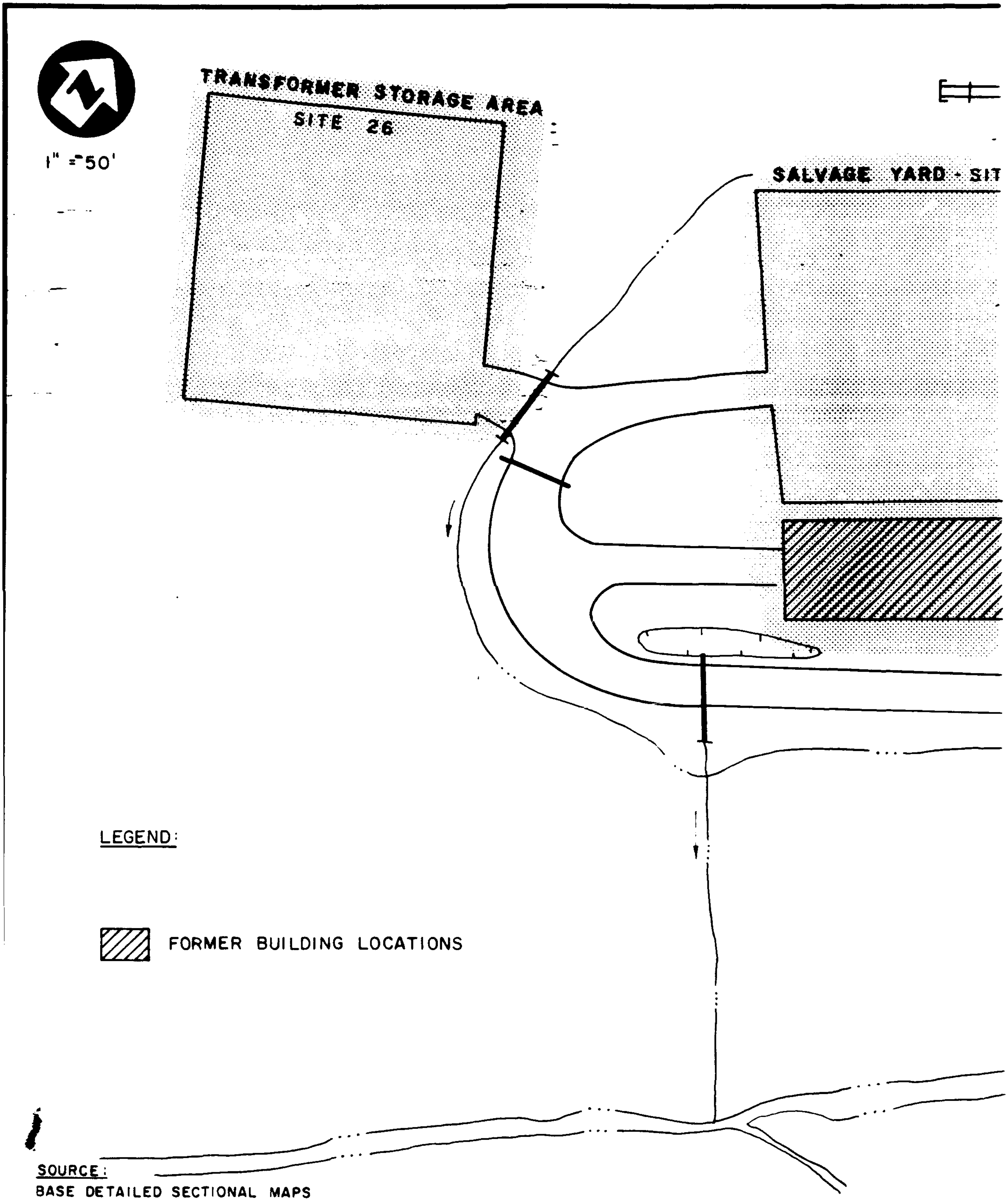
The HAS for this site is 56, ranking 11th of the 22 rated sites.

There is still some doubt as to the location of this site. Reportedly, a fuel line ruptured in 1982 spilling JP-4 on the ground for several days before being discovered. However, the location described in the PA Report has no above-ground fuel line passing through it. For the purposes of the Site Inspection, the area outlined in Figure 1.11 will be assumed correct.

Site 12: Old Drum Storage Area (Figure 1.12)

The HAS for this site is 46, ranking 22nd of the 22 rated sites.

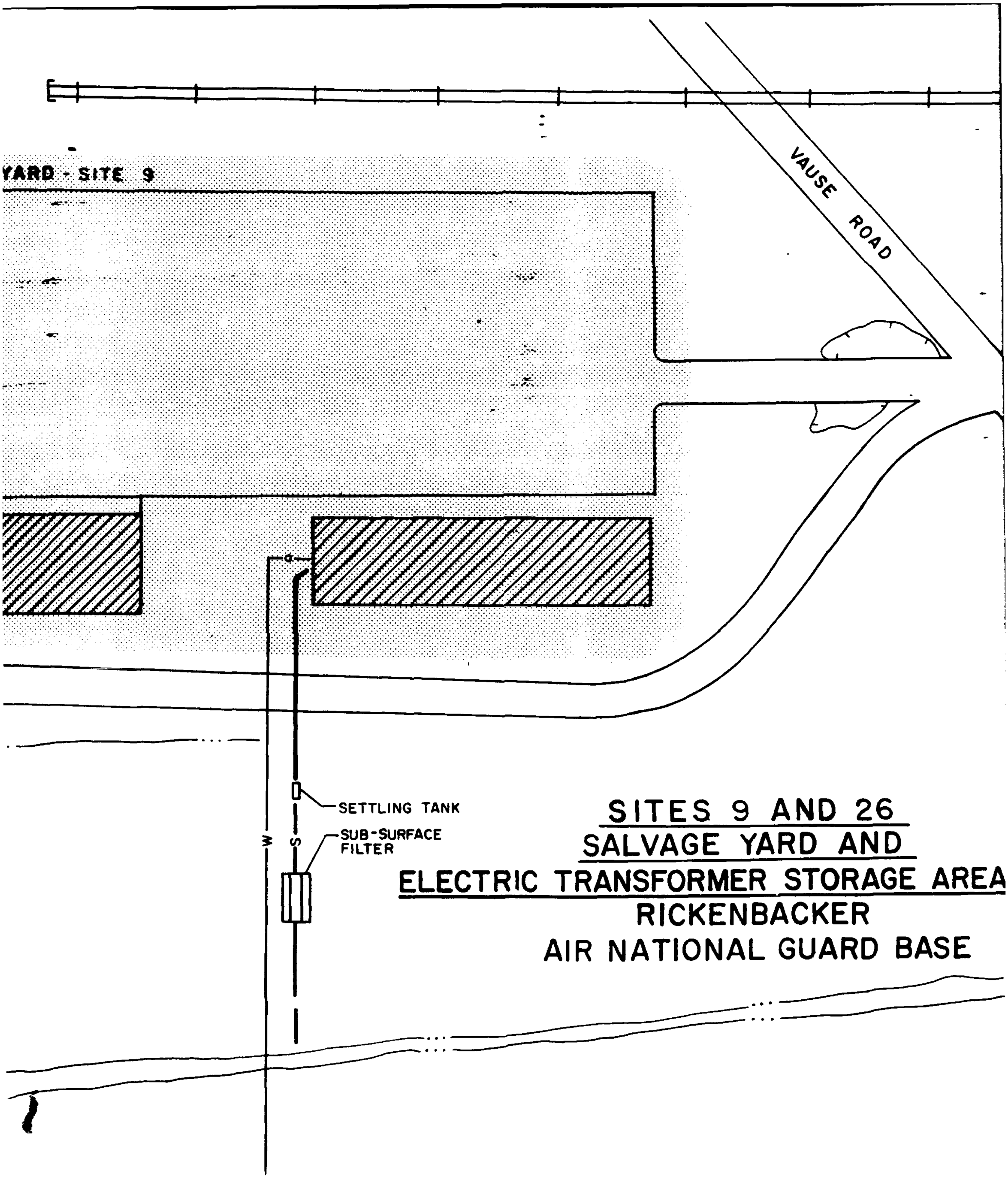
This site includes a concrete paved area and adjacent drainage ditch. The paved area was used as a storage area for drums. Most of the drums were empty when brought to the site. Samples taken from drums that did contain liquid reportedly contained methyl ethyl ketone and other solvents and paint strippers. Some drums of unknown content were dumped into the adjacent drainage ditch and any leakage onto the pavement would have been flushed into the ditch as well.




LEGEND:

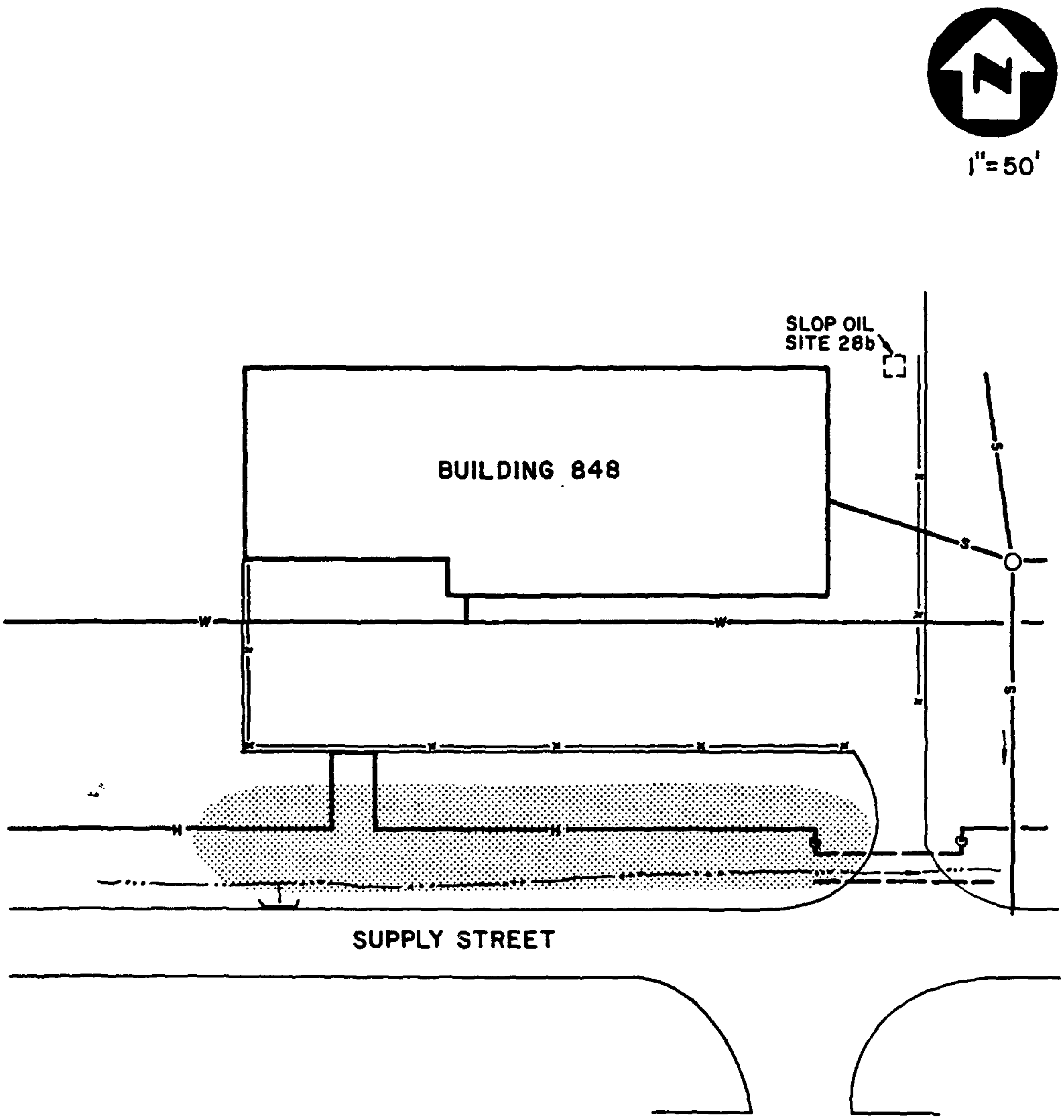
FORMER BUILDING LOCATIONS

SOURCE:
BASE DETAILED SECTIONAL MAPS




## SITES 9 AND 26
## SALVAGE YARD AND
## ELECTRIC TRANSFORMER STORAGE AREA
## RICKENBACKER
## AIR NATIONAL GUARD BASE

FIGURE 1.11



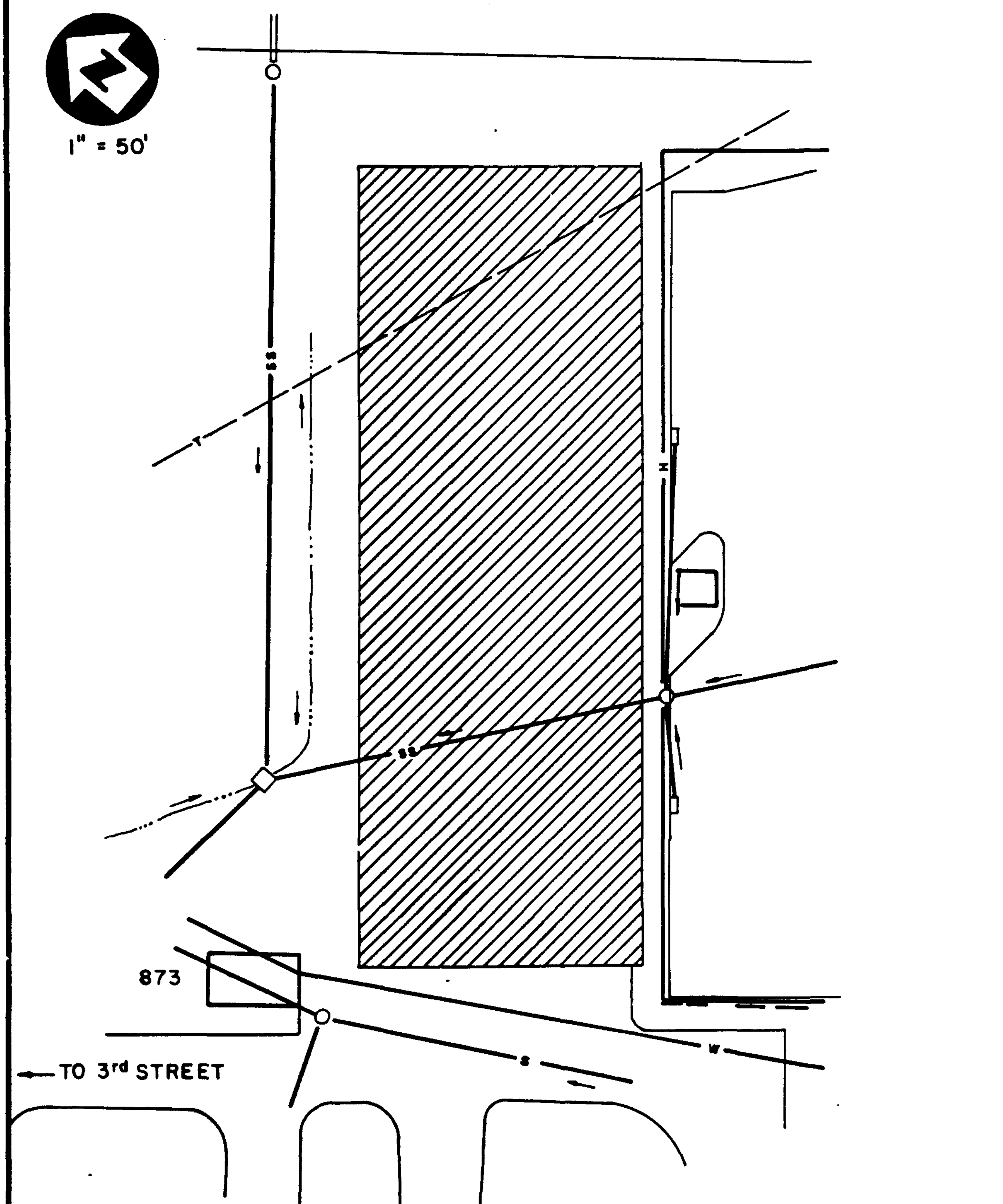

LEGEND:

APPROXIMATE EXTENT OF SPILL

SITE 10
JP4 FUEL LINE RUPTURE
RICKENBACKER
AIR NATIONAL GUARD BASE

SOURCE:
BASE DETAILED SECTIONAL MAPS.

FIGURE 1.12




LEGEND:

PAVED DRUM STORAGE (SITE 12)

SOURCE:
BASE DETAILED
SECTIONAL MAPS

SITE 12
OLD DRUM STORAGE AREA
RICKENBACKER
AIR NATIONAL GUARD BASE

Site 14: KC-135 Crash Site (Figure 1.13)

The HAS for this site is 63, ranking 8th of the 22 rated sites.

In 1960, two KC-135 refueling aircraft collided on the aircraft parking apron near Taxiway F. Up to 10,000 gallons of JP-4 reportedly spilled on the concrete pavement. The fuel probably flowed across the concrete into the grass area between Taxiways G and F or into a nearby catch-basin which is connected to an open drainage ditch in the same grass area.

Sites 15 and 16: Fuel Dump Pits at Ends of Runways (Figures 1.8 and 1.13)

The HAS for these sites are 53, tied for the rank of 17th of the 22 rated sites.

These sites were reportedly designated fuel dumping areas for aircraft to relieve themselves of fuel before entering the hangers for repairs or after an alert. No first-hand accounts of fuel dumping were reported. The practice began in the 1940s. Potentially large quantities of fuel could have been dumped at these sites.

Site 17: Old Entomology Laboratory (Figure 1.14)

The HAS for this site is 56, ranking 12th of the 22 rated sites.

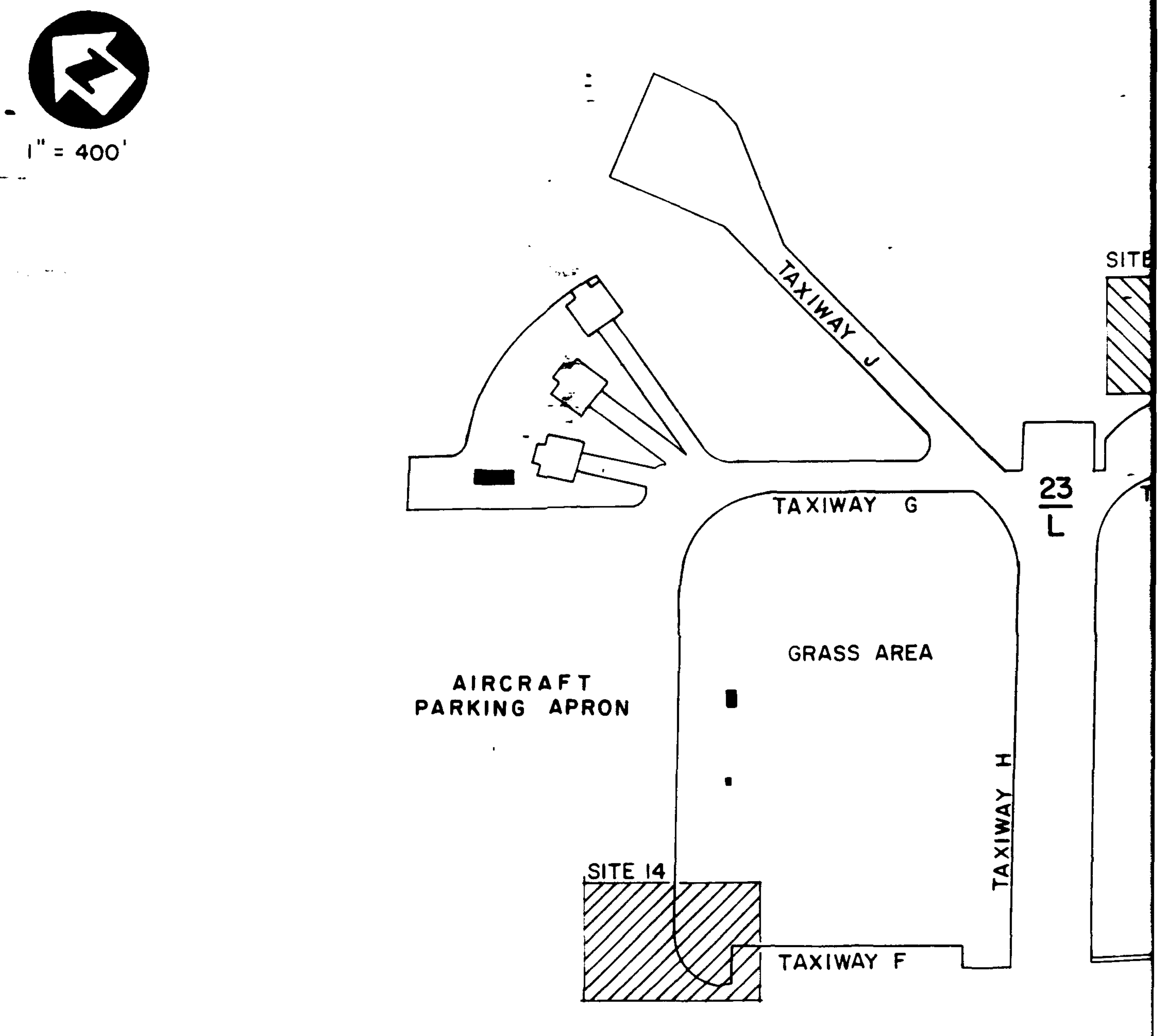
The PA Report described this site as the location of a building where pesticide spraying equipment was cleaned and stored. The building was reportedly destroyed by fire and some malathion may have leaked from some drums during the fire.

A review of records by Base personnel contradicts this account. The only site used as an entomology lab is reportedly the northwest end of Building 422. A nearby building (426) was destroyed in a fire, but it had not been the location of the entomology lab. Further investigation of this discrepancy will be done prior to field activities.

Sites 19 and 20: North and South Coal Piles (Figures 1.15 and 1.16)

The HAS for these sites are 64, tied for the rank of 4th of the 22 rated sites.

The North Coal Pile (Figure 1.15) is a conc.ete slab capable of containing 6,000 tons of coal. The South Coal Pile (Figure 1.16) is an asphaltic concrete slab capable of containing 4,000 tons of coal. Both coal storage areas are surrounded by drainage ditches which receive runoff from the piles and empty into the storm drain network.

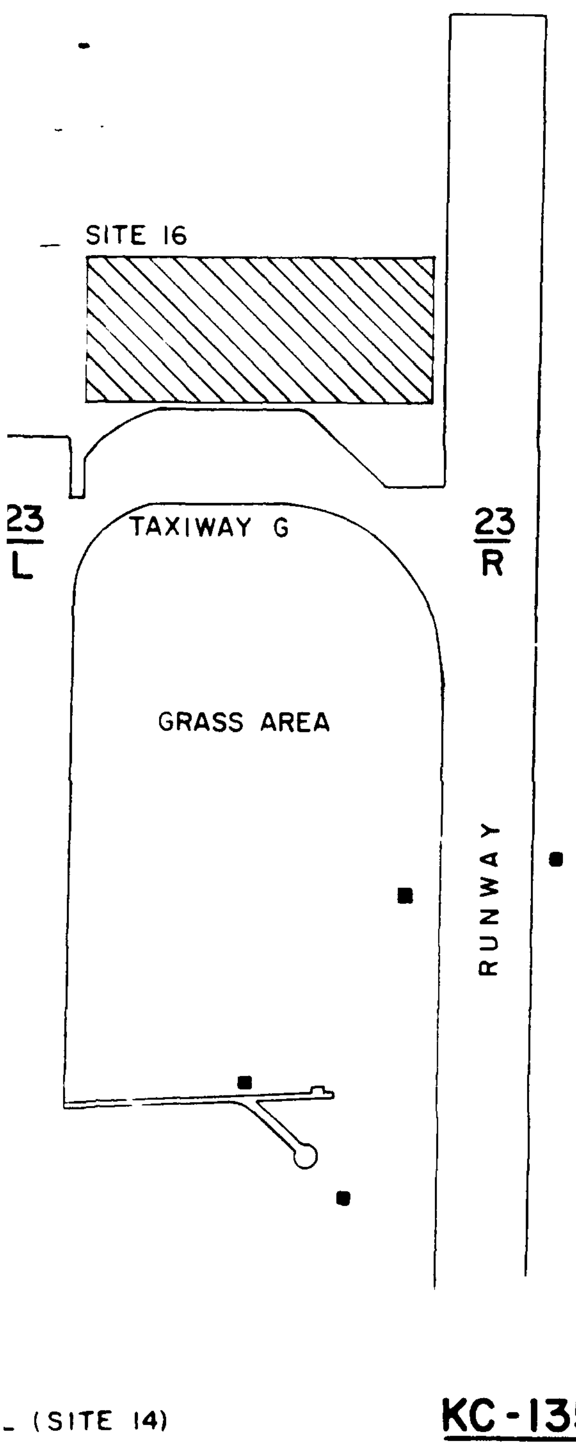



LEGEND:

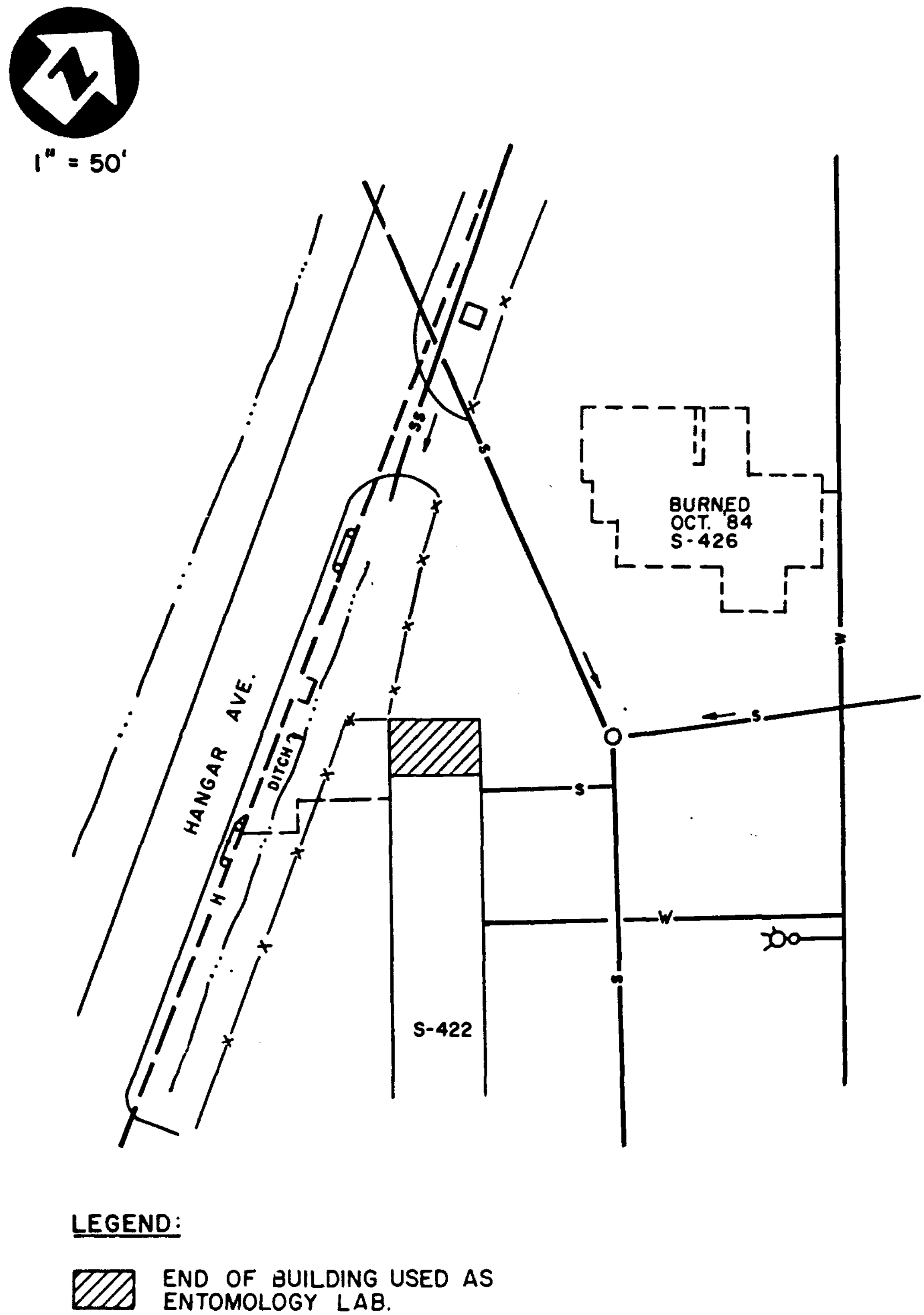
APPROXIMATE AREA OF KC 135 CRASH SPILL (SITE

NORTHEAST FUEL DUMP PIT (SITE 16)

SOURCE:
BASE STORM DRAINAGE SYSTEM PLAN

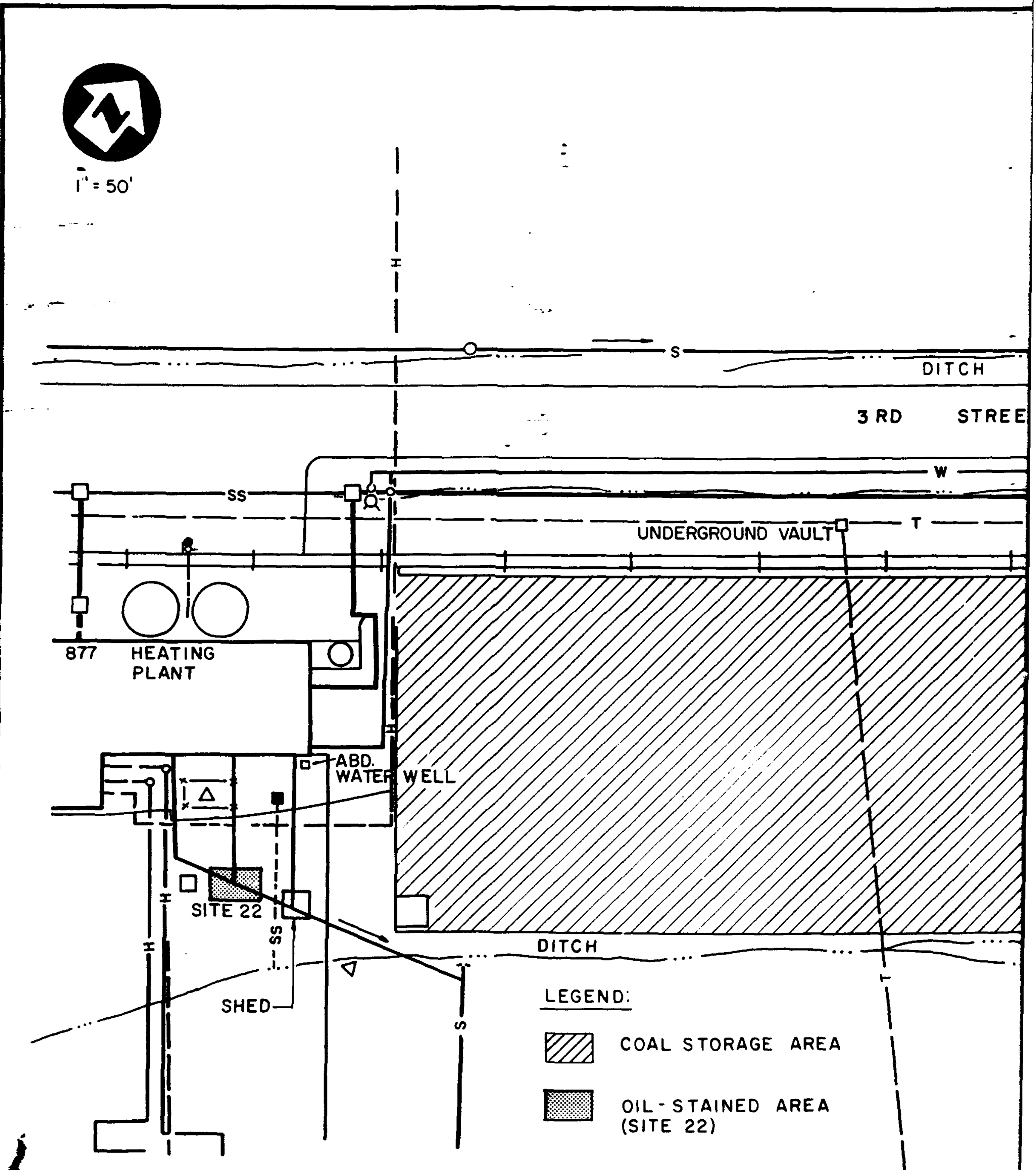



**SITES 14 & 16**
**KC-135 CRASH SITE AND NORTHEAST FUEL DUMP PIT**
**RICKENBACKER AIR NATIONAL GUARD BASE**

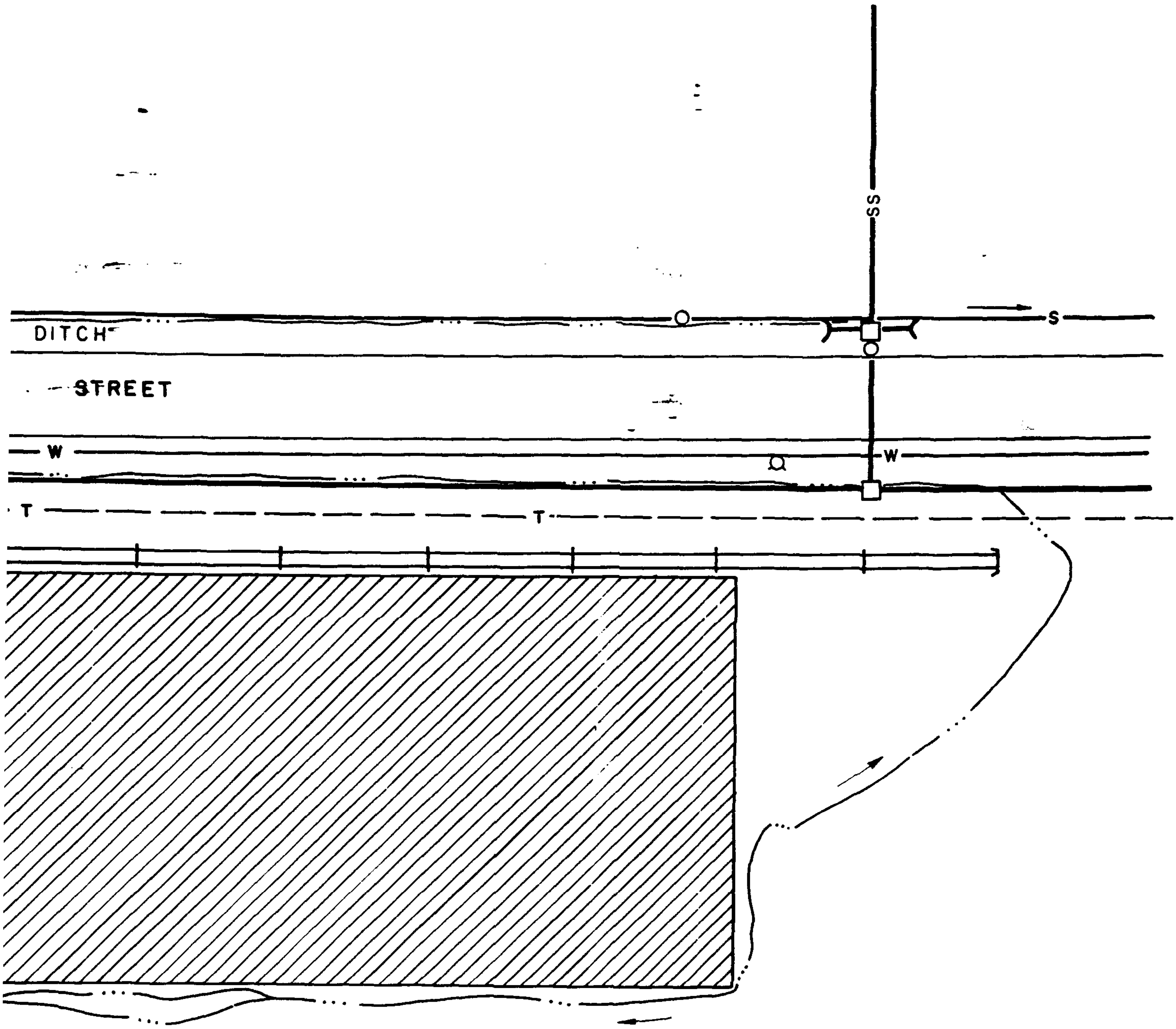



SOURCE:
BASE DETAILED SECTIONAL MAPS.

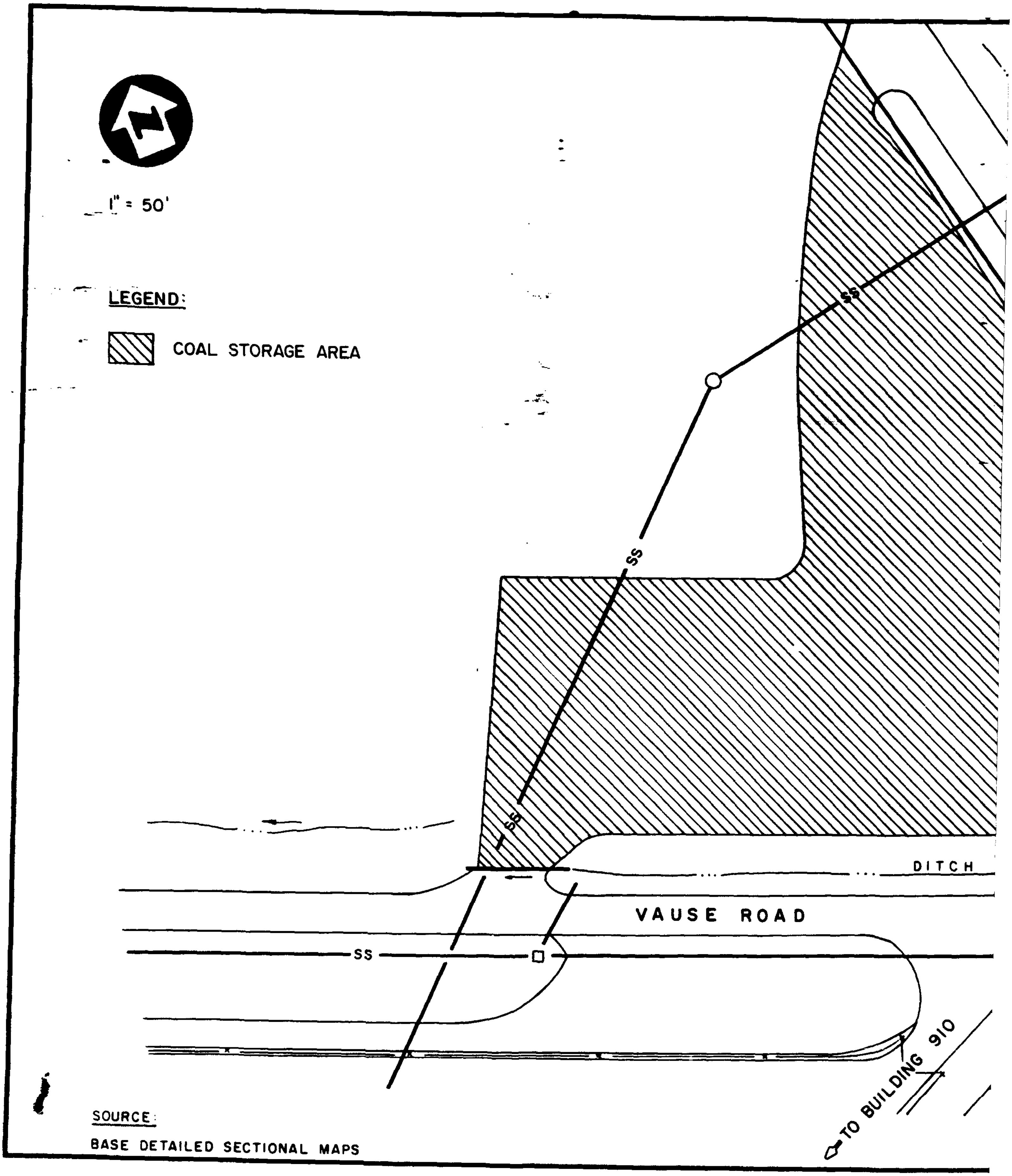
## SITE 17
## OLD ENTOMOLOGY LAB
## RICKENBACKER AIR NATIONAL GUARD BASE



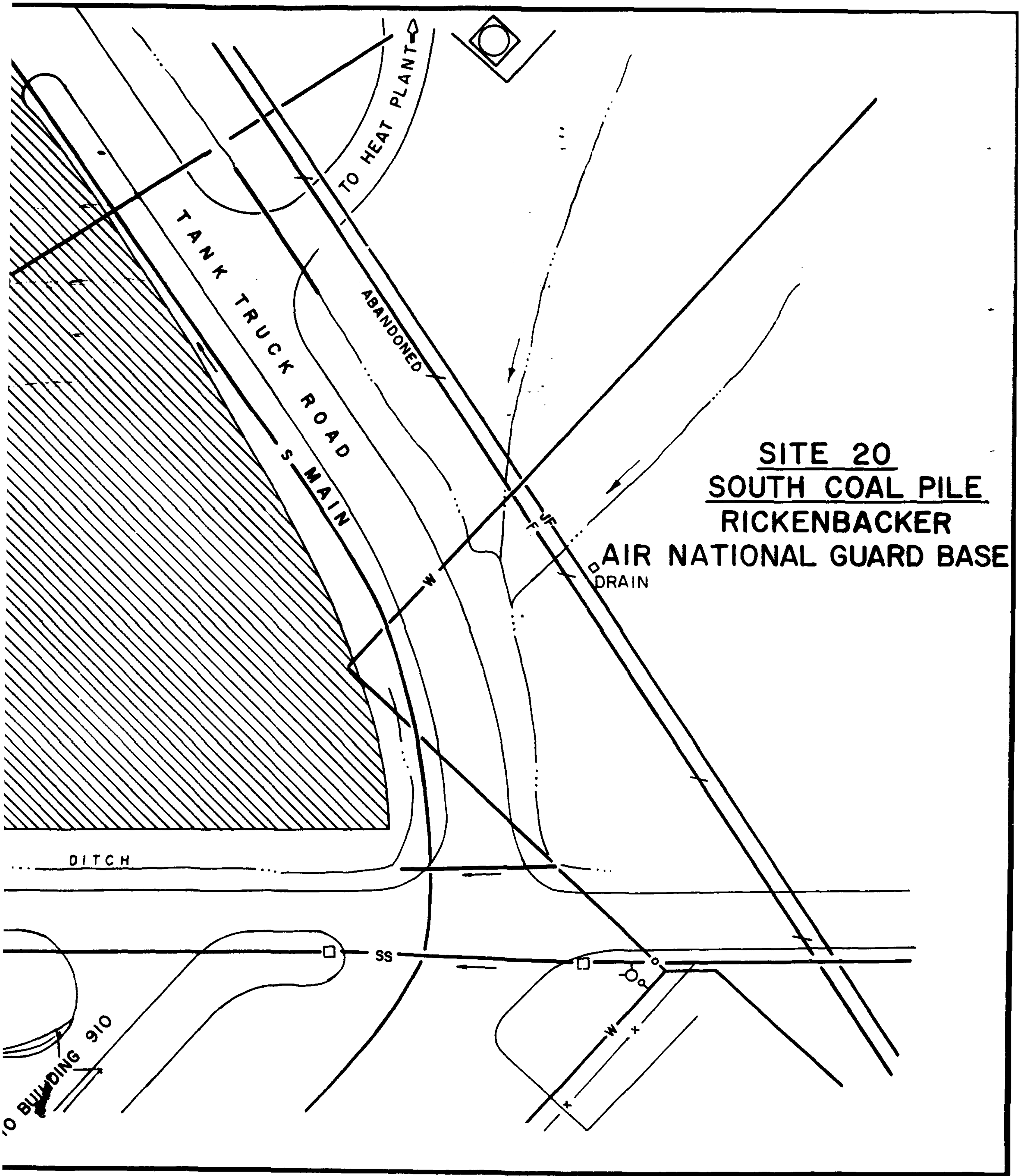

SOURCE:
BASE DETAILED SECTIONAL MAPS




SITES 19 AND 22
NORTH COAL PILE AND
LUBE OIL DRUM STORAGE
RICKENBACKER
AIR NATIONAL GUARD BASE



1" = 50'
LEGEND:
COAL STORAGE AREA
SS
SS
SS
SS
DITCH
VAUSE ROAD
SS
TO BUILDING 910
SOURCE:
BASE DETAILED SECTIONAL MAPS




## SITE 20
## SOUTH COAL PILE
## RICKENBACKER
## AIR NATIONAL GUARD BASE

The coal stored at both piles is high in sulfur content (4%) and was, in the past, soaked with fuel oil to improve ignition and combustion. There is some doubt as to whether present operations include soaking the coal. Further investigation of coal handling practices will be conducted during the SI. Both coal piles have been in use since 1953, the year the heating plant went into operation. Discolored water and stressed vegetation are apparent in the drainage ditches and around the perimeter of the slabs.

Site 21: Leaking Drum & Oil Change Area at Water Treatment Plant (Figure 1.17)

The HAS for this site is 54, ranking 16th of the 22 rated sites.

This site includes: 1) approximately 50 square feet of oil-stained soil surrounding a barrel of WD-30 lubricating oil within the fenced area surrounding the water treatment plant and 2) approximately 100 square feet of oil-stained gravel and soil adjacent to the RV and boat storage yard where crankcase oils have been drained.

Site 22: Heating Plant Lube Oil Drum Storage Area (Figure 1.15)

The HAS for this site is 51, ranking 19th of the 22 rated sites.

This site is a gravel covered area behind the heating plant, adjacent to the North Coal Pile (Site 19). Approximately 50 square feet of oil-stained gravel and some stressed vegetation is apparent between the drums and the adjacent drainage ditch.

Site 23: Fire Training Area (Figure 1.18)

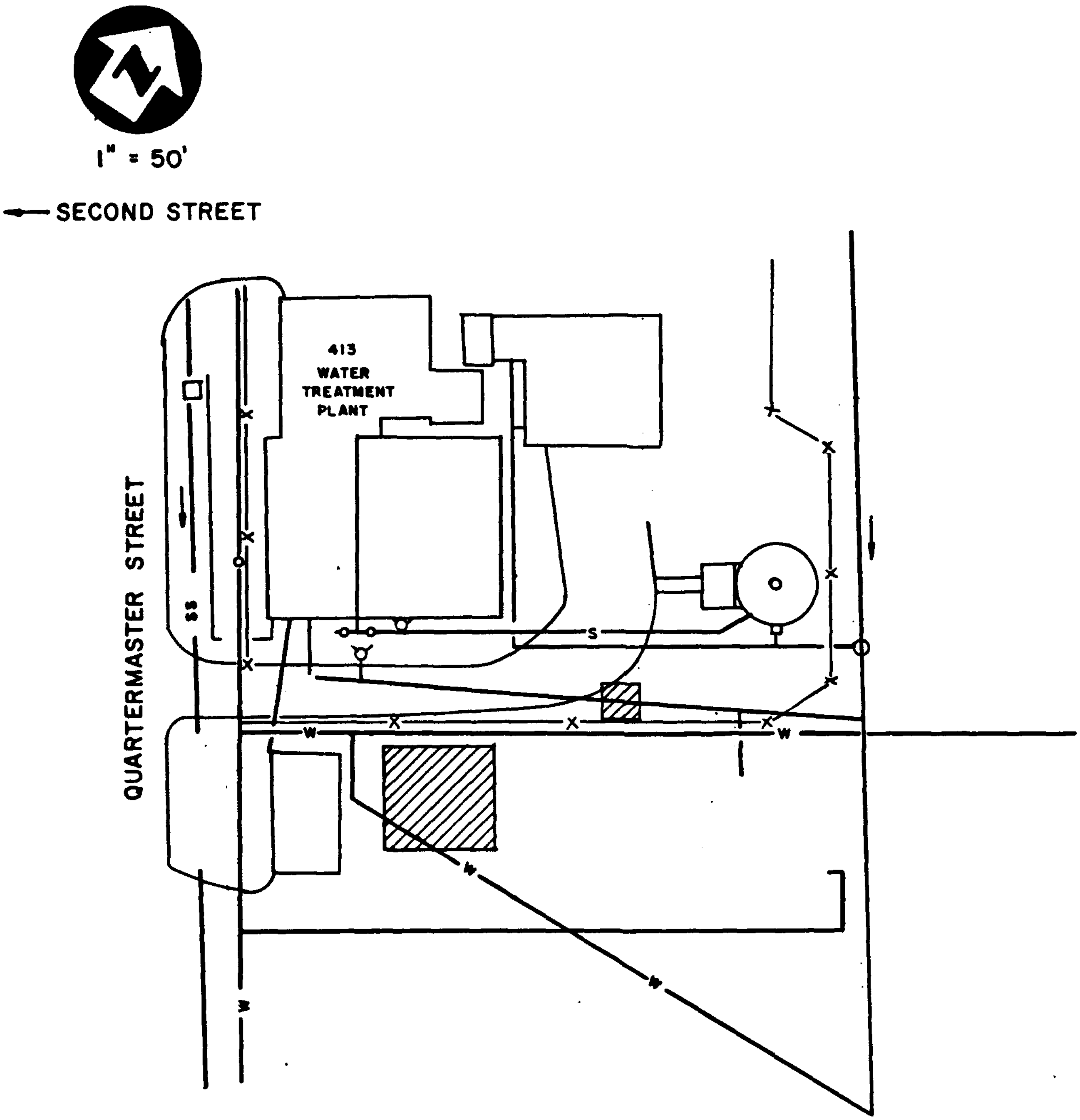
The HAS for this site is 63, ranking 6th of the 22 rated sites.

This site consists of three loosely-packed, earth dikes intended to contain flammable liquids which are ignited for fire-training purposes. The diked areas range in size from 4,000 to 22,000 square feet. The dikes rest on top of an old runway surface which reportedly is constructed of three inches of asphalt over twelve inches of reinforced concrete. A strong odor of petroleum products is apparent in the diked areas and much of the dike material is oil-stained. Surface runoff from this area that escapes the confinement of the dikes would enter the storm drain network underlying the grass area to the east.

Site 24: Sanitary Sewage Treatment Plant Sludge Beds (Figure 1.19)

The HAS for this site is 50, ranking 20th of the 22 rated sites.

This site includes the sludge beds west of the sewage treatment plant




LEGEND:

AREAS OF OIL-STAINED SOILS

—X— FENCE

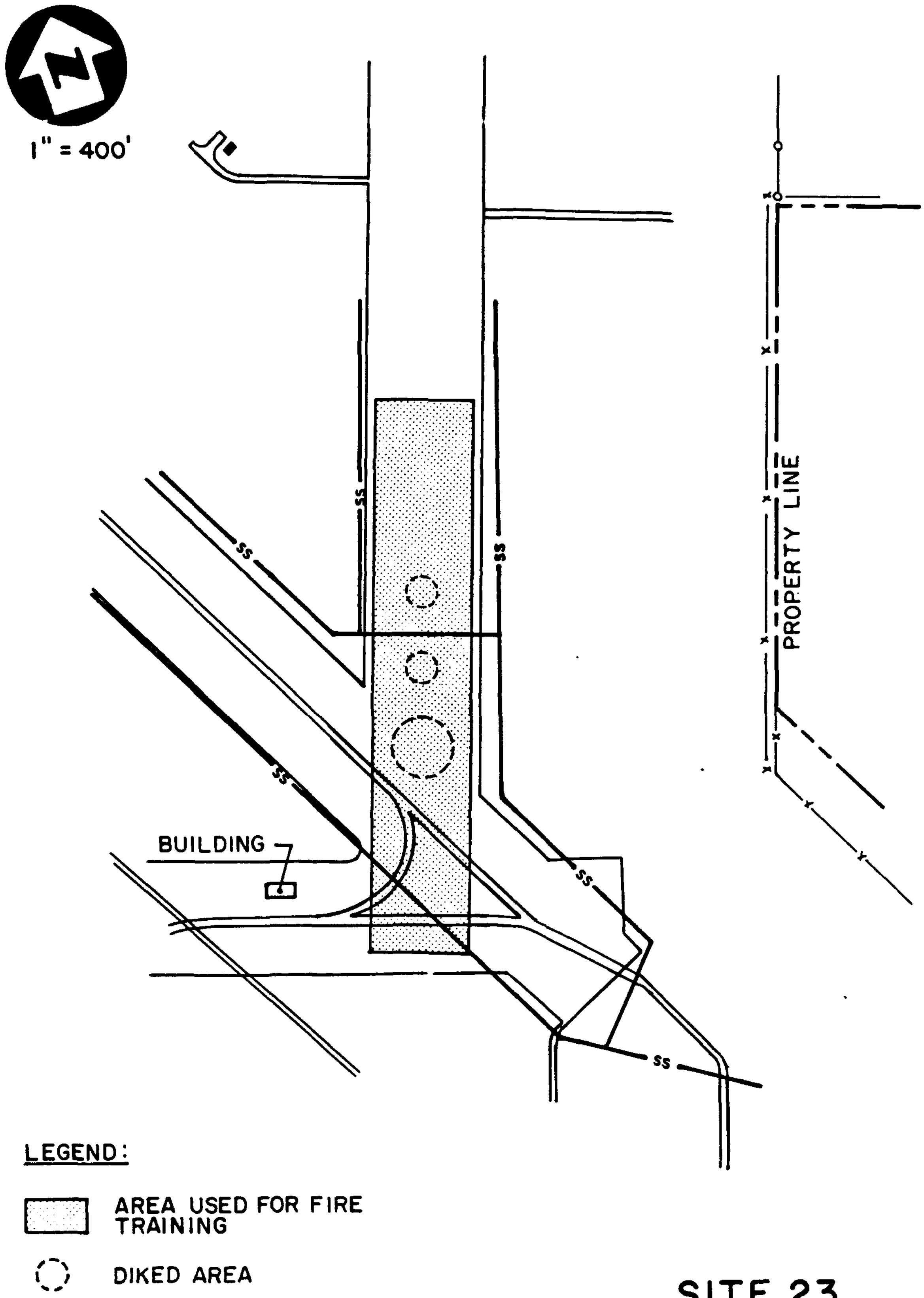
## SITE 21

## LEAKING DRUM AND OIL CHANGE AREA

## RICKENBACKER
## AIR NATIONAL GUARD BASE

SOURCE:
BASE DETAILED SECTIONAL MAPS

FIGURE 1.18




SITE 23
FIRE TRAINING AREA
RICKENBACKER
AIR NATIONAL GUARD BASE

SOURCE: BASE STORM DRAINAGE SYSTEM PLAN

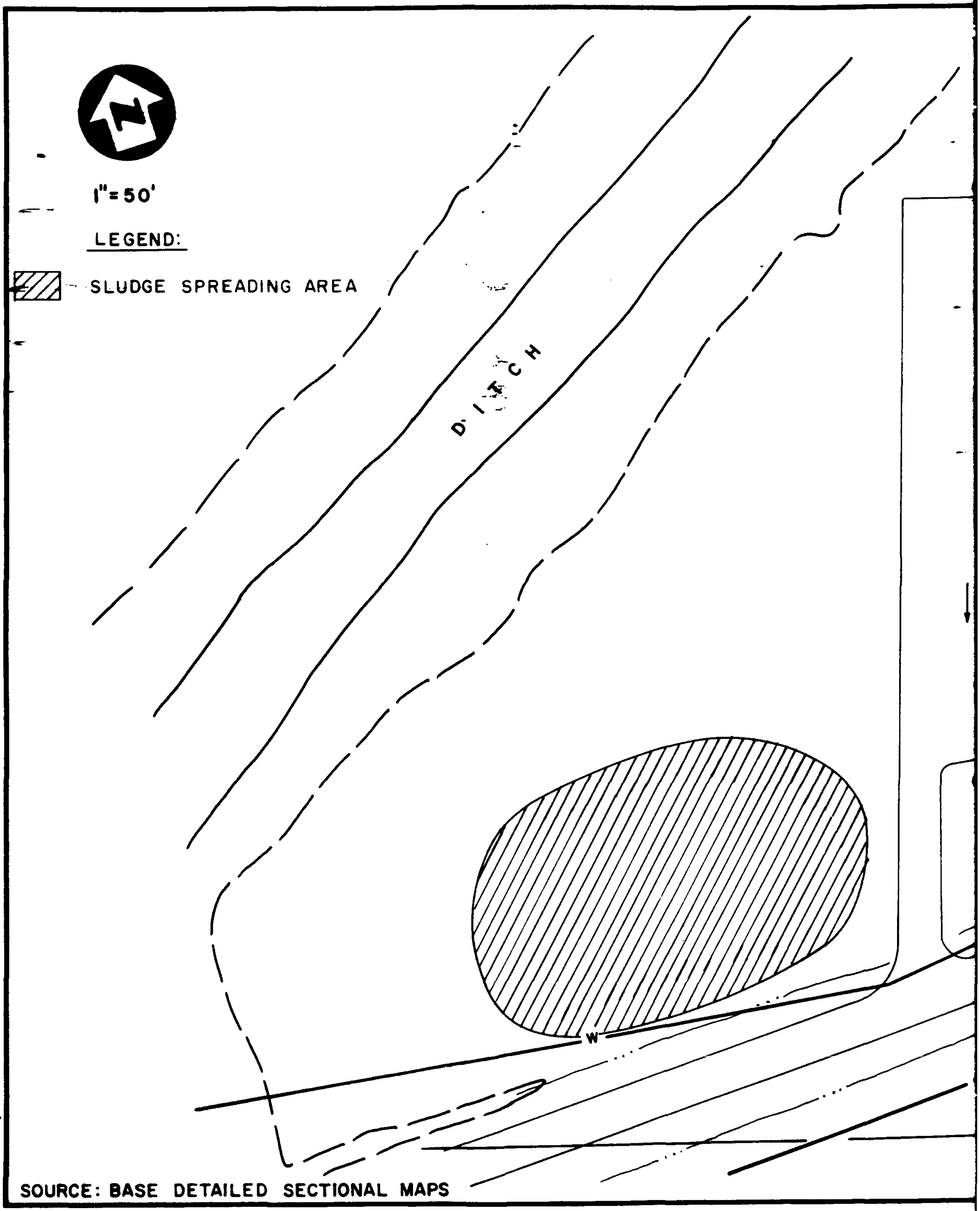
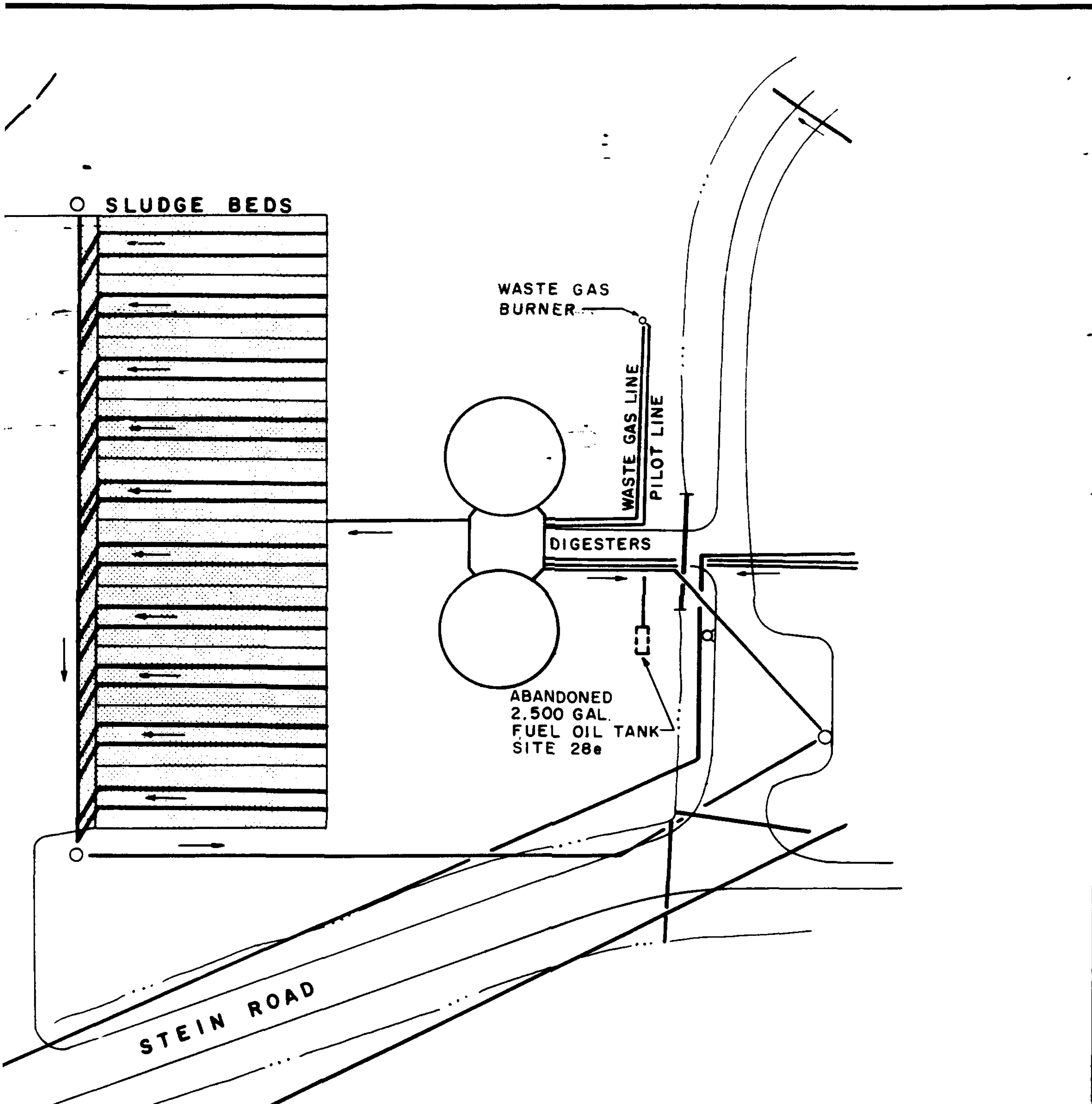

N
1" = 50'
LEGEND:
SLUDGE SPREADING AREA
DITCH
W
SOURCE: BASE DETAILED SECTIONAL MAPS

FIGURE 1.19




SITE 24
SEWAGE TREATMENT PLANT SLUDGE BEDS
RICKENBACKER
AIR NATIONAL GUARD BASE

and the sludge disposal area southwest of the sludge beds. The sewage treatment plant was active from the late 1950s until 1983, treating sewage from the entire Base community. The Base was connected to the Columbus Municipal Sewage System in 1983. While in operation, the sludge beds were filled periodically to allow the sludge to dewater and the partially dried sludge was either transported off-Base or deposited in the sludge disposal area as a soil enhancer for a community garden plot. Residual dried sludge remains in the beds. The beds are constructed of concrete and probably inhibit migration of leachate derived from the sludge.

Site 25: Storm Drainage Ditch System (Figure 1.20)

The HAS for this site is 70, ranking first of the 22 rated sites.

This site includes all of the open drainage ditches throughout the Base. During the long history of operations at Rickenbacker, various solvents and fuels from aircraft maintenance areas and shops have been spilled into drains connected to the Base storm-drain network which eventually leads into open ditches and finally into the oil water separators located at the Base boundaries. Figure 1.20 shows the open drainage ditches and associated separators which will be the primary focus of the investigations. Most shop drains are now connected to the sanitary sewer system which is tied into the City of Columbus Wastewater Treatment System. All surface runoff continues to pass through the drainage ditch system.

Site 26: Electrical Transformer Storage (Figure 1.10)

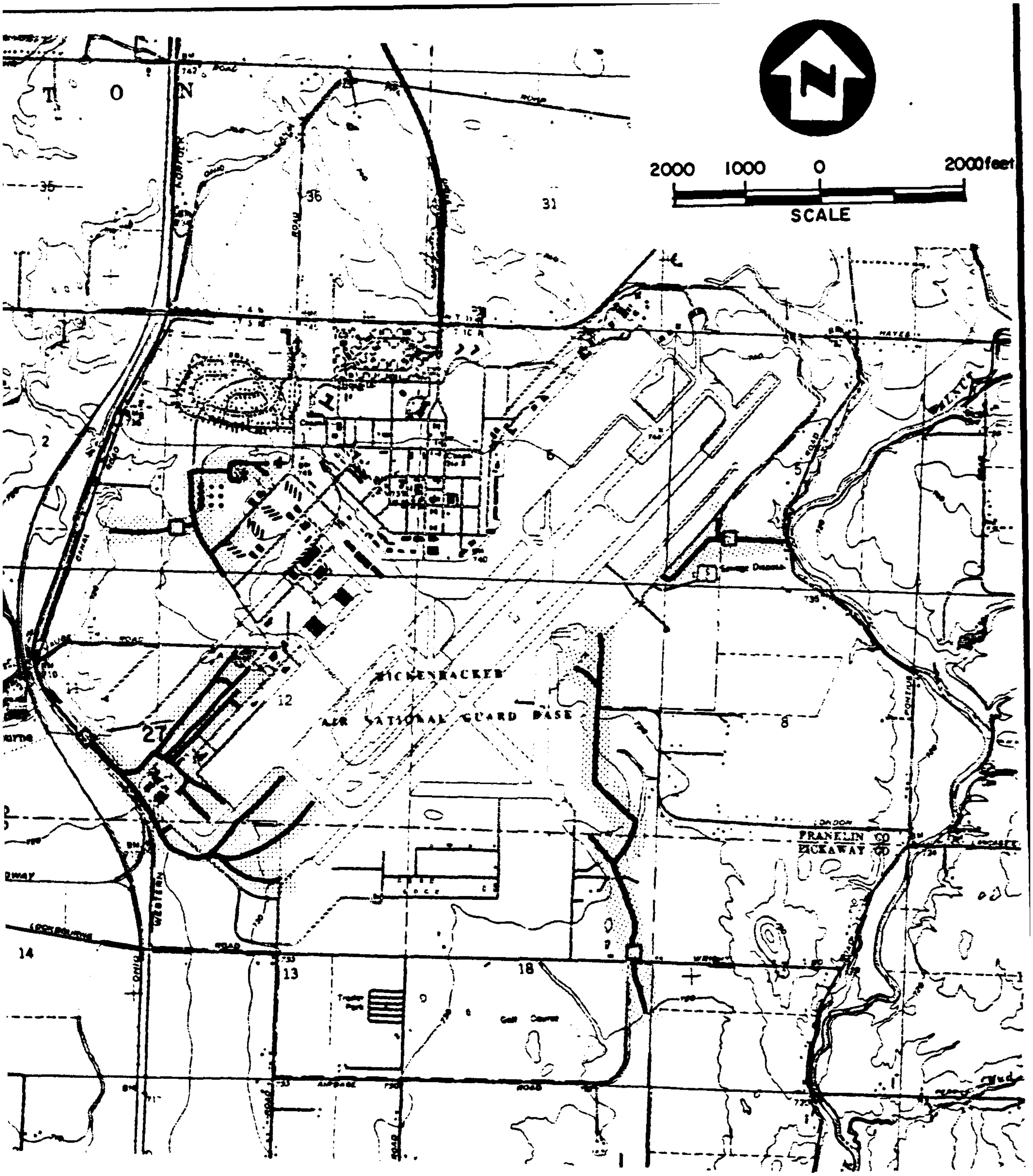
The HAS for this site is 48, ranking 21st of the 22 rated sites.

This site is a gravel covered, open storage yard at the southwest end of the Salvage Yard (Site 9). This location contradicts the Phase I Report, but is based on a recent review of records by Base personnel. The area was used to store electrical transformers until 1975. Twenty-five to thirty transformers were stored at any time. No dielectric fluid leaks have been documented and there is no record of whether the transformers contained polychlorinated biphenyls (PCBs).

Site 27: Drainage Ditch Near Landfill (Figure 1.20)

The HAS for this site is 59, ranking 9th of the 22 rated sites.

The site includes the drainage ditch adjacent to the landfill gate. On 20 August 1982, an unidentified "milky white liquid" was observed in the ditch. A sample collected at that time was analyzed by CTL Engineering,




**LEGEND:**

- ☐ OIL-WATER SEPARATOR
- ▬ OPEN DRAINAGE DITCH
- 27 SITE 27

**SITES 25 & 27**
**DRAINAGE DITCH NETWORK AND DITCH NEAR LANDFILL GATE**
**RICKENBACKER AIR NATIONAL GUARD BASE**

**SOURCE:**
USGS, LOCKBOURNE, OHIO
7.5 MIN. QUADRANGLE

Inc., and found to contain a series of alkylbenzenes, and low molecular weight olefins as head-space gas and terpene hydrocarbons, alkyl benzenes and alkyl naphthalenes as extractable organic compounds (CTL Letter Report, 2 September 1982). The white color was attributed to inorganic compounds, probably paint pigments. Bags of activated carbon were placed downstream of the spill in an attempt to reduce dispersion of contaminants. Investigation of efficacy of the carbon and its disposal will be conducted.

Site 28: Abandoned Underground Tank Investigation

This site was not rated because it was added to the Scope of Work after completion of the PA Report.

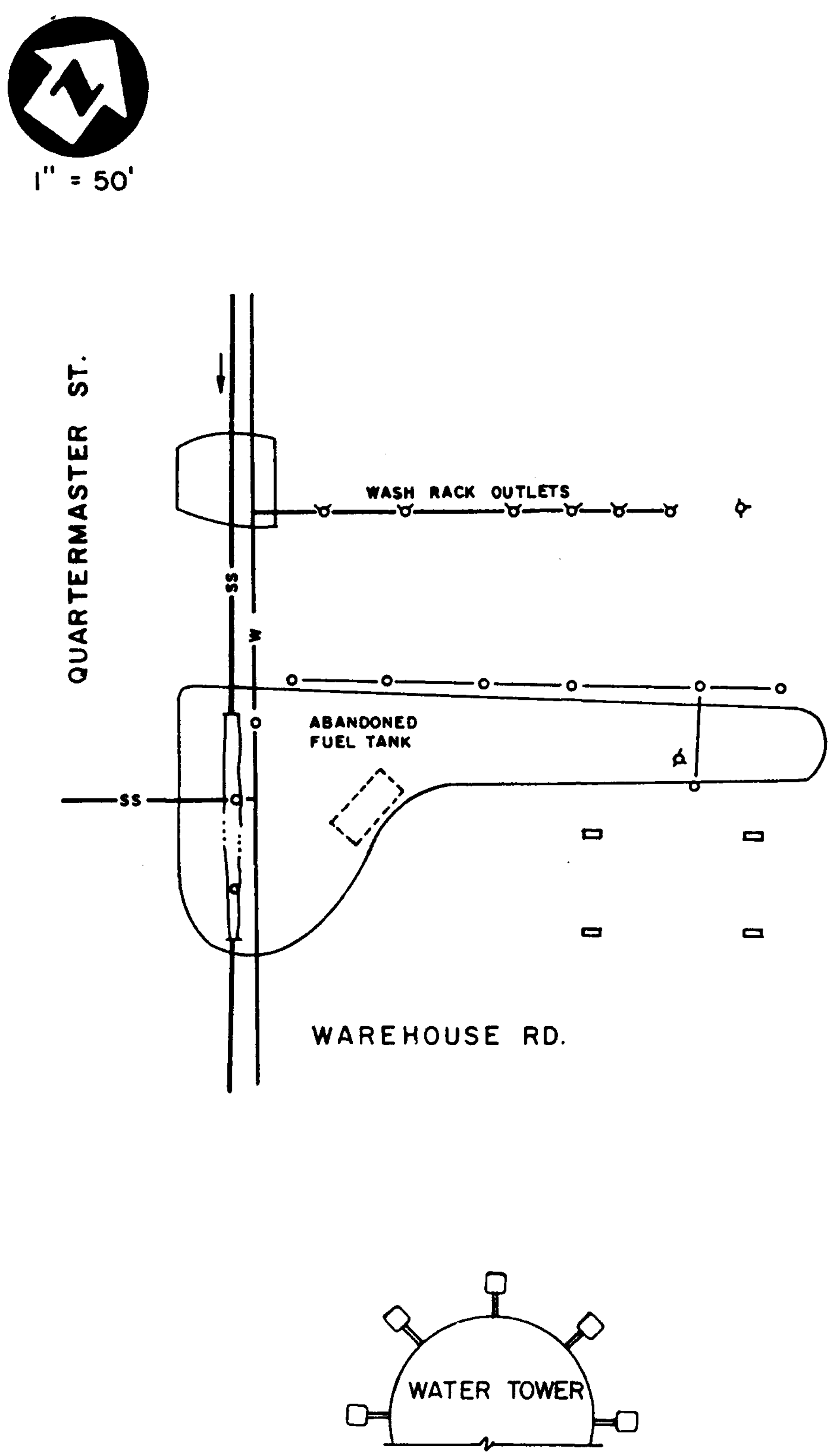
This site includes abandoned underground storage tanks at five sites. Site 28a (Figure 1.21) includes one abandoned underground gasoline tank at an abandoned filling station site adjacent to the Base water tower.

Site 28b (Figure 1.22) is the underground slop oil tank adjacent to the automotive hobby shop (Building 848). The tank was a repository for waste oils generated by the automotive shop and other shops in the area, but is currently not in use.

Site 28c (Figure 1.23) includes four abandoned underground diesel fuel storage tanks along the railroad siding near the hazardous waste storage area (Site 1).

Site 28d (Figure 1.24) includes two abandoned underground gasoline tanks and one abandoned underground slop oil tank behind the Base filling station (Site 6).

Site 28e (Figure 1.19) includes the abandoned 2,500 gallon underground fuel oil tank at the sewage treatment plant (Site 24).

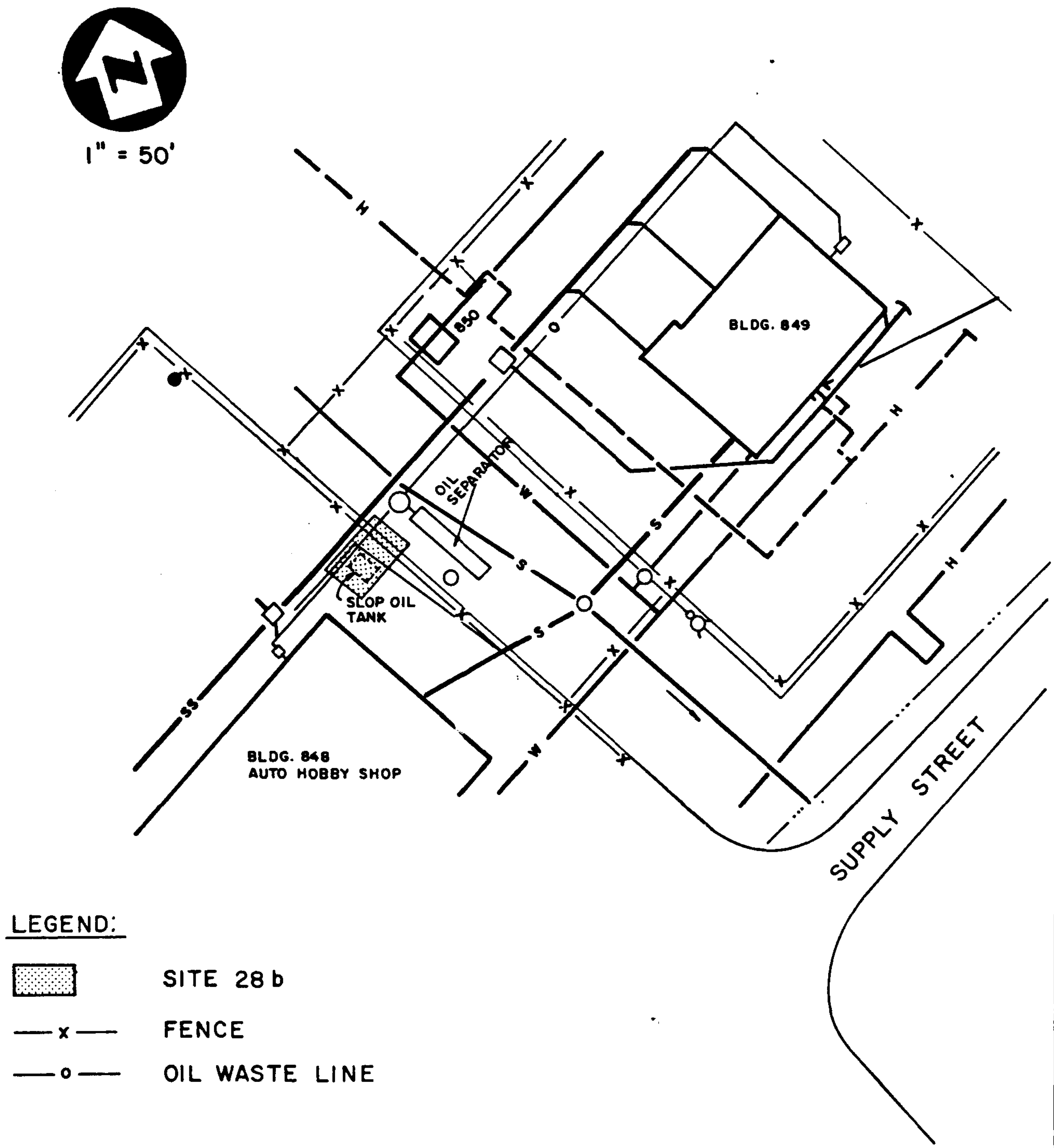



SOURCE: BASE DETAILED SECTIONAL MAPS

# SITE 28a
## ABANDONED GAS STATION
## RICKENBACKER AIR NATIONAL GUARD BASE



ES ENGINEERING—SCIENCE

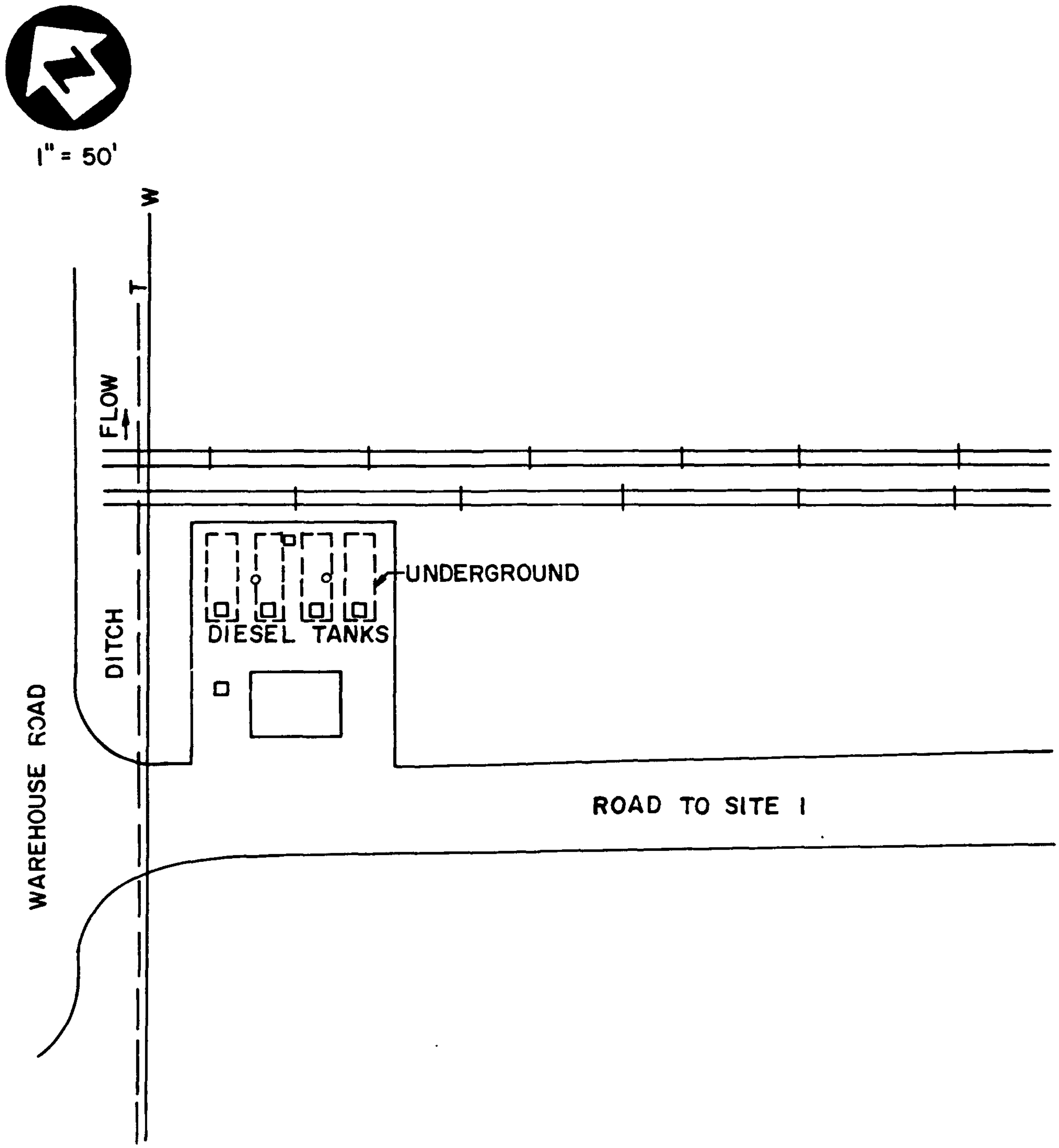



# SITE 28b

## SHOP SLOP OIL TANK

## RICKENBACKER AIR NATIONAL GUARD BASE

SOURCE:
BASE DETAILED SECTIONAL MAPS




SITE 28c

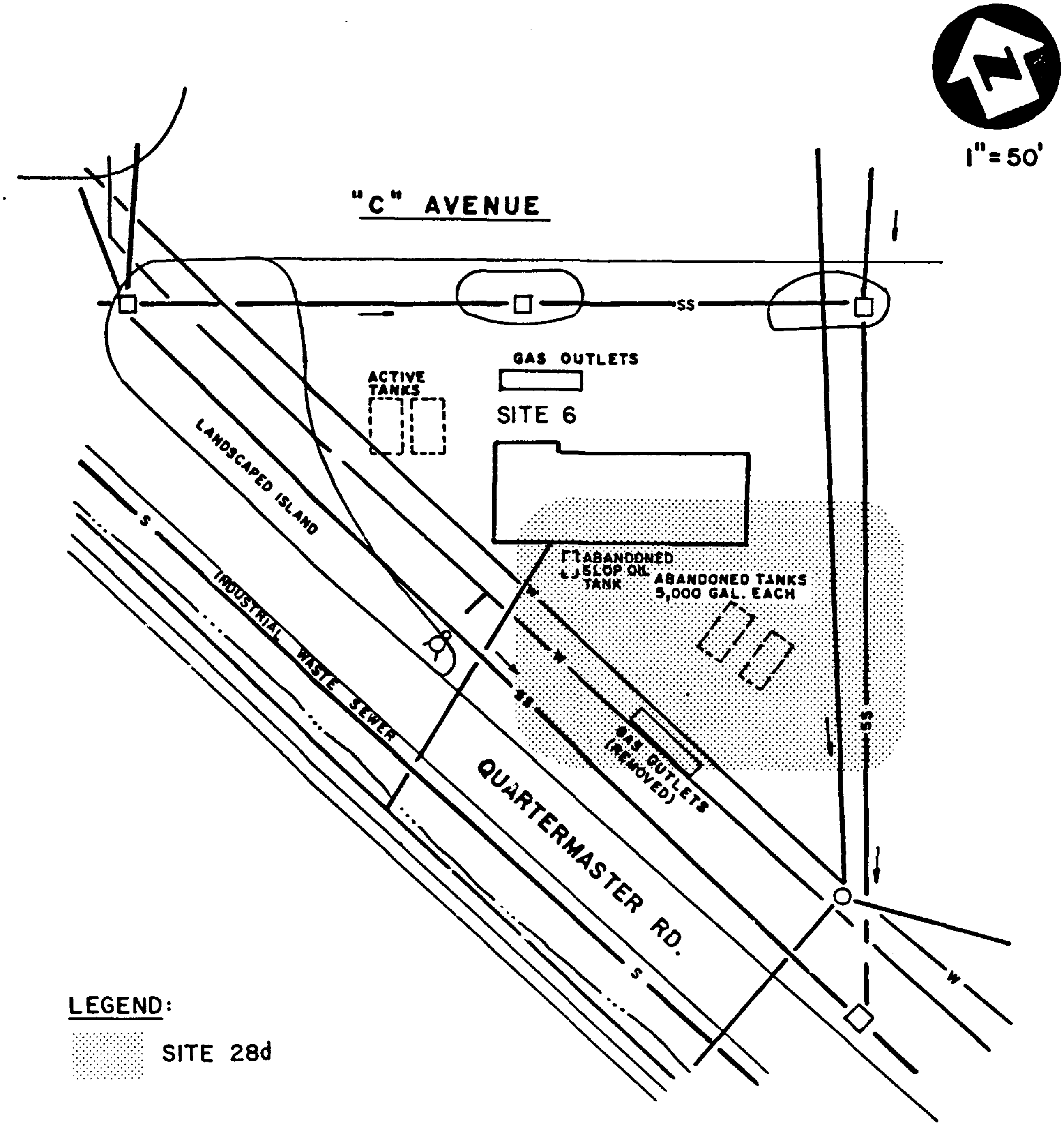
ABANDONED DIESEL FUEL TANKS

NEAR SITE 1

RICKENBACKER

AIR NATIONAL GUARD BASE

SOURCE:
BASE DETAILED
SECTIONAL MAPS




SITE 28d
ABANDONED USTs BEHIND BASE FILLING STATION
RICKENBACKER AIR NATIONAL GUARD BASE

SOURCE:
BASE DETAILED SECTIONAL MAPS.

## SECTION 2
## PROJECT WORK PROGRAM

This section presents the tasks which will be performed for implementation of the Site Inspection/Remedial Investigation/Feasibility Study/Remedial Design (SI/RI/FS/RD) for the 23 sites at Rickenbacker ANGB described in Section 1. The scope of work includes required tasks from preparation of the Work Plan through preparation of plans and specifications for selected remedial measures (if necessary).

### TASK 1 - PREPARE PROJECT WORK PLAN

A Work Plan (this document) will be prepared which will include a scope of work, descriptions of each task, and the schedule for completion of the tasks. The Work Plan will also include a plan for implementation of the Site Inspection and Remedial Investigation, a Health and Safety Plan, a Laboratory Quality Assurance/ Quality Control (QA/QC) Plan, and a Short-Term Community Relations Plan.

### TASK 2 - CONDUCT SITE INSPECTION

The scope of work for the Site Inspection (SI) is described in detail in Section 3 of this document. The purpose of the Site Inspection (SI) is to confirm the presence or absence of contamination of soils, sediment, surface water and groundwater and to assess the potential risks to the environment and human health and welfare. A Site Inspection Report will be prepared at the completion of the SI. This report will summarize the findings of the study and will present recommendations for further work in the Remedial Investigation to determine the extent of contamination.

### TASK 3 - CONDUCT REMEDIAL INVESTIGATION

The scope of work for the Remedial Investigation is described in detail in Section 4 of this document. The purpose of the Remedial Investigation (RI) is to define the extent of contamination detected in the SI and to continue to assess risks to the environment and human health and welfare. A Remedial Investigation Report will be prepared at the completion of the RI. This report will summarize the findings of the study and will present recommendations for further work in the Feasibility Study.

## TASK 4 - FEASIBILITY STUDY

### Screen Control Measures

All control measures, including management methods and technologies relevant to remedying site problems identified in Task 3, will be screened on the basis of feasibility, cost, and environmental and public health effects. Control methods will not be eliminated solely due to non-compliance with regulatory standards because they may be used in conjunction with other control measures to comply with regulatory standards. Innovative, unique, or unproven technologies that are relevant to site problems will be brought to the attention of the NGB. An Alternatives Evaluation Report (AER) will be prepared to include control measures that passed the screening process. The report will also include a discussion of the rationale used for selecting and eliminating all candidate control measures. The report will also identify control measures that should be implemented immediately pending completion of the Feasibility Study Report (FSR), if site conditions warrant such actions. If additional field or technology performance information (including additional site characterization and treatability studies) requirements are identified during the control measure screening process, the NGB will be notified and they will assist in evaluating the additional data needs and will decide if additional studies are warranted.

### Develop Detailed Alternatives

These alternatives will be described in sufficient detail to apply appropriate evaluation and selection criteria. Development of the No Action Alternative will be included. The descriptions of each detailed alternative will include at a minimum:

- o Identification of technologies incorporated;
- o Key design assumptions that will affect performance, implementability, environmental impact, or cost;
- o Measures needed to ensure worker safety during implementation; and
- o Identification of management methods incorporated, such as land use controls, right-of-way acquisition, personnel training and supervision, permanent relocations, and coordination with Federal, State, and local agencies.

Each detailed alternative will include estimates of capital cost, operation and maintenance (O&M) costs, and the results of a present worth analysis.

If additional field or technology performance information requirements are identified during the alternatives development process, the NGB shall be notified and will assist in evaluating the additional data needs.

Evaluate Detailed Alternatives

Each detailed alternative will be evaluated according to five criteria:

- o Engineering feasibility;
- o Cost analysis;
- o Public health analysis;
- o Environmental assessment; and
- o Regulatory requirements.

A narrative matrix that presents the major conclusion of these evaluations will be prepared. An Alternative Evaluation Report (AER) will be prepared to summarize, in the form of a narrative matrix, the evaluation of the detailed alternatives. The AER will also include a table summarizing the cost analysis for each detailed alternative, and the recommended alternative with supporting rationale.

Describe Selected Alternative

The alternative which best meets NGB objectives will be determined and will be described in detail, including the following information.

Engineering Description

- o Conceptual design criteria and rationale
- o Operational description of process units or other facilities
- o Description of operation and maintenance (O&M) requirements
- o Types of equipment required, including approximate capacity, size, and construction materials
- o List of additional engineering data required to proceed with design
- o Preliminary project schedule
- o Conceptual plan view drawing(s) of overall site showing general locations for project actions and facilities

Cost Analysis

- o Capital cost estimates
- o O&M cost estimates and duration of operating expenses

Regulatory Compliance

- o Construction and environmental permit requirements

- o Description of technical requirements for environmental mitigation measures
- o Right-of-way requirements
- o Operating permit requirements

The description will be comprehensive and sufficiently detailed to be used as a baseline document for design and construction of the selected remedial alternative.

Prepare Environmental Assessment

An Environmental Assessment will be prepared which documents all of the environmental analyses conducted in support of FSR preparation. The Environmental Assessment will include summary descriptions of detailed alternatives considered in the FSR, environmental impact analyses of each alternative, either references for all data cited or the actual data that support the analyses, and descriptions of mitigating measures appropriate for each detailed alternative.

Prepare Feasibility Study Report

A Feasibility Study Report (FSR) will be prepared which will document the results of the feasibility study. The FSR will undergo two revisions, an Internal Draft to be reviewed by NGB and Energy Systems and a Draft to be reviewed by regulatory agencies.

## TASK 5 - REMEDIAL DESIGN AND TECHNICAL SUPPORT

Two phases of Remedial Design and Remediation Technical Support will be necessary on this project. The first Remedial Design phase will involve developing plans and specifications for abandoned underground tank removal. The second phase will follow completion of the Feasibility Study Report (FSR) or a decision document with a risk assessment which indicates that development of detailed engineering plans and specifications for site remediation should be initiated.

Abandoned Tank Removal Design and Specifications

Following determination of abandoned tank locations in the SI, plans and specifications (a bid specification package) will be prepared. The package will include plans for tank and associated piping removal, specifications for surrounding soil sampling to determine presence/absence of contamination and available options for disposal of any soils found to be contaminated.

To ensure compliance with the plans and specifications, on-site technical support during tank removal will be provided. This support will include assuring that the laboratory and analysis parameters selected by the Contractor are appropriate, observing and reporting on sampling techniques and reviewing the analytical results.

Remedial Design and Remediation Support

The final design package will include engineering drawings and technical specifications, a detailed construction bid-check estimate, health and safety plan requirements, field and analytical QA/QC requirements, identification of all required permits for completing the work, components of the construction bid package required by the Base Contracting Office, and a schedule for implementation. The design process will include provision for at least three design reviews and subsequent revisions before release of the finished documents. Support to the Base Contracting Officer for selection of the remediation contractor may be supplied if requested by the Energy Systems Project Manager and the Base.

To ensure compliance with the design documents and to assist in determining the correct response to unanticipated findings, if any, on-site technical support to the Base Contracting Office during the remediation process will be provided. This effort will include maintenance of a daily log of events and conditions encountered at the site, submission of periodic progress reports, and preparation of a final report at the conclusion of site activities. The report will summarize what was done and the results of analyses conducted. The report will also include recommendations for the disposition of the site and technical justification. The final report will undergo at least two revisions.

# SECTION 3
# SITE INSPECTION

The primary purpose of the Site Inspection (SI) is to confirm the existence or lack of contamination of the soils, sediments, groundwater and surface water at Rickenbacker Air National Guard Base (the Base) and to assess the potential risks the contamination poses to the environment and human health and welfare. To reach these stated goals, several subtasks are necessary, including evaluation of local hydrogeology, identifying potential receptors and evaluating levels of contamination in the context of federal, state and local standards.

The SI can be divided into three phases: 1) Data Collection, 2) Data Analysis and 3) Reporting. The data collection phase includes installation of monitoring wells, collecting soil and water samples for chemical analysis and conducting soil-gas surveys. Details of the scope and techniques of these investigations are included in this and subsequent sections of this Work Plan.

The data analysis phase overlaps with data collection as many field decisions will be made based on previous results. The goals of the data analysis phase are to: 1) make yes-no decisions on the existence of contamination at each site, 2) evaluate the effect of contamination on the environment and human health and welfare, and 3) reach a decision concerning the continuation of investigations at a site in a Remedial Investigation and/or Feasibility Study.

The reporting phase of the SI involves documenting all activities of the first two phases in a Site Inspection Report (SIR). Included in the SIR will be a water table contour map of the entire Base, estimates of the direction and rate of ground water flow, geologic profiles through several sites, a summary assessment of potential contaminant receptors and impacts and a recommendation for further investigations at specific sites during the RI. If a site is eliminated from the RI, a decision document, including preliminary risk assessments, will be prepared.

The general order of investigation in the data gathering phase of the SI will be: 1) magnetometer surveying, hand boring, ditch bottom and surface sediment sampling and surface water sampling, 2) soil boring and monitor well installation with soil-gas survey screening and 3) groundwater sampling and aquifer testing. Site by site descriptions of the proposed investigations are included later in this Section and summarized in Table 3.1. Detailed descriptions of investigation and sampling techniques are included in Sections 5 and 6 (Field Investigation Procedures and Sampling and Analytical Procedures).

The first part of the field investigations includes magnetometer surveying, hand boring, surface soil sampling, and ditch bottom sediment and surface water sampling. The magnetometer surveying will be done to determine the locations and approximate dimensions of underground storage tanks. Hand borings will be taken at points of visible contamination or vegetative stress and in areas where shallow soil contamination is expected (e.g., Lubricant Storage and Oil Change Area, Sites 21 and 22). Three samples will be collected from each hand boring. Surface soil sampling will be done at sites where surface contamination by compounds with low mobility is suspected (pesticides and PCBs at Sites 1 and 26). Ditch bottom sediment samples will be taken from drainage ditches where contamination is suspected. Surface water samples will be collected, whenever water is present, at the ditch bottom sampling locations (See Sections 5 and 6 for sampling details).

The second part of field investigations includes drilling soil borings, installing monitoring wells and conducting soil-gas surveys. Thirty-eight monitoring wells screened in the upper aquifer are planned for the 28 sites. The upper aquifer is defined as the shallowest saturated sediments encountered in a given boring which, in the judgment of the on-site geologist, are capable of transmitting water. Two soil samples from each well boring will be submitted for chemical analysis. Sections 5 and 6 contain sampling technique details.

Two additional monitoring wells will be installed within the Base water supply well field. One of the wells will be screened in the upper aquifer. The other will be screened in the second aquifer. The second aquifer will be determined in the field by the well-site geologist. No other second aquifer wells are planned for the SI. Investigation of possible contamination of aquifers below the upper aquifer will be done during the RI.

Because of a lack of data on the upper aquifer, 17 wells will be installed in an initial round of well drilling at 16 locations throughout the Base (Figure 3.1). These initial well locations have been selected with the objective of defining the ground-water gradient, so placement of subsequent "up" and "down" gradient wells can be done with greater confidence. The subsurface soil and hydrogeologic information obtained from the initial wells will also be utilized to design a soil-gas survey program.

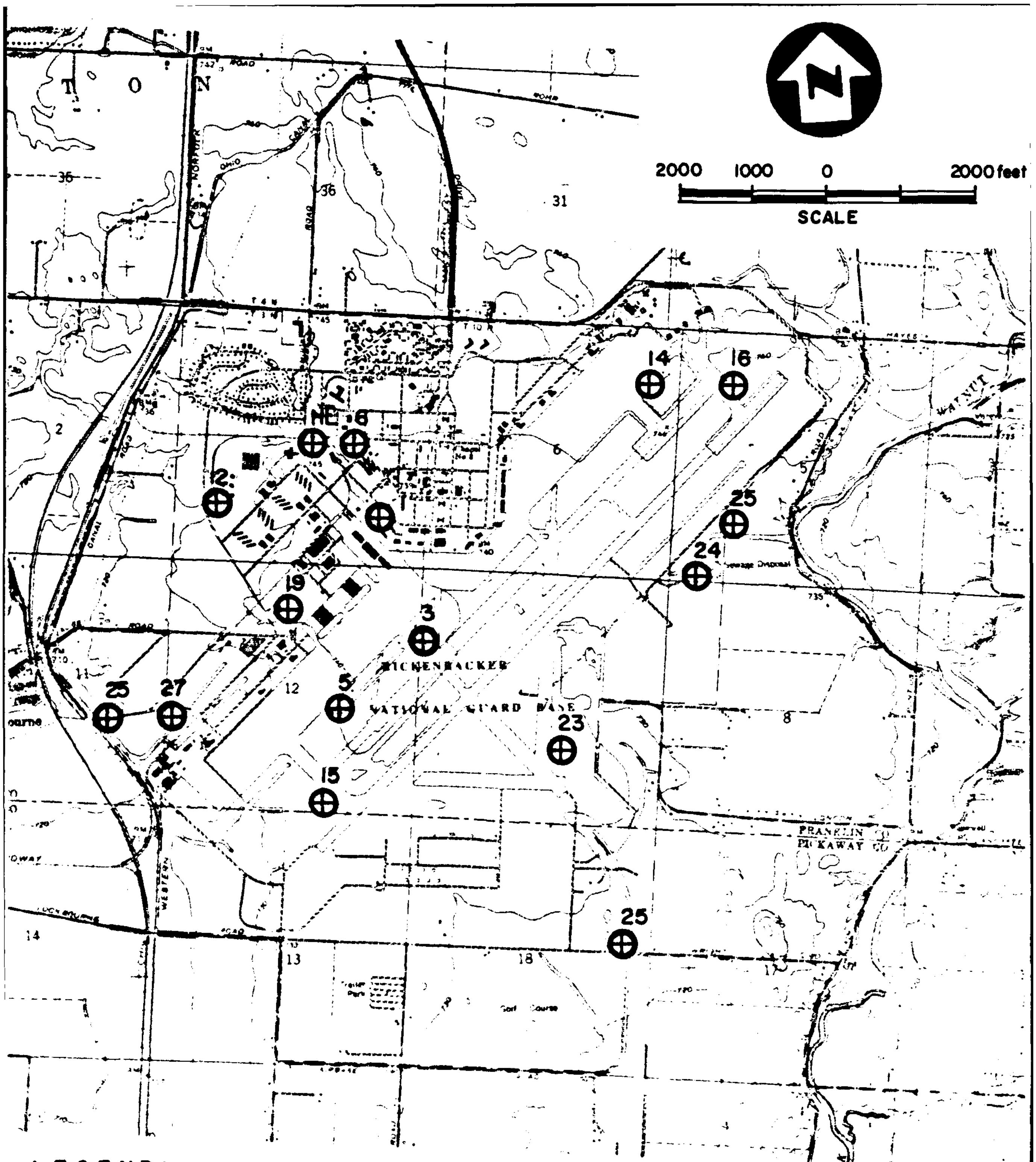
Several factors contribute to the validity of soil-gas survey results. Depth to contaminated water, shallow stratigraphy and the characteristics of the contaminant contribute to the observed soil-gas concentrations. Consequently, an understanding of the hydrogeology and expected contaminants at a site is necessary before designing a soil-gas survey program.

The volatile compounds of interest at the JP-4 spill sites (benzene, toluene and xylenes) are affected by biological degradation in shallow soils, sometimes resulting in false negative soil-gas survey results, especially with older contamination. Impermeable clay layers above contaminated water also can contribute to false negative results by trapping water which impedes the upward migration of volatile gases. At sites where more than one well is planned, the soil-gas and initial well results will be used to finalize additional well and boring locations.

Results of the surface sediment, hand boring and ditch sampling portion of the field investigation will also be used to maximize the effective placement of wells and borings. Well drilling, surveying and soil-gas surveying will be coordinated to reduce driller mobilization and standby time.

Ground water sampling will be done at each site with chemical analyses chosen based on expected contaminants. Justification for choice of analysis is included in the following site by site explanations and summarized in Table 3.1.

Slug tests will be performed on each well to determine hydraulic conductivity, estimate ground-water flow rates and make preliminary estimates of aquifer yields. The tests are planned for all wells in order to document lateral variability in the shallow aquifer.




LEGEND:

HL ⊕ MONITOR WELLS AT HYDROGEOLOGIC CONTROL SITE

6 ⊕ INITIAL MONITOR WELL LOCATION WITH SITE NUMBER

SOURCE:

USGS LOCKBOURNE, OHIO
7.5 MIN. QUADRANGLE

# LOCATIONS OF INITIAL MONITOR WELLS
## RICKENBACKER AIR NATIONAL GUARD BASE COLUMBUS, OHIO

At sites where contamination is detected, an inventory of underground utility trenches and trench fill material will be done using Base records to identify potential contaminant migration pathways.

## SITE BY SITE SCOPE OF SITE INSPECTION

Table 3.1 summarizes the activities and analyses described in the following descriptions. The site drawings (Figures 3.2 - 3.23) include the locations of underground utilities because the backfill around such utility lines often act as contaminant migration pathways. Table 3.2 is a legend for the utility drawings. Sections 5 and 6 include more detailed descriptions of field methods and sampling techniques.

SITE 1 - Hazardous Waste Storage Area: A magnetometer survey will be conducted over the entire area to determine the location and dimension of any UST. Surface soil samples will be collected from the drum storage area enclosed by the fence (Figure 3.2). Surface sampling is appropriate because the types of materials reportedly stored here (PCBs, pesticides and herbicides) are relatively immobile, tending to remain in the upper soil horizon. Soil samples from hand borings will be taken at areas where vegetative stress or surface staining suggests contamination may have penetrated deeper into the soil. These soil samples will be analyzed for pesticides, herbicides, PCB, priority pollutant metals and volatile and semi-volatile organics.

One monitor well to the shallow aquifer will be installed near the hazardous waste tanks to detect possible contamination from the tanks. A ten point soil-gas survey will be conducted after initial well installation. Two additional monitor wells will be installed at locations based on results of the shallow soil sampling, the soil-gas survey and the preliminary hydrogeologic evaluation. One well will be placed upgradient and one at the downgradient edge of the contaminant plume (if any) indicated by the preliminary surveys. Selected soil samples collected while drilling the wells and ground water sampled after well installation will be analyzed for priority pollutants including organic and inorganic constituents.

SITE 2 - JP-4 Tank Farm: The initial well at this site will be installed outside the southwest corner of the diked enclosure (Figure 3.3). This location was chosen because dike-water drainage from the tank cells is through the drainage ditch on the south side of the cells. A ten-point

## TABLE 3.1
## SUMMARY OF SITE INSPECTION PROGRAM

| Site | Field Activity | # Field Samples | Matrix | Analyses* |
|---|---|---|---|---|
| **#1** | **Hazardous Waste Storage Area:** | | | |
| | - Magnetometer Survey to identify locations of underground tanks | -- | -- | -- |
| | - Sixteen surface soil samples from the Drum Storage Area (Compositing adjacent samples) | 8 | Soil | BFGK |
| | - Six Hand-borings in the Drum Storage Area, samples from adjacent borings may be composited | 18 | Soil | A |
| | - Three 2" wells screened in the upper aquifer, near the Storage Building (Bldg. 560). | 6 | Soil | A |
| | - Ten soil-gas survey points | -- | -- | -- |
| | - Ground-Water sampling | 3 | Water | A |
| | - Slug tests in three wells | -- | -- | -- |
| **#2** | **JP-4 Tank Farm:** | | | |
| | - Three 2" wells to upper aquifer | 6 | Soil | E |
| | - Ten soil-gas survey points | -- | -- | -- |
| | - Ground-Water sampling | 3 | Water | E |
| | - Slug tests in three wells | -- | -- | -- |
| **#3** | **JP-4 Pumping Station 4** | | | |
| | - Two 2" wells to upper aquifer within spill area | 4 | Soil | E |
| | - One boring to water table or 15' | 2 | Soil | E |
| | - Ten soil-gas survey points | -- | -- | -- |
| | - Ground-Water sampling | 2 | Water | E |
| | - Slug test two wells | -- | -- | -- |
| **#4** | **JP-4 Pumping Station 5** | | | |
| | - One 2" well to upper aquifer | 2 | Soil | E |
| | - One boring to water table or 15' (or optional well) | 2 | Soil | E |
| | - Ten soil-gas survey points | -- | -- | -- |
| | - Ground-Water sampling | 1 | Water | E |
| | - Slug tests of one well | -- | -- | -- |
| **#5** | **Lateral Safety Zone Spill Area** | | | |
| | - Two 2" wells to upper aquifer | 4 | Soil | E |
| | - Two borings to water table or 15' | 4 | Soil | E |
| | - Thirty soil-gas survey points | -- | -- | -- |
| | - Ground-Water sampling | 2 | Water | E |
| | - Slug tests in two wells | -- | -- | -- |

* EXPLANATION

**A** = Priority Pollutant Scan (Method 8240, 8270, 8080 & Metals)
**B** = Organochlorine Pesticides and Chlorinated Phenoxy Herbicides (Method 8080 & 8150)
**C** = Aromatic Volatile Organics (Method 8020)
**D** = Halogenated Volatile Organics (Method 8010)
**E** = Petroleum Hydrocarbons (Method 418.1)
**F** = Priority Pollutant Metals
**G** = PCB (Method 8080)
**H** = Sulfates (Method 9038), Alkalinity and Acidity
**I** = Lead (Method 7420/ 7421)
**J** = Methyl Ethyl Ketone as an additional compound in organic analyses
**K** = Semi-Volatile Organics (Base/ Neutral and Acid Extractables) (Method 8270)

**TABLE 3.1**
**(continued)**

**SUMMARY OF SITE INSPECTION PROGRAM**

| Site | Field Activity | # Field Samples | Matrix | Analyses* |
|---|---|---|---|---|
| **#6** | **Underground Storage Tanks at the Base Filling Station:** | | | |
| | - One 2" well to upper aquifer | 2 | Soil | EI |
| | - Ten soil-gas survey points | -- | -- | -- |
| | - Ground-Water sampling | 1 | Water | EI |
| | - Slug test in one well | -- | -- | -- |
| **#9** | **Salvage Yard:** | | | |
| | - Ten Hand-Borings around the pavement and within old foundations | 30 | Soil | A |
| | - Two 2" wells to upper aquifer | 4 | Soil | A |
| | - Eight soil-gas survey points | -- | -- | -- |
| | - Ground-Water sampling | 2 | Water | A |
| | - Slug tests in two wells | -- | -- | -- |
| **#10** | **JP-4 Fuel Line Rupture:** | | | |
| | - One 2" well to upper aquifer (optional) | 2 | Soil | E |
| | - Six soil-gas survey points | -- | -- | -- |
| | - Ground-Water sampling | 1 | Water | E |
| | - Slug test one well | -- | -- | -- |
| **#12** | **Old Drum Storage Area:** | | | |
| | - Ten Hand-Borings along edges of pavement, composite by 2's | 15 | Soil | CDEJ |
| | - One 2" well to upper aquifer | 2 | Soil | CDEJ |
| | - Ten soil-gas survey points | -- | -- | -- |
| | - Ground-Water sampling | 1 | Water | CDEJ |
| | - Slug tests in one well | -- | -- | -- |
| **#14** | **KC 135 Crash Site:** | | | |
| | - One 2" well to upper aquifer | 2 | Soil | E |
| | - Three Borings to 15' or Water Table | 6 | Soil | E |
| | - Ten soil-gas survey points | -- | -- | -- |
| | - Ground-Water sampling | 1 | Water | E |
| | - Slug test in one well | -- | -- | -- |

* EXPLANATION

**A** = Priority Pollutant Scan (Method 8240, 8270, 8080 & Metals)
**B** = Organochlorine Pesticides and Chlorinated Phenoxy Herbicides (Method 8080 & 8150)
**C** = Aromatic Volatile Organics (Method 8020)
**D** = Halogenated Volatile Organics (Method 8010)
**E** = Petroleum Hydrocarbons (Method 418.1)
**F** = Priority Pollutant Metals
**G** = PCB (Method 8080)
**H** = Sulfates (Method 9038), Alkalinity and Acidity
**I** = Lead (Method 7420/ 7421)
**J** = Methyl Ethyl Ketone as an additional compound in organic analyses
**K** = Semi-Volatile Organics (Base/ Neutral and Acid Extractables) (Method 8270)

**TABLE 3.1**
**(continued)**

**SUMMARY OF SITE INSPECTION PROGRAM**

| Site | Field Activity | # Field Samples | Matrix | Analyses* |
|---|---|---|---|---|
| **#15 & 16 Fuel Dump Pits:** | | | | |
| | - Four 2" wells to upper aquifer, two per pit | 8 | Soil | EI |
| | - Four borings to 15' or the water table, two per pit, if contamination is detected | 8 | Soil | EI |
| | - Twenty soil-gas survey points per pit | -- | -- | -- |
| | - Ground-Water sampling | 4 | Water | EI |
| | - Slug tests in four wells | -- | -- | -- |
| **#17 Old Entomology Laboratory:** | | | | |
| | - Ten Hand-Borings around perimeter of building, composite by 2's | 15 | Soil | B |
| | - One 2" well to upper aquifer | 2 | Soil | B |
| | - Ground-Water sampling | 1 | Water | B |
| | - Slug test in one well | -- | -- | -- |
| **#19 & 20 North and South Coal Piles:** | | | | |
| | - Four 2" wells to upper aquifer located on margin | 8 | Soil | EFHK |
| | of adjacent drainage ditches | -- | -- | -- |
| | - Eight Borings to 15' or the water table, four per pile | 16 | Soil | EFHK |
| | - Surface water sampling from ditches | 4 | Water | EFHK |
| | - Ditch bottom sediment samples | 4 | Soil | EFHK |
| | - Nineteen soil-gas survey points | -- | -- | -- |
| | - Ground-Water sampling | 4 | Water | EFHK |
| | - Slug tests in four wells | -- | -- | -- |
| **#21 Leaking Drum and Oil Change Area at Water Treatment Plant:** | | | | |
| | - Six Hand-Borings at surface stained locations | 18 | Soil | CEF |
| **#22 Heating Plant Lube Oil Drum Storage Area:** | | | | |
| | - Four Hand-Borings at surface stained locations | 12 | Soil | CDE |

* EXPLANATION
**A** = Priority Pollutant Scan (Method 8240, 8270, 8080 & Metals)
**B** = Organochlorine Pesticides and Chlorinated Phenoxy Herbicides (Method 8080 & 8150)
**C** = Aromatic Volatile Organics (Method 8020)
**D** = Halogenated Volatile Organics (Method 8010)
**E** = Petroleum Hydrocarbons (Method 418.1)
**F** = Priority Pollutant Metals
**G** = PCB (Method 8080)
**H** = Sulfates (Method 9038), Alkalinity and Acidity
**I** = Lead (Method 7420/ 7421)
**J** = Methyl Ethyl Ketone as an additional compound in organic analyses
**K** = Semi-Volatile Organics (Base/ Neutral and Acid Extractables) (Method 8270)

**TABLE 3.1**
**(continued)**

**SUMMARY OF SITE INSPECTION PROGRAM**

| Site | Field Activity | # Field Samples | Matrix | Analyses* |
|---|---|---|---|---|
| **#23** | **Fire Training Area:** | | | |
| | - Four 2" wells to upper aquifer | 8 | Soil | A |
| | - Eight borings to 15' or the water table | 16 | Soil | A |
| | - Twenty soil-gas survey points | -- | -- | -- |
| | - Ground-Water sampling | 4 | Water | A |
| | - Slug tests in four wells | -- | -- | -- |
| **#24** | **Sewage Treatment Plant Sludge Beds:** | | | |
| | - Three 2" wells to upper aquifer | 6 | Soil | BGF |
| | - Four hand borings in sludge spreading area (composite by 2's) | 6 | Soil | BGF |
| | - Ground-Water sampling | 3 | Water | A |
| | - Slug tests in two wells | -- | -- | -- |
| | - Sludge samples from each bed, composited by 2's | 5 | Soil | BGF |
| **#25** | **Storm Drainage Ditch System:** | | | |
| | - Four 2" wells to upper aquifer at separators | 8 | Soil | A |
| | - Thirty ditch-bottom sediment samples @ confluences of open drainage ditches & at sites of suspected contamination. | 30 | Soil | A |
| | - Surface water sampling at ditch-bottom sediment sampling sites | 30 | Water | A |
| | - One Hundred soil-gas survey points | -- | -- | -- |
| | - Ground-Water sampling | 4 | Water | A |
| | - Slug tests in four wells | -- | -- | -- |
| **#26** | **Electrical Transformer Storage Yard:** | | | |
| | - Twenty surface soil samples in equal spaced grid | 20 | Soil | G |
| **#27** | **Drainage Ditch Near Landfill:** | | | |
| | - One 2" well to upper aquifer | 2 | Soil | A |
| | - Two ditch-bottom sediment samples | 2 | Soil | A |
| | - Two surface water samples at ditch-bottom sampling locations | 2 | Water | A |
| | - Five soil-gas survey points | -- | -- | -- |
| | - Ground-Water sampling | 1 | Water | A |
| | - Slug tests in one well | -- | -- | -- |

* EXPLANATION
**A** = Priority Pollutant Scan (Method 8240, 8270, 8080 & Metals)
**B** = Organochlorine Pesticides and Chlorinated Phenoxy Herbicides (Method 8080 & 8150)
**C** = Aromatic Volatile Organics (Method 8020)
**D** = Halogenated Volatile Organics (Method 8010)
**E** = Petroleum Hydrocarbons (Method 418.1)
**F** = Priority Pollutant Metals
**G** = PCB (Method 8080)
**H** = Sulfates (Method 9038), Alkalinity and Acidity
**I** = Lead (Method 7420/ 7421)
**J** = Methyl Ethyl Ketone as an additional compound in organic analyses
**K** = Semi-Volatile Organics (Base/ Neutral and Acid Extractables) (Method 8270)

**TABLE 3.1**
**(continued)**

**SUMMARY OF SITE INSPECTION PROGRAM**

| Site | Field Activity | # Field Samples | Matrix | Analyses* |
|---|---|---|---|---|
| **Additional Hydrogeologic Control (NW Quadrant of Base):** | | | | |
| | - Two 4" wells in well field area, one to upper aquifer and one to second aquifer | 4 | Soil | AH |
| | - Ground-Water sampling | 2 | Water | AH |
| | - Slug test in two wells | -- | -- | -- |
| | - Installation of continuous water level recorders to monitor fluctuations associated w/Base water-supply well pumping. | -- | -- | -- |

* EXPLANATION
**A** = Priority Pollutant Scan (Method 8240, 8270, 8080 & Metals)
**B** = Organochlorine Pesticides and Chlorinated Phenoxy Herbicides (Method 8080 & 8150)
**C** =Aromatic Volatile Organics (Method 8020)
**D** = Halogenated Volatile Organics (Method 8010)
**E** = Petroleum Hydrocarbons (Method 418.1)
**F** = Priority Pollutant Metals
**G** = PCB (Method 8080)
**H** = Sulfates (Method 9038), Alkalinity and Acidity
**I** = Lead (Method 7420/7421)
**J** = Methyl Ethyl Ketone as an additional compound in organic analyses
**K** = Semi-Volatile Organics (Base/Neutral and Acid Extractables) (Method 8270)

TABLE 3.2

# UTILITY LEGEND FOR SITE PLANS

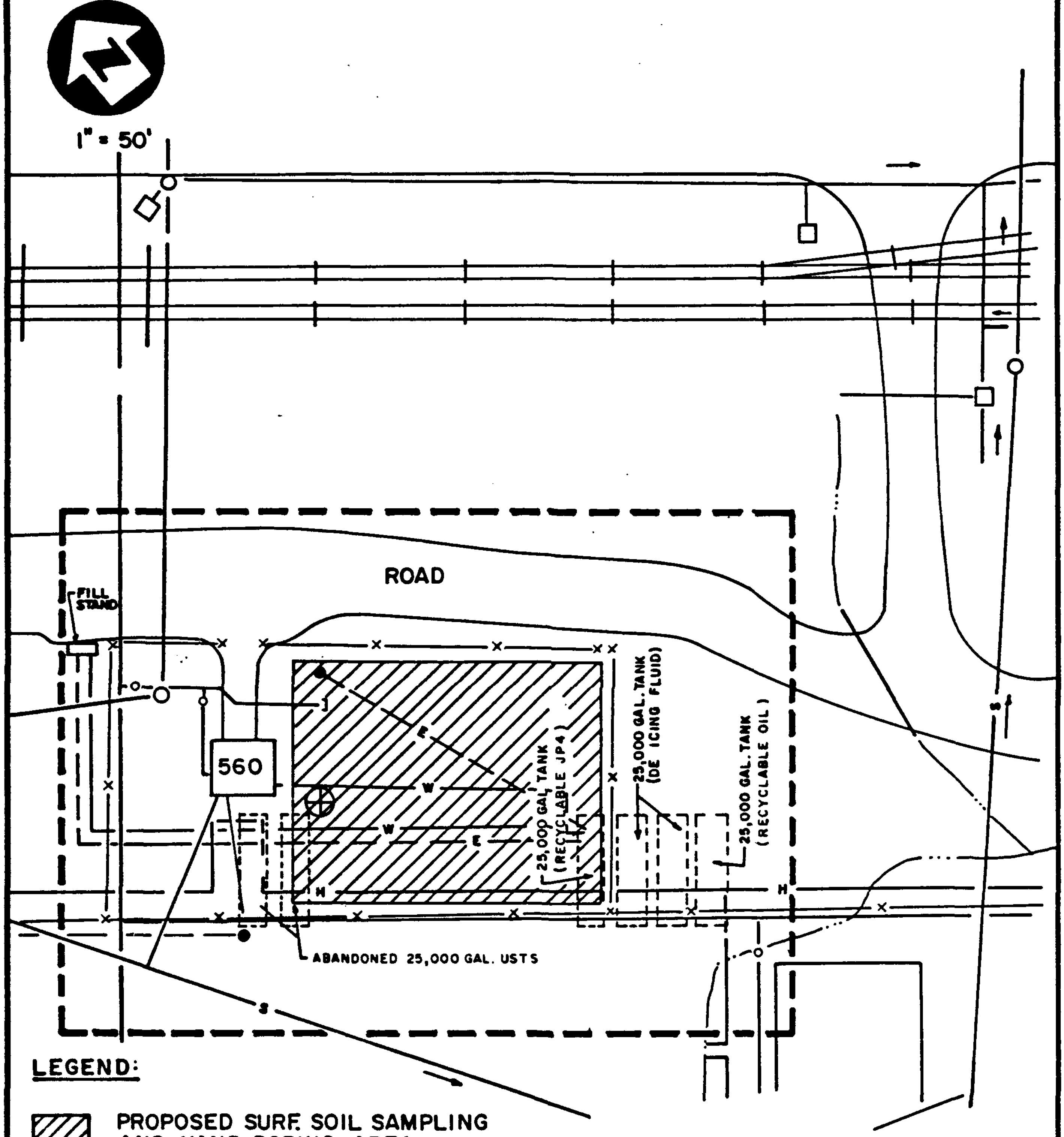
## RICKENBACKER AIR NATIONAL GUARD BASE
## COLUMBUS, OHIO

### ABOVE GROUND UTILITIES AND FEATURES:

| | |
|---|---|
| ╪══╪══╪ | RAILROAD |
| O | MANHOLE |
| o | VALVE |
| ——x—— | FENCE |
| ● | RUNWAY / TAXIWAY LIGHT |
| Ω | FIRE HYDRANT |
| ——H—— | HEAT LINE |
| ——JF—— | JET FUEL LINE |
| △ | ELECTRICAL TRANSFORMER |

### UNDERGROUND UTILITIES:

| | |
|---|---|
| ——H—— (dashed) | HEAT LINE |
| ——JF—— (dashed) | JET FUEL LINE |
| ——E—— (dashed) | ELECTRIC LINE |
| ——T—— (dashed) | TELEPHONE LINE |
| ——W—— | WATER LINE |
| ——S—— | SANITARY SEWER |
| ——SS—— | STORM SEWER |
| □ | JUNCTION BOX |



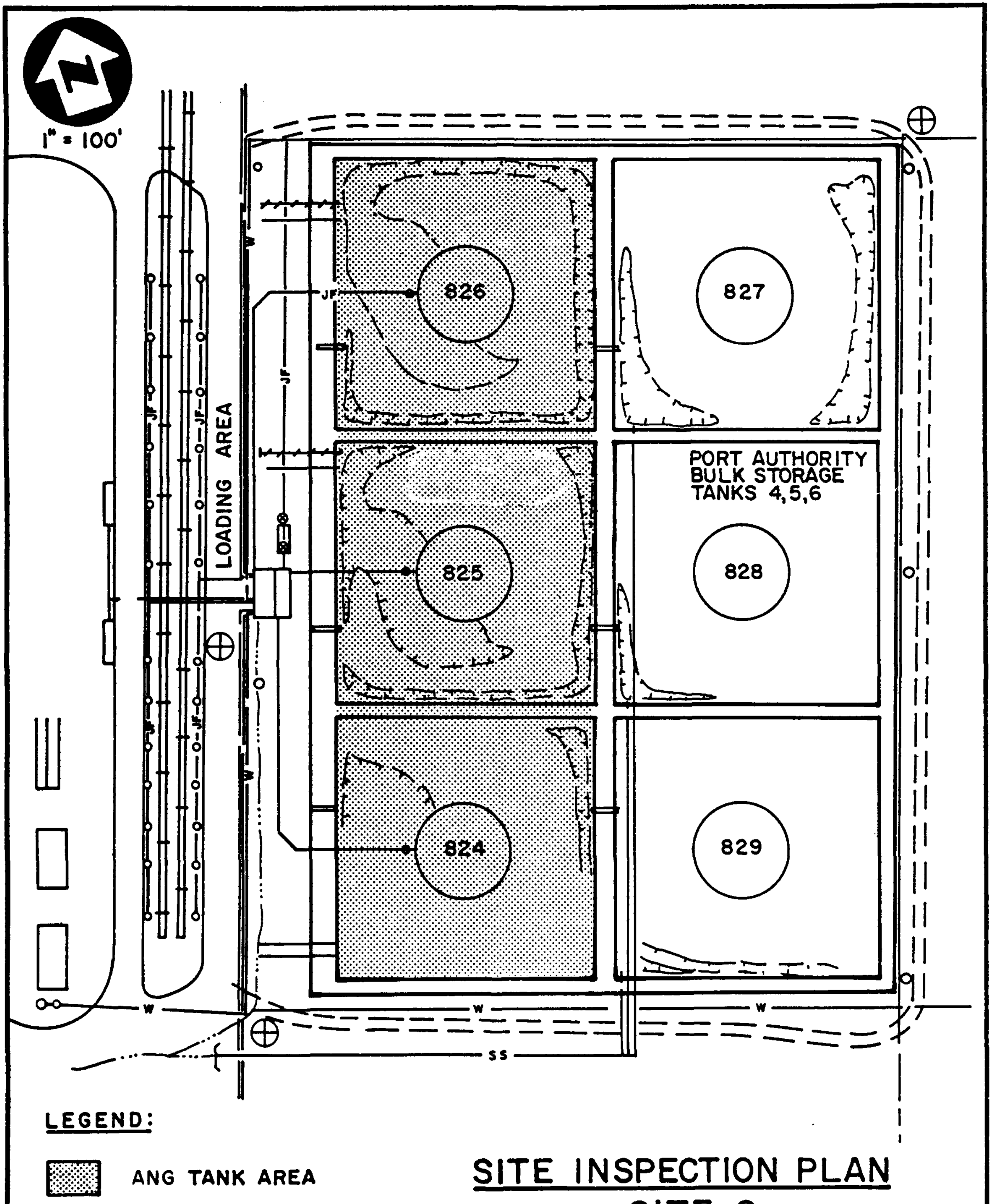

LEGEND:

- PROPOSED SURF. SOIL SAMPLING AND HAND BORING AREA
- APPROX. OUTLINE OF SOIL-GAS SURVEYS
- ⊕ PROPOSED MONITOR WELL

# SITE 1
## HAZARDOUS WASTE STORAGE AREA
## RICKENBACKER AIR NATIONAL GUARD BASE

SOURCE:
BASE DETAILED SECTIONAL MAPS

FIGURE 3.3




## SITE INSPECTION PLAN
## SITE 2
## BULK STORAGE TANK FARM
## RICKENBACKER
## AIR NATIONAL GUARD BASE

SOURCE:
BASE DETAILED
SECTIONAL MAPS

soil-gas survey will be conducted over the site to estimate the extent of contamination (if any). Two additional wells will be installed following the soil-gas survey. One well will be placed in an upgradient position and one at the point of highest soil-gas contamination. If no contamination is detected during the soil-gas survey, the well will be placed at the fuel loading area, a likely location of fuel spills. JP-4 is the only reported potential contaminant at this site so analysis for petroleum hydrocarbons will be done on soil and ground-water samples.

SITE 3 - Fuel Pumping Station 4: An initial well will be installed in the area of reported fuel ponding on the ground surface (Figure 3.4). If no contamination is detected, a ten-point soil-gas survey will be conducted to support the conclusion that a clean condition exists. If contamination is detected in the well, the soil-gas survey will be used to define the extent of the plume. The second well will be installed at the point of highest soil-gas concentration. If the soil-gas indicates a clean condition, an additional boring will be made down-gradient from the USTs, a likely contamination location.

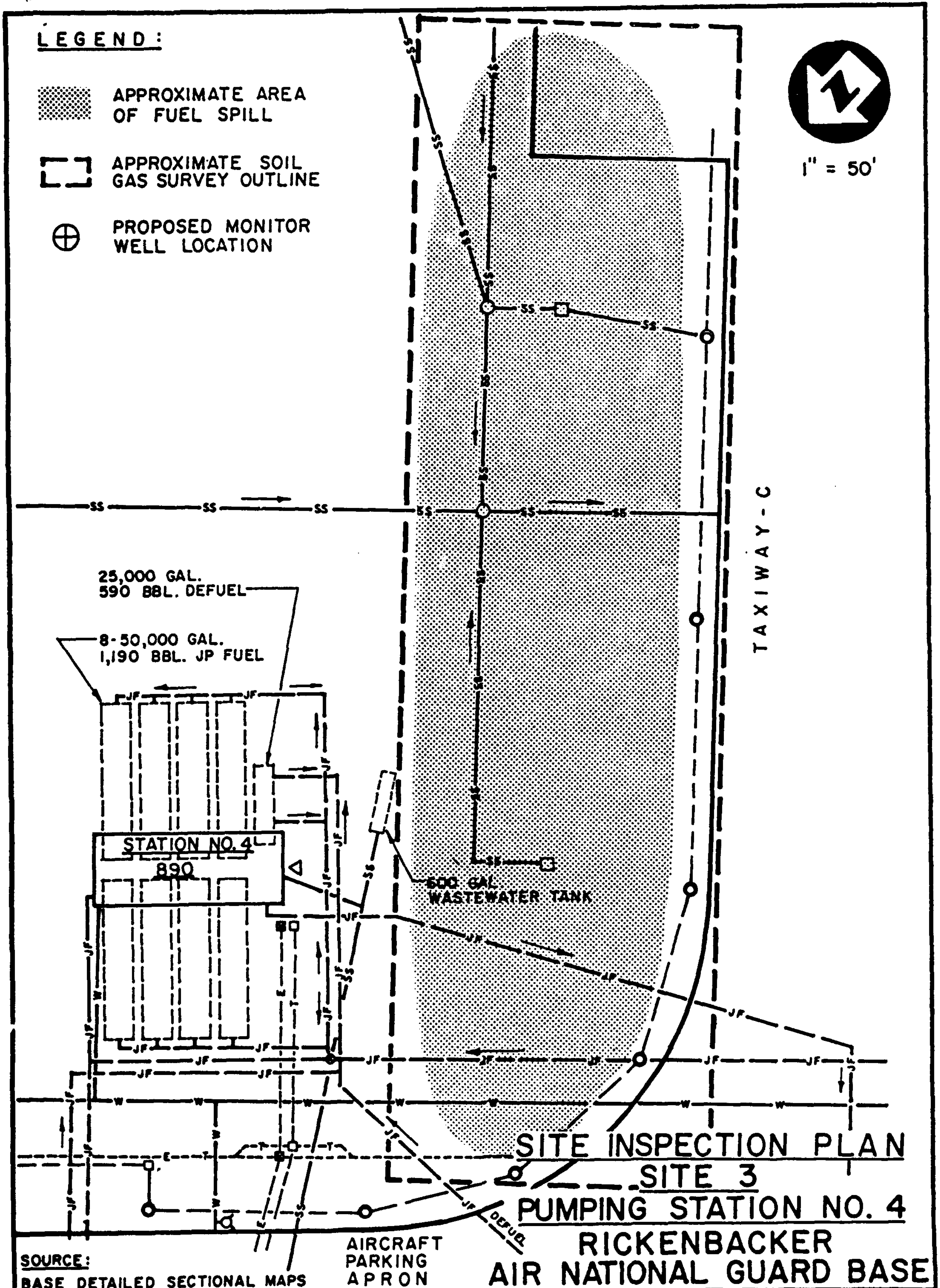
JP-4 is the only known potential contaminant at this site so the soil and ground-water samples will be analyzed for petroleum hydrocarbons.

SITE 4 - Fuel Pumping Station 5: A ten-point soil-gas survey will be conducted centering on the USTs where the reported over-fill loss occurred. A monitoring well will be installed, screened spanning the shallow aquifer, in the area of highest soil-gas response. If no contamination is indicated by soil-gas, the well will be located as indicated in Figure 3.5, down-gradient from the storage tanks, to detect possible contamination from the USTs. If contamination is detected in the first well, an additional well will be installed at a downgradient position.

JP-4 is the only known potential contaminant at this site so soil and ground-water samples will be analyzed for total petroleum hydrocarbons.

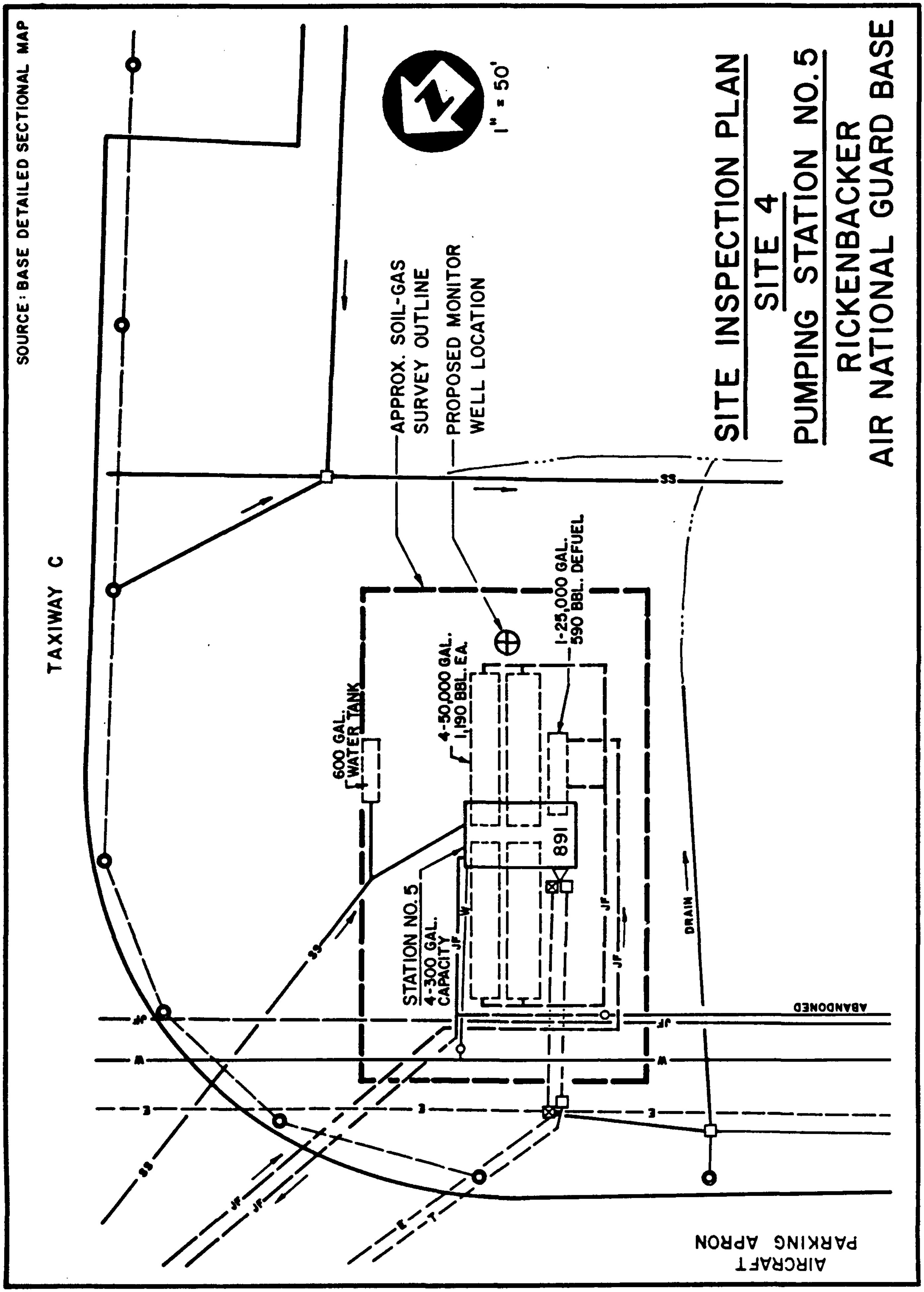
SITE 5 - Lateral Safety Zone Spill Area: An initial monitor well will be installed within the area where fuel reportedly ponded after the spill to evaluate the effect of the spill on soils and ground-water (Figure 3.6). Following installation of the initial well, a thirty-point soil-gas survey will be conducted to define a contaminant plume or substantiate a lack of contamination. If contamination is indicated by the soil-gas survey, an additional well and two borings will be placed to define the extent of soil

FIGURE 3.4

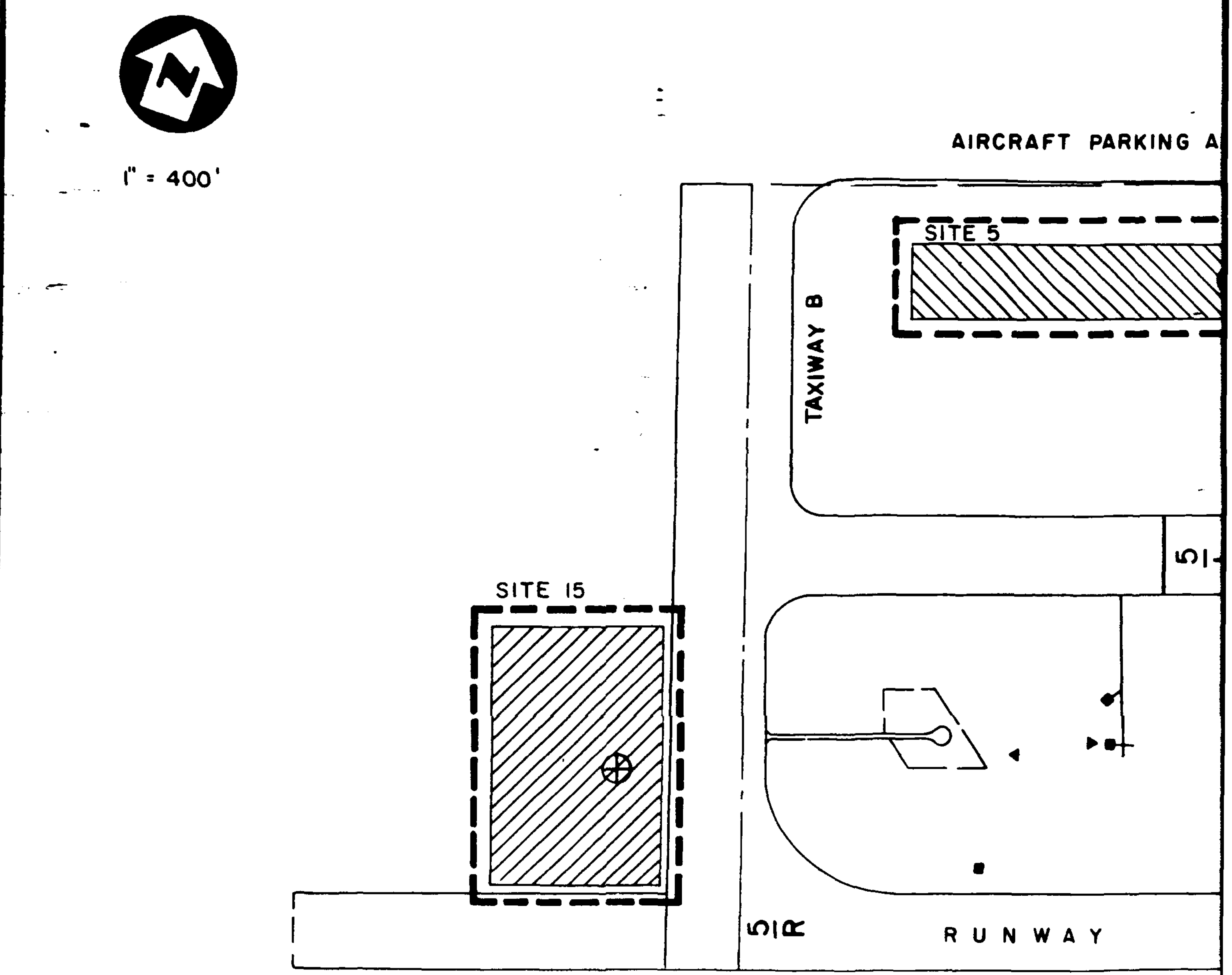



SITE INSPECTION PLAN
SITE 3
PUMPING STATION NO. 4
RICKENBACKER
AIR NATIONAL GUARD BASE

FIGURE 3.5




SITE INSPECTION PLAN
SITE 4
PUMPING STATION NO. 5
RICKENBACKER
AIR NATIONAL GUARD BASE




LEGEND:

⊕ PROPOSED MONITOR WELL LOCATION

APPROX. SOIL-GAS SURVEY OUTLINE

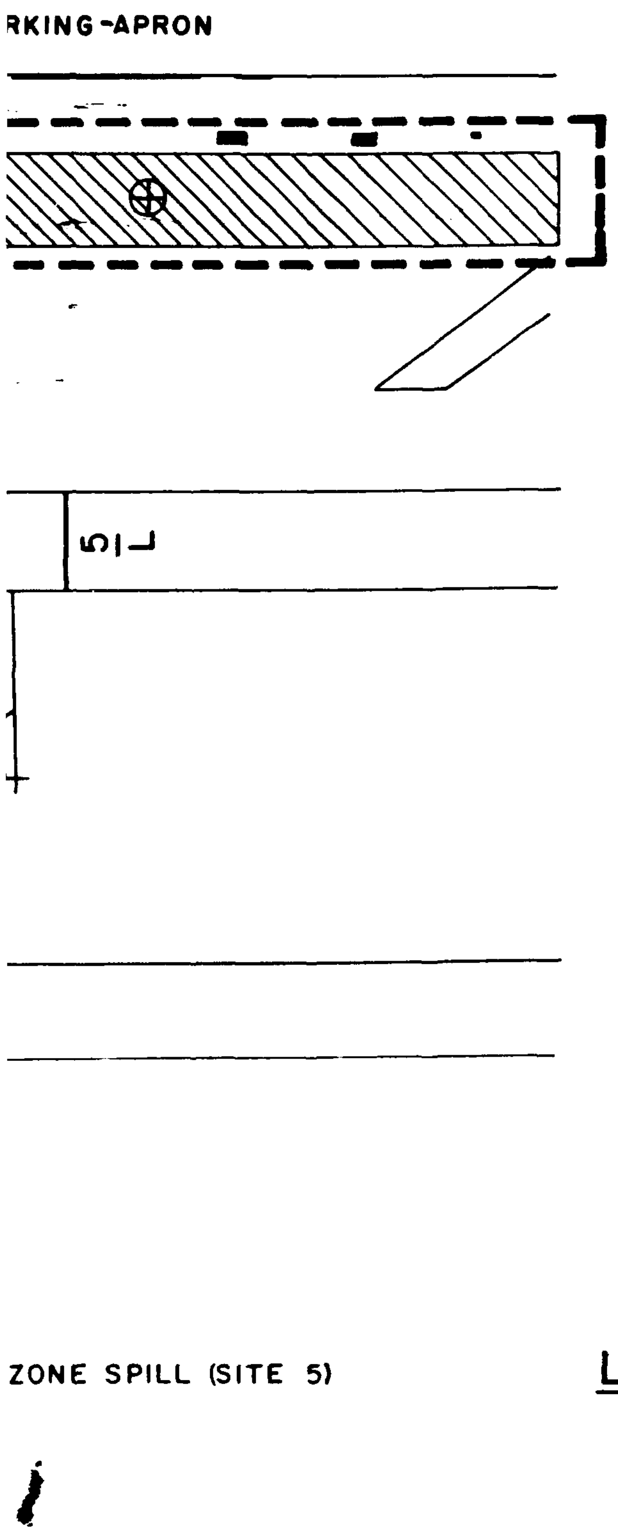
APPROXIMATE AREA OF LATERAL SAFETY ZONE SP

SOUTHWEST FUEL DUMP PIT (SITE 15)

SOURCE

BASE STORM DRAINAGE SYSTEM PLAN

FIGURE 3.6




SITE INSPECTION PLAN
SITES 5 AND 15
LATERAL SAFETY ZONE SPILL AND
SOUTHWEST FUEL DUMP PIT
RICKENBACKER
AIR NATIONAL GUARD BASE

and ground-water contamination. If the soil-gas survey is negative, the borings and well will be placed along the length of the low portion of the spill area to verify the absence of contamination.

As in Sites 3 and 4, selected soil samples and ground water will be analyzed for petroleum hydrocarbons.

SITE 6 - *Underground Storage Tanks at the Base Filling Station*: An initial well will be installed between the active tank pit and the pump islands to detect soil and ground-water contaminantion from the tanks and gasoline lines (Figure 3.7). A ten-point soil-gas survey will be conducted to substantiate the results of the soil and water sampling. The tank pit monitoring well will be used as a point of control to determine presence or absence of petroleum product on the water table.

The past and current sale of leaded and unleaded gasoline at this site warrant analysis of selected soil samples and ground water for petroleum hydrocarbons and lead.

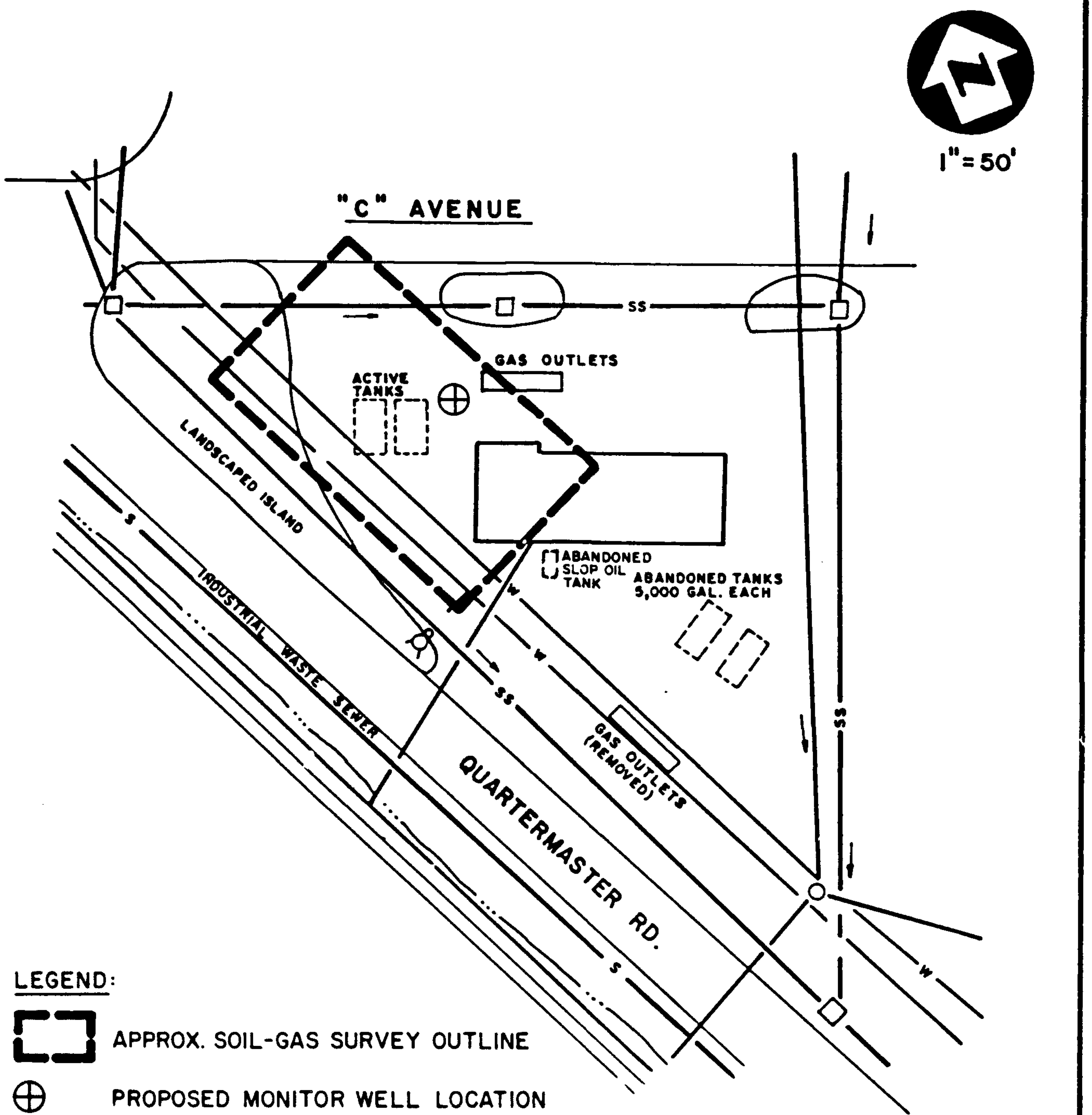
SITE 9 - Salvage yard: Ten hand borings will be made around the edges of the pavement and the old foundations to detect contaminants that may have washed onto the soil (Figure 3.8). One monitor well will be installed in the area of highest contamination as indicated by the hand boring samples to evaluate potential deeper soil and ground-water contamination. An eight-point soil-gas survey will be conducted to screen the area for contamination by volatile compounds. A second monitor well will be placed in an area of contamination indicated by the soil-gas results.

The selected soil samples and ground water samples will be subjected to a complete priority pollutant scan because of the wide variety of hazardous materials reportedly stored here in the past.

SITE 10 - JP-4 Fuel Line Rupture: A six-point soil-gas survey will be conducted to screen the area for volatile contamination (Figure 3.9). If volatile contamination is indicated by the soil-gas survey, one monitoring well will be installed at the point of highest soil-gas contamination to evaluate the impact of the spill on the soils and ground-water.

As JP-4 is the only reported contaminant in this area, the selected soil samples and ground water samples will be analyzed for petroleum hydrocarbons.

FIGURE 3.7



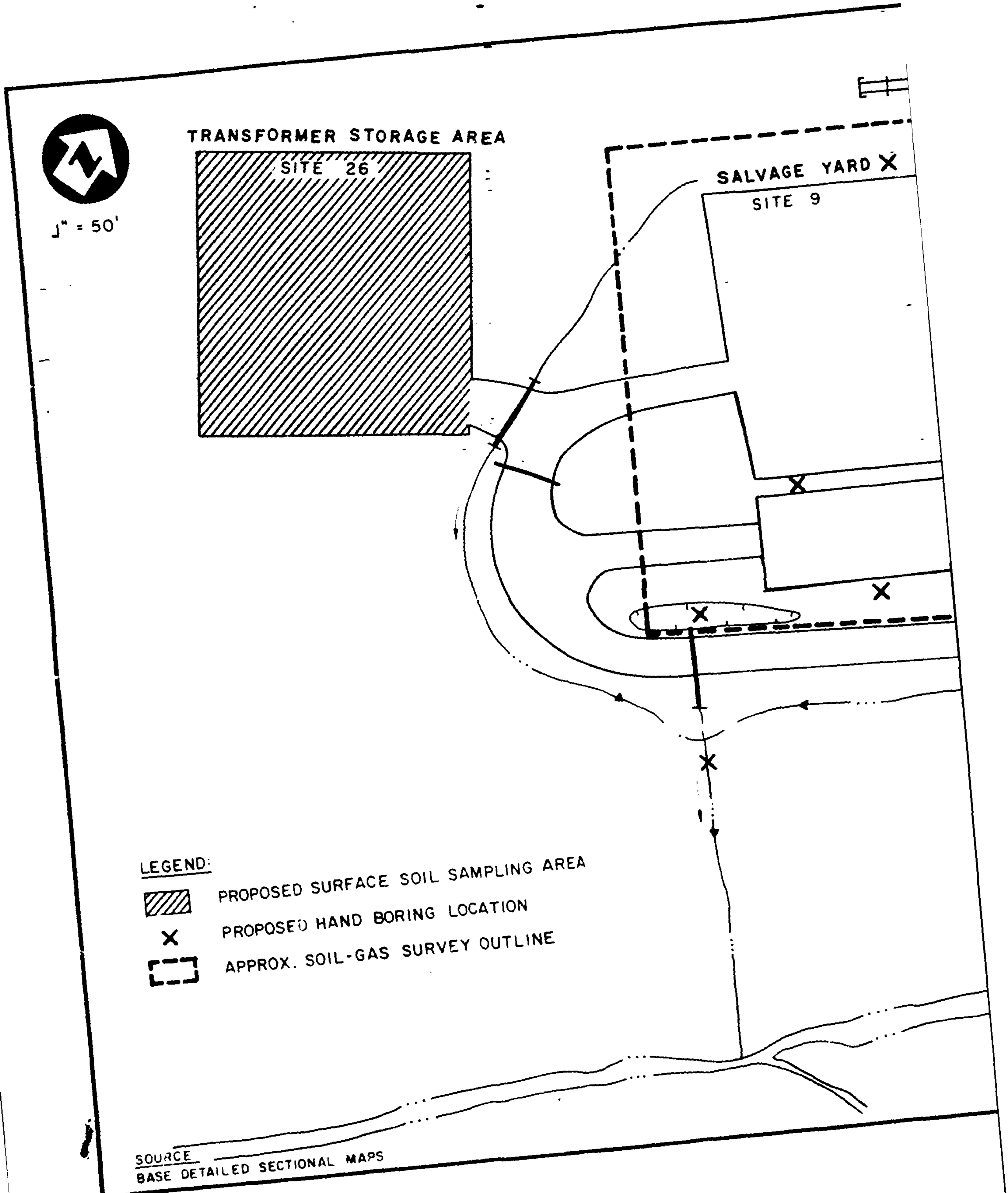

SITE INSPECTION PLAN

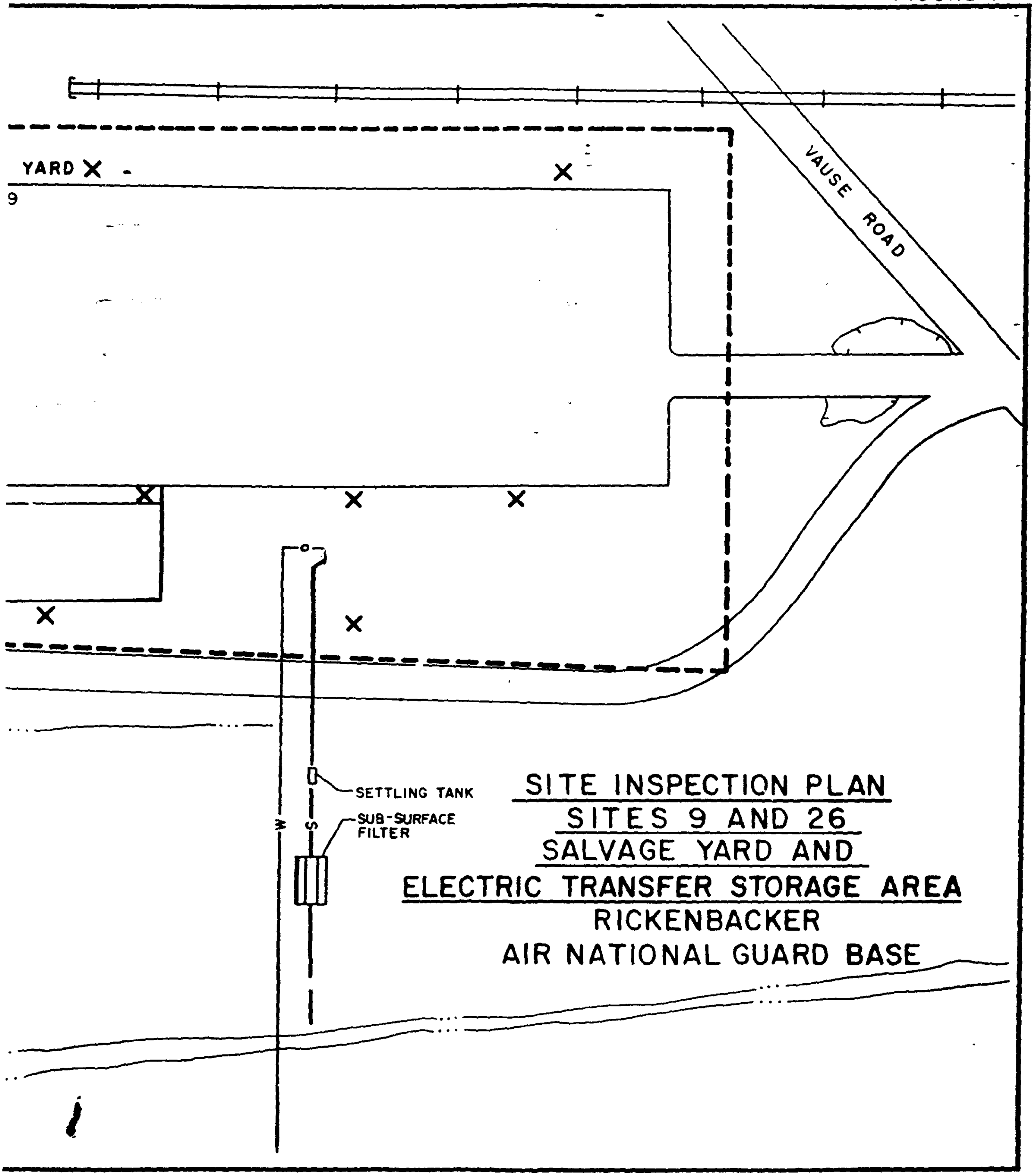
SITE 6

BASE FI_LING STATION

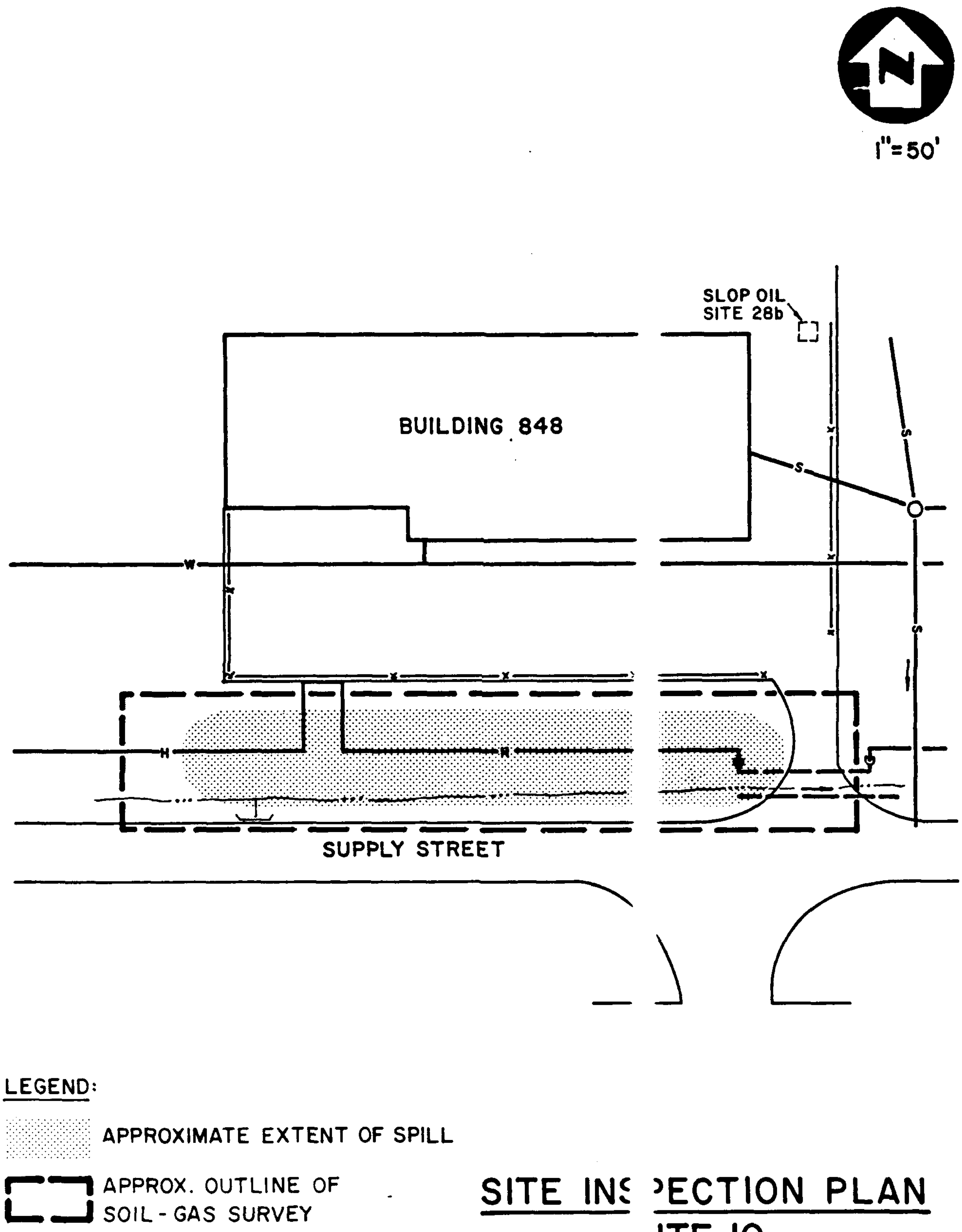
RICKENBACKER AIR NATIONAL GUARD BASE

)URCE:
\SE DETAILED SECTIONAL MAPS.


TRANSFORMER STORAGE AREA
SITE 26
1" = 50'
SALVAGE YARD
SITE 9
LEGEND:
PROPOSED SURFACE SOIL SAMPLING AREA
PROPOSED HAND BORING LOCATION
APPROX. SOIL-GAS SURVEY OUTLINE
SOURCE
BASE DETAILED SECTIONAL MAPS




SITE INSPECTION PLAN
SITES 9 AND 26
SALVAGE YARD AND
ELECTRIC TRANSFER STORAGE AREA
RICKENBACKER
AIR NATIONAL GUARD BASE




SITE INS PECTION PLAN
ITE 10
JP4 FUE LINE RUPTURE
RICI ENBACKER
AIR NATIO AL GUARD BASE

SOURCE:
BASE DETAILED SECTIONAL MAPS.

SITE 12 - Old Drum Storage Area: Ten hand borings will be made around the edges of the pavement, concentrated along the northwest edge where surface runoff would have entered the soil, to evaluate potential shallow soil contamination (Figure 3.10). A ten-point soil-gas survey will be conducted to screen for volatile contamination. One monitor well will be installed in the area of highest contamination indicated by the hand boring samples and/or soil-gas survey results to evaluate potential ground-water and soil contamination.

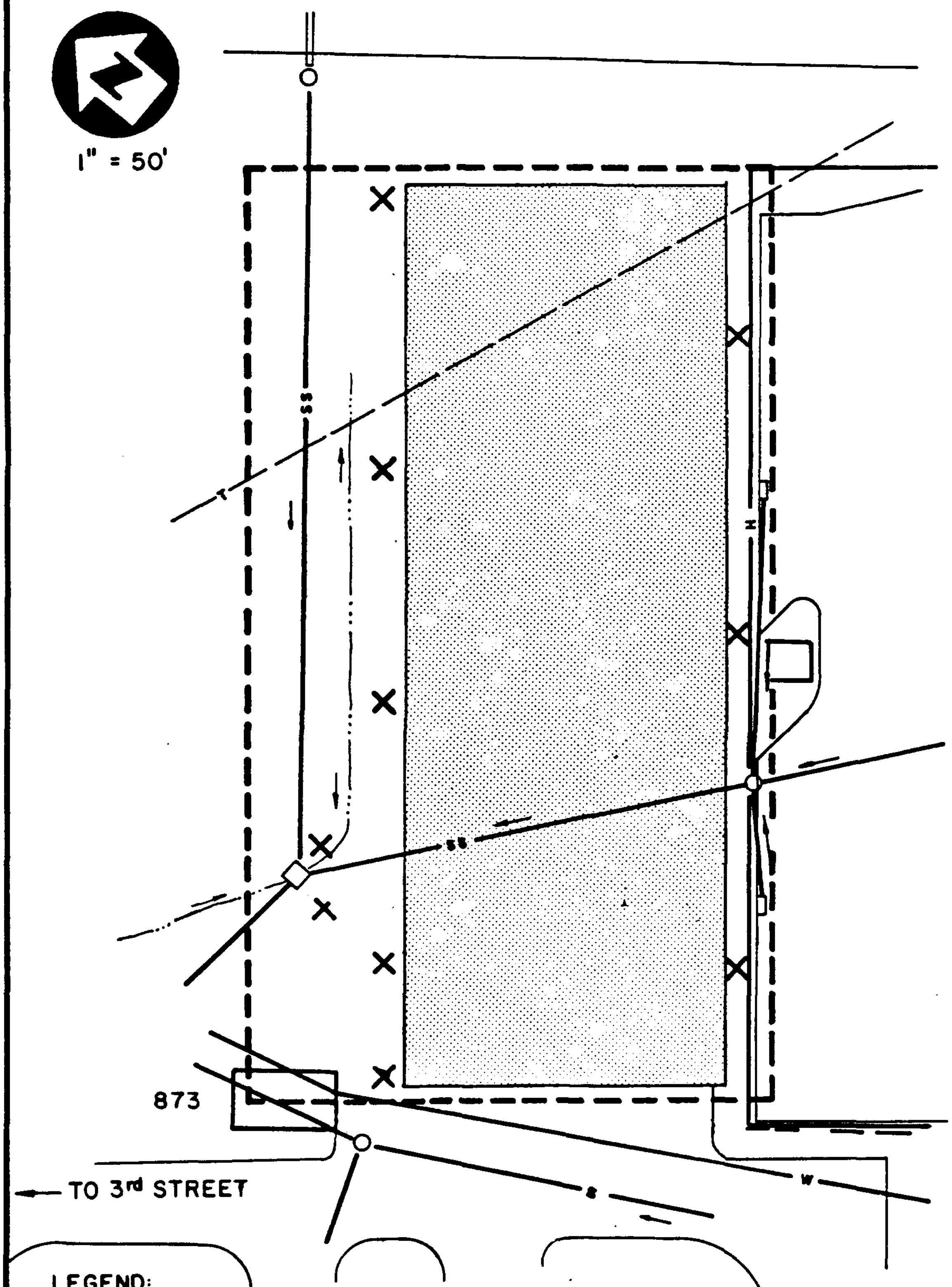
The drums stored here were usually empty, but had contained solvents and oils. The selected soil samples and ground water collected from this site will be analyzed for halogenated and aromatic volatile organics (including methyl ethyl ketone) and petroleum hydrocarbons.

SITE 14 - KC-135 Crash Site: An initial monitoring well will be installed at the reported location of fuel ponding to evaluate the impact of the spill on soil and groundwater (Figure 3.11). A ten-point soil-gas survey will be conducted to identify a contaminant plume or substantiate a "clean" condition. If contamination is detected, three soil borings will be made at the point of highest contamination and on two of the plume edges as defined by the soil-gas survey. One of the borings may be completed as a monitoring well if contamination is detected while drilling. As at other JP-4 spill sites, the soils and groundwater will be analyzed for petroleum hydrocarbons.

SITES 15 and 16 - Fuel Dump Pits: An initial monitor well will be installed in the topographic low of each pit to evaluate potential soil and ground-water contamination from fuel dumping (Figures 3.6 and 3.11). A twenty-point soil-gas survey of each pit will be conducted to substantiate the results of the initial well installations. If contamination is detected, a second well will be placed in the area of highest soil vapor concentration and two borings in each pit will be placed at the downgradient plume edge and half way between the second well and plume edge boring. If no contamination is detected, the second well will be installed downgradient of the first well to investigate the possibility of contaminant migration.

The reported dumping at this site involved leaded fuel. The selected soil samples and ground water will be analyzed for petroleum hydrocarbons and lead.

FIGURE 3.10

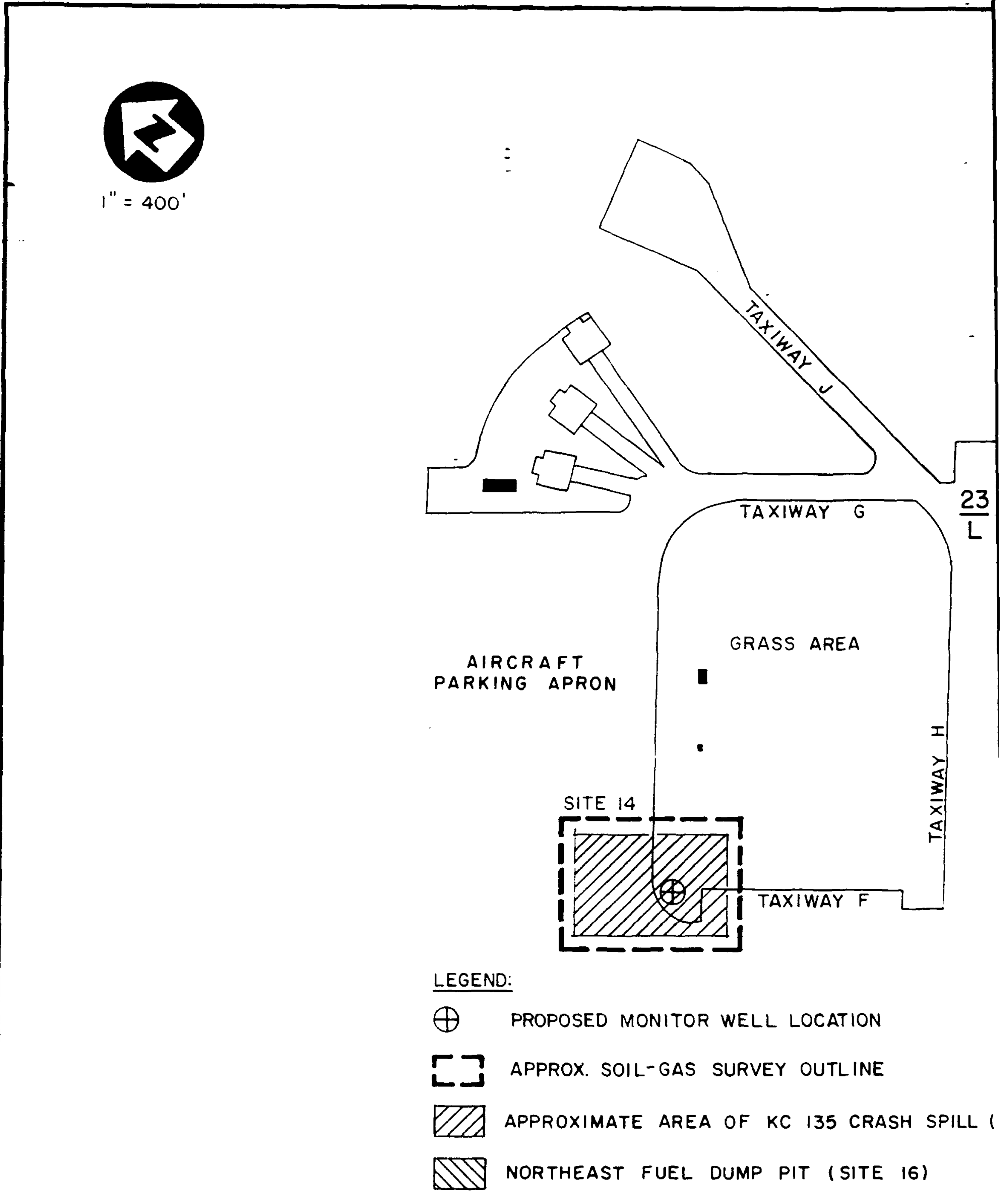



LEGEND:

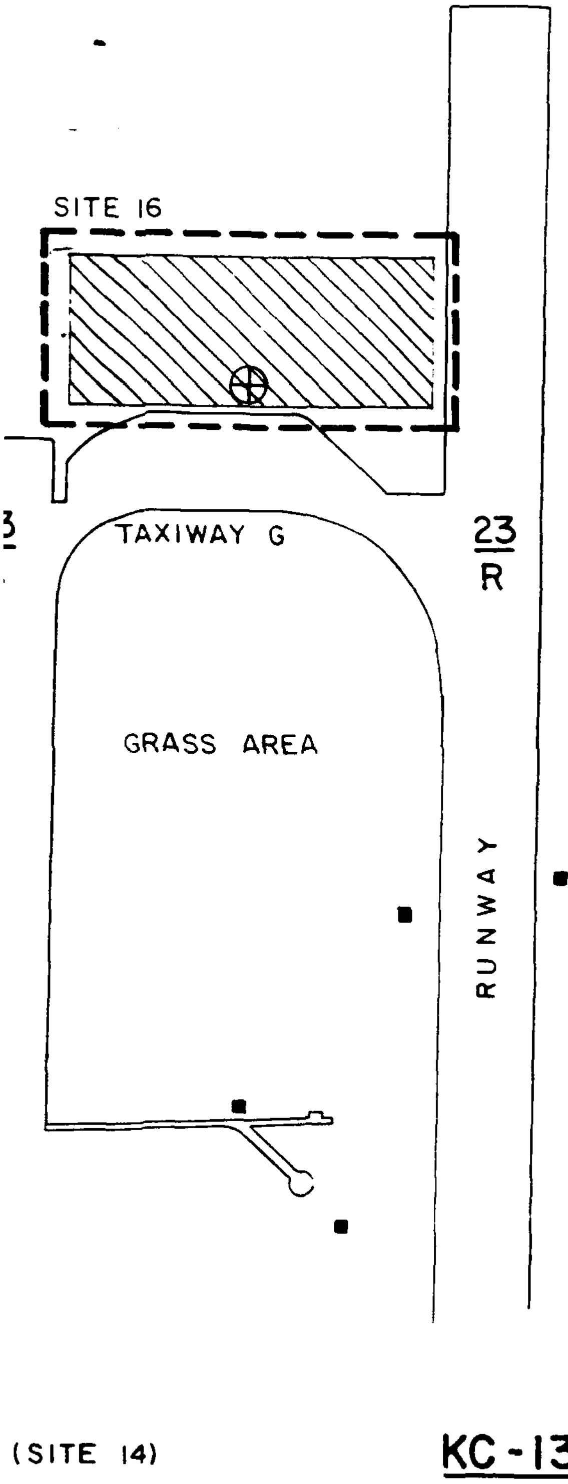
- X PROPOSED HAND BORING LOCATION
- APPROX. SOIL-GAS SURVEY OUTLINE
- PAVED DRUM STORAGE AREA (SITE 12)

SOURCE:
BASE DETAILED SECTIONAL MAPS

# SITE INSPECTION PLAN
## SITE 12
## OLD DRUM STORAGE AREA
RICKENBACKER
AIR NATIONAL GUARD BASE




SOURCE:
BASE STORM DRAINAGE SYSTEM PLAN




SITE INSPECTION PLAN
SITES 14 & 16
KC-135 CRASH SITE AND NORTHEAST FUEL DUMP PIT
RICKENBACKER
AIR NATIONAL GUARD BASE

SITE 17 - Old Entomology Laboratory: Ten hand borings will be made around the exterior of the end of the building where the laboratory was located and near the burned building to detect potential soil contamination (Figure 3.12). A monitor well will be placed at the location of highest detected shallow soil contamination. A soil-gas survey is not warranted here as pesticides and herbicides are not reliably detected by soil-gas survey.

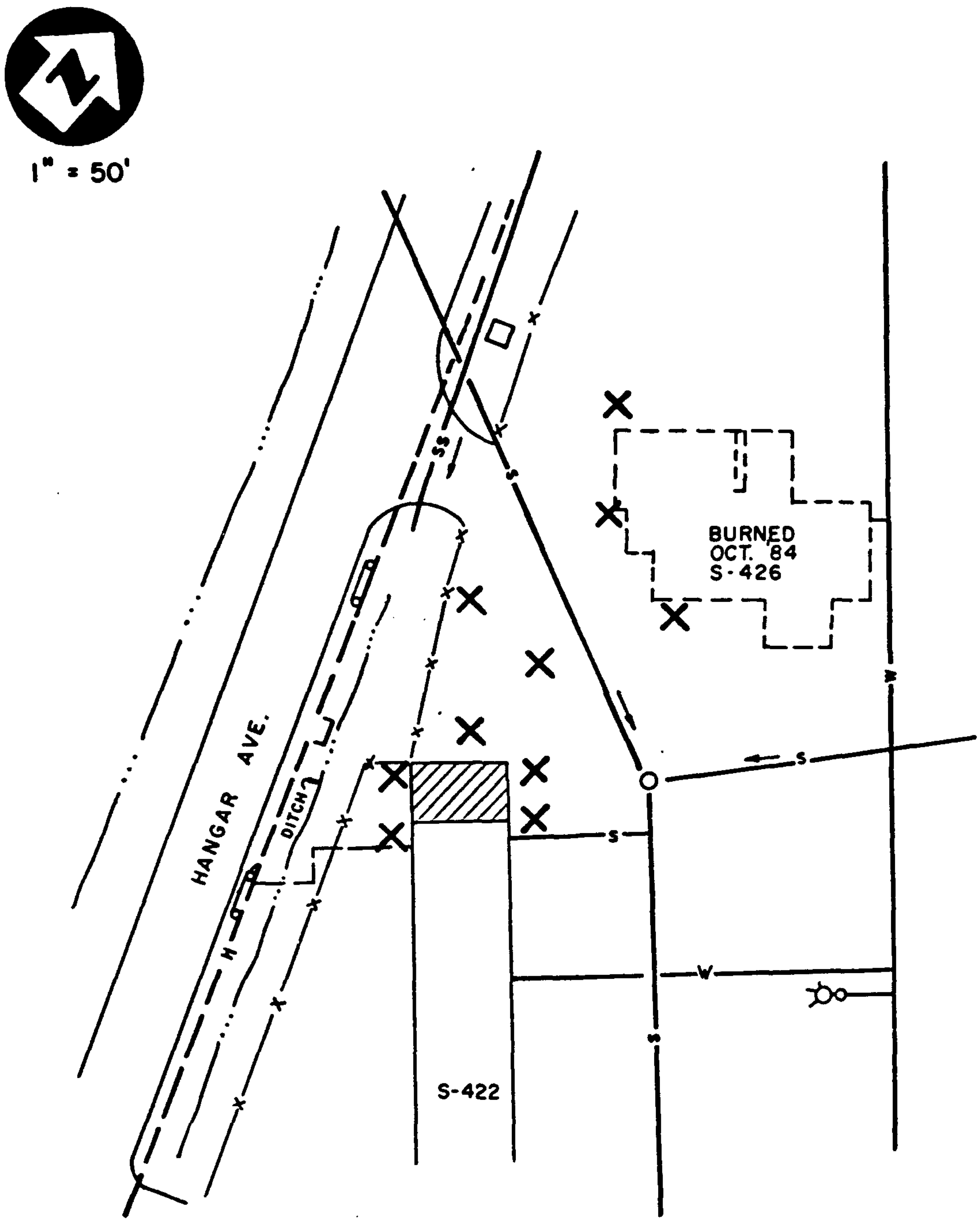
Because of historical use of pesticides and herbicides at this site, soil and ground-water samples will be analyzed for herbicides and pesticides.

SITES 19 and 20 - North and South Coal Piles: Surface water samples will be taken from the standing water in the adjacent drainage ditches to determine the level of contamination of the surface water (Figures 3.13 and 3.14). Ditch bottom sediment samples and a soil sample from an area of stressed vegetation on the ditch bank will also be taken to determine the level of soil and sediment contamination.

An initial monitoring well will be installed adjacent to the drainage ditch at the southwest corner of each area to detect possible soil and ground-water contamination at these sites of likely ground-water recharge. Nineteen soil-gas survey points will be divided between the two piles to substantiate the soil and ground-water sampling results. The concrete/asphalt surface of the storage pad will not be penetrated for sampling. An additional well and four borings will be placed around each pile to better define contaminant plumes indicated by the soil-gas survey.

The practice of dousing the coal with fuel oil and the typical constituents of coal pile runoff warrant analysis of soil and water samples for petroleum hydrocarbons, priority pollutant metals, sulfates, alkalinity, acidity and semi-volatile organics.

SITE 21 - Leaking Drum and Oil Change Area at Water Treatment Plant: Six hand borings will be made at the surface stained locations at these sites to evaluate the horizontal and vertical extent of soil contamination (Figure 3.15). The soils collected from the Oil Change Area will be analyzed for aromatic volatile organics, petroleum hydrocarbons and priority pollutant metals, common constituents of used motor oil. The same analyses, except metals will be performed on samples from the leaking Oil Drum Area.




LEGEND:

▨ END OF BUILDING USED AS ENTOMOLOGY LAB.

✕ PROPOSED HAND BORING LOCATION

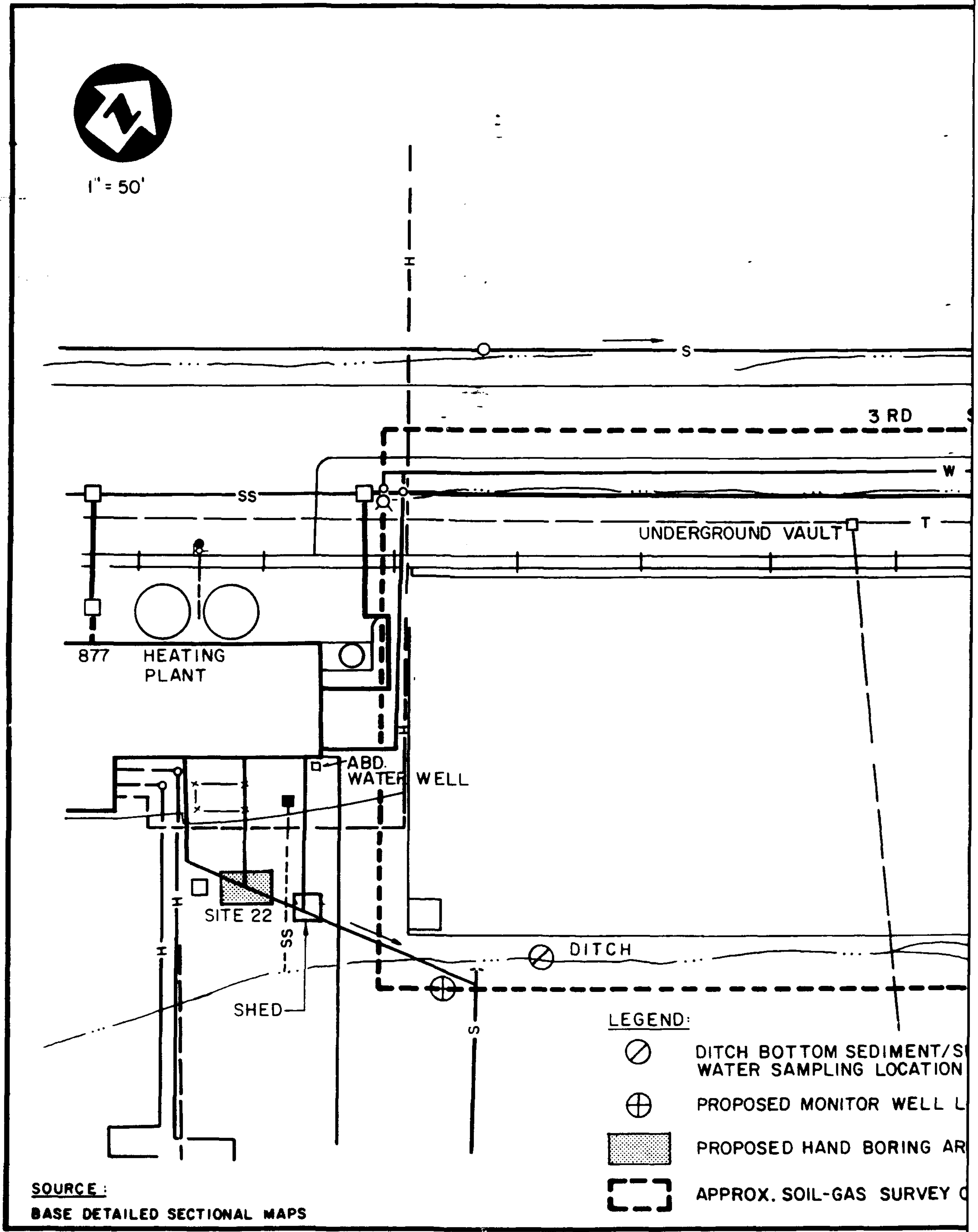
SOURCE:
BASE DETAILED SECTIONAL MAPS.

SITE INSPECTION PLAN

SITE 17

OLD ENTOMOLOGY LAB

RICKENBACKER
AIR NATIONAL GUARD BASE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3 RD
W
SS
UNDERGROUND VAULT
T
877
HEATING
PLANT
ABD.
WATER WELL
SITE 22
SS
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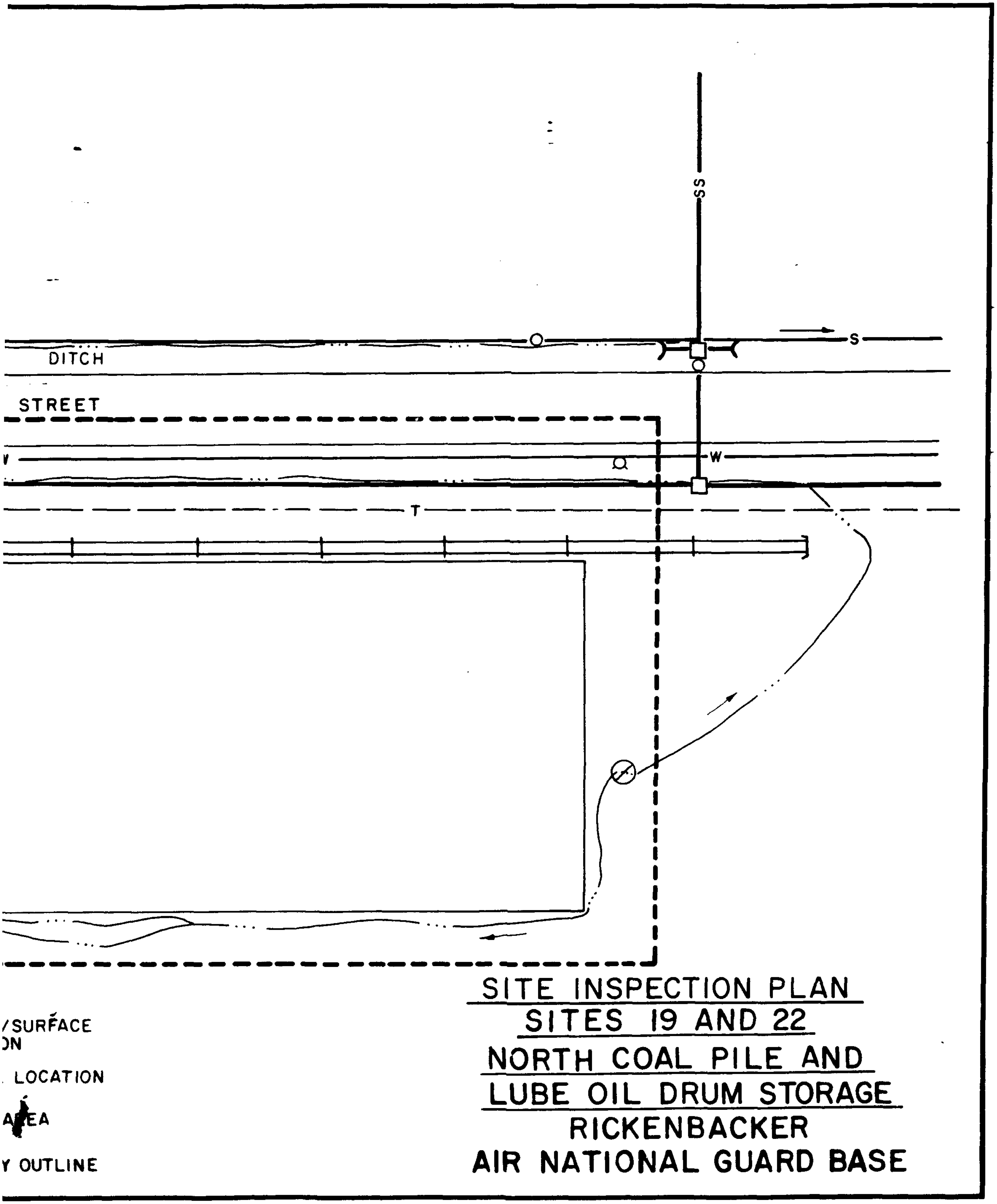
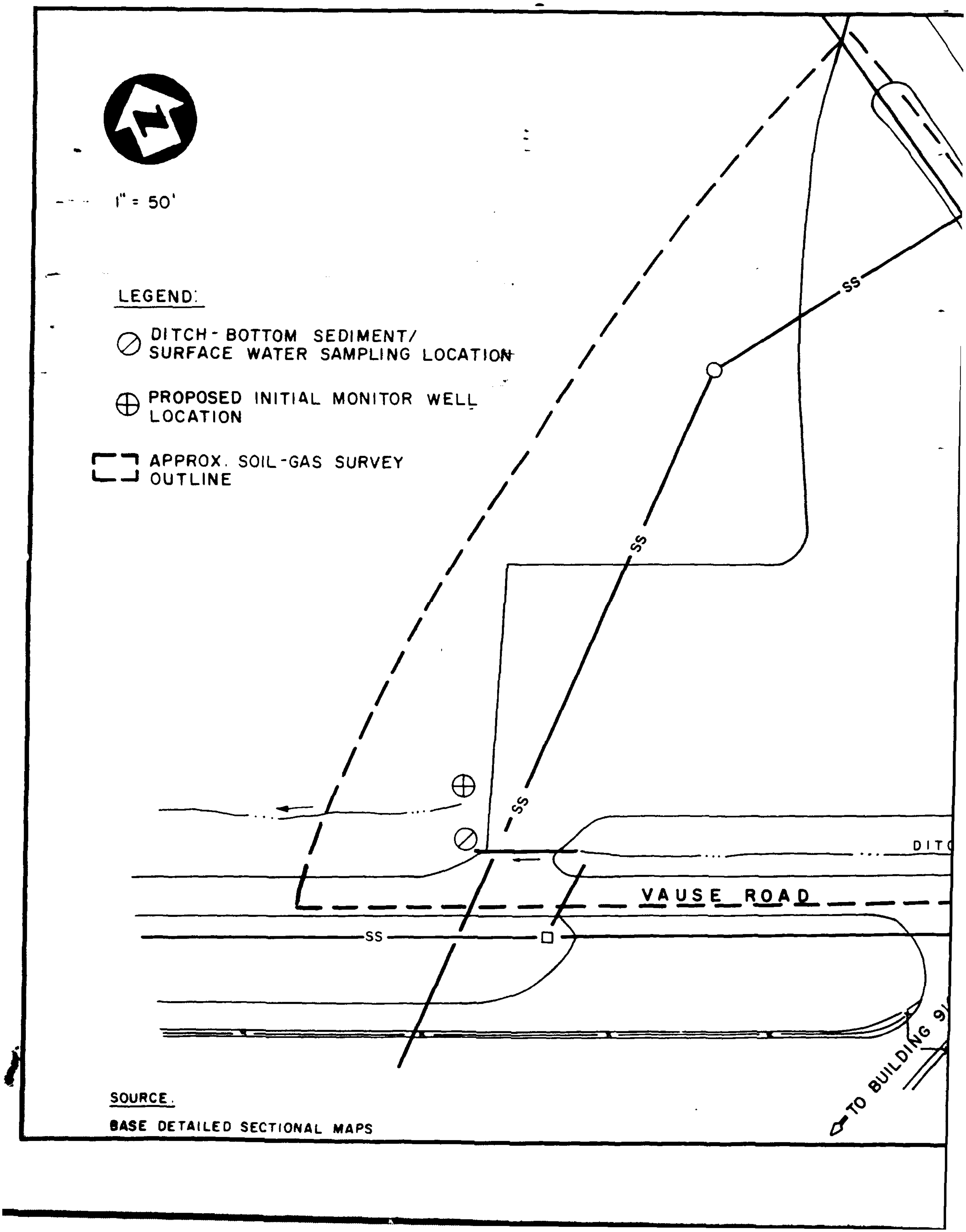
SHED
DITCH
S
LEGEND:
DITCH BOTTOM SEDIMENT/S
WATER SAMPLING LOCATION
PROPOSED MONITOR WELL L
PROPOSED HAND BORING AR
APPROX. SOIL-GAS SURVEY
SOURCE:
BASE DETAILED SECTIONAL MAPS




SITE INSPECTION PLAN
SITES 19 AND 22
NORTH COAL PILE AND
LUBE OIL DRUM STORAGE
RICKENBACKER
AIR NATIONAL GUARD BASE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1" = 50'
LEGEND:
DITCH - BOTTOM SEDIMENT/ SURFACE WATER SAMPLING LOCATION
PROPOSED INITIAL MONITOR WELL LOCATION
APPROX. SOIL-GAS SURVEY OUTLINE
SS
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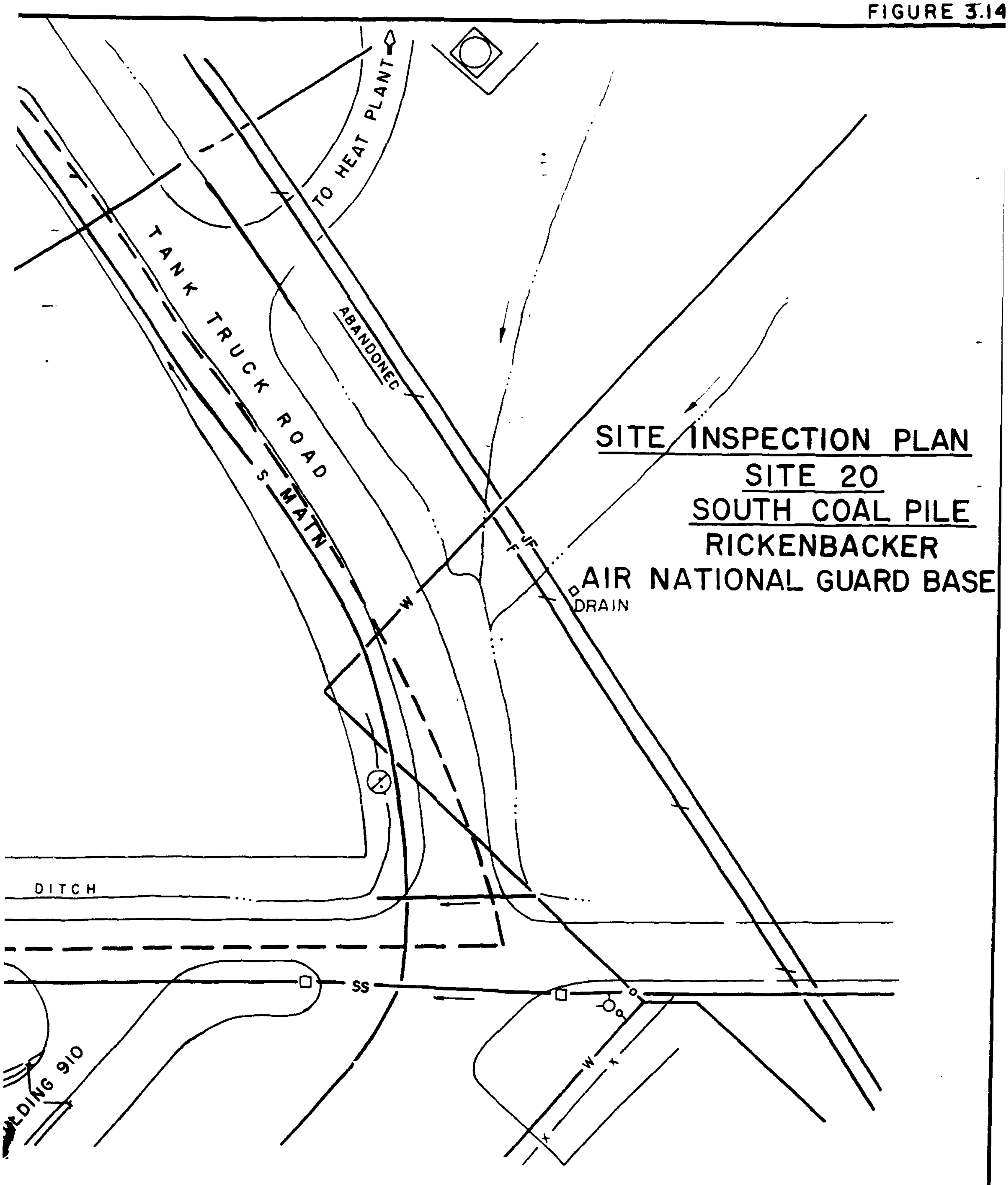
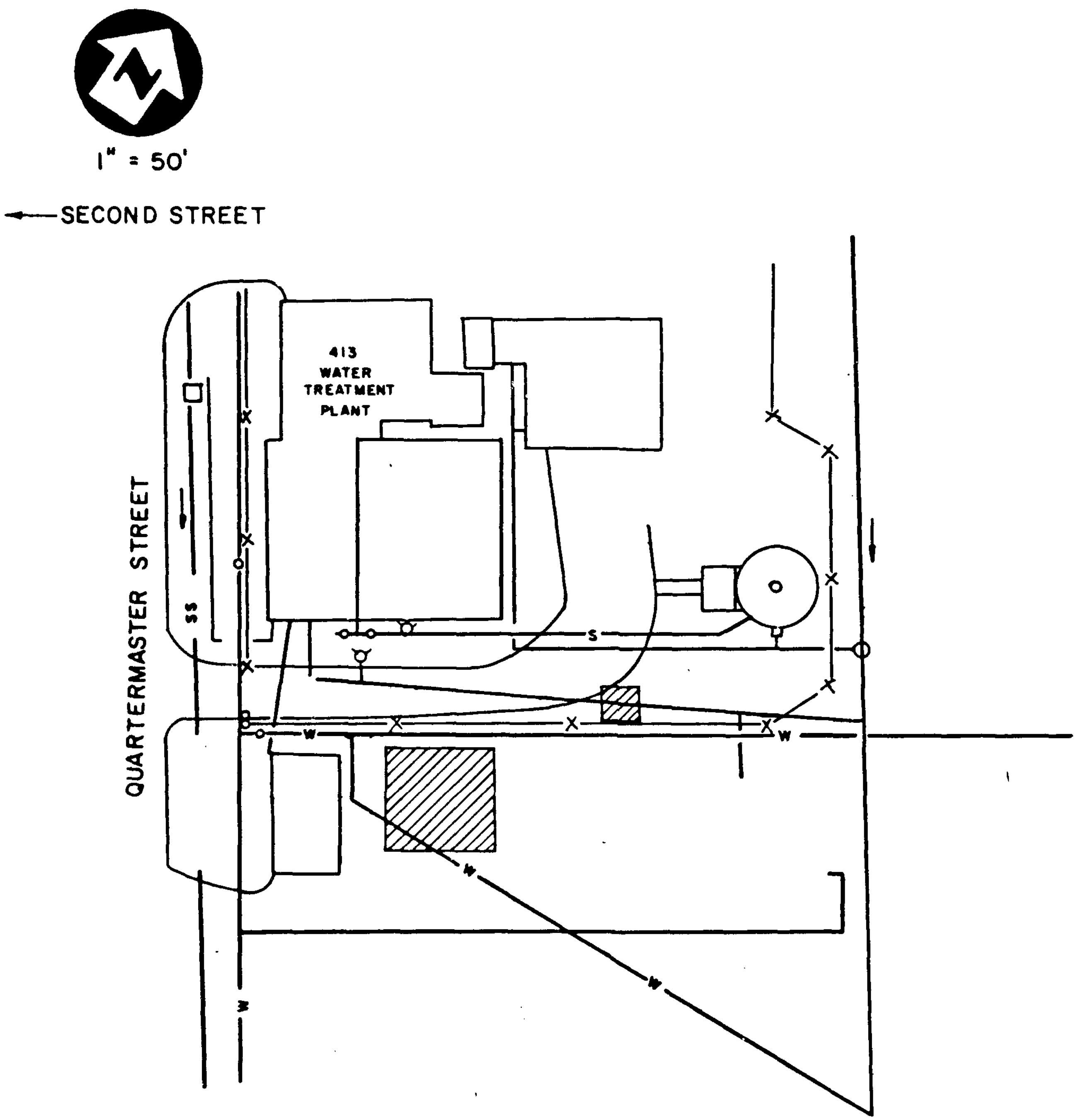
DITC
VAUSE ROAD
TO BUILDING 9
SOURCE:
BASE DETAILED SECTIONAL MAPS




SITE INSPECTION PLAN
SITE 20
SOUTH COAL PILE
RICKENBACKER
AIR NATIONAL GUARD BASE

FIGURE 3.15




LEGEND:

PROPOSED HAND BORING AREA

—X— FENCE

# SITE INSPECTION PLAN
## SITE 21
## LEAKING DRUM AND OIL CHANGE AREA
## RICKENBACKER AIR NATIONAL GUARD BASE

SOURCE:
BASE DETAILED SECTIONAL MAPS

SITE 22 - Lube Oil Storage Area: Four hand borings will be made at oil-stained locations adjacent to the storage pad and around the foundation of a nearby shed to evaluate the horizontal and vertical extent of contamination (Figure 3.13). The soils will be analyzed for aromatic and halogenated volatile organics and petroleum hydrocarbons.

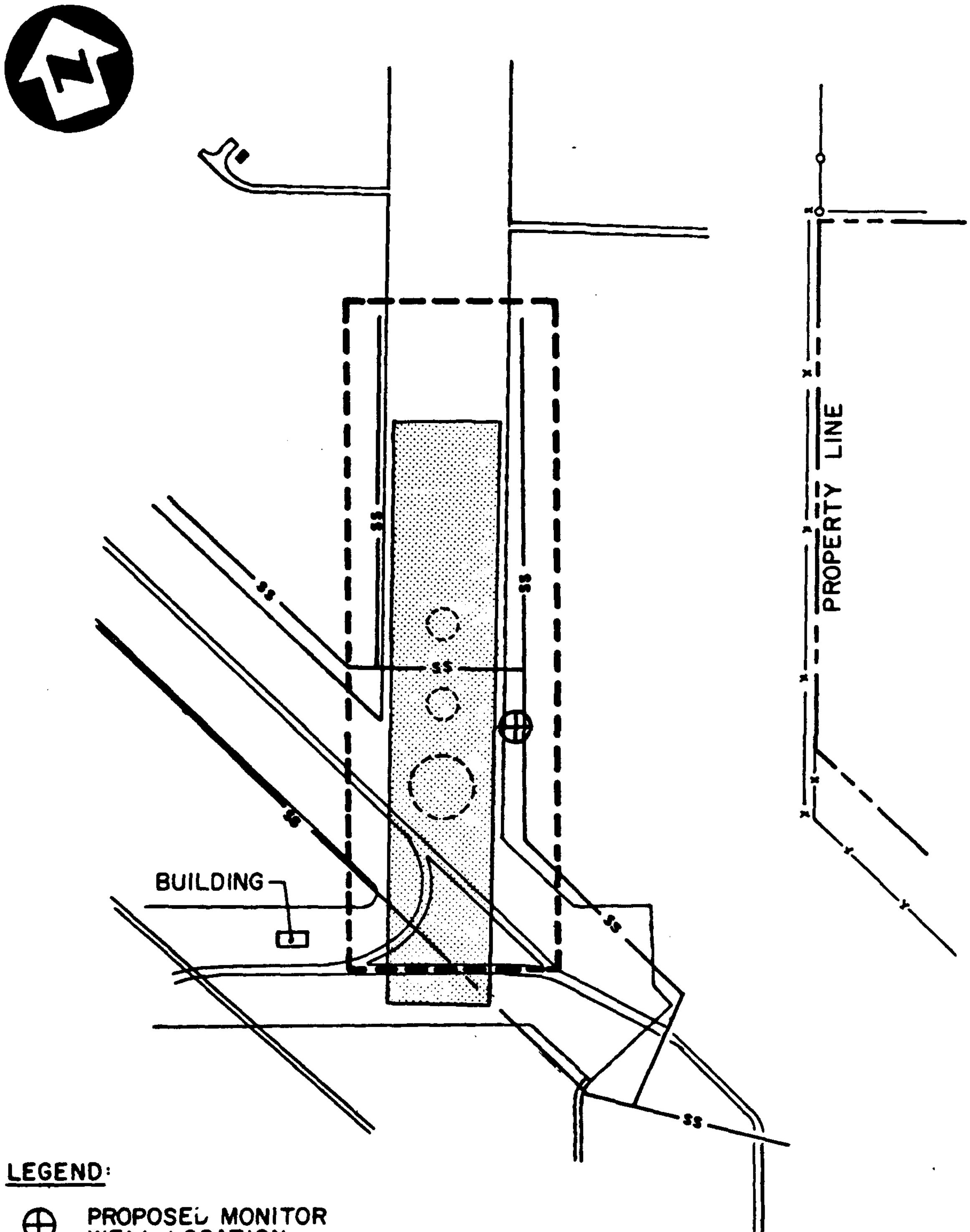
SITE 23 - Fire Training Area: An initial monitor well will be installed due east of the largest dike ring at the east edge of the pavement surface to evaluate the effect of surface runoff from the site on soil and ground-water quality (Figure 3.16). If the thick runway pavement has remained intact, it would probably have minimized the migration of contamination directly to the soil and the surface drainage away from the fire rings to the east would more likely be impacted. A twenty-point soil-gas survey will be conducted to approximate the extent of volatile contamination. Three additional wells and eight borings will be placed to evaluate contamination centers and edges as defined by the soil-gas survey.

Because of the wide range of solvents, fuels and other unidentified materials that were burned at this site, a complete priority pollutant scan will be performed on the soil and water samples.

SITE 24 - Sewage Treatment Plant Sludge Beds: A sludge sample will be collected from each bed and composited with a sample from the adjacent bed (Figure 3.17) to determine contaminant levels in the sludge. An initial monitor well will be installed at the sludge-bed outfall pipe junction (southwest corner of the sludge beds) because water runoff was routed toward that corner and it is a likely location for accumulation of contaminants.

Two additional wells will be located following determination of ground-water gradient using the 17 initial wells. One well will be placed upgradient of the sludge beds and one downgradient. Tentative locations of these wells are identified on Figure 3.17. Four hand borings will be made within the sludge spreading area west-southwest of the treatment plant to evaluate the impact of the sludge on the soils. Equivalent depth samples will be composited from pairs of borings.

All discharges from Base sources into the sanitary sewer system, including solvents, waste oil, pesticides, etc., would have passed through the sewage treatment plant. Consequently, the soil and sludge samples collected at this site will be analyzed for priority pollutants except

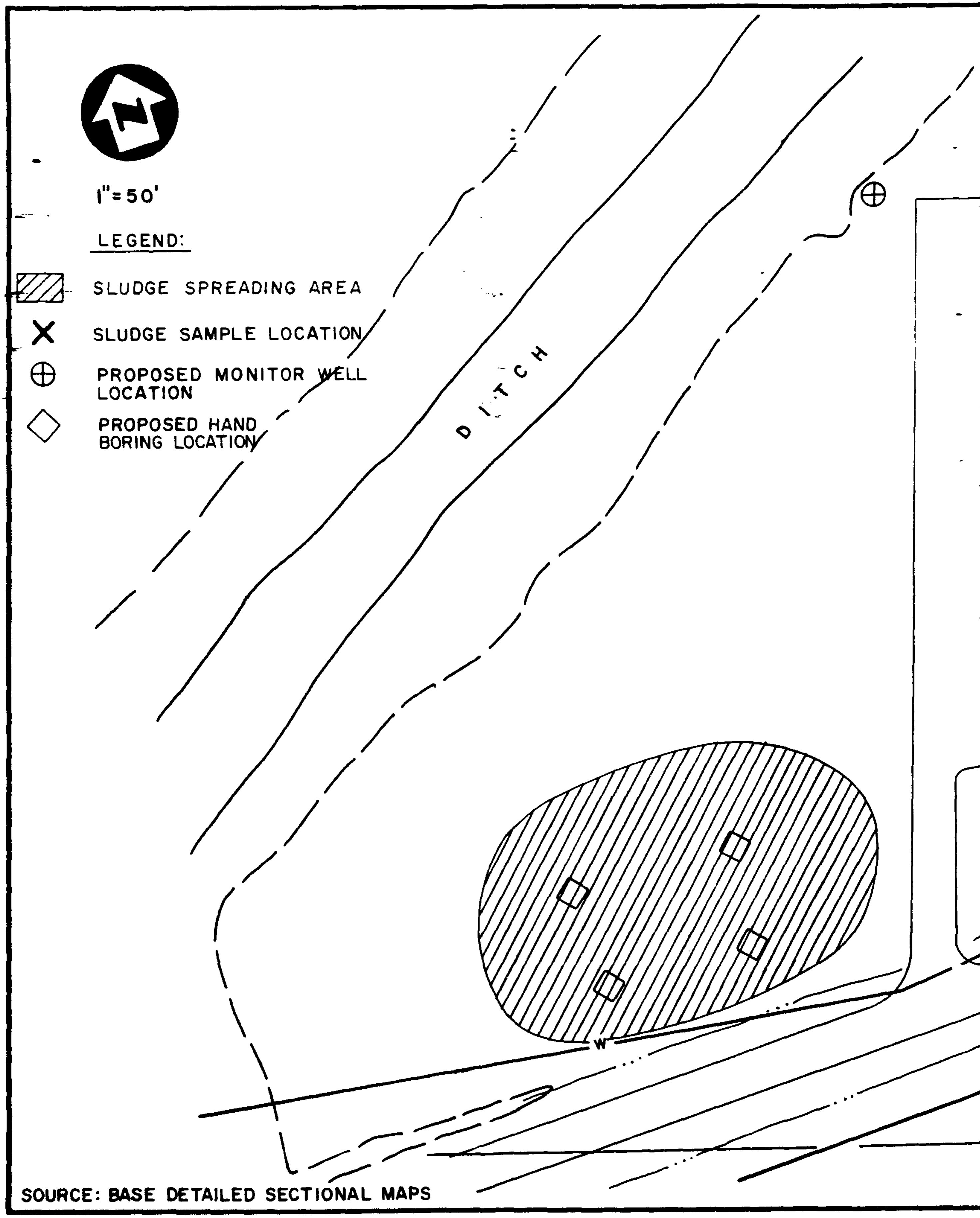


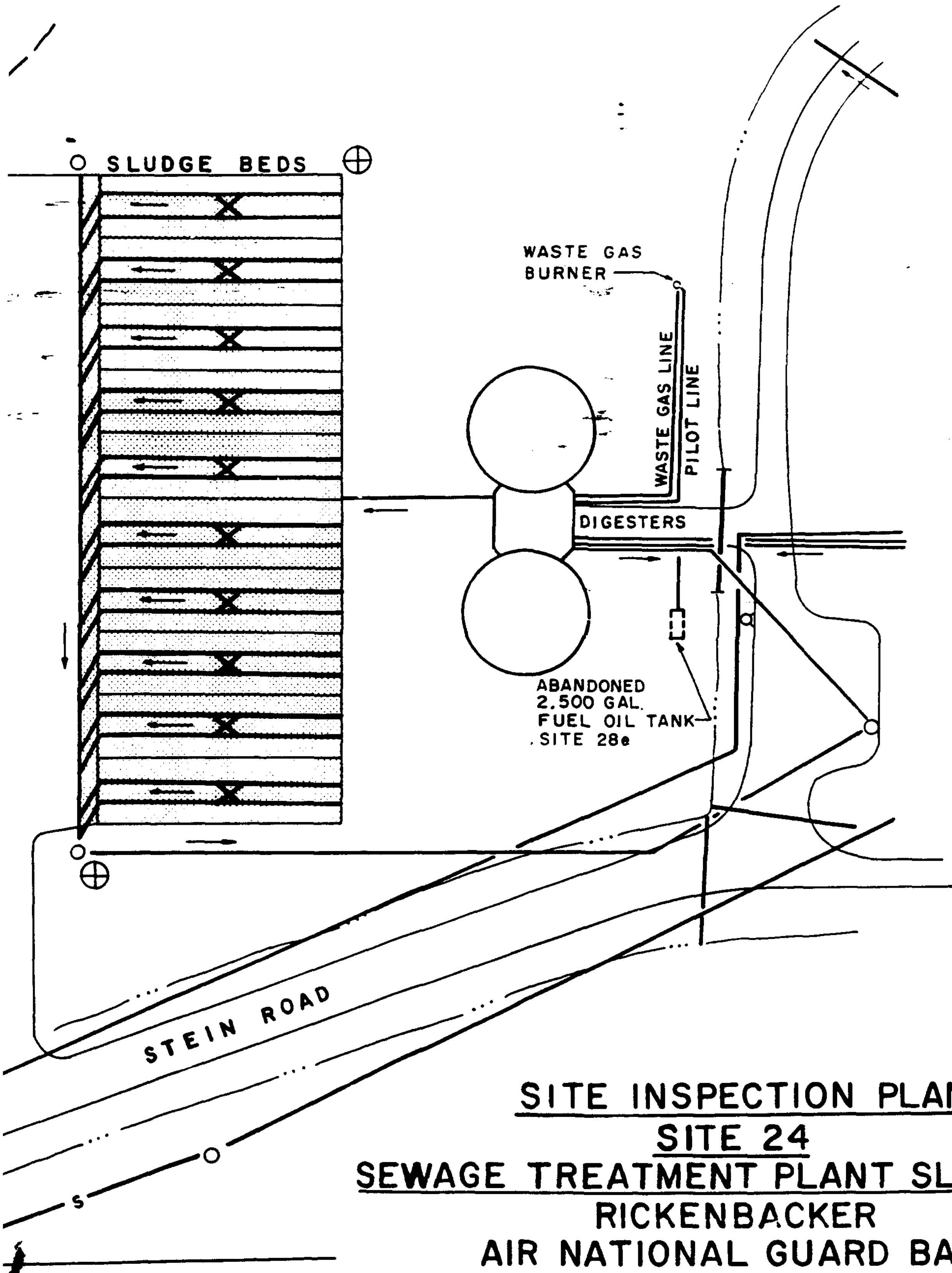

LEGEND:

- PROPOSED MONITOR WELL LOCATION
- APPROX. SOIL-GAS SURVEY OUTLINE
- DIKED AREA
- AREA USED FOR FIRE TRAINING

SOURCE: BASE STORAGE DRAINAGE SYSTEM PLAN

SITE INSPECTION PLAN
SITE 23
FIRE TRAINING AREA
RICKENBACKER
AIR NATIONAL GUARD BASE


N
1"=50'
LEGEND:
SLUDGE SPREADING AREA
SLUDGE SAMPLE LOCATION
PROPOSED MONITOR WELL LOCATION
PROPOSED HAND BORING LOCATION
DITCH
W
SOURCE: BASE DETAILED SECTIONAL MAPS




SITE INSPECTION PLAN
SITE 24
SEWAGE TREATMENT PLANT SLUDGE BEDS
RICKENBACKER
AIR NATIONAL GUARD BASE

volatiles. Volatiles in the sludge and soils are not anticipated as the sludge handling process and the long period of time since plant operations, would have resulted in their volatilization. Ground-water samples will be analyzed with a priority pollutant scan (including volatiles) to detect contamination which may be residual from plant operations.

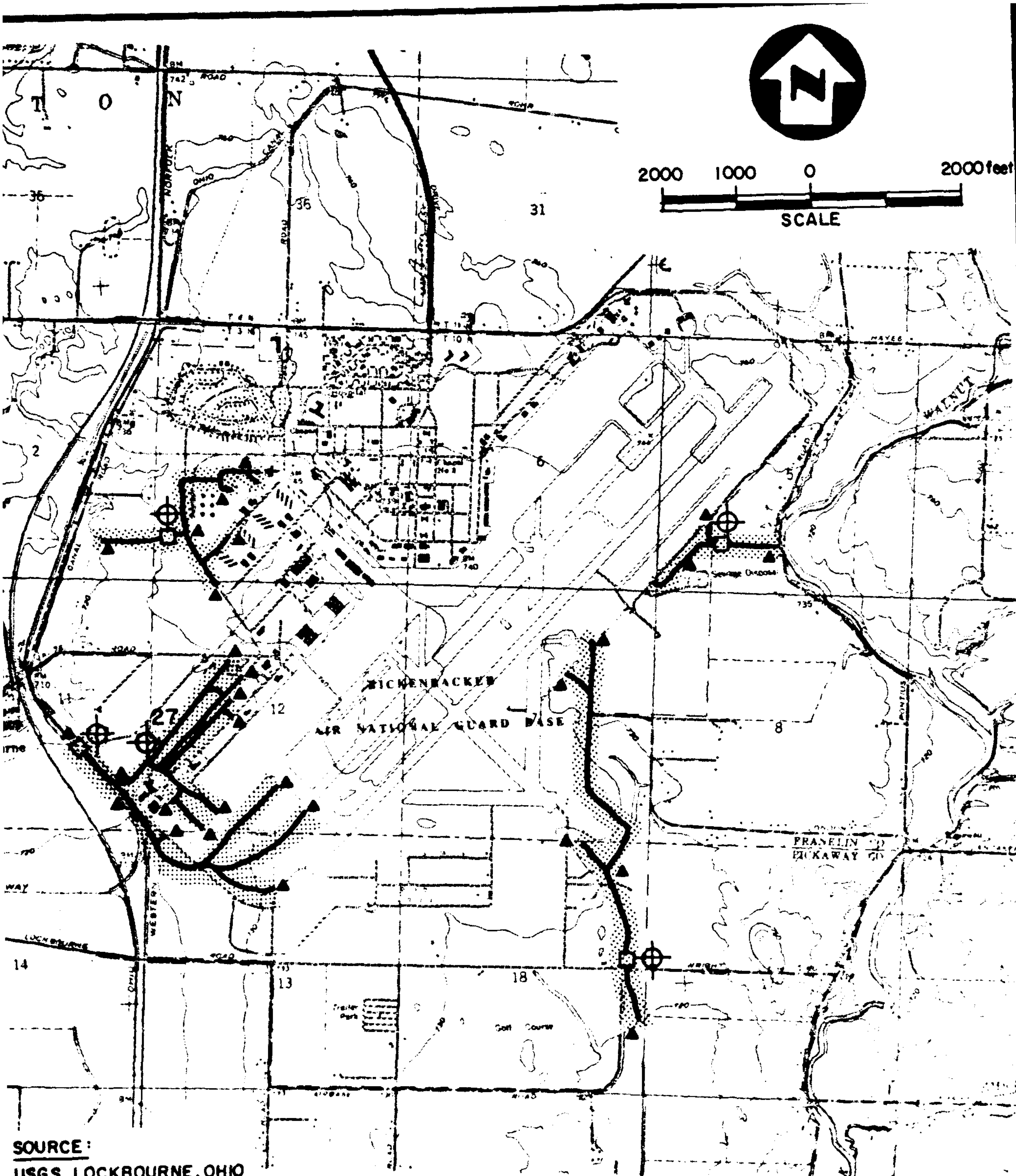
SITE 25 - Storm Drainage Ditch System: The storm drainage ditch system is extensive and although no specific spill or loss events were documented (other than Site 27). Any of the potential contaminants identified at other sites could have been discharged to the drainage network. The approach in the SI is to divide the system up into major segments and test "intersections" of ditches to identify areas of concern and to backtrack to potential source areas and minor outfalls by a process of elimination. Twenty-eight ditch bottom sediment and coincident surface water samples will be collected at the confluences of drainage ditch segments (Figure 3.18). Two additional samples will be taken at suspected point source locations identified while sampling.

The separator at the mouth of each major drainage network is a potential site of contamination concentration. An initial well will be installed near each of the separator structures to evaluate the impact of the contaminants, which were periodically contained by the separators, on the soils and ground water. A one-hundred point soil-gas survey will be conducted along the entire drainage network, concentrating on areas where no surface water or ditch bottom sediment contamination was detected in an effort to substantiate the "clean" nature of a particular ditch segment.

Because of the wide variety of contaminants which could have potentially entered the drainage network, a complete priority pollutant scan will be performed on the selected soil sediment and water samples.

SITE 26 - Electrical Transformer Storage Yard: Twenty surface soil samples will be collected in an equally spaced grid over the site and analyzed for PCB contamination to evaluate the lateral extent of possible contamination from electrical transformers which may have leaked dielectric fluid at this site (Figure 3.8).

SITE 27 - Drainage Ditch Near Landfill: Ditch bottom sediment and surface water samples will be collected in the center of the documented spill area (Figure 3.18) and at a distance approximately 100 feet downstream. A monitoring well will be installed adjacent to the most




**SOURCE:**
USGS, LOCKBOURNE, OHIO
7.5 MIN. QUADRANGLE

**LEGEND:**

- □ OIL-WATER SEPARATOR
- OPEN DRAINAGE DITCH
- 27 SITE 27
- PROPOSED MONITOR WELL LOCATION
- ▲ DITCH BOTTOM SEDIMENT AND SURFACE WATER SAMPLING LOCATION

# SITE INSPECTION PLAN
# SITE 25 & 27
# DRAINAGE DITCH NETWORK AND DITCH NEAR LANDFILL GATE
## RICKENBACKER AIR NATIONAL GUARD BASE

contaminated ditch bottom sediment sample location to evaluate the impact of the spill on adjacent soils and ground water.

A five-point soil-gas survey will be conducted along both sides of the ditch to investigate possible lateral and downstream volatile contaminant migration. Selected soil samples and water samples will be subjected to a complete priority pollutant scan.

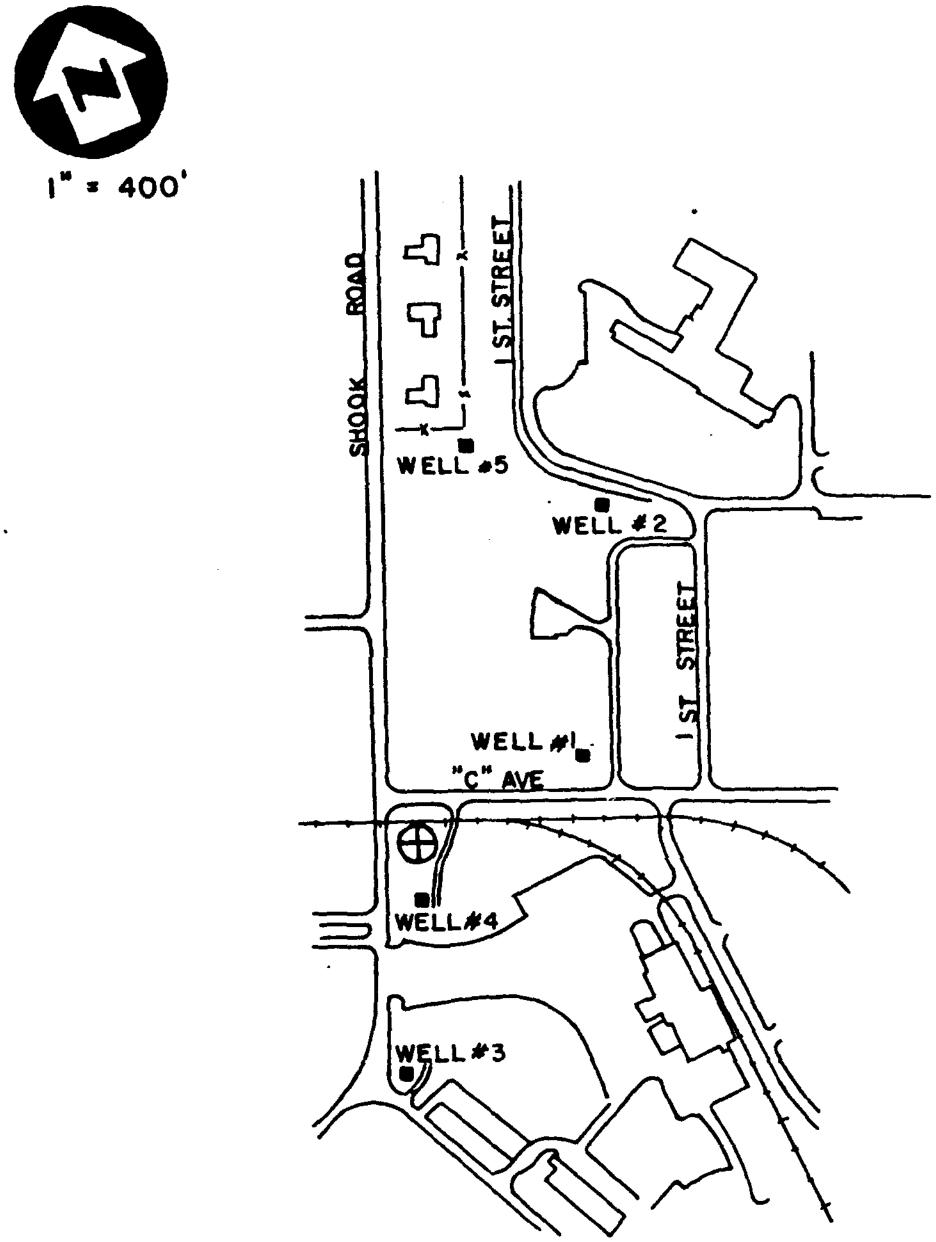
SITE 28 - Abandoned Underground Storage Tank Investigation: A magnetometer survey will be conducted at each abandoned underground storage tank site to determine the location of the tanks. No soil sampling or monitoring well installations will be conducted at the UST sites during the Site Inspection.

Following the magnetometer survey, plans and specifications for tank removal will be prepared (see Section 2, TASK 5).

## ADDITIONAL HYDROGEOLOGIC CONTROL

Two observation wells equipped with continuous water level recorders will be installed as a nested pair near the Base water supply wells (Figure 3.19). One well will be screened in the shallow aquifer and the other will be screened in the second aquifer, as determined while drilling. Base pumping records will be reviewed in conjunction with the water level records to attempt a quantification of the interconnectedness of the Base water supply aquifer and the shallow aquifer.

A composite soil sample collected while drilling and a ground water sample from each well will be submitted for priority pollutant, sulfate, alkalinity and acidity analyses to establish "background" conditions for the Base soils and shallow and second aquifers. If the soils and/or water from these two wells are determined to be unsuitable as "background" samples, off-Base background wells will be installed.




LEGEND:

⊕ PROPOSED MONITOR WELL PAIR EQUIPPED WITH WATER LEVEL RECORDERS

ADDITIONAL HYDROGEOLOGIC CONTROL IN VICINITY OF WATER SUPPLY WELLS
RICKENBACKER AIR NATIONAL GUARD BASE

# SECTION 4
## REMEDIAL INVESTIGATION

The purpose of the Remedial Investigation (RI) is to define the extent of environmental contamination detected in the Site Inspection (SI) and to continue to assess the potential risks of the contamination to the environment and human health and welfare.

The first step of the RI will be updating this Work Plan to reflect new data gathered during the SI. The second phase of the RI will be field investigations similar to those conducted in the SI, to define the extent of contamination. Geophysical and other investigative techniques not used in the SI may be used during the RI. The third and final phase of the RI is the data analysis and reporting phase which will include preparation of an RI Report which in addition to a summary of RI activities and results will include preparation of risk assessments to determine the appropriateness of additional activities at the individual sites and ultimately be used to obtain regulatory concurrence on the decision documents.

At this time, it is not possible to accurately predict which of the twenty-three sites will require further analysis during the Remedial Investigation. However, for planning and budgetary reasons, the sites which are most likely to need additional study have been identified and additional, non-dedicated wells, borings, soil-gas survey points, etc., to cover other miscellaneous sites have been included.

Table 4.1 summarizes the scope of work anticipated. A detailed description of investigations for each site would be premature, as boring and well placement, etc., will vary depending on SI results.

## TABLE 4.1

## SUMMARY OF REMEDIAL INVESTIGATION PROGRAM

| Site | Field Activity | # Field Samples | Matrix | Analyses* |
|---|---|---|---|---|
| #1 | Hazardous Waste Storage Area: | | | |
| | - One Hundred soil-gas survey points | -- | -- | -- |
| | - Eight hand borings | 12 | Soil | A |
| | - Four 15' borings | 8 | Soil | A |
| | - Three wells screened in the upper aquifer | 6 | Soil | A |
| | - Five wells screened in the second aquifer | 10 | Soil | A |
| | - Ground-Water Sampling | 11 | Water | A |
| #2 | JP-4 Tank Farm: | | | |
| | - Sixty soil-gas survey points | -- | -- | -- |
| | - Four wells screened in the upper aquifer | 8 | Soil | E |
| | - One well screened in the second aquifer | 2 | Soil | E |
| | - Ground-Water Sampling | 8 | Water | E |
| #19&20 | North and South Coal Piles: | | | |
| | - Fifty soil-gas survey points | -- | -- | -- |
| | - Six ditch bottom sediment samples | 6 | Soil | EFHK |
| | - Surface water sampling in ditches | 4 | Water | EFHK |
| | - Four 15' borings (2 per pile) | 8 | Soil | EFHK |
| | - Eight wells screened in the upper aquifer | 16 | Soil | EFHK |
| | - Four wells screened in second aquifer | 8 | Soil | EFHK |
| | - Ground-Water Sampling | 16 | Water | EFHK |
| #23 | Fire Training Area: | | | |
| | - One Hundred and Forty soil-gas survey points | -- | -- | -- |
| | - Eight 15' soil borings | 16 | Soil | A |
| | - Five wells screened in the upper aquifer | 10 | Soil | A |
| | - Four wells screened in second aquifer | 8 | Soil | A |
| | - Ground-Water Sampling | 13 | Water | A |

*EXPLANATION
A = Priority Pollutant Scan (Method 8240, 8270, 8080 & Metals)
B = Organochlorine Pesticides and Chlorinated Phenoxy Herbicides (Method 8080 & 8150)
C = Aromatic Volatile Organics (Method 8020)
D = Halogenated Volatile Organics (Method 8010)
E = Petroleum Hydrocarbons (Method 418.1)
F = Priority Pollutant Metals
G = PCB (Method 8080)
H = Sulfates (Method 9038), Acidity and Alkalinity
I = Lead (Method 7420/7421)
J = Methyl Ethyl Ketone as an additional compound in organic analyses
K = Semi-Volatile Organics (Base/Neutral and Acid Extractables) (Method 8270)

**TABLE 4.1**
**(continued)**

**SUMMARY OF REMEDIAL INVESTIGATION PROGRAM**

| Site | Field Activity | # Field Samples | Matrix | Analyses* |
|---|---|---|---|---|
| #24 | Sewage Treatment Plant Sludge Beds: | | | |
| | - Twenty hand borings in sludge disposal area | 20 | Soil | BFG |
| | - Four 15' soil borings | 8 | Soil | BFG |
| | - Three wells screened in the upper aquifer | 6 | Soil | BFG |
| | - Three wells screened in the second aquifer | 6 | Soil | BFG |
| | - Ground-Water Sampling | 9 | Water | A |
| #25 | Storm Drainage Ditch System: | | | |
| | - One Hundred and Fifty soil-gas survey points | -- | -- | -- |
| | - Fifteen ditch bottom sediment samples | 15 | Soil | A |
| | - Fifteen surface water samples from ditches | 15 | Water | A |
| | - Six 15' soil borings | 12 | Soil | A |
| | - Twelve wells screened in the upper aquifer | 24 | Soil | A |
| | - Six wells screened in the second aquifer | 12 | Soil | A |
| | - Ground-Water Sampling | 22 | Water | A |
| Miscellaneous Other Sites: | | | | |
| | - One Hundred soil-gas survey points | | | |
| | - Ten hand borings | 15 | Soil | A/E/CDF |
| | - Four 15' soil borings | 8 | Soil | A/E/CDF |
| | - Six borings to bedrock | 1 | Soil | A/E/CDF |
| | - Ten wells screened in upper aquifer | 20 | Soil | A/E/CDF |
| | - Four wells screened in second aquifer | 8 | Soil | A/E/CDF |
| | - Ground-Water Sampling | 24 | Water | A/E/CDF |
| Aquifer Evaluation: | | | | |
| | - Three 6" wells for pumping tests of various portions of the aquifers. Locations to be determined after the SI. | | | |
| | - Perform 24-hour pump tests on three pumping wells and one of the Base water-supply wells. | | | |

*EXPLANATION
A = Priority Pollutant Scan (Method 8240, 8270, 8080 & Metals)
B = Organochlorine Pesticides and Chlorinated Phenoxy Herbicides (Method 8080 & 8150)
C = Aromatic Volatile Organics (Method 8020)
D = Halogenated Volatile Organics (Method 8010)
E = Petroleum Hydrocarbons (Method 418.1)
F = Priority Pollutant Metals
G = PCB (Method 8080)
H = Sulfates (Method 9038), Acidity and Alkalinity
I = Lead (Method 7420/7421)
J = Methyl Ethyl Ketone as an additional compound in organic analyses
K = Semi-Volatile Organics (Base/Neutral and Acid Extractables) (Method 8270)

# SECTION 5
# FIELD INVESTIGATION TECHNIQUES

Field investigation techniques that will be utilized in the Site Inspection and Remedial Investigation include soil borings, installation of ground water monitoring wells and soil-gas surveys. The methods for performing these techniques in the study at Rickenbacker ANGB will be discussed in this section. Technique details related to the collection of samples for chemical analysis, including decontamination and other sampling protocols are covered in Section 6, the Sampling and Analytical Plan.

## MAGNETOMETER SURVEY

Magnetometer surveys will be conducted at sites where the location of underground storage tanks is unclear. The survey will consist of determining magnetic field at points on an equal-spaced grid above the reported tank location. Grid spacing will be ten feet on center. The magnetic field readings will be used to construct a map delineating the edges of the underground tanks.

## HAND-BORING AND SURFACE SOIL SAMPLING

The purpose of hand-boring and surface soil sampling is to determine the presence or absence and, if present, the extent of contamination in the upper soil horizons at sites where surface spills from drums or transformers were reported or suspected (e.g., Sites 9 and 26) or surface contamination is apparent (e.g., Sites 21 and 22).

Soil boring samples will be taken using a hand or power driven stainless steel auger or soil sampler to a depth of four feet. The four feet of sample will be divided into three discrete-depth samples. At some sites, equivalent-depth samples from adjacent hand borings will be composited. Whether or not compositing will be done at a site is detailed in Section 3.

Surface soil samples will be collected using a stainless steel trowel. Compositing of adjacent surface soil samples will be done at several sites.

## DRILLING PROGRAM

The objectives of the drilling program at Rickenbacker ANGB are to obtain samples for lithologic descriptions and stratigraphic correlation, to obtain samples of soil for chemical analysis, and to install groundwater monitoring wells. The monitoring wells will be used for hydrologeologic characterization of the shallow and second aquifer beneath the base and to obtain samples for evaluation of groundwater quality in both aquifers. Monitoring well drilling and construction will be performed by an experienced driller. All drilling sites will be screened with a metal detector to verify the location of underground pipelines and tanks before commencing drilling.

### Drilling Procedures

Soil borings drilled for collection of soil samples and for installation of monitoring wells will be advanced using 4.25 inch inside diameter (ID) continuous flight hollow-stem augers (approx. 6 inch diameter boring). A stainless steel split-spoon sampler will be used for collection of samples continuously from the 17 initial well borings and at intervals of five feet or at lithologic changes in subsequent borings, using ASTM Method D-1586. Deep borings to bedrock will be drilled during the RI using hollow-stem auger techniques to a depth of approximately 60 feet, temporary casing will be installed/driven to 60 feet and the hole continued using air-rotary drilling methods or other methods appropriate to the expected lithology and environmental concerns.

Where desirable, the deep borings will be filled with a cement/ bentonite grout (94 pounds of cement/4 pounds of granular bentonite/6 gallons of water) (4.08 percent) to an appropriate depth using a tremie pipe and completed as a monitoring well. If not made into a well, the boring will be filled to grade with the grout mixture.

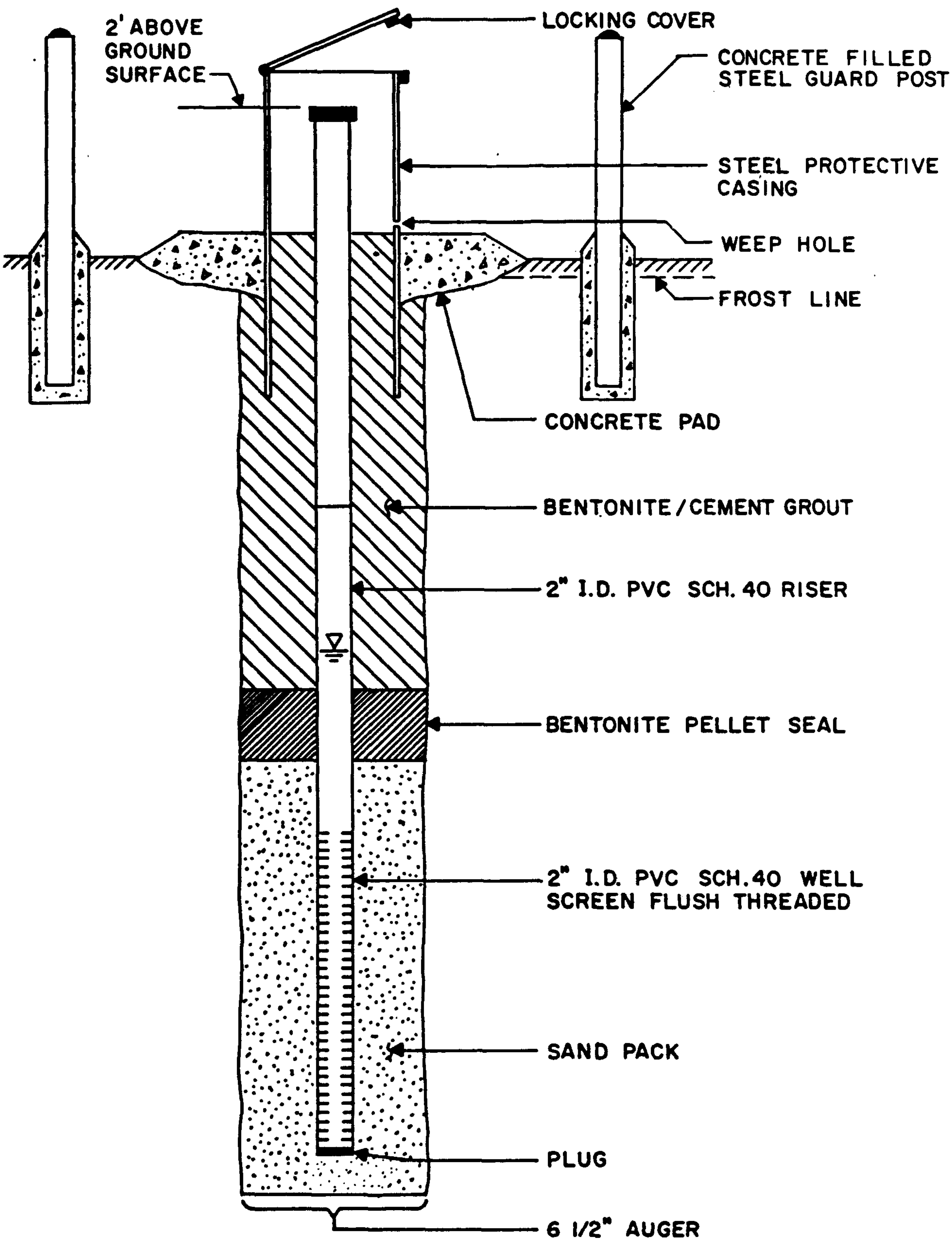
Several shallow borings will be drilled to a depth of fifteen feet or to the water table. These borings will be made with a 3.25 inch ID hollow-stem auger and sampled every five feet using a stainless steel split-spoon sampler. Following drilling, these borings will be filled to grade with a cement/bentonite grout using a tremie pipe.

### Monitoring Well Construction, Completion and Development

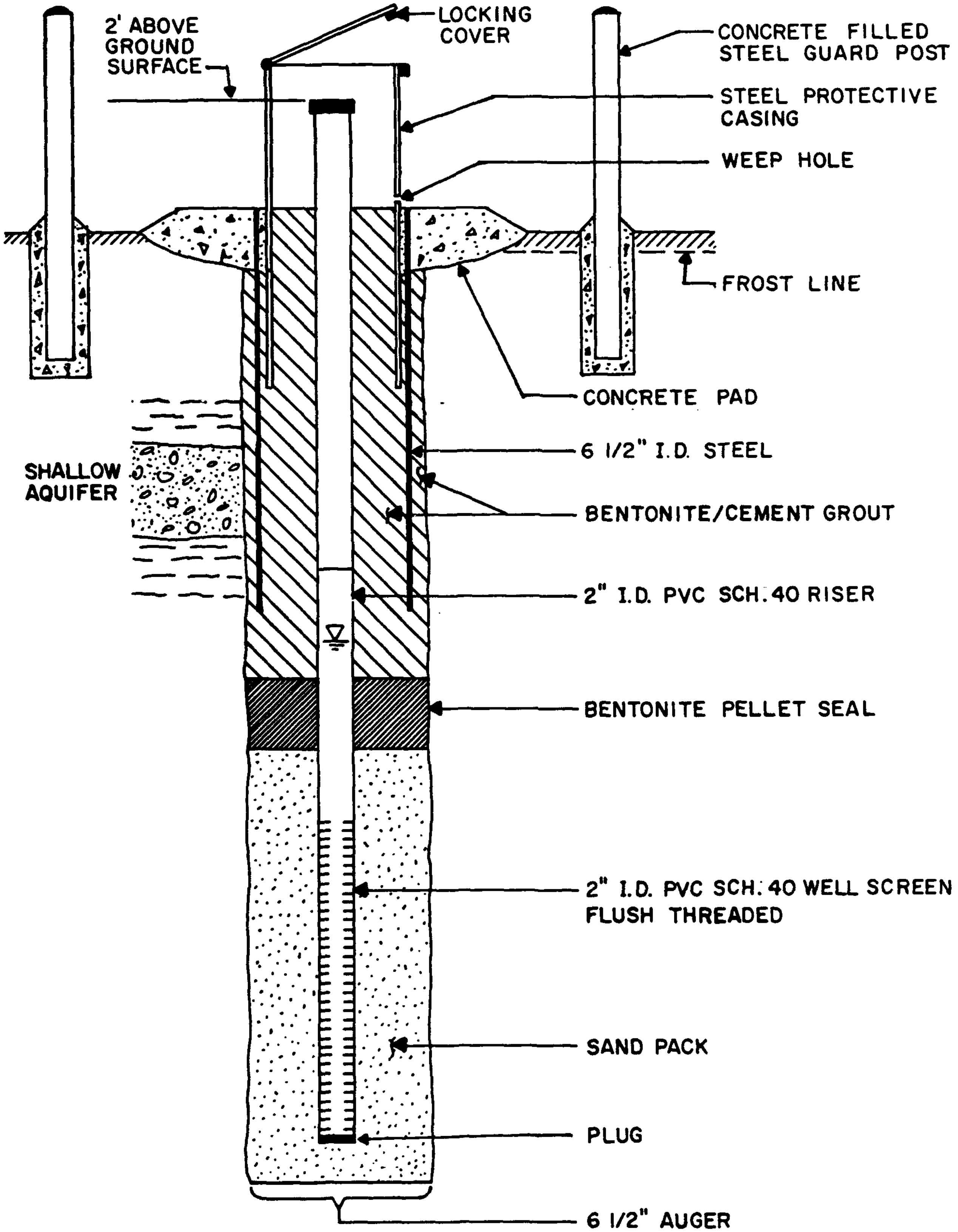
The wells installed to monitor the shallow aquifer at the 23 sites will consist of 2-inch ID Schedule 40 PVC casing and screen. The wells for additional hydrogeologc control will be constructed of 4-inch ID PVC. The casing and screen will have threaded, flush joints and a threaded bottom cap. A ten-foot screen, machine slotted with 0.010 inch openings will be set spanning the water table to detect floating contaminants and to allow for seasonal water table fluctuations. The screen and casing will be installed through the inside of the augers. A sand pack consisting of No. 30 x 40 washed and bagged Ottawa sand or equivalent will be placed around the screen while the augers are slowly withdrawn to prevent bridging of the sand. The sand pack will extend two to three feet above the screen or in accordance with the State of Ohio well construction regulations. A minimum two-foot thick bentonite pellet seal will be placed above the sand pack. A cement/bentonite grout mixture will be placed using a tremie pipe from the top of the bentonite seal to six inches below the ground surface. A typical monitoring well construction diagram for wells to be installed in the shallow aquifer is presented in Figure 5.1.

The wells installed during the RI and the deep well for hydrogeologic control to monitor the second aquifer will be constructed in the same way as the shallow aquifer wells with the addition of steel casing to isolate the shallow aquifer (Figure 5.2). Upon drilling through the shallow aquifer into the underlying clay, a steel casing will be installed and held in place by a cement/bentonite grout. After the grout has set, drilling will continue into the second aquifer and the well will be installed (Figure 5.2).

Most of the wells will be completed with two feet of casing extending above the ground surface. A protective steel casing (six feet long) equipped with a locking cap will be set into the cement grout to a depth below the frost line and a minimum 6 inch thick concrete pad will be installed around the riser pipe of the above-grade wells. The well number will be imprinted on the well cover lid. Three steel guard posts will be erected around each of the protective steel casings, each set four feet deep in separate footings. Wells in vehicle traffic areas will be cut off six inches below grade. A locking protective lid consisting of a cast iron valve box assembly will be installed in a concrete mixture above the cement grout. The top of the valve box will be finished with a slight crest to facilitate runoff away from the well. The well number will be imprinted




TYPICAL
MONITORING WELL CONSTRUCTION
FOR SHALLOW AQUIFER WELLS




TYPICAL
MONITORING WELL CONSTRUCTION
FOR SECOND AQUIFER WELLS

on the valve box lid. Protective casings and valve box lids will be painted a bright color. Each below-grade well will be fitted with a water-tight cap with a 1/8" vent hole.

The monitoring wells will be developed by bailing or pumping until the pH and conductivity has stabilized to ±10 percent. Water level recovery will be monitored after final well development to complement slug test results.

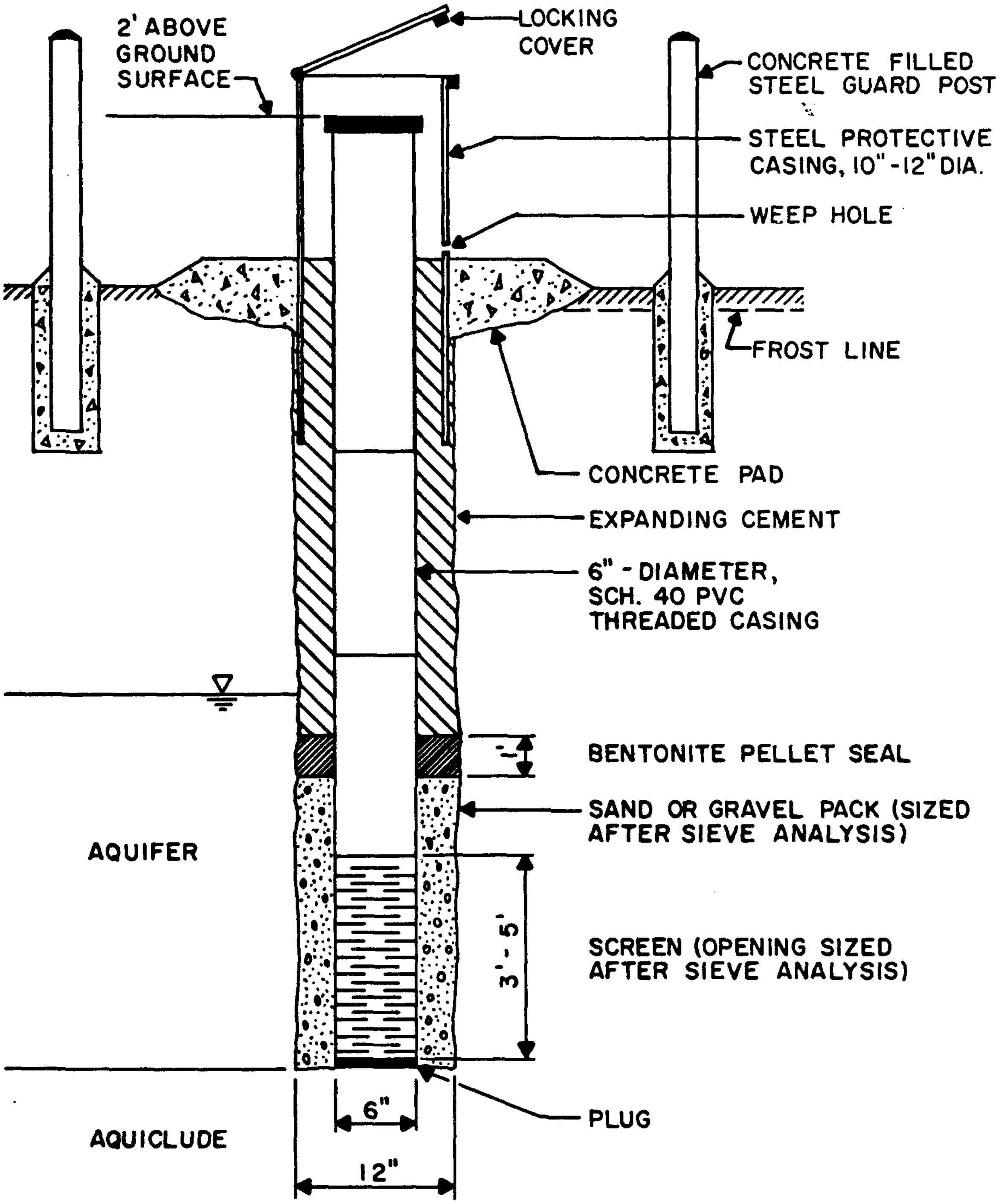
Pumping-Well Drilling and Installation

Up to three 6 inch diameter wells to be used for pumping tests are planned for the RI. The actual locations and design of the wells will be decided during the RI based on contaminant distribution and aquifer variability. If contaminated sites are widely spaced and aquifer variability is great, all three pumping wells may be needed. The following is a general description of the planned wells.

The boring for the 6-inch well will be made to the base of the aquifer of interest by hollow-stem auger or other well drilling techniques and reamed to a 12 inch diameter. The well will be constructed in a similar manner as the monitoring wells except that screen slot size and sand pack grain-size will be determined based on sieve analysis of aquifer sediments (Figure 5.3).

## SOIL-GAS SURVEYING

Soil-gas surveying will be conducted during the SI and RI at selected sites. The soil-gas method for detecting subsurface contamination involves the collection of gas samples from the unsaturated zone and testing the sample for organic compounds. Collection of the gas is accomplished by driving a probe into the ground to a depth of 5 to 15 feet and withdrawing an air sample. A measured volume of the gas is drawn into a glass or stainless steel bulb or Tedlar® bag using a vacuum pump. The gas in the sample container is then screened for total volatile organic concentration using a PID. The sampling is then repeated and the sample analyzed for specific compound concentrations on-site using a portable gas chromatograph (GC). The results of the survey can be used to map concentrations of organic soil vapors and aid in defining a plume of contamination. At sites covered by concrete or asphalt paving, a pilot hole will be drilled through the pavement.




## GENERALIZED PUMPING WELL CONSTRUCTION

Depth of soil-gas sample collection will be based on two evaluation criteria. The log of the well boring nearest the soil-gas survey area will be reviewed to identify lithologic characteristics that may impede vertical gas migration, e.g., a perched water layer. If no impediments to a reliable survey are noted, the survey will be conducted. If an impediment is identified, the possible ramifications on the validity of a soil-gas survey will be evaluated and discussed with the HAZWRAP Project Manager before proceeding.

The initial soil-gas survey point at each site will be located where contamination is expected. Soil-gas samples will be collected at two to five foot intervals to a total depth approximately two feet above the water table or 15' (whichever is less). From this soil-gas profile, the depth from which soil-gas samples will be collected for the rest of the survey will be determined.

## AQUIFER MONITORING AND TESTING

The nested pair of monitoring wells designated for Additional Hydrogeologic Control will be drilled to the shallow aquifer and the second aquifer within the Base well field early in the SI. The wells will be equipped with continuous water-level recorders. The recorders will operate for one year after installation and the resulting records compared to pumping records of the Base wells to attempt an evaluation of aquifer interconnectedness and to monitor seasonal water level fluctuation.

Rising-head (slug) tests will be performed on all monitoring wells installed during the SI to estimate aquifer characteristics. The tests will follow protocol for field determination of hydraulic conductivity set out in EPA Method 9100. The slug tests will be performed in conjunction with well development and presampling purging. Following water withdrawal for sampling or development, water level recovery will be monitored using an electric water level indicator.

The data collected during the slug tests will be used to calculate hydraulic conductivity which will be used to estimate transmissivity and water flow velocity through the tested aquifer.

Pumping tests will be performed on the six-inch wells installed during the RI and possibly on a Base water-supply well. A submersible (or other suitable) pump will be used to remove water from the wells. The tests will be run for a minimum of 24 hours. Pump discharge will be measured by a flow meter and checked periodically by volumetric measurement. Existing two-inch monitoring wells will be used to monitor water table fluctuations throughout the tests. Pressure transducer measuring devices equipped with a recorder will be used to monitor water levels in the pumping well and the nearest two-inch wells. Electric water level indicators will be used at other monitor wells in the vicinity. Hydraulic conductivity, storage coefficient and transmissivity of the aquifer will be determined from pumping test data.

## SITE SURVEYS

All hand-boring, surface soil, ditch sediment, soil boring and monitoring well locations will be identified on maps provided by Base personnel. The horizontal locations of the soil borings and monitoring wells will be surveyed by a licensed surveyor to an accuracy of one foot. The vertical location of a clearly marked measuring point on the top of each monitoring well will also be surveyed with reference to U.S. Geological Survey or U.S. Geodetic Survey benchmarks with an accuracy of $\pm 0.01$ foot. Accurately locating the hand-boring and surface soil sampling sites will be accomplished by tape and compass orientation with respect to a local structure or roadway which appears on Base plans.

## FIELD MEASUREMENTS

Field measurements of temperature, pH, and specific conductance will be performed on water samples at the time of sample collection. Details of sampling techniques are included in Section 6.

### Temperature and pH Measurement

The temperature and pH of each water sample will be measured using an automatic temperature compensating pH probe. The probe will be calibrated using buffer solutions of the appropriate range for expected values of pH. The meter will also be re-calibrated according to manufacturer's instructions.

### Conductivity Measurement

The specific conductance of each water sample will be measured with a portable conductivity meter. Standard potassium chloride solutions will be used to calibrate the instrument prior to use. The meter will also be re-calibrated periodically according to manufacturer's instructions.

## DECONTAMINATION AREA

An equipment decontamination area will be designated. A decontamination pad will be constructed consisting of a concrete base with curbing covered with plastic. The base and curbing will be designed so that all wash water and soils will be contained on the pad and drain into a sump. Waste from the sump will be pumped into drums for temporary storage until final disposition is determined. All drums will be labeled as to date of collection.

The decontamination pad will be of sufficient size to contain the largest drill rig which will be used at the site. Exact specifications of the pad will be determined after coordinating with Base personnel about the location of the pad and decontamination activities.

## CONTAMINATED MATERIALS MANAGEMENT

All excess soil, development water, purge water, pump test discharge water and decontamination waste water will be collected and stored on-site pending receipt of results of chemical analysis of representative samples. The source and date of collection of the waste material in each container will be clearly marked on the outside of the container. Soil and ground water analyses for samples collected from the wells from which the contaminated material came will be used to establish chemical properties of the waste and determine disposal needs. If waste containers include material from several wells, a composite sample will be collected from the container and analyzed for the parameters detected in the source wells.

Materials will be staged at a common secure location, identified and separated by type of material. The containers will be segregated by contaminant and contaminant concentrations. Base personnel will be informed of ongoing status of the materials management. ES will determine proper disposal procedures and arrange for proper transport and disposal. All waste manifests will be signed by ANG personnel.

# SECTION 6
# SAMPLING AND ANALYTICAL PLAN

Soil, sediment, ground-water, surface water, and soil-gas samples will be collected at Rickenbacker ANGB, Columbus, Ohio to confirm the presence or absence of contamination at sites suspected of having environmental contamination because of past hazardous waste disposal practices, spills or leakage. This section presents the procedures for collection of the various media and the methods that will be used to analyze the samples.

## SOIL SAMPLING

Surface soil samples will be collected with a stainless steel trowel to a maximum depth of six inches. Hand boring samples will be collected using a stainless steel auger or soil sampler to a depth of four feet and divided into three equal segments. Some compositing of equivalent-depth samples from adjacent borings will be done at sites where determination of lateral extent of contamination is not imperative.

During drilling operations, soil samples will be collected continuously in the initial 17 wells and at five foot intervals and at lithologic changes in subsequent borings with a split-spoon sampler using the Standard Penetration Test (ASTM D-1586). Soils will be classified with respect to type, by the visual-manual procedure (ASTM D-2488) noting mineralogy, color, odor, staining, etc. The samples will also be checked for the presence of organic vapors. The test for vapors will involve placing a portion of the sample, not intended for volatile analysis at the laboratory, in a jar, sealing the jar with aluminum foil, allowing the sample to equilibrate for five minutes, then measuring the concentration of organics in the headspace of the jar using a meter with a photoionization detector (PID).

In the event that the air temperature is below 40°F, the samples designated for vapor screening will be set aside and at the end of the day placed in a heated room for one hour and then checked for vapors using the PID. This step is taken because PIDs are less accurate below 40°F.

Selected soil samples from drilling, and all surface soil and hand boring samples will be packaged and shipped to a laboratory for chemical analysis. Soil samples selected for chemical analysis for non-volatile constituents will be removed from the sampler and placed in a stainless steel bowl. The sample will be broken apart by means of a stainless steel spoon and split among the various containers for shipment to the laboratory. This same mixing procedure will be used to composite surface and hand boring soil samples. Samples for volatile analysis will be placed in bottles as quickly as possible to minimize volatilization. The sample bottle types that will be used for soil samples are presented in Table 6.1.

All drilling equipment will be decontaminated between boreholes to prevent cross-contamination. The drill rig and out of hole equipment (wrenches, auger head, etc.) will be steam-cleaned. All downhole drilling tools (auger flights, bits and center rods) will be decontaminated with steam cleaning followed by a detergent wash, a clean-water rinse, a deionized organic free water rinse and an isopropyl rinse. The equipment will be allowed to air dry prior to its next use. All tools used for soil sampling and packaging (trowels, soil samplers, split-spoon samplers, stainless steel mixing bowls, and stainless steel mixing spoons) will be decontaminated after the collection of each sample. This will consist of a detergent wash, clean-water rinse, deionized organic-free water rinse and an isopropyl rinse. After the final rinse, the sampling equipment will be allowed to air dry before being re-used.

## DITCH BOTTOM SEDIMENT SAMPLING

Sediment samples will be collected from the upper two to six inches of the ditch bottom. The samples will be collected using a dip sampler by inverting the sampler, immersing it to the bottom of the stream, and slowly filling it.

The water from above the sediment will be decanted before the sample is placed in sample bottles for shipment to the laboratory. The types of bottles that will be used for sediment samples are presented in Table 6.1. The equipment used for collecting and compositing sediment samples will be decontaminated prior to each use. The decontamination procedures will consist of a detergent wash, clean-water rinse, deionized organic free water rinse, and an isopropyl rinse. The equipment will then be allowed to air dry before its next use.

TABLE 6.1

**RICKENBACKER ANGB, COLUMBUS, OHIO**
**ANALYTICAL METHODS AND COLLECTION SPECIFICATIONS FOR SOIL & SEDIMENT SAMPLES**

| Parameter | Analytical Method (1) | Sample Container | Preservation Method | Holding Time |
|---|---|---|---|---|
| Halogenated Volatile Organics | 8010/8240 | 4 oz (120 ml) widemouth glass w/Teflon® liner | Cool, 4°C | 14 days |
| Aromatic Volatile Organics | 8020/8240 | 8 oz, widemouth glass w/Teflon® liner | Cool, 4°C | 14 days |
| Pesticides/PCBs | 8080 | 8 oz, widemouth glass w/Teflon® liner | Cool, 4°C | Samples must be extracted within 14 days and extracts analyzed within 40 days |
| Herbicides | 8150 | 8 oz, widemouth glass w/Teflon® liner | Cool, 4°C | |
| Semi-Volatile Organics | 8270 | 8 oz, widemouth glass w/Teflon® liner | Cool, 4°C | |
| Petroleum Hydrocarbons | EPA 418.1(2) | 4 oz, widemouth glass w/Teflon® liner | Cool, 4°C | 28 days |
| Metals: | 6010 or: | | | |
| Antimony | 7040/7041 | | | |
| Arsenic | 7060/7061 | | | |
| Beryllium | 7090/7091 | | | |
| Cadmium | 7130/7131 | | | |
| Chromium | 7190/7191 | | | |
| Copper | 7210 | | | |
| Lead | 7420/7421 | 8 oz, widemouth glass w/Teflon® liner | Cool, 4°C | 6 months (except Mercury; 28 days) |
| Mercury | 7470/7471 | | | |
| Nickel | 7520 | | | |
| Selenium | 7740/7741 | | | |
| Silver | 7760 | | | |
| Thallium | 7840/7841 | | | |
| Zinc | 7950 | | | |
| Sulfate | 9038 | 8 oz, widemouth glass w/Teflon® liner | Cool, 4°C | 28 days |

1. Source unless otherwise noted: SW 846, Test Methods for Evaluating Solid Wastes, U.S. EPA, November 1986.
2. USEPA, Methods for Chemical Analysis of Water and Wastes, March 1983.

## GROUNDWATER SAMPLING

Prior to sampling each monitoring well, the static water level will be measured, and pH temperature and conductivity of the water will be determined. The well will be purged by pumping or bailing until the total well water volume (TWWV) has been removed and pH, conductivity and temperature have stabilized (±10%) or the well is dry. The TWWV includes water in the screen, riser and sand pack. The TWWV will be calculated for each well after measuring static water level and will be recorded in the field log book. Plastic ground covering will be used at each well site to prevent contamination of down-well sampling devices from surface soils.

The bailers and pumps used for purging will be constructed of Teflon®, stainless steel and PVC. Samples will be collected using a Teflon® Bailer with dedicated line. The first sample withdrawn will be put in a container for volatile analysis. Other sample bottles will be filled with the remaining water. Appropriate preservatives will be added to the sample bottles after sample collection. Vials used for containing samples to be analyzed for volatile organics will be checked to assure that no air bubbles are present before the samples are packaged for shipment. A summary of the types of sample bottles and preservatives that will be used for water samples is presented in Table 6.2.

The bailers, pump, and tip of the water level indicator used at each well will be decontaminated before use at the next sampling location. The decontamination procedure will consist of a detergent wash, clean-water rinse, a deionized, organic free water rinse, and an isopropyl rinse. The bailer will be allowed to air dry completely before subsequent use. The probe of the pH wand and the conductivity meter will be rinsed with deionized, organic free water after each use.

## SURFACE WATER SAMPLING

Surface water samples will be collected from the drainage ditches by inverting the sample bottle, immersing it below the water surface, and slowly filling it as it is removed from the water. If water depth is greater than three feet, samples will be collected from the water surface, the base of the water column and mid-depth. The three discrete-depth samples will be composited into one sample bottle containing appropriate preservatives (Table 6.2).

## TABLE 6.2

## RICKENBACKER ANGB, COLUMBUS, OHIO
## ANALYTICAL METHODS AND COLLECTION SPECIFICATIONS FOR WATER SAMPLES

| Parameter | Analytical Method (1) | Sample Container | Preservation Method | Holding Time |
|---|---|---|---|---|
| Halogenated Volatile Organics | 8010/8240 | 40 ml, glass, Teflon®-lined septum cap | Cool, 4°C | 14 days |
| Aromatic Volatile Organics | 8020/8240 | 40 ml, glass, Teflon®-lined septum cap | HCL(4 drops), (8020 only) Cool, 4°C | 14 days |
| Pesticides/PCBs | 8080 | 1 Liter, glass, Teflon®-lined septum cap | Cool, 4°C | Samples must be extracted within 14 days and extracts analyzed within 40 days |
| Herbicides | 8150 | 1 Liter, glass, Teflon®-lined septum cap | Cool, 4°C | |
| Semi-Volatile | 8270 | 1 Liter, amber glass w/Teflon® liner | Cool, 4°C | |
| Petroleum Hydrocarbons | EPA 418.1 (2) | 2 liter, glass | HCl to pH <2, Cool, 4°C | 28 days |
| Total Metals: | 6010 or: | | | |
| Antimony | 7040/7041 | | | |
| Arsenic | 7060/7061 | | | |
| Beryllium | 7090/7091 | | | |
| Cadmium | 7130/7131 | | | |
| Chromium | 7190/7191 | | | |
| Copper | 7210 | | | |
| Lead | 7420/7421 | 2 liter plastic or glass | $HNO_3$ to pH<2 | 6 months (except Mercury; 28 days) |
| Mercury | 7470/7471 | | | |
| Nickel | 7520 | | | |
| Selenium | 7740/7741 | | | |
| Silver | 7760 | | | |
| Thallium | 7840/7841 | | | |
| Zinc | 7950 | | | |
| Sulfate | 9038 | 500 ml, plastic or glass | Cool, 4°C | 28 days |

1. Source (unless otherwise noted): USEPA SW 846, Test Methods for Evaluating Solid Wastes, November 1986.
2. USEPA, Methods for Chemical Analysis of Water and Wastes, March 1983.

## SOIL-GAS SURVEYING

Soil-gas samples will be withdrawn from depths of five to fifteen feet (dependent on drilling results) using a vacuum pump attached to a stainless steel probe. A stainless steel or glass sample bulb or Tedlar® bag will be in the vacuum line between the pump and probe. Two probe volumes of air will be purged from the probe and a volume of soil vapor will be contained. The sampling probe and bulb will be decontaminated between sampling points using air and/or methanol.

Soil-gas samples will be analyzed within one hour of collection using a Photovac, portable gas-chromatograph (GC) Model 10S50 or equivalent. The GC will be calibrated using a gas standard daily before running the first analysis, the calibration will be checked at mid-day and at the end of the day using the gas standard. Components of the standard will be determined based on suspected contaminants at each site.

## SAMPLE CUSTODY AND DOCUMENTATION

The sample custody and documentation procedures described in this section will be followed during collection of soil, sediment, ground-water and surface water samples at Rickenbacker ANGB, Columbus, Ohio. Personnel involved in Chain of Custody and transfer of samples will be trained in these procedures prior to implementation of the field program at the Base.

### Field Log Books

Bound field log books will be maintained by the field team leader and other team members. Information pertinent to the field survey and/or sampling will be recorded in the log books. These will be bound books, with consecutively numbered pages. Waterproof ink will be used in making all entries. Entries in the log book will include at least the following:

- Name and title of author, date and time of entry, and physical/ environmental conditions during field activity;
- Purpose of sampling activity;
- Name and address of field contact;
- Name and title of field crew;
- Name and title of any site visitors;
- Type of sampled media (e.g., soil, sediment, groundwater, etc.);
- Sample collection method;

- Number and volume of sample(s) taken;
- Description of sampling point(s);
- Date and time of collection;
- Sample identification number(s);
- Sample distribution (e.g., laboratory);
- References for all maps and photographs of the sampling site(s);
- Field observations;
- Any field measurements made, such as pH, temperature, water level, etc.; and
- Weather conditions.

If an error is made in a log book, the person who made the entry should make the correction simply by crossing a line through the error and entering the correct information. The erroneous information should not be obliterated. All entries will be signed and dated and all corrections initialed and dated.

Sample Tags

All physical samples obtained at the site will be placed in an appropriate sample container for shipment to the laboratory. Each sample bottle will be identified with a separate identification tag. The information on the tag will include the following information:

- Project identification;
- Sample identification;
- Preservatives added;
- Date of collection;
- Time of collection; and
- Required analytical method numbers.

Sample Numbering System

Each sample will be assigned a unique sample identification number that describes where the sample was collected. Each number will consist of a group of letters and numbers, separated by hyphens. The sample numbering system is presented in Table 6.3.

# CHAIN OF CUSTODY FORM

## ENGINEERING-SCIENCE

### CHAIN OF CUSTODY RECORD

| ES JOB NO. | PROJECT NAME/LOCATION | NO. OF CON-TAINERS | ANALYSES REQUIRED | SHIP TO: |
|---|---|---|---|---|
| SAMPLER(S): (Signature) | | | | |

| DATE | TIME | SAMPLE DESCRIPTION | NO. OF CON-TAINERS | | | | | | | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
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| Relinquished by: (Signature) | Date/Time | Received by: (Signature) | Relinquished by: (Signature) | Date/Time | Received by: (Signature) |
|---|---|---|---|---|---|
| Relinquished by: (Signature) | Date/Time | Received for Laboratory by: (Signature) | Date/Time | Remarks | |

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

TABLE 6.3

SAMPLE NUMBERING SYSTEM
RICKENBACKER ANGB, COLUMBUS, OHIO

| | |
|---|---|
| Project Identification: | RB |
| Site Identification and Number: | Site Number: 1 through 27 |
| Sample Source Number (sequential): | |
| MW ______ | Monitor Well # |
| HB ______ | Hand Boring # |
| AB ______ | Auger Boring # |
| SU ______ | Surface Sediment Sampling Location # |
| DS ______ | Ditch Sampling Location # |
| Sample Number: | |
| GW ______ | Ground Water |
| SW ______ | Surface Water |
| SS ______ | Soil Sample (Split-Spoon or HB) |
| GS ______ | Surface Soil Grab Sample |
| BS ______ | Ditch-Bottom Sediment Sample |

Example:

RB-06-MW1-SS1
First soil sample from Monitor Well #1 drilled at the Base Filling Station at Rickenbacker ANGB.

## Chain of Custody Records

All samples will be accompanied by a Chain of Custody Record (Fig. 6.1). A Chain of Custody Record will accompany the sample from sample collection and shipment to the laboratory and through the laboratory. If samples are split and sent to different laboratories, a copy of the Chain of Custody Record will be sent with each split.

The "Remarks" column will be used to record specific considerations associated with sample acquisition such as: sample type, container type, sample preservation methods, and method number of analyses to be performed. When transferring samples, the individuals relinquishing and receiving will sign, date and note the time on the record.

Two copies of this record will follow the samples to the laboratory. The laboratory maintains one file copy, and the completed original will be returned to the project manager as a part of the final analytical report to document sample custody transfers. Shipments will be sent by air express courier.

## SAMPLE HANDLING, PACKAGING AND SHIPMENT

Precleaned sample bottles are obtained from a commercial supplier. The bottles are stored in their original unopened packages until used at the collection site, with the exception of the bottles used for trip blanks and sampling blanks. These bottles are filled with organic free water at the laboratory where the analyses will be performed and resealed prior to shipment to the field.

Individual sample bottles will be wrapped in bubble pack and placed in sealed plastic bags to prevent breakage in shipment to the laboratory. The packages will be placed in insulated shipping coolers with a plastic bag of ice. A Chain of Custody Record describing the contents of the cooler will be placed in a sealed plastic bag and taped to the upper inside lid of the cooler. The shipping coolers will be taped shut with security labels taped over opposite ends of the lid. The coolers will then be shipped for overnight delivery to the laboratory.

## QUALITY ASSURANCE SAMPLES

Quality Assurance (QA) samples wil be submitted to the laboratory with the ground water, soil, surface water and sediment samples. Blind duplicate samples will be submitted for soil, sediment and water samples. These duplicate samples will be given a false sample number similar to the true sample
identity. The true sample numbers will be recorded in field records, but will not appear on the sample bottle labels or the Chain-of-Custody Records. The purpose of the duplicate samples is to provide a check on laboratory analytical accuracy. The frequency of the duplicate samples will be one for each ten soil and surface water samples and one for each twenty ground water samples submitted for each analysis. Duplicate samples will be collected for analysis at areas where contamination is suspected based on odor, discoloration, the presence of organic vapors or anomalous pH or conductivity measurements.

Additional QA samples for water samples will consist of: one field blank (deionized organic free water in appropriately preserved sample bottles) from each sampling period or water source, one equipment wash blank (deionized organic free water poured through the decontaminated bailer into the appropriately preserved sample bottles) for every other day of sampling, and one trip blank (VOA vials filled by the laboratory with deionized, organic free water) in each cooler transporting samples for volatile organic analyses. The purpose of the trip blank is to monitor for sample contamination that might occur during shipping and handling or from improperly cleaned sample bottles. The purpose of the field blank is to verify the quality of the deionized, organic free water used for decontamination. The purpose of the equipment wash blanks is to test the effectiveness of decontamination procedures.

## ANALYTICAL METHODS

The samples of soil, sediment, groundwater and surface water will be analyzed for the parameters listed in Tables 6.1 and 6.2. The target compounds for methods using gas chromotography (GC) and gas chromatography/ mass spectrometry (GC/MS) are listed in Tables 6.4 and 6.5, respectively. Second column confirmation will be performed for GC analyses when target compounds are present above detection limits. Confirmation will be required before positive values will be reported. Quantification of the compounds that are detected will be based on the first column results. The samples will be submitted to the ES laboratory in Berkeley, CA.

## DETECTION LIMITS

The detection limits for organic compounds determined by GC or GC/MS methods are published in the respective methods (SW 846). These method detection limits (MDL) are determined using laboratory prepared standard solutions. The actual detection limit obtainable for an environmental sample may be higher due to the sample matrix. The practical quantitation limits published in the methods are used as a guideline for establishment of the lower limit for quantitation.

The minimum detection limits for the requested metals analyses are published for the respective methods. The minimum reporting limits for these metals are shown in Table 6.6.

The detection limit for petroleum hydrocarbons in soil is 100 mg/Kg.

The detection limit for sulfate in soil is 100 mg/Kg.

## TABLE 6.4

## LIST OF COMPOUNDS FOR GC METHODS
## RICKENBACKER ANGB, COLUMBUS, OHIO

**SW 8020 - Aromatic Volatile Organics**

| | |
|---|---|
| Benzene | 1,4-Dichlorobenzene |
| Chlorobenzene | Ethyl Benzene |
| 1,2-Dichlorobenzene | Toluene |
| 1,3-Dichlorobenzene | Xylenes (Dimethyl benzenes) |

**SW8010 - Halogenated Volatile Organics**

| | |
|---|---|
| Bis(2-chloroethoxy)methane | 1,4-Dichlorobenzene |
| Bis(2-chloroisopropy)ether | Dichlorodifluoromethane |
| Bromobenzene | 1,1-Dichloroethane |
| Bromodichloromethane | 1,2-Dichloroethane |
| Bromoform | 1,1-Dichloroethylene |
| | trans-1,2-Dichloroethylene |
| Carbon tetrachloride | |
| Chloroacetaldehyde | Dichloromethane |
| Chlorobenzene | 1,2-Dichloropropane |
| Chloroethane | trans-1,3-Dichloropropylene |
| Chloroform | 1,1,2,2-Tetrachloroethane |
| 1-Chlorohexane | 1,1,1,2-Tetrachloroethane |
| 2-Chloroethyl vinyl ether | Tetrachloroethylene |
| Chloromethane | 1,1,1-Trichloroethane |
| Chlorotoluene | 1,1,2-Trichloroethane |
| Dibromochloromethane | Trichloroethylene |
| Dibromomethane | Trichlorofluoromethane |
| 1,2-Dichlorobenzene | Trichloropropane |
| 1,3-Dichlorobenzene | Vinyl chloride |

**SW8080 - Organochlorine Pesticides and PCBs**

| | |
|---|---|
| Aldrin | Endrin aldehyde |
| a-BHC | Heptachlor |
| -BHC | Heptachlor epoxide |
| -BHC | Kepone |
| -BHC (Lindane) | Methoxychlor |
| Chlordane | Toxaphene |
| 4,4'-DDD | PCB-1016 (Aroclor-1016) |
| 4,4'-DDE | PCB-1221 (Aroclor-1221) |
| 4,4'-DDT | PCB-1232 (Aroclor-1232) |
| Dieldrin | PCB-1242 (Aroclor-1242) |
| Endosulfan I | PCB-1248 (Aroclor-1248) |
| Endosulfan II | PCB-1254 (Aroclor-1254) |
| Endosulfan sulfate | PCB-1260 (Aroclor-1260) |
| Endrin | |

**SW8150 - Chlorinated Herbicides**

| | |
|---|---|
| 2,4-D | Dicamba |
| 2,4-DB | Dichloroprop |
| 2,4-5-T | Dinoseb |
| 2,4-5-TP (Silvex) | MCPA |
| Dalapon | MCPP |

## TABLE 6.5

## LIST OF COMPOUNDS FOR GC/MS METHODS
## RICKENBACKER ANGB, COLUMBUS, OHIO

### SW8270 - Base/Neutral Extractables

Acenaphthene
Acenaphthylene
Anthracene
Aldrin
Benzo(a)anthracene

Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Benzo(ghi)perylene
Benzyl butyl phthalate

b-BHC
d-BHC
Bis(2-chloroethyl)ether
Bis(2-chloroethoxy)methane
Bis(2-ethylhexyl)phthalate

Bis(2-chloroisopropyl)ether
4-Bromophenyl phenyl ether
Chlordane
2-Chloronaphthalene
4-Chlorophenyl phenyl ether

Chrysene
4,4'-DDD
4,4'-DDE
4,4'-DDT
Dibenzo(a,h)anthracene

Di-n-butylphthalate
1,3-Dichlorobenzene
1,2-Dichlorobenzene
1,4-Dichlorobenzene
3,3'-Dichlorobenzidine

Dieldrin
Diethyl phthalate
Dimethyl phthalate
2,4-Dinitrotoluene
2,6-Dinitrotoluene

Di-n-octylphthalate
Endosulfan sulfate
Endrin aldehyde
Fluoranthene
Fluorene
Heptachlor
Heptachlor epoxide
Hexachlorobenzene
Hexachlorobutadiene
Hexachloroethane

Indeno(1,2,3-cd)pyrene
Isophorone
Naphthalene
Nitrobenzene
N-Nitrosodi-n-propylamine

PCB-1016
PCB-1221
PCB-1232
PCB-1242
PCB-1248

PCB-1254
PCB-1260
Phenanthrene
Pyrene
Toxaphene
1,2,4-Trichlorobenzene

### Acid Extractables

4-Chloro-3-methylphenol
2-Chlorophenol
2,4-Diichlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol

2-Methyl-4,6-dinitrophenol
2-Nitrophenol
4-Nitrophenol
Pentachlorophenol
Phenol
2,4,6-Trichlorophenol

**TABLE 6.5**
**(continued)**

**LIST OF COMPOUNDS FOR GC/MS METHODS**
**RICKENBACKER ANGB, COLUMBUS, OHIO**

SW8240 - Volatile Organics

Benzene
Bromobenzene
Bromodichloromethane
Bromoform

Carbon tetrachloride
Chloroacetaldehyde
Chlorobenzene
Chloroethane
Chloroform
1-Chlorohexane
2-Chloroethyl vinyl ether
Chloromethane
Chlorotoluene
Dibromochloromethane
Dibromomethane
1,2-Dichlorobenzene
1,3-Dichlorobenzene

1,4-Dichlorobenzene
Dichlorodifluoromethane
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethylene
trans-1,2-Dichloroethylene

Dichloromethane
1,2-Dichloropropane
trans-1,3-Dichloropropylene
Ethyl Benzene
1,1,2,2-Tetrachloroethane
1,1,1,2-Tetrachloroethane
Tetrachloroethylene
Toluene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethylene
Trichlorofluoromethane
Trichloropropane
Vinyl chloride
Xylenes (Dimethyl benzenes)

## TABLE 6.6

## MINIMUM REPORTING LIMITS

| METAL | ANALYSIS METHODS | WATER ug/L | SOIL mg/Kg |
|---|---|---|---|
| Antimony | 6010/7040 | 100 | 10 |
| Arsenic | 7061 | 10 | 1 |
| Beryllium | 6010/709 | 5 | 0.5 |
| Cadmium | 6010/7130/7131 | 10 | 1 |
| Chromium | 6010/7190 | 50 | 5 |
| Copper | 6010/7210 | 25 | 2.5 |
| Lead | 6010/7240/7421 | 20 | 10 |
| Mercury | 7470/7471 | 0.2 | 20 |
| Nickel | 6010/7520 | 40 | 4 |
| Selenium | 7741 | 10 | 1 |
| Silver | 6010/7760 | 50 | 5 |
| Thallium | 6010/7840/7841 | 100 | 10 |
| Zinc | 6010/7950 | 20 | 2 |

# SECTION 7

# LABORATORY ANALYTICAL
# QUALITY ASSURANCE/QUALITY CONTROL(QA/QC) PLAN

## RESPONSIBILITY

The Engineering-Science (ES) Project Manager shall have overall responsibility for the coordination of field sample collection, sample shipping and handling, chemical analyses, and report preparation, all in accordance with this Laboratory Analytical QA/QC Plan.

The Project Quality Assurance Officer (PQAO) shall report to the Project Manager, and will have direct responsibility to implement and ensure compliance with this Laboratory Analytical QA/QC Plan. To accomplish these objectives, the PQAO will have responsibility and authority to conduct quality assurance audits and implement corrective measures as required to comply with the QA/QC Plan.

## PARAMETERS, ANALYTICAL METHODS, SAMPLE CONTAINERS AND HOLDING TIMES

The parameters, analytical methods, sample containers, and sample holding times for this project are presented in Table 7.1 for water samples and Table 7.2 for soil and sediment samples. Analyses will be performed within the holding times presented in these tables.

## PRECISION AND ACCURACY OF ANALYTICAL DATA

The validity of the data produced will be assessed for precision and accuracy based on results of analysis of QA and QC samples. The procedures to be used for assessing precision and accuracy of the data are in accordance with 44 FR 69533 "Guidelines Establishing Test Procedures for the Analyses of Pollutants, Appendix III - Example Quality Assurance and Quality Control Procedures for Organic Priority Pollutants", December 3, 1979. These procedures, and guidelines for determining when corrective actions are required to maintain analytical quality control, are discussed below.

### Precision

The term precision refers to the relative percentage difference (RPD) in values obtained for two duplicate samples. Precision is calculated as follows:

TABLE 7.1

RICKENBACKER ANGB, COLUMBUS, OHIO
ANALYTICAL METHODS AND COLLECTION SPECIFICATIONS FOR WATER SAMPLES

| Parameter | Analytical Method (1) | Sample Container | Preservation Method | Holding Time |
|---|---|---|---|---|
| Halogenated Volatile Organics | 8010/8240 | 40 ml, glass, Teflon®-lined septum cap | Cool, 4°C | 14 days |
| Aromatic Volatile Organics | 8020/8240 | 40 ml, glass, Teflon®-lined septum cap | HCL(4 drops) (8020 only), cool, 4°C | 14 days |
| Pesticides/PCBs | 8080 | 1 Liter, glass, Teflon®-lined septum cap | Cool, 4°C | Samples must be extracted within 14 days and extracts analyzed within 40 days |
| Herbicides | 8150 | 1 Liter, glass, Teflon®-lined septum cap | Cool, 4°C | |
| Semi-Volatile | 8270 | 1 Liter, amber glass w/Teflon® liner | Cool, 4°C | |
| Petroleum Hydrocarbons | EPA 418.1 (2) | 2 Liter, glass | HCl to pH <2, Cool, 4°C | 28 days |
| Total Metals: | 6010 or: | | | |
| Antimony | 7040/7041 | | | |
| Arsenic | 7060/7061 | | | |
| Beryllium | 7090/7091 | | | |
| Cadmium | 7130/7131 | | | |
| Chromium | 7190/7191 | | | |
| Copper | 7210 | | | |
| Lead | 7420/7421 | 2 Liter plastic or glass | $HNO_3$ to pH<2 | 6 months (except Mercury; 28 days) |
| Mercury | 7470/7471 | | | |
| Nickel | 7520 | | | |
| Selenium | 7740/7741 | | | |
| Silver | 7760 | | | |
| Thallium | 7840/7841 | | | |
| Zinc | 7950 | | | |
| Sulfate | 9038 | 500 ml, plastic or glass | Cool, 4°C | 28 days |

1. Source (unless otherwise noted): USEPA SW 846, Test Methods for Evaluating Solid Wastes, November 1986.
2. USEPA, Methods for Chemical Analysis of Water and Wastes, March 1983.

## TABLE 7.2

**RICKENBACKER ANGB, COLUMBUS, OHIO**
**ANALYTICAL METHODS AND COLLECTION SPECIFICATIONS FOR SOIL & SEDIMENT SAMPLES**

| Parameter | Analytical Method (1) | Sample Container | Preservation Method | Holding Time |
|---|---|---|---|---|
| Halogenated Volatile Organics | 8010/8240 | 4 oz (120 ml) widemouth glass w/Teflon® liner | Cool, 4°C | 14 days |
| Aromatic Volatile Organics | 8020/8240 | 8 oz, widemouth glass w/Teflon® liner | Cool, 4°C | 14 days |
| Pesticides/PCBs | 8080 | 8 oz, widemouth glass w/Teflon® liner | Cool, 4°C | Samples must be extracted within 14 days and extracts analyzed within 40 days |
| Herbicides | 8150 | 8 oz, widemouth glass w/Teflon® liner | Cool, 4°C | |
| Semi-Volatile Organics | 8270 | 8 oz, widemouth glass w/Teflon® liner | Cool, 4°C | |
| Petroleum Hydrocarbons | EPA 418.1(2) | 4 oz, widemouth glass w/Teflon® liner | Cool, 4°C | 28 days |
| Metals: | 6010 or: | 8 oz, widemouth glass w/Teflon® liner | Cool, 4°C | 6 months (except Mercury; 28 days) |
| Antimony | 7040/7041 | | | |
| Arsenic | 7060/7061 | | | |
| Beryllium | 7090/7091 | | | |
| Cadmium | 7130/7131 | | | |
| Chromium | 7190/7191 | | | |
| Copper | 7210 | | | |
| Lead | 7420/7421 | | | |
| Mercury | 7470/7471 | | | |
| Nickel | 7520 | | | |
| Selenium | 7740/7741 | | | |
| Silver | 7760 | | | |
| Thallium | 7840/7841 | | | |
| Zinc | 7950 | | | |
| Sulfate | 9038 | 8 oz, widemouth glass w/Teflon® liner | Cool, 4°C | 28 days |

1. Source unless otherwise noted: SW 846, Test Methods for Evaluating Solid Wastes, U.S. EPA, November 1986.
2. USEPA, Methods for Chemical Analysis of Water and Wastes, March 1983.

$$\text{Relative Percentage Difference (RPD)} = \frac{2\ (C_1 - C_2)}{C_1 + C_2} \times 100$$

where:

$C_1$, $C_2$ = The two values obtained by analyzing duplicate samples

Acceptable levels of precision vary according to the sample matrix, the specific analytical method, and the analytical concentration relative to the method detection limit.

The precision obtained for metals analyses shall be evaluated based upon a control limit of 20 RPD for values greater than 5 times the detection limit. A control limit of 2 times the detection limit will be used for values less than 5 times the detection limit. If either value is less than the detection limit, a RPD is not calculated.

Since specific RPD criteria have not been established for inorganic ions and inorganic water quality parameters, as defined in EPA 600/4-79-020 or EPA SW 846 methods, the same values used for metals will be used (as advisory limits only) for these parameter determinations.

The precision obtained for the analyses of volatile halogenated compounds and volatile aromatic compounds will be evaluated upon the basis of the RPD calculated for quantitation on a single column. The EPA methods for these analyses provide statistical precision data as a function of concentration for individual compounds. These values will be used as a guideline to access the precision of duplicate analyses.

Accuracy

The term accuracy refers to the correctness of the value obtained from analysis of a sample, and is determined by analyzing a given sample and its corresponding matrix spike sample. Accuracy is expressed as percentage recovery (PR) and is calculated using the following formula.

$$\text{Percentage Recovery (PR)} = \frac{S_s - S_o}{S} \times 100$$

value:

$S_o$ = Background value, the value obtained by analyzing the sample before spiking;

$S$ = Concentration corresponding to the spike addition to the sample; and

$S_s$ = Value obtained by analyzing the matrix spike sample with the spike added.

The degree of accuracy, or percentage recovery (PR), to be expected is dependent upon the sample matrix, specific analytical method, and the concentration of the analyte relative to its detection limit. The closer the measured value is to the detection limit, the lower the accuracy of analysis. Metals and other inorganic water quality parameters are normally determined within the range of 70 to 125 percent or as specified by ES Laboratory Control Charts.

The procedures for spiking samples to be analyzed by gas chromotography methods 8010, 8020, 8240, 8080, 8270 and 8150 are described in each respective method. The expected range for recoveries of each compound are also provided in the method descriptions.

## INTERNAL QUALITY CONTROL SAMPLES AND PROCEDURES

Internal quality control samples will be run routinely throughout the project. These will consist of duplicate samples, matrix spike samples, surrogate spike samples, and reagent blanks. The number of quality control samples will be dependent on the total number of samples received for each sample matrix (soil, water, etc.) and the frequency of sample shipments. A minimum of one blank, one matrix spike, and one duplicate will be analyzed for each ten field samples received. Quality control samples will be analyzed with each set of samples analyzed.

### Duplicate Samples

Whenever possible, internal duplicate samples will be generated for analysis by splitting randomly-selected samples to obtain two identical samples. For some analyses and sample types it is not possible to obtain identical duplicates in this manner. External field duplicates must then be collected to determine precision. An example of this includes water samples collected for oil and grease analysis.

### Matrix/Spike Duplicate Samples

Each set of samples or 20 samples of similar matrix which are analyzed by EPA Methods 8240 and 8270 are prepared/analyzed with both a matrix spiked sample (MS) and a matrix spike duplicate sample (MSD). The acceptance criteria for percentaged recovery and relative percentaged difference for the MS and MSD are as published in the methods. These matrix spikes and duplicates will be prepared using reagent grade salts, pure compounds, or certified stock solutions whenever possible. Concentrated solutions will be used to minimize differences in the sample matrix resulting from dilution. The final concentration after spiking should be within the same range as the samples being analyzed to avoid the need for dilution, attenuation of instrument outputs, or other required alterations in the procedure which might affect the instrument response and determination of accuracy.

Surrogate Spike Samples

Surrogate compounds are used to determine the efficiency of the sample preparation/analysis process. The surrogate compounds, selected for their similarity of physical and chemical properties to the target compounds, are spiked into both environmental samples and quality control samples. The surrogate compounds used for specific tests are listed in Table 7.3. The percentage recovery range used for evaluation of the data is as published for the method. For tests that have not had this criteria established by the U.S. EPA, the laboratory control charts are utilized. The laboratory maintains control charts for the percentage recovery of surrogate compounds in water and soil. A warning limit of two standard deviations from the mean, and a control limit of three standard deviations from the mean are used for evaluation of data quality.

Reagent Blanks

To verify that the procedures used do not introduce contaminants that affect the analytical results, reagent blanks will be run for all appropriate analyses.

The reagent blank will be prepared by addition of all reagents to a substance of similar matrix as the sample. It will then undergo all of the procedures required for sample preparation. The resultant solution will be analyzed with the field samples prepared under identical conditions. An analyte concentration of two times the reporting limit in Tables 7.1 and 7.2 will be used as an advisory limit, and results greater than five times the reporting limit will require re-analysis of the samples prepared with the blank for those parameters where the contaminant is an analyte of interest.

Calibration Procedures and Frequency

Instruments and equipment used to gather, generate, or measure environmental data will be calibrated with sufficient frequency and in such

## TABLE 7.3

## SURROGATE SPIKING COMPOUNDS FOR ORGANIC ANALYSES

| TEST | EPA METHOD NUMBER | SURROGATE COMPOUND | CONCENTRATION ug/L | ug/Kg |
|---|---|---|---|---|
| Volatile Halogenated Compounds | 8010 | 1-Chloro-2-bromopropane | 15 | 15 |
| Volatile Aromatic Compounds | 8020 | a,a,a-Trifluorotoluene | 15 | 15 |
| Organchlorine Pesticides | 8080 | Dibutyl chlorendate | 1 | 33 |
| Volatile Organic Compounds | 8240 | Toluene-d8 | 50 | 50 |
| | | p-Bromofluorobenzene | 50 | 50 |
| | | 1,2-Dichloroethane-d4 | 50 | 50 |
| Semivolatile Organic Compounds | 8270 | 4,4'-Dibromodiphenyl | 100 | 333 |
| | | Nitrobenzene-d5 | 100 | 333 |
| | | p-Difluorobenzene | 100 | 333 |
| | | Phenol-d5 | 200 | 667 |
| | | 2-Fluorophenol | 200 | 667 |
| | | 2,4,6-Tribromophenol | 200 | 667 |

a manner that accuracy and reproducibility of results are consistent with standards of the discipline. Calibration of instruments and equipment will be performed at intervals as specified by the manufacturer or the method, or more frequently as conditions dictate. Calibrations will be performed at the start of each test run and verified throughout the analysis. Such calibrations will also be re-initiated as a result of delay due to meals, work shift changes, or damage incurred to the equipment.

Where appropriate, reagent blanks will be prepared, as described in the previous section, for use in instrument and equipment calibration. Standards used for preparation of a calibration curve will be of a concentration range that brackets the concentrations of the prepared samples. Continuing concentration verification will be performed by reanalysis of a mid-range standard after analysis of a maximum of 15 samples. Internal calibration standards may be used for GC analyses and quantitation based upon relative response factors as described in the specific methods. Calibration standards used as reference standards will be traceable to the

National Bureau of Standards or USEPA whenever such standards are available.

## DATA REDUCTION, VALIDATION, AND REPORTING

The Project Quality Assurance Officer (PQAO) will review all data and be responsible for reports of laboratory analyses and quality control results. The Laboratory Supervisor will review 10 percent of the raw data, calculations and QC analyses.

### Data Reduction and Validation

The analytical and data reduction procedures specified in 44 FR 69559 Appendix IV, "Optical Emission Spectrometric Method for Trace Element Analysis of Water and Wastes" (EPA-600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", Section 200; Metals) are used to qualify and quantify metals data analyses.

Other analytical procedures as specified from Methods for Chemical Analysis of Water and Wastes (EPA-600/4-79-020), Test Methods for Evaluating Solid Waste (EPA/SW-846), and Standard Methods for the Examination of Water and Wastewater, 16th Edition, are used to qualify and quantify these analyses.

The QA/QC practices used by the laboratory are consistent with the procedures recommended for the referenced methods. The EPA recommended acceptance criteria for QC data, published with the method, is used to determine the acceptability of the results for those tests where this information is available. The laboratory maintains control charts for each of the tests performed routinely. The control charts for percentage spike recovery and relative percentage difference of duplicate analyses are used to evaluate the quality of data obtained for the tests for which the EPA has not established recommended limits for these parameters.

The sample results associated with a QC sample for which the data is not consistent with the recommended acceptance criteria are reported with the "flag" prescribed in the procedure. If the corrective action specified is other than "flagging" the data, the recommended action is taken. Examples of such corrective action include: Analysis of an analytical spike of the prepared extract or digestate, serial dilution of the extract/ digestate, analysis by the Method of Standard Additions, reextraction/ redigestion of the affected samples and QC sample.

Preparation blanks are analyzed with each set of samples. If the blank is found to contain a concentration of the analyte(s) greater than the reporting value for the test, the data associated with the blank is flagged with "B", or the blank and the affected samples are reprepared and analyzed, depending upon the corrective action recommended in the method.

Data Reporting

Reporting of analytical results for this project will contain analytical results summaries and the results of analysis of QC samples. Analytical results reports will contain the following items.

- Project identification
- Field sample number
- Laboratory sample number
- Sample matrix description
- Date and time of sample collection
- Analytical method description and reference citation
- Individual parameter results
- Date of analysis (extraction, first run, and subsequent runs)
- Detection limits achieved
- Dilution or concentration factors
- Corresponding QC report.

Completed copies of the original chain-of-custody records for the appropriate samples will be included in the analytical results reports. The following units shall be used in reporting. Parameters determined in water samples will be reported in units of mg/L, except for specific organic compounds analyzed by GC or GC/MS, which will be reported in units of ug/L. Parameters determined in soil and sediment samples will be reported in units of mg/Kg dry weight. The percentage moisture will be presented with the results of the soil and sediment samples.

Quality control reports will be prepared which summarize the results of samples analyzed by the laboratory for quality control purposes. These reports will summarize all the quality control data results for the samples, including results for method blanks, duplicates, and matrix spikes. Spike concentrations, percent recoveries and relative percent differences will be reported. These reports will be used to prepare a project quality assurance report.

## CORRECTIVE ACTIONS

The laboratory operates under the guidelines of the ES Laboratories Quality Assurance/Quality Control Manual and Standard Operating Procedures. These documents, supplemented as needed by the QC requirements contained in the referenced analysis method, contain descriptions of the acceptance criteria for quality control measurements. In the event a QC test does not meet the prescribed criteria, the analyst immediately notifies the Laboratory Supervisor. In the event the problem is not one readily identifiable by the analyst, the Laboratory Supervisor and the Quality Control Coordinator review all QC results. When a problem is encountered, the QC Coordinator and Laboratory Supervisor implement the corrective action required. The QC Coordinator notifies the Technical Manager for Laboratory Services (Corporate QA Manager for laboratories) of any QC problems and the corrective action taken. In the event of a question regarding the appropriate action required, the Technical Manager is consulted for recommendations.

The corrective actions may include, checking the calculations, flagging data in accordance with the procedures prescribed for the method, recalibration of the instrument, and/or re-analyses of the samples associated with the out of control limits QC data.

## PERFORMANCE AND SYSTEM AUDITS

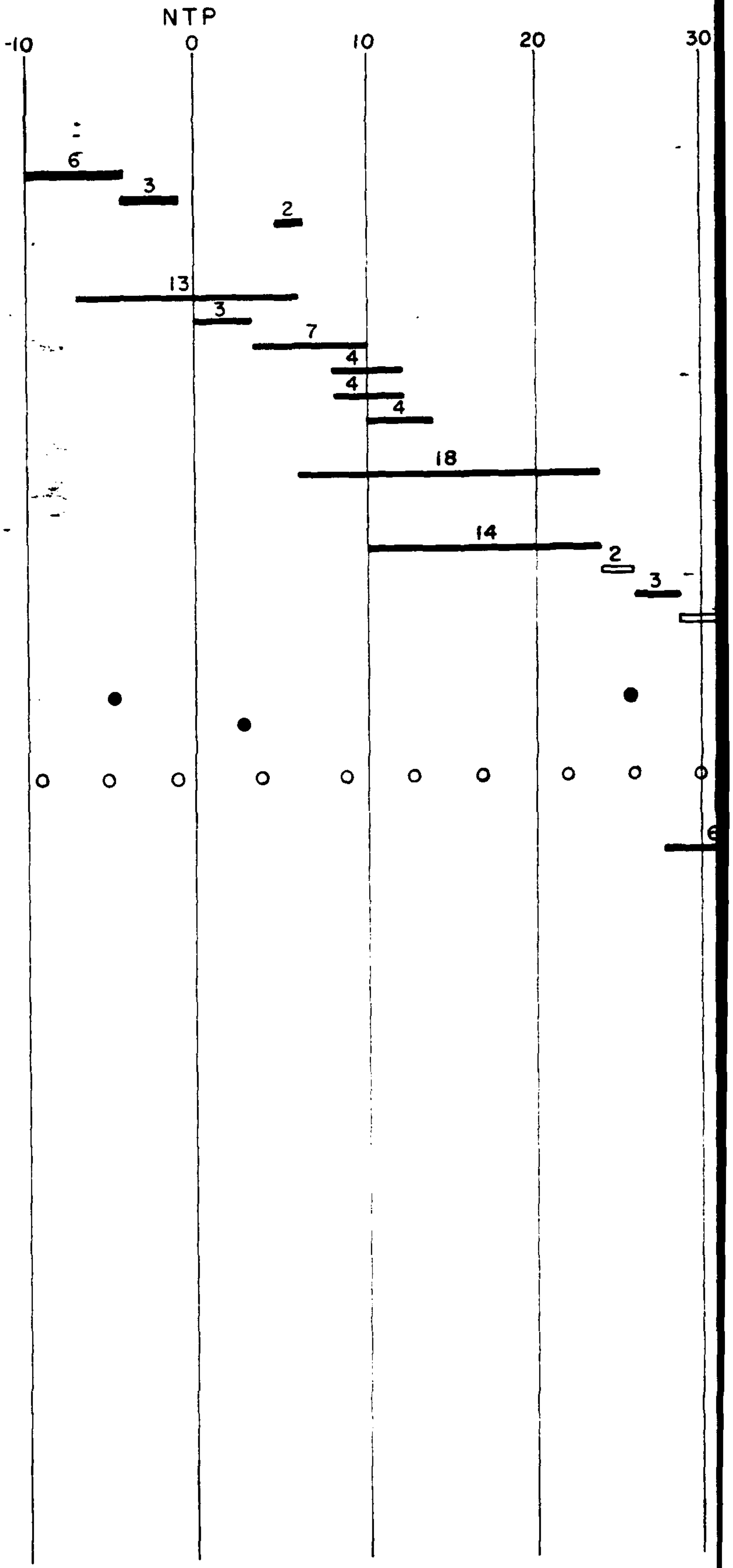
After the first set of samples is received at the laboratory, the Project Manager will visit the laboratory to review performance and procedures. Later in the project, the Martin Marietta Energy Systems Laboratory Quality Assurance Officer will visit the laboratory to conduct an audit.

# SECTION 8
# PROJECT SCHEDULE

The schedule for the project through submission of the Final Remedial Investigation Report (RIR) is presented in Figure 8.1. Table 8.1 lists the week following the Notice To Proceed (NTP) during which key milestones will be reached or deliverables submitted.

# SITE INSPECTION/REMEDIAL INVESTIGATION

**TASK**




1. PREPARE PROJECT WORK PLAN
   - INTERNAL DRAFT
   - HAZWRAP/NGB REVIEW
   - DRAFT
   - REGULATOR REVIEW
   - FINAL
   - BI-ANNUAL UPDATES

2.1 SITE INSPECTION
- MOBILIZATION
- HAND BORING ETC.
- BORINGS AND WELL INSTALLATION
- SURVEYING
- GROUNDWATER SAMPLING
- AQUIFER TESTING

2.2 DATA ORGANIZATION

2.3 PREPARE SI REPORT
- INTERNAL DRAFT
- HAZWRAP/NGB REVIEW
- DRAFT
- REGULATOR REVIEW
- FINAL

MEETINGS: ANDREWS AFB
RICKENBACKER ANGB

MONTHLY REPORTS

3.1 WORK PLAN UPDATE
- INTERNAL DRAFT
- HAZWRAP/NGB REVIEW
- DRAFT
- REGULATOR REVIEW
- FINAL
- BI-ANNUAL UPDATES

3.2 REMEDIAL INVESTIGATION
- MOBILIZATION
- SOIL GAS AND HAND BORINGS
- BORINGS AND WELL INSTALLATION
- SURVEYING
- GROUNDWATER SAMPLING
- AQUIFER TESTING

3.3 DATA ORGANIZATION

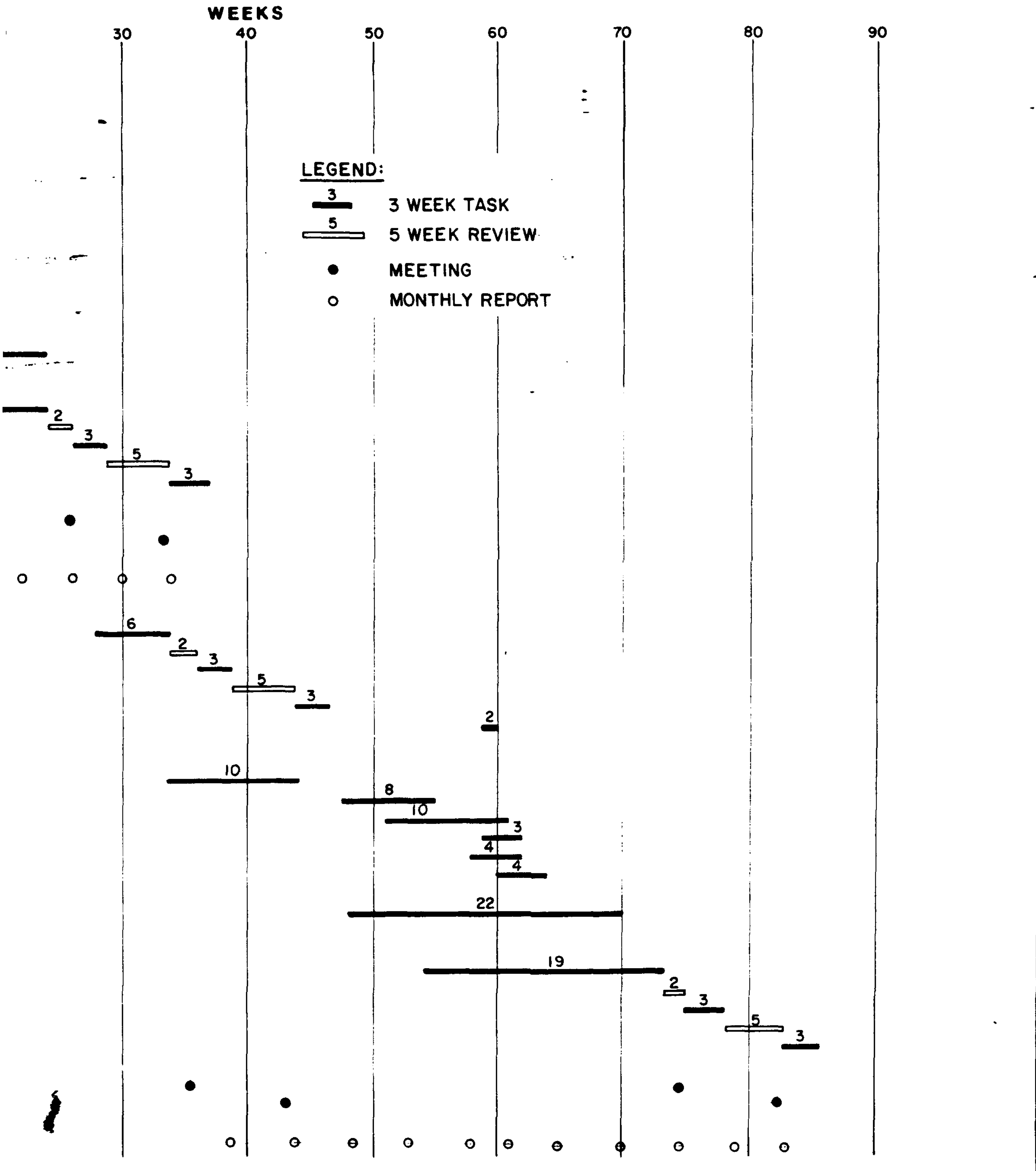
3.4 PREPARE RI REPORT
- INTERNAL DRAFT
- HAZWRAP/NGB REVIEW
- DRAFT
- REGULATOR REVIEW
- FINAL

MEETINGS: ANDREWS AFB
RICKENBACKER ANGB

MONTHLY REPORTS

FIGURE 8.1

TIGATION SCHEDULE, RICKENBACKER ANGB




ES ENGINEERING—SCIENCE

## TABLE 8.1

## MILESTONES AND DELIVERABLES SCHEDULE
## RICKENBACKER AIR NATIONAL GUARD BASE
## COLUMBUS, OHIO

| Milestones or Deliverables | Weeks After Notice To Proceed |
|---|---|
| a) Submit Internal Draft Work Plan | |
| b) Submit Draft Work Plan | -10 |
| c) Review Draft Work Plan with Regulators | -3 |
| d) Submit Final Work Plan | -1 |
| e) Begin Site Inspection Field Activities | 0 |
| f) Complete Site Inspection Field Activities | 14 |
| g) Submit Internal Draft Site Inspection Report | 24 |
| h) Submit Draft Site Inspection Report | 29 |
| i) Review Draft Site Inspection Report with Regulators | 34 |
| j) Submit Final Site Inspection Report | 37 |
| k) Submit Internal Draft Remedial Investigation Work Plan | 34 |
| l) Review Internal Draft Remedial Investigation Work Plan with NGB and HAZWRAP | 36 |
| m) Submit Draft Remedial Investigation Work Plan | 39 |
| n) Review Draft Remedial Investigation Work Plan with Regulators | 44 |
| o) Submit Final Remedial Investigation Work Plan | 47 |
| p) Begin Remedial Investigation Field Activities | 48 |
| q) Complete Remedial Investigation Field Activities | 64 |
| r) Submit Internal Draft Remedial Investigation Report | 73 |
| s) Review Internal Draft Remedial Investigation Report with NGB and HAZWRAP | 75 |
| t) Submit Draft Remedial Investigation Report | 78 |
| u) Review Draft Remedial Investigation Report with Regulators | 83 |
| v) Submit Final Remedial Investigation Report | 86 |

Monthly Progress Reports will be submitted by the 7th of every month. The Project Work Plan will be updated every six months. Revised Work Plans will be submitted on or before 15 January and 15 July for each project year.

# APPENDIX A

# HEALTH AND SAFETY PLAN

# HEALTH AND SAFETY PLAN

FOR

Rickenbacker Air National Guard Base

Columbus, Ohio

CL115

MARCH 1988

Prepared By:

J.E. Bishop, W.D. Hughes

Reviewed and Approved By:

| | Name | Date |
|---|---|---|
| Project Manager | [signature] | 6-1-88 |
| Office Health and Safety Representative | [signature] | 6/15/88 |
| Corporate Health and Safety Manager * | | |

* If Levels A or B Protection are required

# TABLE OF CONTENTS

## LIST OF FIGURES



## LIST OF TABLES

# CHAPTER 1
# PURPOSE AND POLICY

The purpose of this Plan is to establish personnel protection standards and mandatory safety practices and procedures. The Plan also provides for contingencies that may arise during field investigations and operations.

The provisions of this Plan are mandatory for all on-site investigations. All Engineering-Science (ES) personnel shall abide by this plan. Any supplemental plans used by subcontractors shall conform to this plan as a minimum. All personnel who engage in field investigation activities shall be familiar with this plan and comply with its requirements.

A Site Description and Scope of Work Summary for the project is provided in Chapter 2. Chapter 3 presents the project team organization, personnel responsibilities, and lines of authority. Site-specific training and medical monitoring requirements are contained in Chapter 4. Chapter 5 presents a safety and health risk analysis. Chapter 6 contains the site emergency response plan and a list of emergency contacts. Site-specific requirements for levels of protection are included in Chapter 7, and air monitoring procedures are provided in Chapter 8. Site control measures, including designation of site work zones, are contained in Chapter 9, while Chapter 10 provides decontamination procedures. Standard operating procedures are included in Chapter 11. Attachment A contains a Plan Acceptance Form, Accident Report Form, and respirator log forms. The remaining attachments contain the ES general standard operating guidelines for hazardous waste site investigations.

# CHAPTER 2

# SITE DESCRIPTION AND SCOPE OF WORK

The Rickenbacker Air National Guard Base (ANGB), Columbus, Ohio, is located south of the City of Columbus near the Village of Lockbourne. Rickenbacker ANGB, previously known as Lockbourne Air Force Base (AFB), has been active since 1942. Over the years, the types of military aircraft based and serviced at Rickenbacker ANGB have varied. Both past and present operations have involved the use of hazardous materials and disposal of hazardous wastes. Because of the use of hazardous materials and disposal of hazardous wastes at its installations, the Air National Guard (ANG) has implemented its Installation Restoration Program (IRP). The IRP is a three-phase program consisting of the following:

**PRELIMINARY ASSESSMENT (PA)**

The PA will identify past spill or disposal sites posing a potential and/or actual hazard to public health or the environment.

**SITE INSPECTION/REMEDIAL INVESTIGATION (SI/RI)**

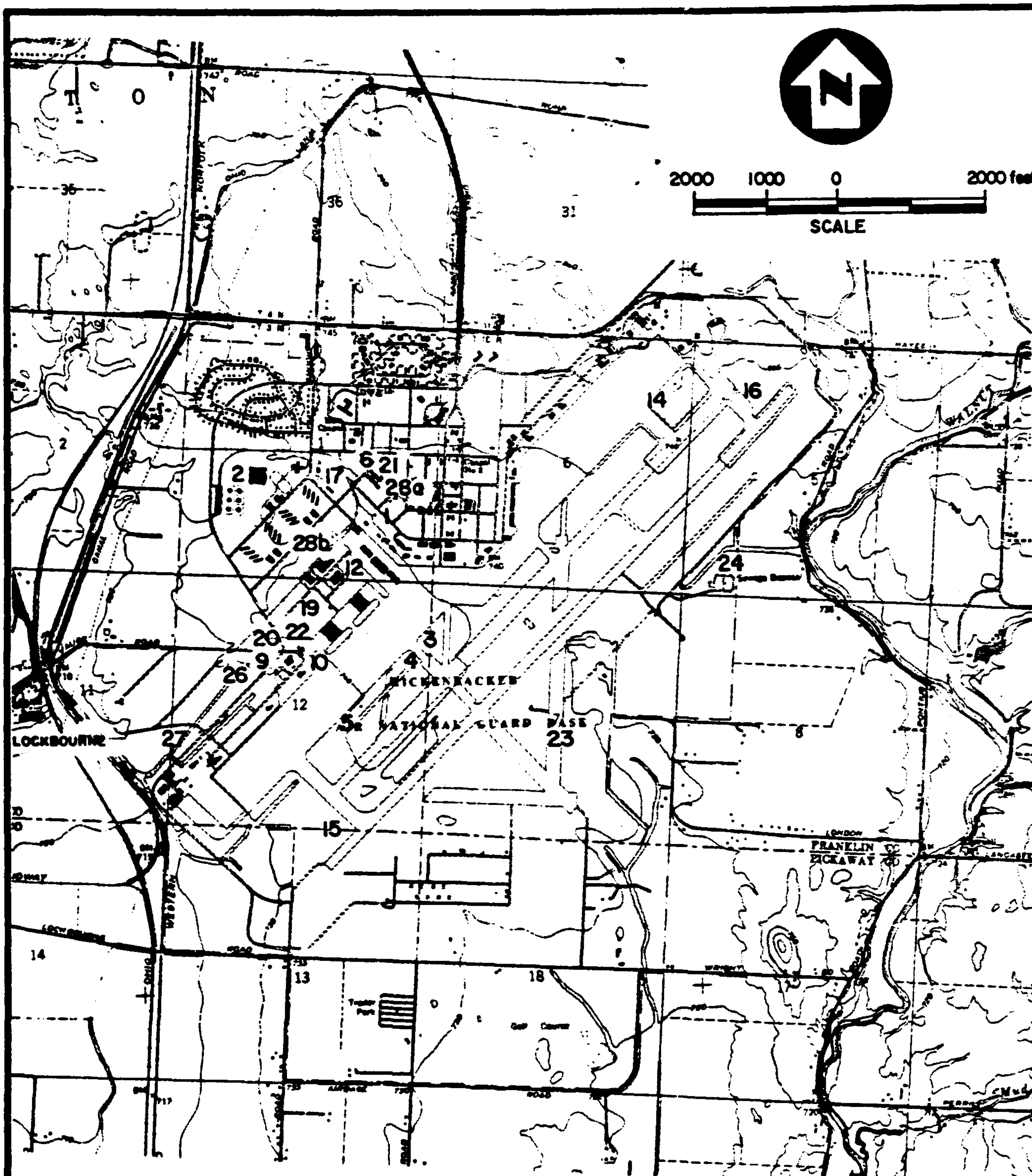
The purpose of the SI/RI is to confirm the presence or absence of environmental contamination, quantify the levels of contaminants, determine the source and extent of the contamination, and to determine if remedial action is required.

**FEASIBILITY STUDY/REMEDIAL DESIGN (FS/RD)**

The purpose of the FS/RD is to prepare a Remedial Action Plan (RAP), to develop possible remedial actions where necessary, and to provide technical support to the Base during contractor selection and remediation activities.

Under Phase I, the Records Search, twenty-seven potential sites were identified and rated by the Hazardous Materials Technical Center (HMTC) in Rockville, Maryland. Of these, twenty-two (22) sites were recommended for follow-up Installation Restoration Program (IRP) work. The sites are shown on Figure 2.1. Specific details and history of each site are presented in Section 1 of this Work Plan.

FIGURE 2.1




EXPLANATION:

22 - SITE LOCATION

IRP SITE LOCATIONS

RICKENBACKER

AIR NATIONAL GUARD BASE

SOURCE:
USGS, LOCKBOURNE, OHIO
7.5 MIN. QUADRANGLE

The investigations at the Base will involve sediment and soil sampling, monitor well installation, water sampling, magnetometer surveying, and soil-gas surveying. Sections 2 through 6 include detailed descriptions of the intended scope of work and techniques to be used.

# CHAPTER 3
# PROJECT TEAM ORGANIZATION

The following personnel are designated to carry out the stated job function on-site (NOTE: One person may carry out more than one job function).

| | |
|---|---|
| Project Manager: | Christopher F. Raddell, P.E. |
| Field Team Leader: | William D. Hughes, CPG |
| Project Health & Safety Officer: | William D. Hughes, CPG |
| Alternate Project Health & Safety Officer | Chris W. Viani |
| Field Team Members: | Lee Monnens<br>Kevin A. Palombo<br>Mark Schumacher<br>Judith M. Stangl<br>Mark W. Straub<br>Chris W. Viani |

Table 3.1 describes the responsibilities of all on-site personnel.

## CHAPTER 4

## EMPLOYEE TRAINING AND MEDICAL MONITORING REQUIREMENTS

Each field team member and subcontractor employee will have completed a forty hour safety training course or have equivalent experience as defined in 29 CFR 1910.120.

In addition, the Project Health and Safety Officer will be responsible for developing a training program to be presented to all personnel working on the site. The training will be conducted before beginning the work. The following topics will be included:

- o Names of personnel responsible for site health and safety
- o Acute effects of compounds at the site
- o OSHA Regulations
- o Safety, health and other hazards at the site
- o Work practices by which employees can minimize risk from hazards
- o Decontamination procedures
- o Proper use of personnel protection equipment.

The Project Health and Safety Officer will conduct daily briefings to discuss specific procedures and hazards that will be encountered that day.

### Heat Stress Monitoring

To monitor the body's recuperative ability to excess heat, one or more of the following techniques should be used as a screening mechanism. Monitoring of personnel wearing protective clothing should begin when the ambient temperature is 70° Fahrenheit (F) or above. Frequency of monitoring should increase as the ambient temperature increases or if slow recovery rates are indicated. When heavy physical activity is performed and temperatures exceed 80°F, workers should be monitored for heat stress after every 30 minute work period. A site safety officer should be present under these circumstances to conduct periodic monitoring.

- o Heart rate (HR) should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats per minute. If the HR is higher, the next work period should be shortened by 10 minutes (or 33 percent), while the length of the rest period stays the same. If the pulse rate is 100 beats per minute at the beginning of the next rest period, the following work cycle should be shortened by 33 percent.

- Body temperature should be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature (OT) at the beginning of the rest period should not exceed 99° F. If it does, the next work period should be shortened by 10 minutes (or 33 percent), while the length of the rest period stays the same. However, if the OT exceeds 99° F at the beginning of the next period, the following work cycle should be further shortened by 33 percent. OT should be measured again at the end of the rest period to make sure that it has dropped below 99° F. If not, the individual should be removed from duty until the OT drops below 99° F.

Cold Exposure Monitoring

The site safety officer should periodically monitor the field team members for signs of cold exposure. This should include visual inspection of the extremities and temperature monitoring.

# CHAPTER 5

# SAFETY AND HEALTH RISK ANALYSIS

The following substances are known or suspected to be on-site. The primary hazards for each are identified.

| Substance | Primary Hazards |
|---|---|
| JP-4 | Fire hazard, explosive hazard |
| POL (Petroleum oils and lubricants) including used engine oils, crankcase oil and No. 2 fuel oil | Dermal irritant, fire hazard |
| Unleaded gasoline | Fire hazard |
| Pesticides including: | |
| dieldrin | Poisonous |
| malathion | Poisonous |
| diazinon | Poisonous |
| chlordane | Poisonous |
| Solvents and paint strippers | Poisonous, fire hazard |
| PCBs | Toxic fumes when heated |
| Methyl Ethyl Ketone | Fire hazard, explosion hazard |

Many of the above substances are generic and this project is intended to determine specific constituents. As substances are detected, the project health and safety officer will determine additional procedures or hazards and notify site personnel in the daily briefings.

There are several areas on Base which are designated or potentially have hazardous levels of noise. Personnel working in these areas will be provided proper ear protection.

Heat stress and cold exposure are also possible site hazards and employees should be monitored for the effects when applicable.

**TABLE 5.1**

**SAFETY AND HEALTH RISK ANALYSIS - CONTAMINANTS OF CONCERN**

| Contaminant | IDLH | TLV | Route of Exposure | Symptoms of[c] Acute Exposure | Other Characteristics/Comments |
|---|---|---|---|---|---|
| JP-4 | -- | A TLV for JP-4 has not been established. The TLV for gasoline is 300 ppm. | Inhalation, dermal | Headache, blistering, eye irritant | Clear, aromatic, volatile liquid |
| Dieldrin | Ca | 0.25 $mg/m^3$[a]<br>0.25 $mg/m^3$[b] | Oral, dermal, inhalation | Headache, nausea, vomiting, general malaise, dizziness, convulsions, coma. | Colorless to light tan solid with a mild, chemical odor. |
| Malathion | 5000 $mg/m^3$ | 15 $mg/m^3$[a]<br>10 $mg/m^3$[b] | Oral, dermal, inhalation | Eye and skin irritation, tight chest, wheezing, nausea, vomiting | Colorless to brown liquid with a mild skunk-like odor. |
| Diazinon | -- | 0.1 $mg/m^3$[b] | Oral, dermal | | Liquid with faint ester-like odor. |
| Chlordane | 500 $mg/1m^3$ | 0.5 $mg/m^3$[a] | Oral, dermal, inhalation | Blurred vision, confusion, cough, abdominal pain, nausea, vomiting, convulsions | Thick, amber liquid with a chlorine-like color. |
| PCBs (42% Cl) (chlorodiphenyl) (54% Cl) | Ca<br>Ca | 1 $mg/m^3$[a]<br>0.5 $mg/m^3$[a] | Oral, dermal, inhalation | Eye irritant, chloracne, liver damage, jaundice | Colorless to dark brown liquid (42%) or pale yellow viscous liquid (54%) with mild, hydrocarbon odor. |
| Methylethyl Ketone (2-Butanone) | 3000 ppm | 200 ppm[a]<br>590 $mg/m^3$[a] | Oral, dermal, inhalation | Eye and nose irritation, dizziness, vomiting, headache | Clear, colorless liquid with a fragrant, mint-like, moderately sharp odor. |
| Kerosene | | | Inhalation, ingestion | Headache, stupor, nausea, vomiting | Oral $LD_{50}$ = 28 g/kg; iv $LD_{50}$ = 180 mg/kg |

a. OSHA Permissible Exposure Limit (PEL), as found in 29 CFR 1910, Subpart Z, General Industry Standards for Toxic and Hazardous Substances. Exposure limits are 8-hour time-weighted average (TWA) concentrations.
b. Threshold Limit Values (TLVs) for Chemical Substances in Workroom Air Adopted by American Conference of Governmental Industrial Hygienists (ACGIH) for 1978. Exposure limits are 8-hour TWA concentrations.
c. Source: NIOSH Pocket Guide to Chemical Hazards.
-- = Not Available
Ca = NIOSH has recommended that the substance be treated as a potential human carcinogen; IDLHs are not listed for those substances.

# CHAPTER 6

# EMERGENCY RESPONSE PLAN

Chemical and physical hazards exist at Richenbacker ANGB. Chemical hazards occur in the form of exposure to substances listed in Table 5.1. The proper use of protective clothing and respiratory protection will minimize the chances of personnel exposure.

The major physical hazards are injuries occurring during drilling operations. Again, safe working habits will reduce the risk for these occurrences.

## EMERGENCY PROCEDURES

In the event that an emergency develops on site, the procedures delineated herein are to be immediately followed. Emergency conditions are considered to exist if:

- o Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on-site.
- o A condition is discovered that suggests the existence of a situation more hazardous than anticipated.

All emergency situations should first be reported to the appropriate Base response unit (Fire Department, Ambulance, etc.) using an emergency radio supplied by the Base or telephone. If personal injury is involved, a report should be made to the following:

| | |
|---|---|
| Rickenbacker Base Civil Engineer Inspector | (614) 492-4673 |
| Rickenbacker Base Safety Department | (614) 492-3206 |
| Engineering-Science Project Manager | Chris Raddell/<br>1-312-990-7200 or 420-8444 |

If a major accident occurs, the Base Disaster Preparedness Plan will be invoked by Base safety personnel.

## CHEMICAL EXPOSURE

If a member of the field crew demonstrates symptoms of chemical exposure the procedures outlined below should be followed:

- o Another team member (buddy) should remove the individual from the immediate area of contamination, if possible without undue risk.

- Precautions, including work stoppage, should be taken to avoid exposure of other individuals to the chemical.
- If the chemical is on the individual's clothing, the clothing should be removed if it is safe to do so.
- If the chemical has contacted the skin, the skin should be washed with copious amounts of water, preferably under a shower.
- In case of eye contact, an emergency eye wash should be used. Eyes should be washed for at least 15 minutes.
- If necessary, the victim should be transported to the nearest hospital or medical center. An ambulance should be called to transport the victim, if necessary.

**PERSONAL INJURY**

In case of personal injury at the site, the following procedures should be followed:

- All field team members are trained in first-aid and can administer treatment to an injured worker.
- The victim should then be transported to the nearest hospital or medical center. If necessary, an ambulance should be called to transport the victim.
- For less severe cases, the individual can be taken to the site dispensary.
- The site manager is responsible for making certain that an accident report form (Attachment A) is completed. This form is to be submitted to the health and safety coordinator. Follow-up action should be taken to correct the situation that caused the accident.

Smoking, eating, and the application of contact lenses or cosmetics will not be permitted on site.

Evacuation Procedure

- An evacuation plan for field team members will be established for each work site.
- Evacuation of personnel is initiated by on-site supervisory personnel.
- All personnel in the contract work area should evacuate the area and meet in the common designated area for each work site.
- All personnel suspected to be in or near the contract work area should be accounted for and the whereabouts of missing persons determined immediately.
- Further instruction will then be given by the field team leader.

Procedures Implemented by the Contractor in the Event of a Major Fire, an Explosion, or On-Site Health Emergency Crisis

- Notify the Base Fire Department immediately;
- Notify the Base Emergency Ambulance Service immediately;

- o Signal the evacuation procedure previously outlined and implement the entire procedure;
- o Isolate the area;
- o Stay upwind of any fire;
- o Keep area surrounding the problem source clear after the incident occurs; and
- o Complete accident report form and distribute to appropriate personnel.

## EMERGENCY CONTACTS

In the event of any situation of unplanned occurrence requiring assistance, the appropriate contact(s) should be made from the list below. For emergency situations, contact should first be made with the Security Police or Fire Department, using the emergency radio supplied by the Base or a telephone. The location of the nearest telephone will be determined before work is begun at ech site. This emergency contacts list must be posted at the site.

Emergency Phone Numbers

| | |
|---|---|
| Off-Base Telephone Prefix: | 492 |
| Security Police: | 614-492-4727 or -4728 (on Base, call x4727 or x4728) |
| Fire Department: | 614-492-4111 (on Base, call x4111) |
| Rocky Mountain Poison Control Center: | 1-800-332-3073 |
| Poison Control: | 1-800-632-2727 |

Medical Emergency

| | |
|---|---|
| Medical Aid Station: | 614-492-4542 (on Base, call x4542) |
| Ambulance: | 614-492-3200 (on Base, call x3200) |
| Hospital (see Figure 6.1): | Mount Carmel East |
| Address: | 6001 East Broad Street |
| Emergency Phone Number: | 1-614-225-5212 |

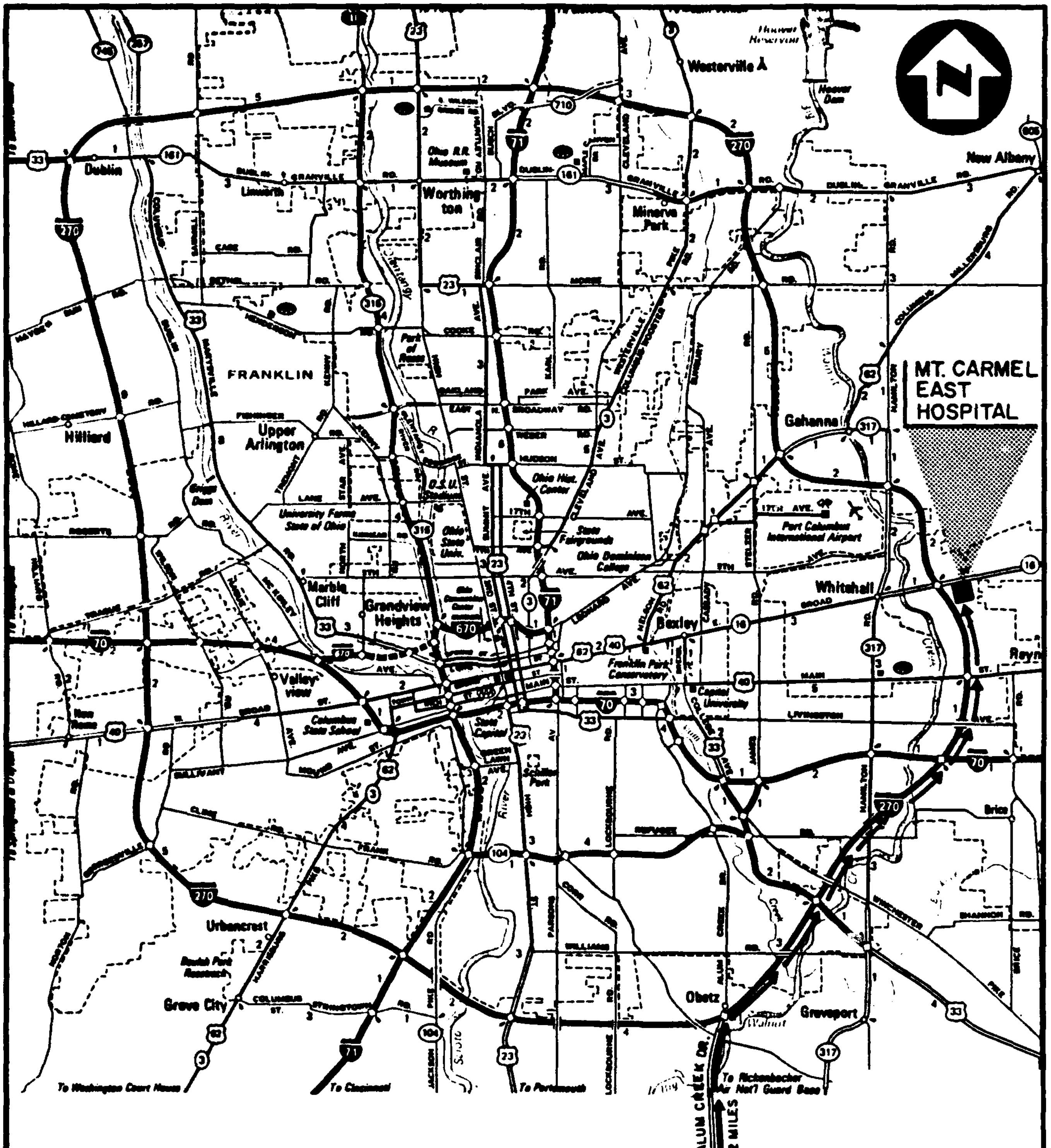
Directions: Go North on Alum Creek Drive to I-270. Go Northeast on I-270 for 9 miles, exit onto Route 16, go east to hospital on right (see Map, next page).

Rickenbacker ANGB Contacts

| | |
|---|---|
| Base point of contact: | Mr. Alan Friedstrom |
| Address: | Building 910 |
| Phone Number: | 1-614-492-3358 |

Engineering-Science Contacts

| | |
|---|---|
| ES Project Manager: | Mr. Christopher Raddell<br>1-321-990-7200 or 420-8444 |
| ES Project Health and Safety Officer: | Mr. William Hughes<br>1-216-486-9005 or on-site |




LEGEND:

ROUTE

MAP OF ROUTE TO HOSPITAL
RICKENBACKER
AIR NATIONAL GUARD BASE

| | |
|---|---|
| ES Cleveland Office Health & Safety Officer: | Ms. Kathleen Scheutzow<br>1-216-486-9005 |
| Corporate Health & Safety Manager | Mr. Phil Storrs<br>(818) 440-6000 |
| Deputy Corporate Health & Safety Manager: | Mr. Edward Grunwald<br>404-325-0770 |

Medical Monitoring

| | |
|---|---|
| Euclid Clinic Attn:<br>Industrial Medicine Section<br>18599 Lakeshore Boulevard<br>Cleveland, OH 44119 | Mr. William L. Kahl<br>1-216-383-6052 |

**ACCIDENT PREVENTION**

All field personnel will receive health and safety training prior to the initiation of any site activity. On a day-to-day basis, individual personnel should be constantly alert for indicators of potentially hazardous situations and for signs and symptoms in themselves and others that warn of hazardous conditions and exposures. Rapid recognition of dangerous situations can avert an emergency. Regular meetings will be held before daily work assignments,. Discussion will include:

- Tasks to be performed.
- Time constraints (e.g., rest breaks, cartridge changes).
- Hazards that may be encountered, including their effects, how to recognize symptoms or monitor them, concentration limits, or other danger signals.
- Emergency procedures.

Each phase (drilling, groundwater sampling) presents unique hazards of which the field team should be vigilent.

Drilling

Prior to any drilling activity efforts should be made to determine whether underground installations (i.e., telephone cables, sewer lines, fuel pipes, electric lines, etc.) will be encountered and, if so, where these installations are located. The project manager or field team leader must coordinate with the Base Civil Engineer to locate underground utilities prior to performing drilling activities. The field team leader and/or safety officer will provide constant on-site supervision of the drilling subcontractor to ensure that they are meeting the Health and Safety requirements. If deficiencies are found, work will be stopped and corrective action will be taken (i.e., retrain, purchase additional safety equipment). Reports of health and safety deficiencies and the corrective action taken will be forwarded to project safety officer. Periodic air monitoring will be performed by the safety officer to ensure that proper personal protection is being utilized.

Groundwater Sampling

Protective clothing will be worn while sampling. Periodic air monitoring will be conducted to determine whether atmospheric chemical conditions have changed from the initial air characterization. The field team will be trained in fire protection and emergency contingencies. Constant monitoring of field activities will be performed to ensure compliance with the safety plan.

## HEAT AND COLD PROTECTIVE MEASURES

### Introduction

Adverse weather conditions are important considerations in planning and conducting site operations. Hot or cold weather can cause physical discomfort, loss of efficiency, and personal injury.

### Heat Stress

Heat stress may result when protective clothing decreases natural body ventilation and can occur even when temperatures are moderate. One or more of the following recommended actions can help reduce heat stress:

- Provide plenty of liquids to replace body fluids (water and electrolytes) lost due to sweating.
- Provide cooling devices to aid natural body ventilation. These devices, however, add weight, and their use should be balanced against worker efficiency.

- o Long cotton underwear acts as a wick to help absorb moisture and protect the skin from direct contact with heat-absorbing protective clothing. It should be the minimum undergarment worn.
- o Install mobile showers and/or hose-down facilities to reduce body temperature and cool protective clothing.
- o In extremely hot weather, conduct non-emergency response operations in the early morning or evening.
- o Ensure that adequate shelter is available to protect personnel against heat, cold, rain, snow, or other adverse weather conditions which decrease physical efficiency and increase the probability of accidents.
- o In hot weather, rotate workers wearing protective clothing.
- o Good hygienic standards must be maintained by frequent change of clothing and daily showering. Clothing should be permitted to dry during rest periods. Workers who notice skin problems should immediately consult medical personnel.

These recommendations should be implemented, as appropriate to site conditions, to reduce heat stress.

Effects of Heat Stress

If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur. They can range from mild reactions such as fatigue, irritability, anxiety, and decreased concentration, dexterity, or movement to death. Medical help must be obtained for the more serious cases of heat stress.

Heat-related problems include:

- o Heat rash: Caused by continuous exposure to heat and humid air and aggravated by chafing clothes. Decreases ability to tolerate heat as well as being a nuisance.
- o Heat cramps: Caused by profuse perspiration with inadequate fluid intake and chemical replacement, especially salts. Signs include muscle spasm and pain in the extremities and abdomen. The victim should be given water and firm pressure with warm, wet towels placed over the cramped area.

- Heat exhaustion: Caused by increased stress on various organs to meet increased demands to cool the body. Signs include shallow breathing; pale, cool, moist skin; profuse sweating; and dizziness and lassitude. The victim should be allowed to rest and be given cool liquids.
- Heat stroke: The most severe form of heat stress. Body must be cooled immediately to prevent severe injury and/or death. Signs include red, hot, dry skin; no persipiration; nausea; dizziness and confusion; strong, rapid pulse; and possibly, coma. Quickly cool the victim by any available means and seek medical help immediately.

## Cold Exposure

Persons working outdoors in temperatures at or below freezing may suffer from cold exposure. During prolonged outdoor periods with inadequate clothing, effects of cold exposure may even occur at temperatures well above freezing. Cold exposure may cause severe injury by freezing exposed body surfaces (frostbite) or result in profound generalized cooling, possibly causing death. Areas of the body which have high surface area-to-volume ratios such as fingers, toes, and ears are the most susceptible to frostbite.

Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 10° F with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at -18° F. Cold exposure is particularly a threat to the hazardous waste site worker if the body cools suddenly when chemical-protective equipment is removed and the clothing underneath is perspiration soaked. The presence of wind greatly increases the rate of cooling.

Local injury resulting from cold is included in the generic term frostbite. There are several degrees of damage. Frostbite of the extremities can be categorized into:

- Frost nip or incipient frostbite: characterized by sudden blanching or whitening of skin.
- Superficial frostbite: skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.

o <u>Deep frostbite:</u> tissues are cold, pale, and solid; extremely serious injury.

First aid for frostbite is to bring the victim indoors and rewarm the areas <u>quickly</u> in warm (not hot) water between 39° C and 40.5° C. Warm fluids such as water or soup should be given. The victim should not smoke. After soaking the area for 30 minutes it should be elevated and wrapped with sterile gauze. Medical help should be sought immediately.

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. Its symptoms are usually exhibited in five stages: (1) shivering; (2) apathy, listlessness, sleepiness, and (sometimes) rapid cooling of the body to less than 95° F; (3) unconsciousness, glassy stare, slow pulse, and slow respiratory rate; (4) freezing of the extremities; and (5) death. Hypothermia victims should be warmed and medical help should be obtained.

## CHAPTER 7

## LEVELS OF PROTECTION AND PERSONAL PROTECTIVE EQUIPMENT REQUIRED FOR SITE ACTIVITIES

Because of the low to moderate levels of contamination expected at RICKENBACKER ANGB, Level "D" personnel protection equipment will be used. The following items should be used:

1) Coveralls
2) Gloves
3) Work boots
4) Safety glasses
5) Hard hat - mandatory for drilling operations.

If screening methods outlined in Chapter 8, or results of preliminary sampling and analyses indicate more extensive contamination, the level of protection will be re-evaluated based on the criteria detailed in Attachments E, F and G.

# CHAPTER 8

## FREQUENCY AND TYPES OF AIR MONITORING

Air monitoring will be used to identify and quantify airborne levels of hazardous substances. The expected levels and types of contamination at Rickenbacker ANGB warrant air monitoring while drilling borings and monitoring wells. Table 8.1 summarizes the equipment and procedures that will be used. Tables 8.2 and 8.3 describe calibration procedures for the monitoring instruments. If, while conducting air monitoring, the TLV listed in Table 5.1 is exceeded, the respiratory protection level will be re-evaluated based on guidelines detailed in Attachment C.

In the event of discovery of additional potential air hazards, the monitoring program will be modified based on Attachment C.

**TABLE 8.1**

**AIR MONITORING PROCEDURES**

| Type of Equipment | Calibration Check | Parameter(s) to be Measured | Sampling Frequency | Sampling Locations |
|---|---|---|---|---|
| HNU or TIP-PID | Daily | Organic Vapor Concentrations | Every 5 feet while advancing or withdrawing augers | Breathing zone near auger |
| LEL Meter | Daily, when drilling in an area of suspected petroleum hydrocarbon contamination | Lower Explosive Limit | Every 5 feet while advancing or withdrawing augers | Near auger at ground level |

## TABLE 8.2

CALIBRATION PROCEDURE FOR HNU PHOTOIONIZATION DETECTOR (PID)

---

1. Battery Check -- Turn the function switch to BATT. The needle should be in the green region. If not, recharge the battery.

2. Zero Set -- Turn the function switch to STANDBY. In this position, the lamp is OFF and no signal is generated. Set the zero point with the ZERO set control. The zero can also be set with the function switch on the X1 position and using a "Hydrocarbon-free" air. In this case, "negative" readings are possible if the analyzer measures a cleaner sample when in service.

3. 0-20 or 0-200 range -- For calibrating on the 0-20 or 0-200 range, only one gas standard is required. Turn the function switch to the range position and note the meter reading. Adjust the SPAN control setting as required to read the ppm concentration of the standard. Recheck the zero setting (Step 2). If readjustment is needed, repeat Step 3. This gives a two-point calibration; zero and the gas standard point. Additional calibration points can be generated by dilution of the standard with zero air is desired (See Section 8).

4. 0-2000 range -- For calibrating on the 0-2000 range, use of two standards is recommended. *First calibrate with the higher standard* using the SPAN control for setting. Then calibrate with the lower standard using the ZERO adjustment. Repeat these several times to ensure that a good calibration is obtained. The analyzer will be approximately linear to better than 600 ppm. If the analyzer is subsequently to be used on the 0-20 or 0-200 range, it must be recalibrated as described in Steps 2 and 3, above.

5. Lamp Cleaning -- If the span setting resulting from calibration is 0.0 or if calibration cannot be achieved, then the lamp must be cleaned.

6. Lamp Replacement -- If the lamp output is too low or if the lamp has failed, it must be replaced.

---

## TABLE 8.3

## FIELD CHECKING PROCEDURE FOR BACHARACH MODEL "L" (SNIFFER)

Normally, the SNIFFER should be checked for a response to a known gas sample before each day's operation.

**NOTE**: Use the slotted screw adjustment to mechanically zero the meter pointer with the power OFF before proceeding.

A quick and simple method for testing is to turn ON the instrument with the ZERO/ON-OFF control and adjust until meter pointer indicates at scale zero.

Obtain a cylinder of gas with a known concentration such as Bacharach Code 23-4007 (contains 2% methane-in-air) and connect a regulator valve to the cylinder. Open the regulator valve and direct a stream of gas from the cylinder towards the sample inlet fitting.

Squeeze the aspirator bulb several times and observe that the meter pointer deflects upscale. After checking response, flush thoroughly with air by again squeezing the aspirator bulb several times until meter pointer indicates at scale zero. The qualitative test just described provides that the indicator did respond to the presence of a combustible gas. If no response is observed, the instrument should be returned for calibration by an authorized technician.

# CHAPTER 9
# SITE CONTROL MEASURES

Site control measures are intended to minimize potential contamination of workers, protect the public from potential site hazards, and to prevent unauthorized access to the site.

Due to the low to moderate levels of contamination expected at the site, exclusion zones will be established around the drilling rig. Should subsequent investigation indicate a need for larger exclusion zones, this chapter will be revised according to guidelines described in Attachment D.

# CHAPTER 10
# DECONTAMINATION PROCEDURES

Personnel and equipment leaving the Exclusion Zone drilling site shall be thoroughly decontaminated.

Personnel decontamination will involve removal of gross soil contamination from clothing and boots and depositing it in the drums on-site for storage of auger cuttings. Hands and boots will be washed on-site with water and detergent to remove all residual soils. Soiled clothing will be removed as quickly as practicable and laundered. Each individual will bathe upon leaving the field to remove any residual contamination which penetrated the clothing.

Equipment decontamination will involve removal of gross soil contamination from augers, drill pipe and sampling equipment. All equipment will then be transported to the central equipment decontamination area for thorough cleaning as outlined in the Sampling Plan (Section 6).

The equipment decontamination area will be equipped with runoff-collecting devices to prevent the spread of contaminated liquids. Drums containing the collected decontamination liquids will be stored in a secure area until proper disposal can be accomplished.

If other levels of protection are warranted, the decontamination procedures outlined in Attachment H will be followed.

# CHAPTER 11

# STANDARD OPERATING PROCEDURES

The general standard operating procedures (SOPs) and forms for ES hazardous waste site investigations are presented in Appendix A. In addition, the following procedures specified by the Base Fire Department shall be followed:

## 1. FIRE PREVENTION PROCEDURES:

AFOSH Standards, ANGR 92-1, BR 92-1 and NFPA Codes must be followed in regards to fire prevention procedures.

## 2. WELDING/CUTTING OPERATIONS:

a. Only fully qualified workmen will perform welding or cutting operations.

b. Where practicable, move object to be welded or cut to a safe location.

c. If the object to be welded or cut cannot be moved, all combustible materials will be moved a safe distance away. Immovable combustibles shall be covered with a non-combustible shield to confine sparks. When possible, the protective cover will be dampened with water.

d. Before each welding, brazing, or cutting operation is started, the fire department must issue a permit (Ext. 4333). The fire department will decide if a standby truck is required. The Contractor is required to have proper fire extinguishers available.

## 3. PARKING OF EQUIPMENT:

a. At least 10 feet of clearance will be maintained between structures and construction materials.

b. Vehicles, equipment, materials and supplies shall not be placed in such a manner that obstructs access to fire hydrants, fire lanes and firefighting equipment.

## 4. FLAMMABLE/COMBUSTIBLE LIQUIDS:

a. All tanks, containers and pumping equipment used for the storage or handling of flammable liquids shall meet the recommendations of the National Fire Protection Association and the American Petroleum Institute.

b. Drums, barrels and other flammable liquid containers will be kept tightly capped. This applies to empty as well as filled containers. All containers shall be marked as to contents.

c. Gasoline or similar liquids will not be used for cleaning purposes (except the use of methanol in the designated decontamination area).

5. **FIRE PROTECTION EQUIPMENT/SYSTEMS:**

a. The use of fire hydrants by the Contractors as a source of water is prohibited if not approved by the Base Fire Department.

b. No vehicles will be driven over an unbridged fire hose or follow fire apparatus within 500 ft.

c. Upon approach of emergency vehicles with lights and sirens sounding, all traffic will immediately move to the right curb and stop until all emergency vehicles have passed. Driveways or stream intersections will not be blocked.

d. Fire extinguishers will not be moved or relocated from their installed positions except to combat a fire or when approved by the Base Fire Department for standby purposes.

e. Water mains, fire hydrant water main control valves and post indicator valves will not be turned off, or any maintenance performed that will interfere with the water supply without first notifying the Base Fire Department.

6. **OPEN FLAMES:**

a. Smoking is prohibited in all areas where flammable or combustible materials are stored, such as warehouses, repair shops, paint and carpenter shops, and other hazardous areas, except locations specifically provided for such purposes and approved by the Base Fire Department.

b. The burning of rubbish and similar materials will not be allowed at anytime.

7. Tarpots and kettles will be safely located outside of the building at least 25 feet away and will not be placed on any combustible roofs. Flare posts will not be used on the flight line or in POL areas. Approved type electrical lanterns will be used in hazardous areas.

8. All contractor personnel will be familiar with the fire reporting procedures. To report a fire, call 492-411 or Ext. 4111 from a Base phone. On the flight line, there are direct lines to the fire station, but they are for emergency use only.

9. Any fire hazard or potential fire hazard not specifically covered by the foregoing paragraphs will be brought to the attention of the Base Fire Chief or his designated representative, or the CE Inspector.

10. If there are any questions concerning fire procedures on Rickenbacker ANGB, contact the Fire Prevention Section, Ext. 4303 or 4305.

The following procedures specified by the Base Safety Manager shall be followed:

1. The following traffic regulations must be understood and obeyed by all contractor personnel:
   a. Alert vehicles with yellow flashing lights have the right-of-way. During an alert exercise, the intersection lights will flash and vehicles must pull to the right and stop until the lights quit flashing.
   b. Vehicles are not allowed on the flight line unless specifically authorized.
2. If contractor operations require vehicles on the flight line, the Contractor must receive a special flight line briefing from the Chief of Airfield Management, 492-4288 or Ext. 4288 from the Base.
3. For any welding operation, the Fire Department must be notified so a welding permit is issued prior to starting.
4. All flammable storage must be approved by the Base Fire Marshal.
5. Contractors must furnish personal protective equipment for their employees and insure they use the equipment when a job creates hazards to the employees. This personal protective equipment must meet the OSHA standards. There are several areas on Base which are designated as hazardous noise areas, so personnel working in these areas must be furnished proper ear protection.
6. Digging permits are required for excavating or anytime the earth is penetrated more than four inches. The sides or all excavation five feet or more deep will be guarded by shoring or sloping of the ground so employees working in trenches will not be endangered by moving earth.

# HEALTH AND SAFETY PLAN

## ATTACHMENT A
## FORMS

# JOB SAFETY & HEALTH PROTECTION

The Occupational Safety and Health Act of 1970 provides job safety and health protection for workers by promoting safe and healthful working conditions throughout the Nation. Requirements of the Act include the following:

## Employers

All employers must furnish to employees employment and a place of employment free from recognized hazards that are causing or are likely to cause death or serious harm to employees. Employers must comply with occupational safety and health standards issued under the Act.

## Employees

Employees must comply with all occupational safety and health standards, rules, regulations and orders issued under the Act that apply to their own actions and conduct on the job.

The Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor has the primary responsibility for administering the Act. OSHA issues occupational safety and health standards, and its Compliance Safety and Health Officers conduct jobsite inspections to help ensure compliance with the Act.

## Inspection

The Act requires that a representative of the employer and a representative authorized by the employees be given an opportunity to accompany the OSHA inspector for the purpose of aiding the inspection.

Where there is no authorized employee representative, the OSHA Compliance Officer must consult with a reasonable number of employees concerning safety and health conditions in the workplace.

## Complaint

Employees or their representatives have the right to file a complaint with the nearest OSHA office requesting an inspection if they believe unsafe or unhealthful conditions exist in their workplace. OSHA will withhold, on request, names of employees complaining.

The Act provides that employees may not be discharged or discriminated against in any way for filing safety and health complaints or for otherwise exercising their rights under the Act.

Employees who believe they have been discriminated against may file a complaint with their nearest OSHA office within 30 days of the alleged discrimination.

## Citation

If upon inspection OSHA believes an employer has violated the Act, a citation alleging such violations will be issued to the employer. Each citation will specify a time period within which the alleged violation must be corrected.

The OSHA citation must be prominently displayed at or near the place of alleged violation for three days, or until it is corrected, whichever is later, to warn employees of dangers that may exist there.

## Proposed Penalty

The Act provides for mandatory penalties against employers of up to $1,000 for each serious violation and for optional penalties of up to $1,000 for each nonserious violation. Penalties of up to $1,000 per day may be proposed for failure to correct violations within the proposed time period. Also, any employer who willfully or repeatedly violates the Act may be assessed penalties of up to $10,000 for each such violation.

Criminal penalties are also provided for in the Act. Any willful violation resulting in death of an employee, upon conviction, is punishable by a fine of not more than $10,000, or by imprisonment for not more than six months, or by both. Conviction of an employer after a first conviction doubles these maximum penalties.

## Voluntary Activity

While providing penalties for violations, the Act also encourages efforts by labor and management, before an OSHA inspection, to reduce workplace hazards voluntarily and to develop and improve safety and health programs in all workplaces and industries. OSHA's Voluntary Protection Programs recognize outstanding efforts of this nature.

Such voluntary action should initially focus on the identification and elimination of hazards that could cause death, injury, or illness to employees and supervisors. There are many public and private organizations that can provide information and assistance in this effort, if requested. Also, your local OSHA office can provide considerable help and advice on solving safety and health problems or can refer you to other sources for help such as training.

## Consultation

Free consultative assistance, without citation or penalty, is available to employers, on request, through OSHA supported programs in most State departments of labor or health.

## More Information

Additional information and copies of the Act, specific OSHA safety and health standards, and other applicable regulations may be obtained from your employer or from the nearest OSHA Regional Office in the following locations:

Atlanta, Georgia
Boston, Massachusetts
Chicago, Illinois
Dallas, Texas
Denver, Colorado
Kansas City, Missouri
New York, New York
Philadelphia, Pennsylvania
San Francisco, California
Seattle, Washington

Telephone numbers for these offices, and additional area office locations, are listed in the telephone directory under the United States Department of Labor in the United States Government listing.

Washington, D.C.
1985
OSHA 2203

William E. Brock, Secretary of Labor

**U.S. Department of Labor**
Occupational Safety and Health Administration

**Under provisions of Title 29, Code of Federal Regulations, Part 1903.2(a)(1) employers must post this notice (or a facsimile) in a conspicuous place where notices to employees are customarily posted.**

**ES** ENGINEERING-SCIENCE COMPANIES

# ACCIDENT REPORT FORM



Project: ______________________________

EMPLOYER

1. Name: ______________________________________________

2. Mail Address: ______________________________________
(No. and Street) (City or Town) (State)

3. Location, if different from mail address: ______________________

______________________________________________________

INJURED OR ILL EMPLOYEE

4. Name: ______________________ Social Security Number: __________
(First) (Middle) (Last)

5. Home Address: ______________________________________
(No. and Street) (City or Town) (State)

6. Age: ______ 7. Sex: Male ( ) Female ( )

8. Occupation: ______________________________________
(Specific job title, <u>not</u> the specific activity employee was performing at time of injury)

9. Department: ______________________________________
(Enter name of department in which injured persons is employed, even though they may have been temporarily working in another department at the time of injury)

THE ACCIDENT OR EXPOSURE TO OCCUPATIONAL ILLNESS

10. Place of accident of exposure: ______________________________
(No. and Street) (City or Town) (State)

11. Was place of accident or exposure on employer's premises? Yes ( ) No ( )

12. What was the employee doing when injured? ______________________
(Be specific - Was employee

______________________________________________________
using tools or equipment or handling material?)

______________________________________________________

**ES** ENGINEERING-SCIENCE COMPANIES

# ACCIDENT REPORT FORM



13. How did the accident occur? ______________________________
(Describe fully the events that resulted in the

______________________________

injury or occupational illness. Tell what happened and how. Name objects

______________________________

and substances involved. Give details on all factors that led to accident.

______________________________

Use separate sheet for additional space.)

14. Time of accident: ______________

15. ES WITNESS TO ACCIDENT

| (Name) | (Affiliation) | (Phone No.) |
|---|---|---|
| (Name) | (Affiliation) | (Phone No.) |
| (Name) | (Affiliation) | (Phone No.) |

OCCUPATIONAL INJURY OR OCCUPATIONAL ILLNESS

16. Describe injury or illness in detail; indicate part of body affected:

______________________________

______________________________

17. Name the object or substance that directly injured the employee. (For example, object that struck employee; the vapor or poison inhaled or swallowed; the chemical or radiation that irritated the skin; or in cases of strains, hernias, etc., the object the employee was lifting, pulling, etc.).

______________________________

______________________________

18. Date of injury or initial diagnosis of occupational illness ______________
(Date)

19. Did the accident result in employee fatality? Yes ( ) No ( )

ENGINEERING-SCIENCE COMPANIES

# ACCIDENT REPORT FORM



OTHER

20. Name and address of physician ______________________________

______________________________________________________________

21. If hospitalized, name and address of hospital ______________________

______________________________________________________________

Date of report __________ Prepared by ______________________________

Official position ______________________

ENGINEERING-SCIENCE COMPANIES

# PLAN ACCEPTANCE FORM

## PROJECT HEALTH AND SAFETY PLAN

I have read and agree to abide by the contents of the Health and Safety Plan for the following project:

____________________________________________

________________________

Signed

________________________

Date

Return to Office Health and Safety Representative before starting to work on subject project work site.

**ES** ENGINEERING-SCIENCE COMPANIES

# SCBA RESPIRATOR LOG

SITE: ______________________________

LOCATION: ______________________________

DATES OF INVESTIGATION: ______________________________

| User | Date of Use | SCBA # | Satisfactory Checkout (Yes/No - Initials) | Date Cleaned |
|---|---|---|---|---|
| | | | | |
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SCBA Performance Comments:

______________________________

Project Health and Safety Officer or ES Project Manager    Date

Return to Office Health and Safety Representative at the completion of field activities.

**ES** ENGINEERING-SCIENCE COMPANIES

# AIR PURIFYING RESPIRATOR LOG

SITE: ______________________________

LOCATION: ______________________________

DATES OF INVESTIGATION: ______________________________

| User | Date of Use | Cleaned and Inspected Before Use (Initials) | Cartridges Changed Before Use (Yes, No, N/A) | Total Hours on Cartridge |
|---|---|---|---|---|
| | | | | |
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______________________________________________________________

Project Health and Safety Officer or ES Project Manager — Date

Return to Office Health and Safety Representative at the completion of field activities.

ES-COR-15(4/87)

HEALTH AND SAFETY PLAN

ATTACHMENT B
MEDICAL EXAMINATION

# ATTACHMENT B

## MEDICAL EXAMINATION

### EXAMINATION CONTENT

Each participant in the ES medical program will receive a comprehensive base-line examination with periodic screening exams thereafter. These periodic exams may include an interim medical and occupational history review, a physical exam, laboratory blood and urine test, and a physician's evaluation. The periodic examinations will be supplemented by procedures and special tests as warranted by exposure to specific hazards.

### MEDICAL HISTORY

Each participant will complete an occupational and medical history form before seeing a physician. When completed, the form will be turned over to the physician or the physician's designee.

The confidential occupational and medical history form is designed to elicit general and specific information concerning employee health. While this information is essential in determining health status, it also represents an opportunity for the employee to express concern regarding his occupational environment. Responses given will allow the medical staff to determine those test and procedures most appropriate to that work situation.

SAMPLE PRE-PLACEMENT PHYSICAL

## Occupational and Medical History

Perform a complete medical history emphasizing these systems: nervous, skin, lung, blood-forming, cardiovascular, gastrointestinal, genitourinary, and reproductive.

## Physical Examination

Physical examination include at least the following:

- o Height, weight, temperature, pulse, respiration, and blood pressure.
- o Head, nose, and throat.
- o Eyes. Include vision tests that measure refraction, depth perception, and color vision. These tests should be administered by a qualified technician or physician. Vision quality is essential to safety, the accurate reading of instruments and labels, the avoidance of physical hazards, and for appropriate response to color-coded labels and signals.
- o Ears. Include audiometric tests, performed at 500; 1,000; 2,000; 3,000; 4,000; and 6,000 hertz (Hz) pure tone in an approved booth (see requirements listed in 29 CFR Part 1910.95, Appendix D). Test should be administered by a qualified technician, and results read by a certified audiologist or a physician familiar with audiometric evaluation. The integrity of the eardrum should be established because perforated eardrums can provide a route of entry for chemicals into the body. The physician evaluating employees with perforated eardrums should consider the environmental conditions of the job and discuss the possible specific safety controls with the Office or Laboratory Health and Safety Representative before deciding whether such individuals can safely work.
- o Chest (heart and lungs).
- o Peripheral vascular system.
- o Abdomen and rectum (including hernia exam).

- Spine and other components of the musculoskeletal system.
- Genitourinary system.
- Skin.
- Nervous system.

Test

- Blood.
- Urine.
- A 14 by 17-inch posterior/anterior view chest x-ray, with lateral or oblique views. The x-ray should be taken by a certified radiology technician and interpreted by a board-certified or board-eligible radiologist. Check x-rays taken in the last 12-month period, as well as the oldest chest x-ray available, should be obtained and used for comparison. Chest x-rays should not be repeated more than once a year, unless otherwise determined by the examining physician.

Ability to Perform While Wearing Protective Equipment

To determine a worker's capacity to perform while wearing protective equipment, additional test may be necessary, for example:

- Pulmonary function testing: Measurement should include forced expiratory volume in 1 second ($FEV_1$), forced vital capacity (FVC), and $FEV_1$-to-FVC ratio, with interpretation and comparison to normal predicted values corrected for age, height, race, and sex. A permanent record of flow curves should be placed in the worker's medical records. The tests should be conducted by a certified technician and the results interpreted by a physician.
- Electrocardiogram (EKG). A standard, 12-lead resting EKG should be performed.

The above physical is recommended by OSHA for employees who routinely handle toxic substances; however, not all test are applicable for each ES division. For example, ES laboratory personnel do not encounter noise exposure above 85 dBA, thus an audiometric test may not be necessary. A tetanus immunization will be required every 5 years for personnel working at waste water and sewage treatment plants. This immunization is recommended for personnel who perform hazardous waste operation. The Office or Laboratory Health and Safety Representative must consult with the examining physician to tailor the pre-employment physical specifically to the individual's job description.

SAMPLE PERIODIC MEDICAL EXAMINATION

Interval Medical History

Interval medical history should be performed focusing on changes in health status, illnesses, and possible work-related symptoms. The examining physician should have information about the worker's interval exposure history, including exposure monitoring results (if performed).

Physical Examination

- Height, weight, temperature, pulse, respiration, and blood pressure.
- Head, nose, throat.
- Vision tests that measure refraction, depth preception, and color vision.
- Chest (heart and lungs).
- Peripheral vascular system.
- Abdomen and rectum (including hernia exam).
- Spine and other components of the musculoskeletal system.
- Genitourinary system.
- Skin.
- Nervous system.
- Blood test.
- Urine test.

## Additional Tests

Additional medical testing may be performed, depending on available exposure information, medical history, and examination results. Testing should be specific for the possible medical effects of the worker's exposure. Multiple testing for a large range of potential exposures is not always useful; it may involve invasive procedures (e.g., tissue biopsy), be expensive, and may produce false-positive results.

### Pulmonary Function

Pulmonary function test should be administered if the individual uses a respiratory, has been or may be exposed to irritating or toxic substances, or if the individual has breathing difficulties, especially when wearing a respirator.

### Audiometric Tests

Annual retest are required for personnel subject to high noise exposures (an 8-hour, time-weighted average of 85 dBA or more), those required to wear hearing protection, or as otherwise indicated.

### Electrocardiogram

An electrocardiogram (EKG) will be performed annually for those over 40 and every three years for all others. The EKG will be the standard 12-lead resting type.

### Chest X-Rays

Chest x-rays will be performed when clinically indicated or every three years. The x-ray should be at least 14 by 17-inch P-A (posterior/anterior).

## Blood and Urine Test

Blood and urine test frequently performed by occupational physicians include:

### Blood Test

- Complete blood count with differential and platelet evaluation
- White cell count
- Red blood cell count

- Hemoglobin
- Hermatocrit
- Reticulocyte count
- Total protein
- Albumin
- Globulin
- Total bilirubin
- Alkaline phosphatase
- Gamma glutamyl transpeptidase (GGTP)
- Lactic dehydrogenase (LDH)
- Serum glutumigoxaloacetic transaminase (SGOT)
- Serum glutamic-pyruvic transaminase (SGPT)
- Blood urea nitrogen (BUN)
- Creatinine
- Uric Acid

Urinalysis

- Color
- Specific gravity
- pH
- Qualitative glucose
- Protein
- Bile
- Acetone
- Microscopic examination of cetrifuged sediments

# HEALTH AND SAFETY PLAN

## ATTACHMENT C
## PRINCIPLES OF AIR MONITORING

# ATTACHMENT C

## PRINCIPLES OF AIR MONITORING

### PURPOSE

OSHA, in 29 CFR Part 1910.120 (h), requires air monitoring to be used to identify and quantify airborne concentrations of hazardous substances. The purpose of this guideline is to establish fundamental air monitoring principles that can be used to evaluate potential risks at a site.

### GUIDELINE

Various dangers may exist when working at a hazardous waste site. Explosive vapors, oxygen deficient atmospheres, and a variety of toxic gases and vapors can be encountered with lethal properties.

When first approaching a waste site, the potential hazards must be recognized and exposure risks evaluated. This can be done by a methodical initial site survey. To perform initial site surveys and subsequent monitoring, various portable instruments must be available. The types of air monitoring that can be performed and the interpretation of the results of this monitoring are presented in the following paragraphs.

#### Oxygen-Deficient Atmospheres

At sites where oxygen depletion or displacement is anticipated, oxygen levels must be monitored by the use of a portable oxygen detector. A typical oxygen detector measures the percent oxygen in the immediate atmosphere using a galvanic cell. Terrain variations in the land and unventilated rooms or areas often do not contain enough oxygen to support life, making these instruments invaluable to response personnel. The normal ambient oxygen concentration is 20.8 percent.

The National Institute for Occupational Safety and Health (NIOSH) requires that if oxygen levels in the ambient air become less than 19.5 percent supplied air, respirators must be worn. Oxygen-enriched atmospheres (oxygen greater than 25 percent) increase the potential for fire or explosion; no work or testing should ever be performed under such conditions.

Limitations

The operation of oxygen detectors depends on the absolute atmospheric pressure. The concentration of natural oxygen (not manufactured or generated oxygen) is a function of the atmospheric pressure at a given altitude.

At sea level, where the weight of the atmosphere is greatest, more oxygen molecules are compressed into a given volume than at higher elevations. As elevation increases, this compression decreases, resulting in fewer oxygen molecules being "squeezed" into a given volume. Consequently, an oxygen indicator calibrated at sea level and operated at an altitude of several thousand feet will falsely indicate an oxygen-deficient atmosphere (less than 19.5 percent).

Combustible Gases/Vapors

The presence or absence of combustible vapors or gases must be evaluated at a waste site. A typical combustible gas detector determines the concentration of combustible vapors and gases present in an atmosphere. The level is recorded as a percentage of the Lower Explosive Limit (LEL), which is measured as the change in electrical resistance in a wheatstone bridge circuit.

The LEL of a combustible gas or vapor is the lowest concentration by volume in air that will explode, ignite, or burn when there is an available ignition source.

The NIOSH has established the following guidelines concerning working in an explosive environment:

1. If explosivity readings are detected between 10 to 25 percent LEL, work activities in the area should be limited to those that do not generate sparks.

2. If the explosivity reading on the combustible gas indicator is above 25 percent, operations will stop and the on-site area must be immediately evacuated until appropriate action can be taken to eliminate the hazard.

Once a site has been evacuated, the resumption of on-site activities cannot occur until project personnel have consulted with personnel experienced in fire or explosion hazards. On-site activities around enclosed spaces and material containers should be carefully monitored for the presence of combustible gases and vapors. Around well drilling and welding operations, the air above the borehole also needs to be monitored for combustible/explosive gases and vapors.

Limitations

The combustible gas detector cannot be used to test the vapors of leaded gasoline, halogens, and sulfur compounds. These substances interfere with the filament unit, reducing the instruments sensitivity. Compounds containing silicone will also destroy the platinum filament.

The combustible gas detector can only be used in normal atmospheres, not oxygen enriched or deficient. Oxygen concentrations that are less than or greater than normal may cause erroneous readings.

Organic Vapor/Gases

The initial survey of a site should always include measurements for organic vapors. Sufficient data should be obtained during the initial entry to screen the site for various levels of organic vapors. These gross measurements can be used on a preliminary basis to (1) determine levels of personnel protection, (2) establish site work zones, and (3) select candidate areas for more thorough qualitative and quantitative studies.

Organic vapor concentrations at a site can be determined by the use of a photoionization detector (PID) or a flame ionization detector (FID).

## Photoionization Detector

Photoionization instruments (HNU® for example) use an ultraviolet (uv) light to ionize chemical compounds. The photoionization process can be illustrated as:

$$RH + hv \longrightarrow RH^{+} + e-$$

where RH is an organic or inorganic molecule and hv represents a photon of uv light. The photon has energy equal to or greater than the molecules ionization potential and causes the emission of an electron e-.

The PID consists of a chamber containing a pair of electrodes. When a positive potential is applied to one electrode, the field created drives any ions formed by the absorption of uv light to the collector electrode, where the current (proportional to the concentration) is measured.

### Limitations

Compounds with high ionization potentials will not be detected if the lamp used does not have the sufficient energy required to ionize the compound (HNU® manufactures three uv lamps with different ionization energies).

The response to a gas or vapor may radically change when the gas or vapor is mixed with other materials. As an example, a PID calibrated to ammonia and surveying an atmosphere containing 100 ppm ammonia would indicate 100 on the meter. Likewise, an instrument calibrated to benzene would record 100 in an atmosphere containing 100 ppm benzene. However, in an atmosphere containing 100 ppm of each compound, the instrument could indicate considerably less or more than 200 ppm, depending on how it was calibrated.

## Flame Ionization Detector

The flame ionization detector (FID) uses ionization as the detection method much the same as in the PID, except that the ionization is caused by a hydrogen flame, rather than a uv light. The flame has enough energy to ionize any organic molecule with an ionization potential of 15.4 ev or less.

Inside the instrument's detection chamber, the sample is exposed to a hydrogen flame that ionizes the organic vapors. As the organic vapors burn, positively charged, carbon-containing ions are produced and collect on a negatively charged electrode. As the positive ions accumulate, a current proportional to the hydrocarbon concentration is generated on the input electrode.

Limitations

Flame ionization detectors do not detect inorganic gases and vapors and many synthetic compounds. Similar to the PID, the FID responds differently to different compounds. For example, an FID that has been calibrated to methane will read 100 ppm methane in an atmosphere containing 100 ppm methane. However, this instrument may only register 10 ppm of carbon tetrachloride in an atmosphere actually containing 100 ppm of that compound. The relative sensitivity to various compounds must be considered when using this instrument.

Calorimeteric Indicator Tubes

Often, while evaluating a hazardous waste site, the need arises to quickly measure a specific gases. Direct-reading calorimetric indicator tubes can successfully fill that need. These tubes are usually calibrated in parts per million (ppm) or percent concentration for easy interpretation.

Calorimetric indicator tubes consist of a glass tube impregnated with an indicator chemical. A known volume of contaminated air is drawn through the tube at a predetermined rate. The contaminant reacts with the indicator chemical in the tube, producing a discoloration that is proportional to the chemicals concentration. Detector tubes are chemical specific and must be selected before leaving for the site.

Limitations

Several indicator chemicals may be able to measure the concentration of a particular gas or vapor. Each chemical operates on a different chemical principle and is affected in varying degrees by temperature, air volume pulled through the tube, and interference from other gases or vapors. A "true" concentration versus the "measured" concentration may vary considerably among and between tube manufacturers.

A major limitation of this apparatus involves the process by which the operator "reads" the endpoint. The jagged edge where contaminant meets indicator chemical makes it difficult to get accurate results from this seemingly simple test. However, a diligent and experienced operator should be able to accurately read the endpoint.

### Radiation Survey Instrument

Although radiation monitoring is usually not necessary, it should be incorporated into the initial survey where radioactive materials may potentially be present.

Normal gamma radiation background is approximately 0.01 to 0.02 mR/hr (millirem per hour) on a gamma survey instrument. Work can continue with slightly elevated radiation exposure rates; however, if the exposure rate increases to 3 to 5 times above gamma background, the Project Health and Safety Officer should be consulted. At no time should work continue with an exposure rate of 10 mR/hr or above.

The absence of gamma readings above background should not be interpreted as the complete absence of radioactivity. Radioactive materials emitting low-energy gamma, alpha, or beta radiation may be present, but for a number of reasons may not cause a response on the instrument. Unless airborne, these radioactive materials should present minimal hazard. More thorough surveys should be conducted as site operations continue, to document the absence of radioactive materials.

#### Limitations

Radiation survey meters must only be used by persons who have been trained in the proper interpretation of their readings. The meters require frequent calibration and checking to ensure that the readings are accurate.

## PERSONAL MONITORING

Selective monitoring of high risk workers (i.e., those closest to the source of contamination generation) is recommended during cleanup activities. This methodology is based on the rationale that the probability of significant exposure varies with distance from the source. If workers closest to the source of contamination are not significantly exposed, the all other workers are supposedly not exposed and do not need to be monitored.

Personal monitoring samples should be collected in the breathing zone. These samples represent the inhalation exposure of workers who are not wearing respiratory protection. "Full shift" or 8-hour air samples are analyzed in a laboratory. Full shift air samples may be collected using passive dosimeters, or by a pump that draws air onto a sorbent or filter. It is best to use pumps that maintain a constant flow rate to collect samples, because it is difficult to adjust the pump with protective equipment on. Table C.1 lists some sampling and analytical techniques used at a hazardous waste site.

PERIODIC MONITORING

The monitoring surveys made during the initial site entry phase are for a preliminary evaluation of atmospheric hazards. In some situations, the information obtained may be sufficient to preclude additional monitoring. However, because site activities and weather conditions change during the course of a day, a program to periodically monitor atmospheric changes must be implemented (see Table C.2 for action levels).

PERIPHERAL MONITORING

Monitoring along the site perimeter where personal protective equipment is no longer required, measures the contamination away from the site and enables the Project Health and Safety Officer to evaluate the intergrity of the site's clean area.

TRAINING

It is imperative that personnel using monitoring instruments be thoroughly familiar with their use, limitations, and operating characteristics. All instruments have inherent constraints in their

TABLE C.1

SAMPLE COLLECTION AND ANALYTICAL METHODS

| Substance | Collection Device[a] | Analytical Method[b] | Typical Detection Limit of Analytic Instrument (ug) |
|---|---|---|---|
| Anions: | Prewashed silica gel tube | Ion chromatography | |
| Bromide | | | 10 |
| Chloride | | | 5 |
| Fluoride | | | 5 |
| Nitrate | | | 10 |
| Phosphate | | | 20 |
| Sulfate | | | 10 |
| Aliphatic Amines | Silica gel | GC/NPD | 10 |
| Asbestos | MCEF | PCM | 100[c] |
| Metals | MCEF | ICP-AES | 0.5 |
| Organics | Charcoal tube | GC/MS | 10 |
| Nitrosamines | Thermosorb/N | GC/TEA | 0.01 |
| Particulates | MCEF | Gravimetric | |
| PCBs | GF filter and florisil tube | GC-ECD | 0.001 |
| Pesticides | 13-mm GF filter and chromosorb 102 Tube | GC/MS | 0.05 |

[a] MCEF = mixed cellulose ester filter.
GF = glass fiber filter.

[b] GC/NPD = gas chromatography and nitrogen/phosphorus detector; PCM = phase contrast microscopy; ICP-AES = inductivitely coupled plasma atomic emission spectrometry; GM/MS = gas chromatography and mass spectrometry; GC/TEA = gas chromatography using thermal engergy analyzer; GC-ECD = gas chromatography using an electrical conductivity detector.

[c] Units in fibers per $mm^2$ of filter (Method No. 7400 from the NIOSH Manual of Analytical Methods, 3rd edition).

Source: NIOSH, OSHA, USCGG, EPA. (1985). Occupational Safety and Health Guidance Manual for Hazardous Waste Activities.

TABLE C.2

ATMOSPHERIC HAZARD GUIDELINES

| Monitoring Equipment | Hazard | Ambient Level | Action |
|---|---|---|---|
| Combustible gas indicator | Explosive atmosphere | <10% LEL | Continue investigation. |
| | | 10% to 25% | Continue onsite monitoring with extreme caution as higher levels are encountered. |
| | | >25% LEL | Explosion hazard; withdraw from area immediately. |
| Oxygen concentration meter | Oxygen | <19.5% | Monitor, wearing self-contained breathing apparatus (SCBA). Note: Combusible gas readings are not valid in atmospheres with <19.5% oxygen. |
| | | 19.5% to 21% | Continue investigation with caution. SCBA not needed, based on oxygen content only. |
| | | >25% | Discontinue inspection; fire hazard potential. |
| Radiation | Radiation | <1 mR/hr | Continue investigation. If radiation is detected above background levels, this signifies the presence of possible radiation sources; at this level, more thorough monitoring is advisable. Consult with the Project Health and Safety Officer. |
| | | >10 mR/hr | Potential radiation hazard; evacuate site. |
| Colorimetric tubes | Organic and inorganic vapors/ gases | Depends on species | Consult standard reference manuals for air concentrations/toxicity data. |

TABLE C.2 (Continued)

| Monitoring Equipment | Hazard | Ambient Level | Action |
|---|---|---|---|
| Photoionization Detector | Organic vapors/ gases | Depends on species | Consult standard reference manuals for air concentrations/toxicity data. |
| | | Total response mode | Consult Engineering-Science Guidelines for the selection of appropriate level of protection. |
| Flame Ionization Detector | Organic | Depends on species | Consult standard reference manuals for air concentrations/toxicity data. |
| | | Total response mode | Consult Engineering-Science Guidelines to the selection of appropriate level of protection. |

ability to detect and/or quantify the hazard for which they were designed. Unless trained personnel use the instruments properly and accurately assess the data readout, air hazards can be grossly misinterpreted, endangering the health and safety of field personnel.

INSTRUMENT SENSITIVITY

Although the measurement of total vapor/gas concentrations can be a useful adjunct to professional judgment in the selection of an appropriate level of protection, caution should be used in the interpretation of the readout of the measuring instrument. The response of an instrument to a gas or vapor cloud containing two or more substances does not provide the same sensitivity as measurements involving the individual, pure constituents. Hence, the instrument readout may overestimate or underestimate the concentration of an unknown composite cloud. This same type of inaccuracy could also occur in measuring a single unknown substance with the instrument calibrated to a different substance. The idiosyncrasies of each instrument must be considered in conjunction with the other parameters in selecting the protection equipment needed. Using the total vapor/gas concentration to determine levels of protection should provide protection against concentrations greater than the readout of the instrument. However, when the upper limits of Levels C and B are approached, serious consideration should be given to selecting a higher level of protection. Cloud constituents must be identified as rapidly as possible and levels of protection based on the toxic properties of the specific substances identified.

HEALTH AND SAFETY PLAN

ATTACHMENT D
PRINCIPLES OF SITE CONTROL

## ATTACHMENT D

## PRINCIPLES OF SITE CONTROL

### PURPOSE

OSHA requires (29 CFR Part 1910.120[d]) that a site control program be developed before the initiation of hazardous waste operations. The purpose of this guideline is to establish site control principles that will minimize potential contamination for ES employees and protect the public from the sites hazards.

### GUIDELINE

The activities required during hazardous waste operations involve the movement of materials (contaminants) from the site to unaffected areas. ES personnel working and equipment used around hazardous substances may become contaminated and carry the materials into clean areas. Materials may become airborne because of its volatility, or the disturbance of contaminated soil may cause it to become wind blown. To reduce the transfer of hazardous substances from the site contamination control procedures are needed.

Several site control procedures can be implemented to reduce worker and public exposure to chemical, biologic, physical, and safety hazards:

- o Compile a site map.
- o Establish work zones.
- o Use the buddy system when necessary.
- o Establish and strictly enforce decontamination procedures for both personnel and equipment (see Appendix H).
- o Establish site security measures as needed.
- o Set up communication networks.
- o Enforce safe work practices.

Site Map

A site map indicating topographical features, prevailing wind direction, and the location of containers, impoundments, pits, ponds, and building is helpful in:

- o Planning activities.
- o Assigning personnel.
- o Identifying access routes, evacuation routes, and problem areas.
- o Identifying areas of the site that require use of personal protective equipment.
- o Supplementing the daily safety and health briefings of the field team.

This map should be prepared before site activities.

Site Work Zones

One method of preventing or reducing the migration of contamination is to delineate zones on the site where prescribed operations occur. Movement of personnel and equipment between zones and onto the site itself would be limited by access control points. By these means, contamination would be expected to be contained within certain relatively small areas on the site and its potential for spread minimized. Three contiguous zones (Figure D.1) are recommended.

Exclusion Zone

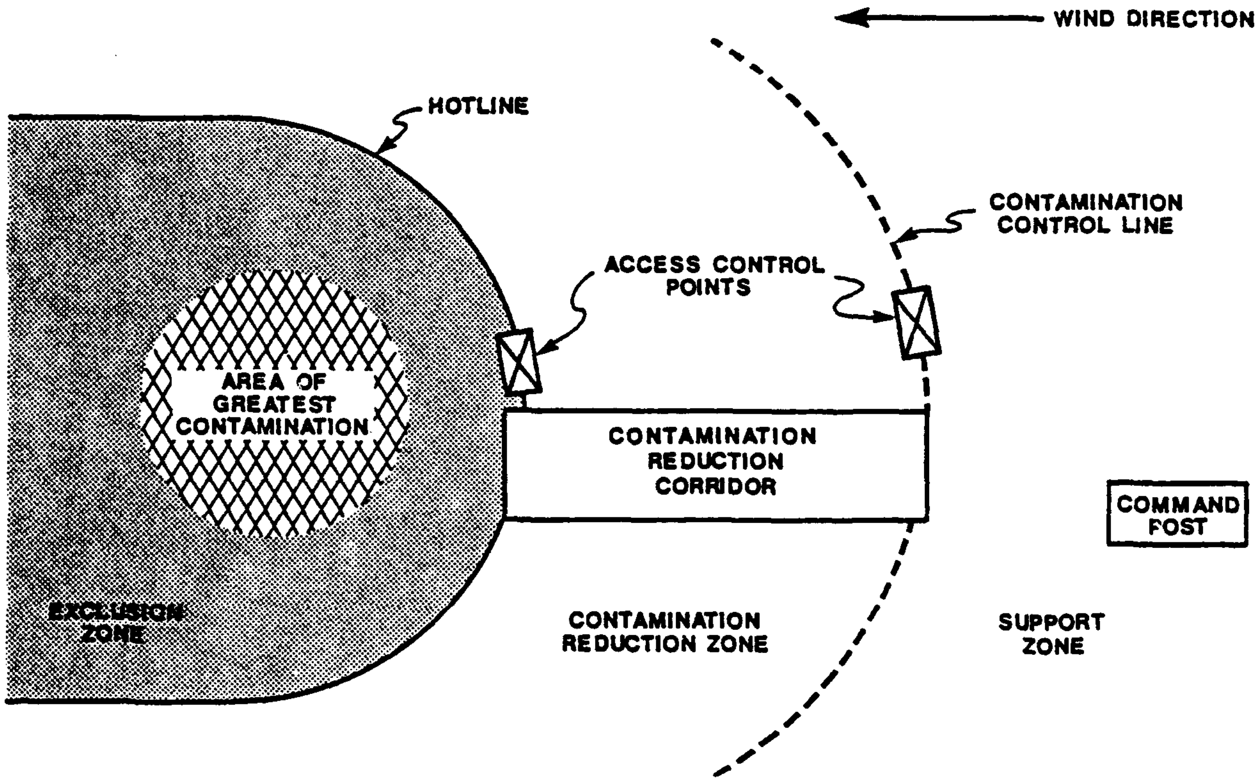
The Exclusion Zone is an area where contamination does or could occur. Major activities that are performed in the Exclusion Zone include:

- o Site characterization, such as mapping, photographing, and sampling.
- o Installation of wells for groundwater monitoring.
- o Cleanup work, such as drum movement, drum staging, and materials bulking.

All people entering the Exclusion Zone must wear prescribed levels of protection. An entry and exit check point must be established at the periphery of the Exclusion Zone to regulate the flow of personnel and

FIGURE D.1

# DIAGRAM OF SITE WORK ZONES



equipment in and out of the zone and to verify that the procedures established to exit and enter are followed.

The outer boundary of the Exclusion Zone, the Hotline, is initially established by visually surveying the immediate environs of the incident and determining where the hazardous substance involved are located; where any drainage, leachate, or spilled material is; and whether any discolorations are visible. Guidance in determining the boundaries is also provided by data from the initial site survey indicating the presence of organic or inorganic vapors/gases or particulates in air, combustible gases, and radiation, or the results of water and soil sampling.

Additional factors that should be considered include the distances needed to prevent fire or an explosion from affecting personnel outside the zone, the physical area necessary to conduct site operations, and the potential for contaminants to be blown from the area. Once the Hotline has been determined, it should be physically secured, fenced, or well-defined by landmarks. During subsequent site operations, the boundary may be modified and adjusted as more information becomes available.

Contamination Reduction Zone

The Contamination Reduction Zone (CRZ) is located between the contaminated area and clean area. This zone is designed to reduce the probability that the clean Support Zone will become contaminated and/or affected by other hazards on site. The distance between the Exclusion Zone and Support Zone provided by the CRZ, together with decontamination of workers and equipment, limits the physical transfer of hazardous chemicals into clean areas. The degree of contamination in the CRZ decreases as one moves from the Exclusion Zone to Support Zone because of the distance and the decontamination procedures.

The boundary between the Support Zone and the CRZ, the Contamination Control Line, separates the possibly low contamintion area from the clean Support Zone. Access to the CRZ from the Support Zone is through a control point. Personnel entering there would wear the prescribed personnel protective equipment, if required, for working in the CRZ. Entering the Support Zone requires removal of any protective equipment worn in the CRZ.

Support Zone

The Support Zone, the outermost part of the site, is considered noncontaminated or clean area. The Support Zone is the location of the administrative and other support functions necessary to maintain smooth operations in the Exclusion Zone and CRZ. Personnel may wear normal work clothes in this area. Any potentially contaminated equipment or clothing must be decontaminated before entry into this area.

The location of the Support Zone depends on a number of factors including:

- Accessibility: topography; open space available; locations of highways, railroad tracks; or other limitations.
- Wind direction: preferably the support facilities should be located upwind of the Exclusion Zone. However, shifts in wind direction and other conditions may be such that an ideal location based on wind direction alone does not exist.
- Resources: adequate roads, power lines, water, and shelter.

## The Buddy System

All activities in contaminated areas must be conducted with a partner (buddy) who can:

- Provide his or her partner with assistance.
- Observe his or her partner for signs of chemical or heat exposure.
- Periodically check the integrity of his or her partner's protective clothing.
- Notify the Field Team Leader or others if emergency help is needed.

## Site Security

Site security at a hazardous waste site is necessary to:

- Prevent the exposure of unauthorized, unprotected people to the site hazards.

- Prevent theft.
- Avoid interference with safe working procedures.

During the work day, site security can consist of:

- Assign responsibility for enforcing authority for entry and exit requirements.
- Maintain security in the Support Zone and at Access Control Points.
- If the site is not fenced, post signs around the perimeter.
- Have the Field Team Leader approve all visitors to the site. Make sure they have a valid purpose for entering the site. Have trained site personnel accompany visitors at all times.

During off-duty hours, site security can consist of:

- If needed, use security guards to patrol the site boundry. Guards must be fully apprised of the hazards at the site.
- Secure the equipment.

Site Communication

Two communication systems should be established during hazardous waste operations; an internal communication among personnel on site, and an external communication between on-site and off-site personnel.

Internal communication at site is used to:

- Alert personnel to emergencies.
- Convey safety information (e.g., amount of time left in air tanks, heat stress check, etc.).
- Communicate changes in the work to be performed.
- Maintain site control.

Often at a site, communications can be impeded by background noise and the use of personal protective equipment. For communications to be effective, commands must be pre-arranged. In addition, audio or visual cues can aid in conveying the message. Some common internal communication devices are: two-way radios, noisemakers (e.g., bells, whistle, compressed air horn, etc.), and visual signals (e.g., flags, hand signals, and lights). Radios used in the Exclusion Zone must be intrinsically safe and not capable of sparking.

An external communication system between on-site and off-site personnel is necessary to:

- o Report to management.
- o Coordinate emergency response.
- o Maintain contact with essential off-site personnel.

The primary means of external communication is the telephone. If a telephone is not present at the site, all team members must know where the nearest phone is located. The correct change and necessary phone number should be readily available.

Safe Work Practices

To ensure a strong safety awareness during hazardous waste operations, a list of standing orders stating the practices that may never occur in contaminated areas should be developed. Sample standing orders for personnel entering an Exclusion Zone may include:

- o No smoking, eating, drinking, or application of cosmetics in this zone.
- o No matches or lighters in this zone.
- o Check in at the entrance Access Control Point before you enter this zone.
- o Check out at the exit Access Control Point before you leave this zone.
- o Always have your buddy with you in this zone.
- o Wear an air purifying respirator in this zone.
- o If you discover any signs of radioactivity, explosivity, or unusual conditions such as dead animals at the site, exit immediately and report this finding to your supervisor.

Standing orders should be posted conspicuously at the site.

In addition to standing orders, employees should be briefed on the chemical information of the site contaminant at the beginning of the project. Daily site safety meetings should be held for employees.

Working with tools and heavy equipment is a major hazard at sites. Injuries can result from equipment hitting personnel, impacts from flying objects, burns from hot objects, and damage to protective equipment such as supplied-air respirator systems. The following precautions will help prevent injuries because of such hazards:

- o Keep all heavy equipment that is used in the Exclusion Zone in that zone until the job is done. Completely decontaminate such equipment before moving it into the clean zone.
- o Train personnel in proper operating procedures.
- o Install appropriate equipment guards and engineering controls on tools and equipment.
- o Where portable electric tools and appliances can be used (i.e., where there is no potential for flammable or explosive conditions), use three-wire grounded extension cords to prevent electric shocks.
- o Keep all non-essential people out of the work area.
- o Prohibit loose-fitting clothing around moving machinery.
- o Do not exceed the rated load capacity of a vehicle.
- o Do not operate cranes or derricks within 10 feet of power lines.

## HEALTH AND SAFETY PLAN

## ATTACHMENT E
## GUIDELINES FOR THE SELECTION OF APPROPRIATE RESPIRATORY PROTECTION

## ATTACHMENT E

### GUIDELINES FOR THE SELECTION OF APPROPRIATE RESPIRATORY PROTECTION

PURPOSE

The purpose of this guideline is to aid Engineering-Science (ES) personnel in the selection of respiratory protection equipment needed to conduct hazardous waste site investigations.

GUIDELINE

The investigation of hazardous waste sites presents workers with a number of environmental conditions, some of which are better defined than others. It is not the purpose of this document to provide precise decision logic criteria encompassing every environmental situation in which one may be faced with. Each situation is unique. This document recognizes that many respiratory decisions involve aspects of risk assessment. This guideline ensures that all relevant data are considered in the process of conducting respiratory risk assessments resulting in the selection of specific respiratory equipment items for protection against hazardous chemical exposure. Steps to take include:

1. Assimilate all available information pertaining to the hazard, including:

    a. Past activities.

    b. Suspected materials.

    c. Historical information.

    d. Land use.

    e. Analytical data.

    f. Nature of current activities, etc.

2. Evaluate the relevancy and timeliness of the data to determine the appropriate protective level needed for the task:

   a. Is the analytical data relevant?

   b. Was the past sampling or monitoring conducted during the same season as is anticipated. for the activities planned? If not what implication might this hold?

   c. Was past sampling or monitoring conducted from a medium that is pertinent to evaluate hazards associated with the activities specified in the task work plan?

3. Identify substances present at the work area.

4. Using the subject areas listed below, evaluate any of the known or suspected chemicals on site. Topics requiring elaboration are detailed in the decision logic criteria subsection (see Figure E.1).

   a. Permissible exposure limits (PEL), threshold limit values (TLVs).

   b. Eye irritation potential for substance (see decision logic criteria subsection).

   c. Warning properties of substance (see decision logic criteria subsection).

   d. Immediately dangerous to life and health (IDLH) (see decision logic criteria subsection)?

   e. Any possibility of poor sorbent efficiency at IDLH concentrations and below?

   f. Is there a possibility of severe skin irritation resulting from contact of the skin with corrosive gases (see decision logic criteria subsection)?

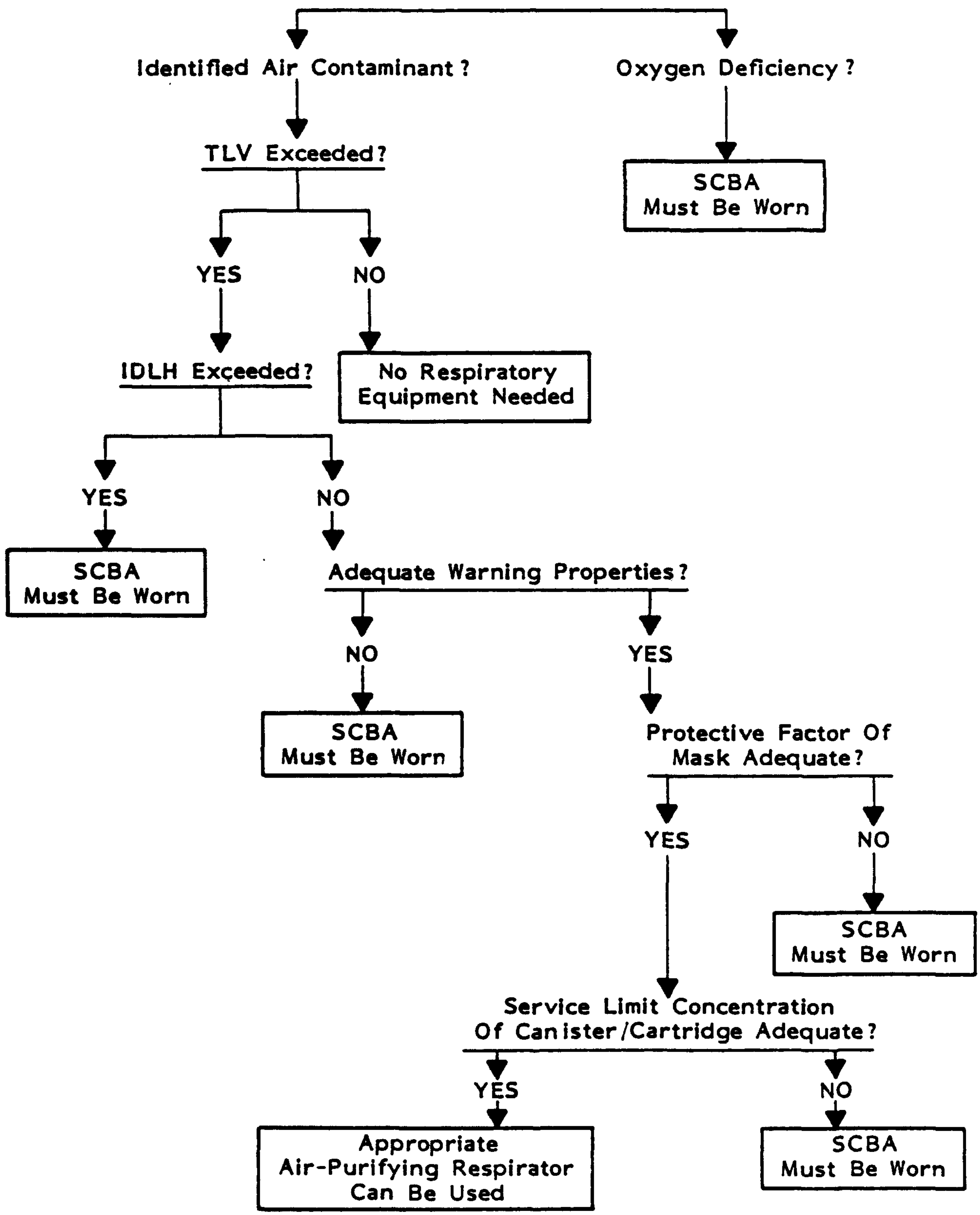
   g. The vapor pressure of the substance.

   h. Any possibility of high heat of reaction with sorbent material in cartridge or canister (see decision logic criteria subsection)?

   i. Is there a possibility of shock sensitivity of chemical being sorbed onto the cartridge or canister (see decision logic criteria subsection)?

FIGURE E.1

## DECISION LOGIC FLOW CHART ON CHOOSING APPROPRIATE RESPIRATOR



5. Determine the physical state(s) of the substance as it is likely to be encountered at the hazardous waste site. It will be either:

   a. A gas or vapor.

   b. Particulate (dust, fume, or mist).

   c. A combination of a and b.

6. Oxygen deficient atmospheres (ANSI Z88.2-1980) — air-purifying respirators shall not be worn in environments deficient in oxygen (less than 19.5 percent by volume or partial pressure less than 100 mm of mercury).

Decision Logic Criteria

Skin Adsorption and Irritation

A supplied-air suit may provide skin protection from extremely toxic substances that may be absorbed through the skin or cause severe skin irritation. Most information concerning skin irritation is not quantitative but rather is presented in commonly used descriptive terms, such as "a strong skin irritant, highly irritating to the skin" and "corrosive to the skin." Decisions made concerning skin irritation are judgmental and are often based on this nonquantitative information. As a guideline for the use of the supplied-air suit for substances that are sorbed through the skin, a single skin penetration $LD_{50}$ of 2 g/kg for any animal species is used.

Poor Warning Properties

Air-purifying devices cannot be used to protect against organic vapors with poor warning properties. Warning properties include odor, eye irritation, taste imparting characteristics, and respiratory irritation. Warning properties provide an indication to the wearer of possible cartridge exhaustion or of poor face piece fit. Adequate warning properties can be assumed when the substances odor, taste, or irritation effects are detectable and persistant at concentrations at or below the TLV.

If the odor or irritation threshold of a substance is more than three times greater than the TLV, this substance should be considered to have poor warning properties. If the substance odor or irritation threshold is slightly above the TLV (not in excess of three times the limit) and there is no ceiling limit, consideration should be given to whether undetected exposure in this concentration range could cause serious or irreversible health effects. Some substances have extremely low thresholds of odor and irritation in relation to the permissible exposure limit. These substances can be detected by a worker within the face piece of the respirator even when the respirator is functioning properly. These substances are considered to have poor warning properties (see Table E.1).

Although 30 CFR Part 11* does not specifically eliminate the use of air-purifying respirators for pesticides with poor warning properties, prudent practices dictate that a respirator should not be used to protect against any substance with poor warning properties.

Sorbents

There are certain limitations to the use of sorbent cartridge/canister respirators. When the following conditions exist, a sorbent cartridge is not recommended:

- A cartridge/canister air-purifying respirator can never be used when evidence exists of immediate (less than 3 minutes) breakthrough time at or below the IDLH concentration.
- An air-purifying canister/cartridge respirator shall not be used when there is reason to suspect that the sorbent does not provide adequate efficiency against the removal of a specific contaminant(s) that may be encountered at the site.

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*The primary technical criteria for what constitutes a permissible respirator is determined by the technical requirements of 30 CFR Part 11 (Department of Interior, Bureau of Mines, Respiratory Protective Devices and Test for Permissibility).

TABLE E.1

COMPARISON OF SELECTED ODOR THRESHOLDS
AND TLVs FOR CHEMICAL COMPOUNDS

| Compounds | Odor Threshold (ppm) | TLV (ppm) |
|---|---|---|
| Group 1 - Odor Threshold and TLV Approximately the Same | | |
| Acrylonitrile | 21 | 20 |
| Arsine | 0.21 | 0.05 |
| Cyclohexane | 300 | 300 |
| Cyclohexanol | 100 | 50 |
| Epichlorhydrin | 10 | 5 |
| Ethyl benzene | 200 | 100 |
| Ethylene diamine | 11 | 10 |
| Hydrogen chloride | 10 | 5 |
| Methyl acetate | 200 | 200 |
| Methylamine | 10 | 10 |
| Methyl chloroform | 500 | 350 |
| Nitrogen dioxide | 5 | 5 |
| Propyl alcohol | 200 | 200 |
| Styrene monomer | 200 | 100 |
| Turpentine | 200 | 100 |
| Group 2 - Odor Threshold from 2 to 10 Times the TLV | | |
| Acrolein | 0.2 | 0.1 |
| Allyl alcohol | 7 | 2 |
| Carbon tetrachloride | 75 | 10 |
| Chloroform | 200 | 25 |
| 1,2-Dichloroethylene | 500 | 200 |
| Dichloroethyl ether | 35 | 5 |
| Dimethyl acetamide | 46 | 10 |
| Hydrogen selenide | 0.3 | 0.05 |
| Isopropyl glycidyl ether (IGE) | 300 | 50 |
| Group 3 - Odor Threshold Equal to or Greater than 10 Times TLV | | |
| Bromoform | 530 | 0.5 |
| Camphor (synthetic) | 1.6-200 | 2 |
| Chloroacetophenone | 1 | 0.05 |
| Chloropicrin | 1 | 0.1 |
| Crotonaldehyde | 7 | 0.1 |
| Diglycidyl ether (DGE) | 5 | 0.5 |
| Dimethylformamide | 100 | 0 |
| Ethylene oxide | 500 | 50 |
| Methyl formate | 2000 | 100 |
| Methanol | 2000 | 200 |
| Methyl cyclohexanol | 500 | 50 |
| Phosgene | 1.0 | 0.1 |
| Toluene 2,4-diisocyanate (TDI) | 2 | 0.2 |

- o Where there is reason to suspect that a sorbent has a high heat of reaction with a substance, use of that sorbent is not allowed.
- o Where there is reason to suspect that a substance sorbed onto the surface of a cartridge or canister is shock sensitive, use of air-purifying respirators is prohibited.

Eye Irritation

The decision of whether to use a full-face respirator or a half or quarter-face respirator is often made by considering the chemical's potential for producing eye irritation or damage. The following guidelines deal with eye protection.

Any eye irritation is considered unacceptable for routine work activities. Therefore, only full-face respirators are permissible in contaminant concentrations that produce eye irritation. For escape, some eye irritation is permissible if it is determined that such irritation would not inhibit escape and such irritation is reversible.

In instances where quantitative eye irritation data cannot be found in literature references, and theoretical considerations indicate that the substance should not be an eye irritant, half-face piece respirators are allowed.

In instances where a review of the literature indicates a substance causes eye irritation, but no eye irritation threshold is specified, the full-face piece respirators can be used.

IDLH

The definition of IDLH provided in 30 CFR 11.3(t) is as follows:

> "'Immediately dangerous to life or health' means conditions that pose an immediate threat to life or health or conditions that pose an immediate threat of severe exposure to contaminants, such as radioactive materials, which are likely to have adverse cumulative or delayed effects on health."

The purpose of establishing an IDLH exposure concentration is to ensure that the worker can escape without injury or irreversible health effects in the event of failure of the respiratory protective equipment. The IDLH is considered the maximum concentration above which only a highly reliable positive-pressure self contained breathing apparatus is permitted. Because IDLH values are conservatively set, any approved respirator may be used up to its maximum use concentration below the IDLH.

In establishing the IDLH concentration the following factors are considered:

1. Escape without loss of life or irreversible health effects. Thirty minutes is considered the maximum permissible exposure time for escape.

2. Severe eye or respiratory irritation or other reactions that would prevent escape without injury.

IDLH should be determined from the following sources:

1. Specific IDLH concentration provided in the literature such as the AIHA Hygienic Guides.

2. Human exposure data.

3. Acute animal exposure data.

4. Acute toxicological data from analogous substances.

The following guidelines should be used to interpret toxicological data reported in the literature for animal species:

1. Where acute inhalation exposure data (30 minutes to 4 hours) are available for various animal species the lowest exposure concentration causing death or irreversible health effects in any species is determined to be the IDLH concentration.

2. Chronic exposure data may have little relevance to the acute effects and should not be used in determining the IDLH.

Protection Factors

The protection factors of respiratory protection devices are a useful numerical tool to aid in the selection of appropriate respiratory protection. Protection factors measure the overall effectiveness of a respirator.

The protection factor of a given respirator for a specific user multiplied by the TLV for a given substance is the maximum allowable concentration of that substance for which the respirator may be used. For example, if the protection factor for a full-face mask respirator is 100 and substance X has a PEL (or TLV) of 10 ppm, the full-face mask respirator will provide protection up to 1000 ppm (see Table E.2).

Escape

Engineering-Science will provide and ensure that all employees will carry an escape respirator on initial site entries (as required in 29 CFR Part 1910.120) or where exposure to extremely toxic substances may occur (an extremely toxic substance is defined as a gas or vapor having an $LC_{50}$ equal to or less than 10 ppm).

TABLE E.2

SELECTED RESPIRATOR PROTECTION FACTORS

| Type of Respirator | Protection Factor (Qualitative Test) |
|---|---|
| Air-purifying | |
| quarter-mask | 10 |
| half-mask | 10 |
| Air-line | |
| quarter-mask | 10 |
| half-mask | 10 |
| Hose mask | |
| full facepiece | 10 |
| SCBA, demand | |
| quarter-mask | 10 |
| half-mask | 10 |
| Air-purifying | |
| full facepiece | 100 |
| Air-line, demand | |
| full facepiece | 100 |
| SCBA, demand | |
| full facepiece | 100 |
| Air-line, pressure-demand, with escape provision | |
| full facepiece (no test required ) | 10,000+ |
| SCBA, pressure-demand or positive pressure | |
| full facepiece (no test required) | 10,000+ |

For additional information consult ANSI Z88.2 - 1980.

**HEALTH AND SAFETY PLAN**

**ATTACHMENT F**
**GUIDELINES FOR SELECTION OF PROTECTIVE CLOTHING**

# ATTACHMENT F

## GUIDELINES FOR SELECTION OF PROTECTIVE CLOTHING

### PURPOSE

To establish guidelines to be used by Engineering-Science personnel in the selection of protective clothing for hazardous waste site investigations.

### GUIDELINES

Protective clothing is needed to ensure the health and safety of field personnel involved with hazardous substances. Specific protective garments are selected on the basis of a variety of criteria. Clothing is selected by evaluating the performance characteristics of the clothing against the requirements and limitations of the site- and task-specific conditions. The selection of chemical protective clothing is a complex task and should be performed by personnel with training and experience.

#### Considerations for Choice of Protective Clothing

##### Performance Requirement

Clothing must be able to withstand a variety of physical abuses. The advantages and disadvantages of reusable versus disposable clothing must be considered.

##### Construction Requirements

The construction requirements of any garment depend on the intended use of the garment. The material that the garment is made of has been selected because of its effectiveness as a barrier against specific hazards--there is no such thing as "universal" protection.

1. The physical construction of the garment must prevent penetration (e.g., location of seams and zippers, size of clothing).

2. The material that the garment is constructed of must resist penetration. In some instances, it may be necessary to layer protective clothing to achieve the desired protection.

Permeation Rate

Permeation rate is affected by a combination of the base material, the nature of the chemicals to which the material is exposed, and the duration and nature of exposure. Most materials allow some degree of permeation.

Ease and Cost of Decontamination

Considerations that should be made upon purchasing garments are the ability and degree to which the garment can be decontaminated and the cost of decontamination. Disposable clothing may be advantageous in some situations; however, such clothing is rather expensive in the long run. In most instances, field personnel will use a combination of disposable and reusable clothing.

Protective Materials

The following materials are generally available for a number of garments:

1. Cellulose or paper
2. Natural and synthetic fibers
   a. Tyvek®
   b. Nomex®
3. Elastomers
   a. Polyethylene
   b. Saran®-Dow-product
   c. Polyvinyl chloride
   d. Neoprene
   e. Butyl rubber
   f. Chlorapel®
   g. Viton®

Materials such as Tyvek® or paper offer little or no protection against hazardous contaminants. Such materials can, however, protect against particulate contaminants. Tyvek® should be used as an outer covering over the primary protective gear such as splash or fully encapsulating suits. Although Tyvek® provides little chemical resistance, it does limit the amount of direct contamination on the primary protective gear. Tyvek® garments are disposable.

Elastomers (polymeric materials that, after being stretched, return to about their original length) provide the best protection against chemical degradation, permeation, and penetration from toxic and corrosive liquids or gases. Elastomers are used in boots, gloves, overalls, and fully encapsulating suits. They are sometimes combined with a flame-resistant fabric called Nomex® to enhance durability and protection.

The abilities of elastomers to resist degradation and permeation range from poor to excellent. The selection of a particular material should be based on its resistance to chemical degradation, as well as on its ability to resist permeation.

Table F.1 indicates the effectiveness of certain materials to resistance from degradation.

## Types of Protective Clothing

Each type of protective clothing has a specific purpose; many, but not all, are designed to protect against chemical exposure. Table F.2 describes the types of protective clothing available, details the protection they offer, and lists factors to consider in their selection and use.

## SELECTION OF WORK ENSEMBLE

### Protection Level

The individual components of clothing and equipment must be assembled into a full protective ensemble that both protects the worker from the site-specific hazards and minimizes the hazards and drawbacks of the personal protective equipment ensemble itself.

TABLE F.1

CHEMICAL PROTECTION OF CLOTHING MATERIALS
BY GENERIC CLASS

| Generic Class | Butyl Rubber | Polyvinyl Chloride | Neoprene | Natural Rubber |
|---|---|---|---|---|
| Alcohols | E | E | E | E |
| Aldehydes | E-G | G-F | E-G | E-F |
| Amines | E-F | G-F | E-G | G-F |
| Esters | G-F | P | G | F-P |
| Fuels | F-P | G-P | E-G | F-P |
| Halogenated hydrocarbons | G-P | G-P | G-F | F-P |
| Hydrocarbons | F-P | F | G-F | F-P |
| Inorganic acids | G-F | E | E-G | F-P |
| Inorganic bases and salts | E | E | E | E |
| Ketones | E | P | G-F | E-F |
| Natural fats and oils | G-F | G | E-G | G-F |
| Organic acids | E | E | E | E |

Key: E, excellent; F, fair; G, good; P, poor.

Source: "Survey of Personnel Protective Clothing and Respiratory Apparata..." September 1974, Department of Transportation, Office of Research and Development.

TABLE F.2

PROTECTIVE CLOTHING AND ACCESSORIES

| Type of Clothing or Accessory | Description | Type of Protection |
|---|---|---|
| Fully-encapsulating suit | One-piece garment. Boots and gloves may be integral, attached and replaceable, or separate. | Protects entire body against splashes, dust, gases, and vapors. |
| Non-encapsulating suit | Jacket, hood, pants, or bib overalls, and one-piece coveralls. | Protects body against splashes, dust, and other materials but not against gases and vapors. Does not protect parts of head or neck. |
| Aprons, leggings, and sleeve protectors | Fully sleeved and gloved apron.<br><br>Separate coverings for arms and legs.<br><br>Commonly worn over non-encapsulating suit. | Provides additional splash protection of chest, forearms, and legs. |
| Firefighters' protective clothing | Gloves, helmet, running or bunker coat, running or bunker pants (NFPA No. 1971, 1972, 1973), and boots. | Protects against heat, hot water, and some particles. Does not protect against gases and vapors, or chemical permeation or degradation. NFPA Standard No. 1971 specifies that a garment consist of an outer shell, an inner liner, and a vapor barrier with a minimum water penetration of 25 $lb/in^2$ (1.8 $kg/cm^2$) to prevent the passage of hot water. |
| Safety helmet | Hard plastic or rubber hat. | Protects the head from blows. Helmets shall meet OSHA Standard 29 CFR Part 1910.135. |

TABLE F.2 (Continued)

| Type of Clothing or Accessory | Description | Type of Protection |
|---|---|---|
| Face shield | Full-face coverage, eight-inch minimum. | Protects face and eyes against chemical splashes. |
| Safety glasses | Plastic or glass lenses with side shields. | Protects eyes against large particles and projectiles. Safety glasses shall meet OSHA Standard 29 CFR Part 1910.133. |
| Goggles | Plastic lenses, flexible fitting. | Depending on their construction, goggles can protect against vaporized chemicals, splashes, large particles, and projectiles (if constructed with impact-resistant lenses). Goggles shall meet OSHA Standard 29 CFR Part 1910.133. |
| Gloves and sleeves | May be integral, attached, or separate from other protective clothing. | Protects hands and arms from chemical contact. |
| | Overgloves. | Provides supplemental protection to the wearer and protects more expensive undergarments from abrasions, tears, and contamination. |
| Safety boots | Boots constructed of chemical-resistant materials (e.g., neoprene, nitrile, butyl rubber, etc.). | Protects feet from contact with chemicals. |

TABLE F.2 (Continued)

| Type of Clothing or Accessory | Description | Type of Protection |
|---|---|---|
| Safety boots (continued) | Boots constructed with some steel materials (e.g., toes, shanks, insoles). | Protects feet from compression, crushing, or puncture by falling, moving, or sharp objects. All boots must meet specifications required by OSHA (29 CFR Part 1910.136). |
| | Boots constructed from nonconductive, spark-resistant materials or coatings. | Protects the wearer against electrical hazards and prevents ignition of combustible gases or vapors. |
| Disposable shoe or boot covers | Made of a variety of materials. Slip over the shoe or boot. | Protects safety boots from contamination. Protects feet from contamination. |

SOURCE: NIOSH, OSHA, USCG, EPA. 1985. Occupational Safety and Health Guidance Manual For Hazardous Waste Site Activities.

Level A

Level A protection should be used when percutaneous hazards exist or where there is no known data to rule out percutaneous hazards. Because wearing a fully encapsulated suit is physiologically and psychologically stressful, the decision to use this protection must be carefully considered. The following conditions suggest a need for Level A protection.

1. The hazardous substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on either the measured (or potential for) high concentration of atmospheric vapors, gases, or particulates; or based on the site operations and work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin or capable of being absorbed through the intact skin.

2. Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible.

3. Operations must be conducted in confined, poorly ventilated areas and the absence of conditions requiring Level A have not yet been determined.

The following items constitute Level A protection:

1. Pressure-demand, full-face piece, self-contained breathing apparatus (SCBA), or pressure-demand supplied air respirator with escape SCBA, approved by the National Institute for Occupational Safety and Health (NIOSH).

2. Totally-encapsulating chemical-protective suit.

3. Coveralls.

4. Long underwear.*

5. Gloves, outer, chemical resistant.

6. Gloves, inner, chemical resistant.

*Optional, as applicable.

7. Boots, chemical-resistant, steel toe and shank.

8. Hard hat (under suit).*

9. Disposable protective suit, gloves, and boots (depending on suit construction, may be worn over totally-encapsulating suit).

10. Two-way radios (worn inside encapsulating suit).

Before a fully encapsulated suit can be worn into a hazardous situation the suit must be properly inspected. The following is a checklist for visually inspecting all types of fully encapsulated suits.

1. Spread suit out on flat surface.

2. Examine the following:

   a. Fabric and seams for abrasions, cuts, or holes.
   b. Zippers and other connecting devices for proper sealing.
   c. Visor for dirt and cracks.
   d. Exhaust valves (if applicable) for inhibiting debris and proper functioning.

3. If air source is available, seal the suit and inflate it. Check for any leaks on surface and seams using a mild soap solution.

4. Record each suit's inspection, use, and repair status.

<u>Level B</u>

Level B protection should be worn when the highest level of respiratory protection is necessary, but a lesser level of skin protection is needed. The following conditions constitute a need for Level B protection.

1. Atmospheres with concentrations of known substance greater than protective factors associated with full-face, air-purifying respirators.

2. The atmosphere contains less than 19.5 percent oxygen.

3. Site operations make it highly unlikely that the small, exposed areas of the head or neck will be contacted by splashes of extremely hazardous substances.

4. Type(s) and concentration(s) of vapors in air do not present a cutaneous or percutaneous hazard to the small, unprotected areas of the body.

The following items constitute Level B protection:

1. Pressure-demand, full-face piece, self-contained breathing apparatus (SCBA), or pressure-demand supplied air respirator with escape SCBA (NIOSH approved).

2. Hooded chemical-resistant clothing (overalls and long-sleeved jacket, coveralls, one or two-piece chemical splash suit; disposable chemical-resistant overalls).

3. Coveralls.*

4. Gloves, outer, chemical resistant.

5. Gloves, inner, chemical resistant.

6. Boots, outer, chemical-resistant, steel toe and shank.

7. Boot covers, outer, chemical-resistant (disposal)*.

8. Hard hat.

9. Two-way radios.*

10. Face shield.*

Level C

Level C protection should be worn when the type(s) of airborne substance(s) is measured, and the criteria for using air-purifying respirators are met. The following conditions suggest a need for Level C protection:

1. The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin.

*Optional, as applicable.

2. The types of air contaminants have been identified, concentrations measured, and a canister or cartridge respirator is available that can remove the contaminants.

3. All criteria for the use of air-purifying respirators are met.

The following items constitute Level C protection:

1. Full-face or half-mask, air-purifying canister or cartridge equipped respirators (NIOSH approved).

2. Hooded chemical-resistant clothing (overalls; two-piece, chemical-splash suit; disposal, chemical-resistant overalls).

3. Coveralls.*

4. Gloves, outer, chemical-resistant.

5. Gloves, inner, chemical-resistant.

6. Boots (outer), chemical-resistant, steel toe and shank.*

7. Boot covers, outer, chemical-resistant (disposal).*

8. Hard hat.*

9. Escape mask.*

10. Two-way radios.*

11. Face shield.*

Level D

Level D protection should not be worn on any site where respiratory or skin hazard exist. Level D protection should be used when:

1. The atmosphere contains no known hazard.

2. Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

*Optional, as applicable.

The following items constitute Level D protection:

1. Coveralls.

2. Gloves.*

3. Boots/shoes, chemical-resistant, steel toe and shank.

4. Boots, outer, chemical-resistant (disposal).*

5. Safety glasses or chemical splash goggles.*

6. Hard hat.*

7. Escape mask.*

8. Face shield.*

The type of clothing used and the overall level of protection should be reevaluated periodically as information about the site increases and as workers perform different operations. The Project Health and Safety Officer will determine when to upgrade or downgrade the level of protection for site personnel.

Reason to upgrade:

1. Known or suspected presence of dermal hazards.

2. Occurrence or likely occurrence of gas or vapor emission.

3. Change in work task that will increase contact or potential contact with hazardous materials.

4. Request of the individual performing the task.

Reasons to downgrade:

1. New information indicating that the situation is less hazardous than was originally thought.

2. Change in site conditions that decreases the hazard.

3. Change in work task that will reduce contact with hazardous materials.

---

*Optional, as applicable.

HEALTH AND SAFETY PLAN

ATTACHMENT G
GUIDELINES FOR THE PROPER USE OF PERSONAL PROTECTIVE EQUIPMENT

# ATTACHMENT G

## GUIDELINES FOR THE PROPER USE OF PERSONAL PROTECTIVE EQUIPMENT

PURPOSE

These guidelines are provided to establish a personal protective equipment program for hazardous waste operations.

GUIDELINE

Personal protective equipment (PPE) can only provide a high degree of protection if it is used properly. The following areas must be addressed for an effective PPE program:

- training
- work duration
- fit testing
- donning of equipment
- in-use monitoring
- doffing of equipment
- inspection
- storage

Training

Training in PPE use is required as part of the initial training for all ES employees that are to work on hazardous waste sites. This training allows the user to become familiar with the equipment in a non-hazardous environment. As a minimum, the PPE training portion should delineate the user's responsibilities and explain the following:

1. OSHA requirements as delineated in 29 CFR Part 1910 Subparts I and Z.

2. The proper use and maintenance of the selected PPE, including capabilities and limitations.

3. Instruction in inspecting, donning, checking, fitting, and using PPE.

4. Individualized respirator fit testing to ensure proper fit.

5. The user's responsibility (if any) for decontamination cleaning, maintenance, and repair of PPE.

6. Emergency procedures and self-rescue in the event of PPE failure.

Work Mission Duration

Before entering a hazardous waste site in personal protective equipment, the anticipated work mission duration must be established in the project health and safety plan. Several factors limit the work mission length. These are:

1. Air supply.
2. The permeation and penetration rates of chemical contaminants.
3. Ambient temperature.

Respirator Fit Testing

The integrity of the face piece-to-face seal of a respirator determines its effectiveness. A secure fit is important with positive-pressure equipment, and is necessary to the safe functioning of negative-pressure equipment. Most face pieces are designed to fit only a certain percentage of the population; thus, every face piece must be tested on the potential wearer. The procedure for fit testing an air-puryifying respirator is presented below.

Prior to each use of the respirator, the user will conduct a negative pressure and positive pressure sealing test.

Negative Pressure Sealing Test

1. With the cartridge in place, cover the porous area of the cartridge with your hand.

2. Inhale attempting to achieve a negative pressure in the face piece.

3. Inability to achieve or maintain negative seal may be indicative of poor repirator fit or malfunction.

4. Recheck integrity of the respirator and reposition respirator for better seal.

5. Repeat step 1 and 2.

6. Do not use respirator if unable to achieve a negative pressure.

7. This is not considered a qualitative fit test, but rather a quick check of respirator integrity and seal.

Positive Pressure Sealing Test

1. Remove the protective covering of the exhalation valve and seal the exhalation port with your hand.

2. Exhale slightly.

3. Inability to maintain a slight positive pressure without indications of leakage may be indicative of poor respirator fit or malfunction.

A respirator-fit test using an irritant or odorous agent is required before donning a new negative pressure respirator.

Irritant Agent Test

1. Conduct an amyl acetate pre-test before using stannic chloride.

2. Break the ends off a stannic chloride tube, taking care not to get any of the material on your skin.

3. Attach the squeeze bulb to one end of the tube. Squeeze the bulb to ensure that a satisfactory stream of chloride can be generated for the fit test.

4. Have the subject don their respirator with the appropriate cartridge. In a closed space (a large trash bag is satisfactory) with the stannic chloride tube approximately two feet from the respirator, begin exposing the subject to the irritant agent.

5. Watch the subject closely for signs of irritation. If no penetration of the irritant agent is detected, move the stannic chloride closer to within 6 inches of the respirator, and direct smoke to potential leak areas.

6. If no penetration of smoke is detected at this stage, have the subject rotate the head from side to side, up and down, and undertake deep breathing.

7. If the respirator wearer does not detect the penetration of smoke into the respirator, the subject is deemed to have achieved a satisfactory fit.

Donning of Equipment

Periodic practice for donning chemical resistant clothing and respirators should be established. Assistance should be provided because donning and doffing operations are difficult to perform alone. Table G.1 lists sample procedures for donning a chemically resistant suit/SCBA ensemble.

After the equipment has been donned, the fit should be evaluated. Clothing that are too small will restrict movement, thus increasing the possibility of tearing the suit and increasing worker fatigue. Clothing that are too large increases the possibility of snagging the suit and the worker's dexterity and coordination may be compromised. In each instance, the worker should be recalled and refitted.

In-Use Monitoring

The wearer of protective clothing must understand all aspects of the clothing's operation and limitation. This is particularly important for fully-encapsulating ensembles where misuse could result in suffocation.

Worker should report any perceived problems or difficulties with equipment to their Project Health and Safety Officer. These malfunctions include, but are not limited to:

- Degradation of protective clothing.
- Perception of odor while wearing a respirator.
- Skin irritation.

TABLE G.1

SAMPLE DONNING PROCEDURES

1. Inspect respiratory equipment and clothing before donning.

2. Standing or sitting, put on chemically-resistant suit. Secure the suit by closing all fasteners on openings.

3. Put on chemically-resistant safety boots. Tape the leg cuff over the tops of the boots.

4. Put on inner gloves (surgical gloves). Additional overgloves may be worn. Tape the sleeves of the suit over the gloves.

5. Put on air tanks and harness assembly of the SCBA. Don the face piece and adjust it to be secure, but comfortable. Perform negative and positive respirator face-piece seal test procedures. Open the main valve.

6. Put on hard hat.

7. Have assistant check all closures.

8. Have assistant observe the wearer for a period of time to ensure that the wearer is comfortable, psychologically stable, and that the equipment is functioning properly.

- Resistance in breathing during respirator use.
- Fatigue because of respirator use.
- Vision or communication difficulties.
- Personal responses such as rapid pulse, chest pain, and nausea.

If a supplied-air respirator is being used, all hazards that might endanger the integrity of the air line should be removed from the working area before use. During use, air lines should be kept as short as possible and other workers and vehicles should be excluded from the area.

Doffing of Equipment

Procedures for removing chemically-resistant suit/SCBA ensembles must be developed and followed precisely to prevent the spread of contaminants from the work area to the wearer's body, and to decontamination personnel. Doffing should be performed in concert with the decontamination of the suited worker. Throughout the doffing precedure, both the worker and decontamination personnel should avoid direct contact with the outside surface of the suit.

## Inspection

An effective PPE program will consist of three different inspections:

1. Inspection of equipment as it is issued to workers.
2. Inspection after use in training.
3. Periodic inspection of stored equipment.

Each inspection will cover different areas in varying degrees of detail. Explicit inspection procedures are usually available from the manufacturer. The inspection checklists provided in Table G.2 will also be an aid. It is the responsibility of the field worker to inspect the integrity of his or her equipment before use on a site.

Records must be maintained of all inspection procedures. Identification numbers should be assigned to all reusable pieces of equipment (ID numbers) and records should be kept by that number. As a minimum, each inspection should record the ID number, date, inspector, findings, and any future actions to be taken. Periodic review of these records may indicate an item or type of item with excessive maintenance costs or a high level of down time.

## Storage

Clothing and respirators must be properly stored to prevent damage or malfunction due to exposure to dust, moisture, sunlight, temperature extremes, and impact. Procedures should be developed for pre-issuance warehousing and post-issuance (in-use) storage. Improper storage can cause equipment failures.

TABLE G.2

SAMPLE PPE INSPECTION CHECKLIST

---

Clothing

To be done before use:

- Determine that the clothing material is correct for the specific task at hand.
- Visually inspect for:

  - imperfect seams
  - non-uniform coatings
  - tears
  - malfunctioning closures

- Hold up to light and check for pinholes.
- Flex product:

  - observe for cracks
  - observe for other signs of shelf deterioration

- If the product has been used previously, inspect inside and out for signs of chemical attack:

  - discoloration
  - swelling
  - stiffness

To be done during the work task:

- Evidence of chemical attack (e.g., discoloration, softening, etc.). Chemical permeation can occur without visable signs.
- Tears
- Punctures
- Seam discontinuities

Table G.2 (Continued)

Gloves

To be done before use:

- o Pressurize the gloves to check for holes. Either blow into glove, then roll gauntlet towards fingers or inflate glove and hold under water. In any event, no air should escape.

Air-Purifying Respirator

The respirator shall be inspected after each cleaning and before each use. The following items, at a minimum, must be addressed in the course of each inspection:

- o Cartridges are fresh and of the appropriate type for the contaminant(s) encountered (check before use).
- o Cartridge receptacle gaskets are present (two each).
- o Inhalation valve seats and flapper valves are in place (two each).
- o Exhalation flapper valve is in place.
- o The speaking diaphragm and gasket are in place.
- o The lens ring is secure with two nuts.
- o The respirator is capable of maintaining a negative and positive pressure seal when fully assembled.

Self-Contained Breathing Appuratus (SCBA)

The following list of items must be addressed by the user immediately before donning of SCBAs. Any malfunction found should be cause to set the unit aside until it can be repaired by a certified repair person.

- o Check all connections for tightness.
- o Check material conditions for:

  - signs of pliability.
  - signs of deterioration.
  - signs of distortion.

TABLE G.2 (Continued)

- o Check for proper setting and operation of regulators and valves (according to manufacturer's instruction).
- o Check operation of low pressure alarm.
- o Check face shield and lense for:

  - cracks.
  - crazing.
  - fogginess.

SCBAs shall be inspected once a month by a Office Health and Safety Representative to ensure that they are working properly. Monthly inspection involve the following:

- o The routine checkout procedure used by personnel before every use of an SCBA must be repeated.
- o A complete physical examination must be made of all external working parts on a monthly basis.
- o Gaskets, seals, and rubber parts are examined for pliability and signs of deterioration.
- o A physical examination of the diaphragm, diaphragm spring, and lever assembly must be made.

SCBAs must be checked twice a year on a portable regulator tester to ensure that the regulator is mechanically sound. Checks on the regulator tester must include the following:

- o Static Pressure check.
- o Airflow performance test.
- o A test for excess aspiration of the regulator.

Air tanks must also be hydrostatically tested to ensure soundness. Aluminum cylinders wound in fiberglass must be tested every three years, steel cylinder need only be tested every five years. All test dates must be recorded in the inspection log book for SCBAs.

Clothing

- Contaminated clothing should be stored in an area separate from street clothing.
- Contaminated clothing should be stored in a well-ventilated area.
- Different types and materials of clothing and gloves should be stored spearately to prevent issuing the wrong material by mistake.

Respirators

- SCBAs and air-purifying respirators should be dismantled, washed, and disinfected after each use.

# HEALTH AND SAFETY PLAN

## ATTACHMENT H
## PRINCIPLES OF DECONTAMINATION

## ATTACHMENT H

### PRINCIPLES OF DECONTAMINATION

PURPOSE

To establish fundamental decontamination principles to be used as a guide on developing site and activity specific decontamination procedures.

GUIDELINE

Personnel responding to hazardous substance incidents may become contaminated during the course of their work at a site. Protective clothing and respirators help to prevent the wearer from becoming contaminated or inhaling contaminants. Good work practices help reduce the contamination of protective clothing, instruments, and equipment. Even with these safeguards, contamination may occur. Harmful materials can be transferred into clean areas, exposing unprotected personnel. In removing contaminated clothing, personnel may come into direct contact with and/or inhale contaminants. To prevent such occurrences, contamination reduction and decontamination procedures must be developed and implemented. Such procedures are to be in place before anyone enters a hazardous area and must continue (modified if necessary) throughout the period of operation.

Decontamination consists of phy ically removing contaminants and/or converting them chemically into innocuous substances. The extent of decontamination depends on a number of factors, the most important being the type of contaminants involved. The more harmful the contaminant, the more extensive and thorough the decontamination required. Combining decontamination, the correct donning of protective equipment, and the zoning of site work areas minimizes the possibility of cross-contamination from protective clothing to wearer, or from equipment to personnel. Only general guidance can be given on methods and techniques for decontamination. The exact procedure is determined by evaluating a number of factors specific to the site.

## Initial Planning

The initial decontamination plan is based on the assumption that all personnel and equipment leaving the Exclusion Zone (area of potential contamination) are grossly contaminated. The plan includes a system for washing and rinsing, at least once, all of the protective equipment worn. The washing and rinsing are done in combination with a sequential doffing of clothing, starting at the first station with the most heavily contaminated article and progressing to the last station with the least contaminated article.

## Contamination Avoidance

Contamination avoidance is the best method for preventing the spread of contamination from a hazardous waste site. While planning site operations, methods are to be developed to prevent the contamination of personnel and equipment. Each person involved in site operations must regularly practice the basic methods of site contamination avoidance listed below.

- Know the limitations of all protective equipment being used.
- Do not enter a contaminated area unless it is necessary to carry out a specific objective.
- When in a contaminated area, avoid touching anything unnecessarily.
- Walk around pools of liquids, discolored areas, or any area that shows evidence of possible contamination.
- Walk upwind of contamination, if possible.
- Do not sit or lean against anything in a contaminated area. If you have to kneel (e.g., to take samples), use a plastic ground sheet.

- o Before sampling any hazardous waste, read the label and manifest (if available) for all containers to determine the identity of the substance to be sampled and the potential contamination hazard.
- o While checking for waste contents, the field personnel should also check for potential incompatibility of wastes. These conditions might be caused by heat, fire, or gas; an explosion; the contact of water and alkali metals; violent polymerization; or solubilization of toxic substances. Check waste containers for evidence of these conditions such as bulged drums, blistered paint, exploded drums, bubbles, dead vegetation, or melted plastic.
- o If at all possible, do not set sampling equipment directly on contaminated areas. Place equipment on a protective cover such as a ground cloth.
- o Use the proper tools necessary to safely conduct the study.

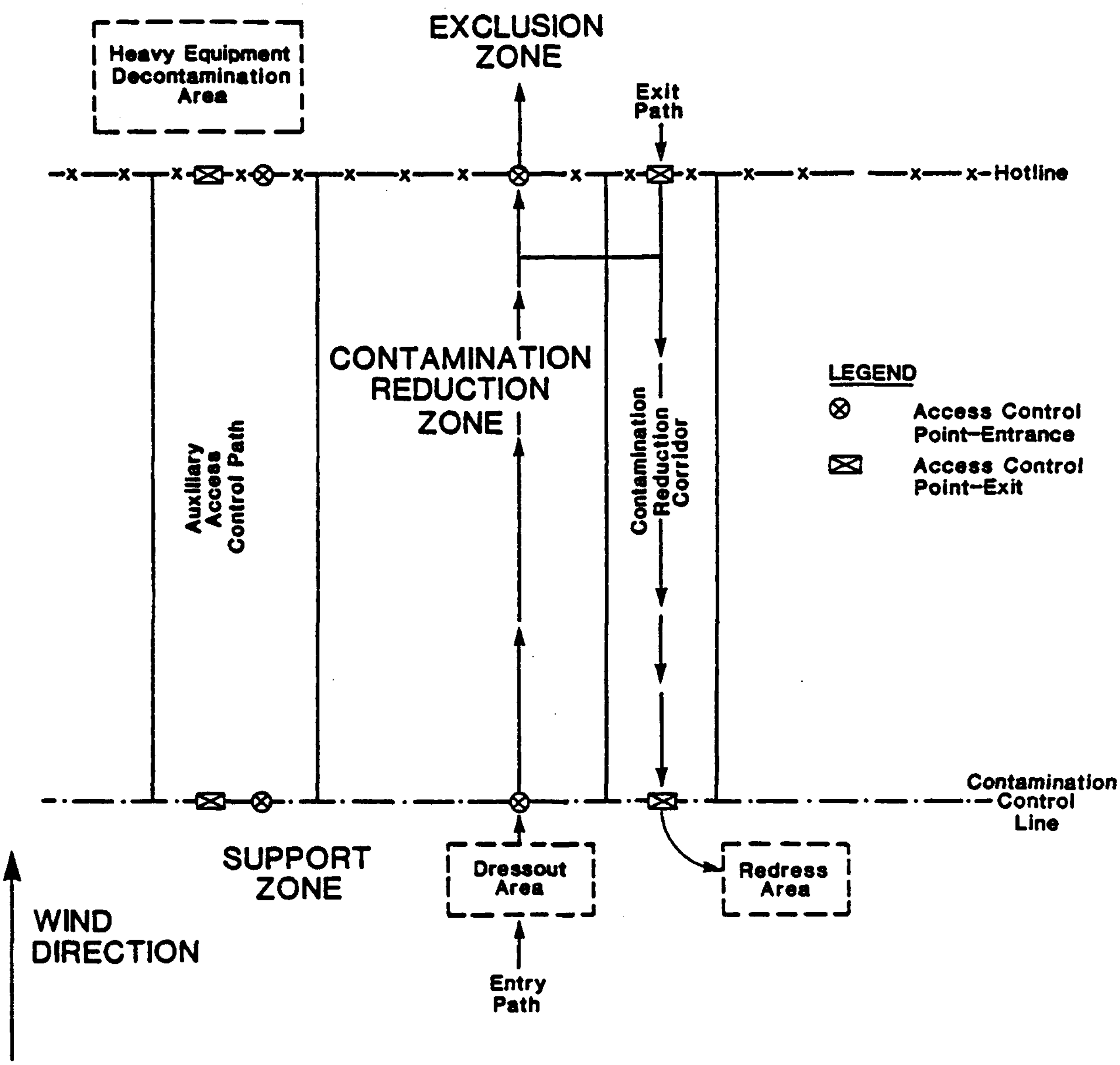
Where possible, plan very specific methods to reduce the risk of contamination. Using remote sampling techniques, opening containers by non-manual means, bagging monitoring instruments, using drum grapplers, watering down dusty areas, and avoiding areas of obvious contamination reduces the possibility of contamination and precludes elaborate decontamination procedures.

Site Organization

An area within the CRZ (Figure H.1) is designated the Contamination Reduction Corridor (CRC). The CRC controls access into and out of the Exclusion Zone and confines personnel decontamination activities to a limited area. The size of the corridor depends on the number of stations in the decontamination procedure, the overall dimension of work controls zones, and the amount of space available at the site. A corridor of 75 feet by 15 feet should be adequate for full decontamination. Whenever possible, it should be a straight path. The CRC boundaries should be conspicuously marked, with entry and exist restricted. The boundary between the Exclusion Zone and the CRZ is referred to as the hotline. Personnel exiting the Exclusion Zone must go through the CRC. Anyone in the CRC should be wearing the level of

FIGURE H.1

# CONTAMINATION REDUCTION ZONE LAYOUT



protection designated for the decontamination crew. Within the CRC, distinct areas are set aside for decontamination of personnel, portable field equipment, and clothing. These areas must be marked and restricted to those personnel wearing the appropriate protection. All activities within the corridor are confined to decontamination. The level of decontamination must be spelled out in the project health and safety plan.

Protective clothing, respirators, monitoring equipment, sampling supplies, and other equipment are all maintained in a support area outside of the CRC. Personnel don their protective equipment (dressout) away from the CRC and enter the Exclusion Zone through a separate access control point at the hotline.

Decontamination Guidance

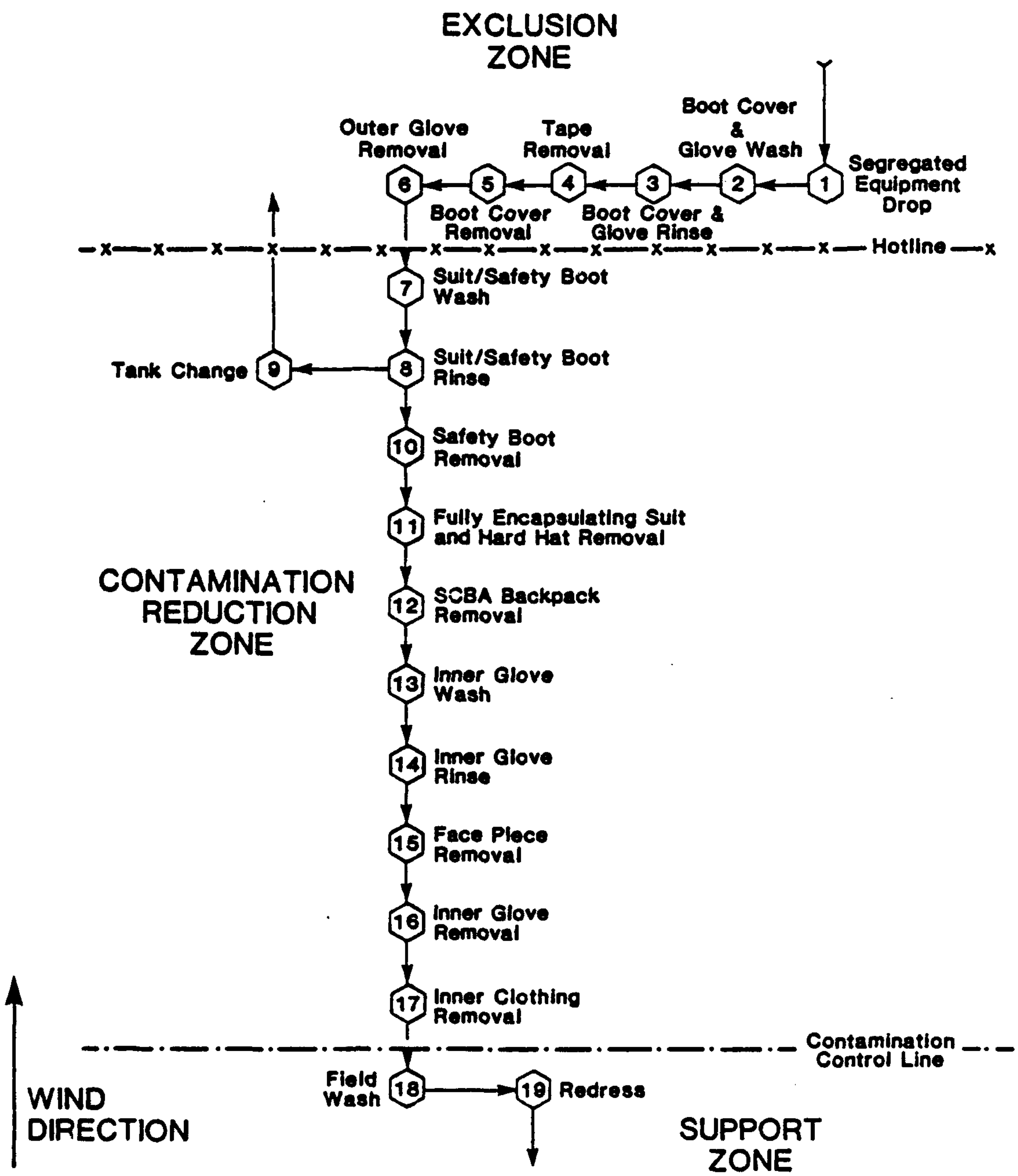
The protection selected for an investigation and the specific pieces of clothing worn in the exclusion zone dictate the items required and layout of the decontamination line. Different degrees of protection present a different situation with respect to the type of decontamination procedure required. Figures H.2, H.3, H.4, H.5, and H.6 outline the decontamination line organization for standard levels of protection.

The reason for leaving the Exclusion Zone determines the need for and extent of decontamination. Also, the time required for personnel decontamination must be determined and incorporated in the scheduling of site activities. A worker leaving the Exclusion Zone to pick up or drop off tools or instruments and immediately returning may not require full decontamination. A worker leaving to get a new air cylinder or change a respirator or canisters, however, would require some degree of decontamination. Personnel wearing self-contained breathing apparatuses must leave their work areas with sufficient air to walk to the CRC and go through decontamination. Individuals departing the CRC at breaktime, lunchtime, or the end of the day must be thoroughly decontaminated.

The type of decontamination equipment, materials, and supplies are generally selected on the basis of availabiity. The ease of equipment decontamination and disposibility are also considered. Most equipment and supplies are easily procured. Soft-bristle scrub brushes or

FIGURE H.2

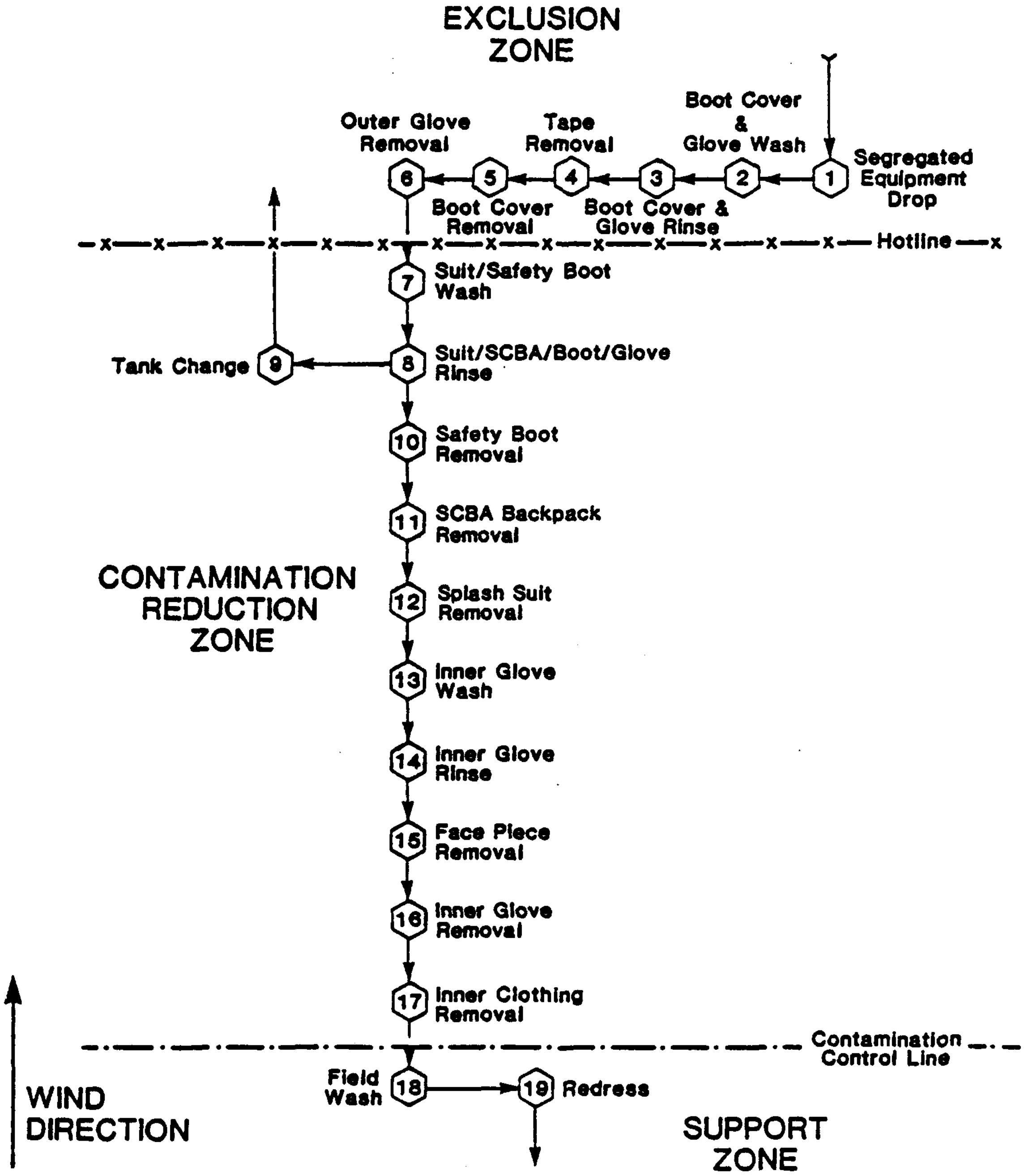
# COMPLETE DECONTAMINATION LAYOUT FOR LEVEL A PROTECTION




SOURCE: USEPA 1983. Material Hazards Incidents Training Manual.

FIGURE H.3

# COMPLETE DECONTAMINATION LAYOUT FOR LEVEL B PROTECTION




SOURCE: USEPA 1983. Material Hazards Incidents Training Manual.



M-010

FIGURE H.4

# MINIMUM DECONTAMINATION LAYOUT FOR LEVELS A AND B PROTECTION

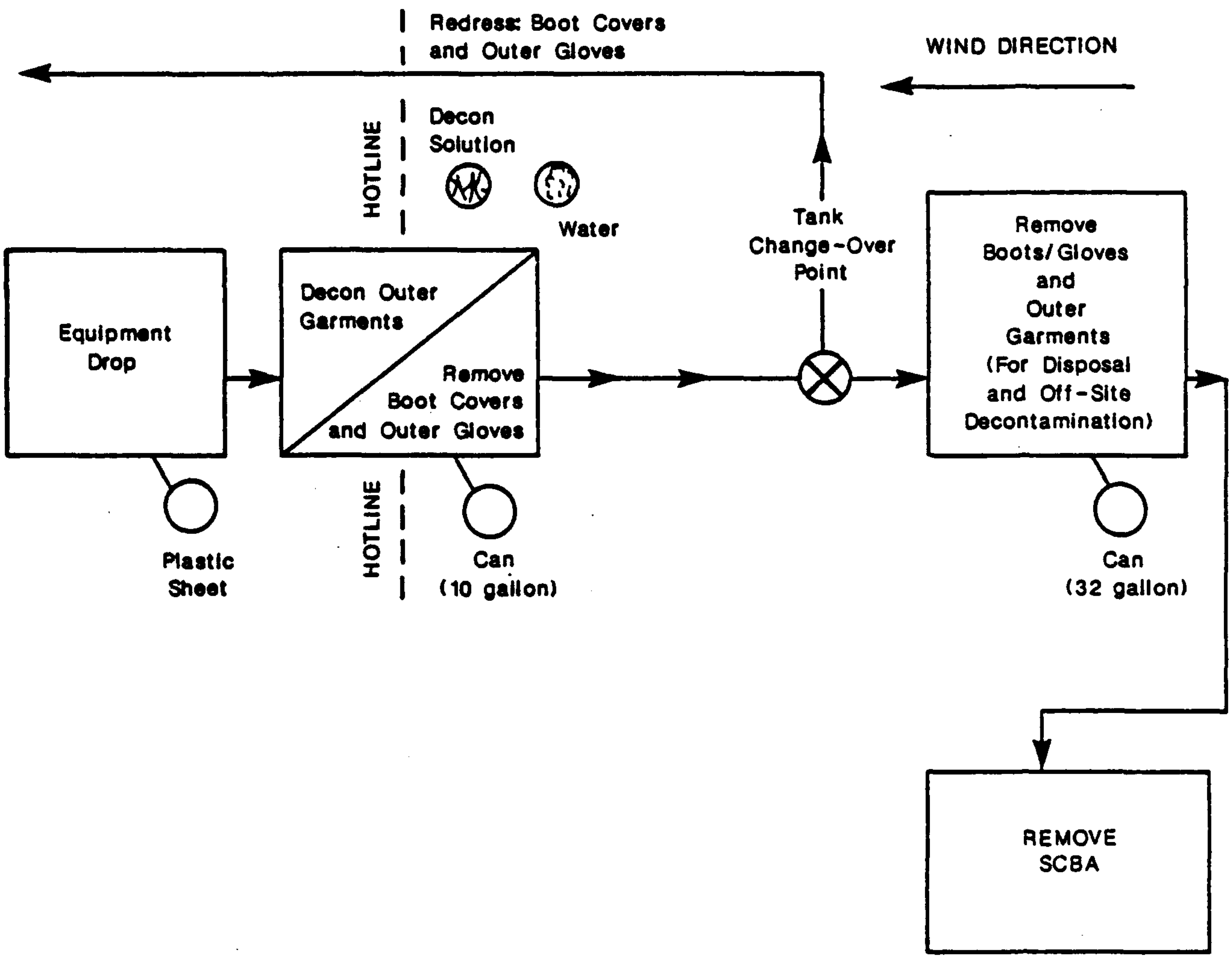
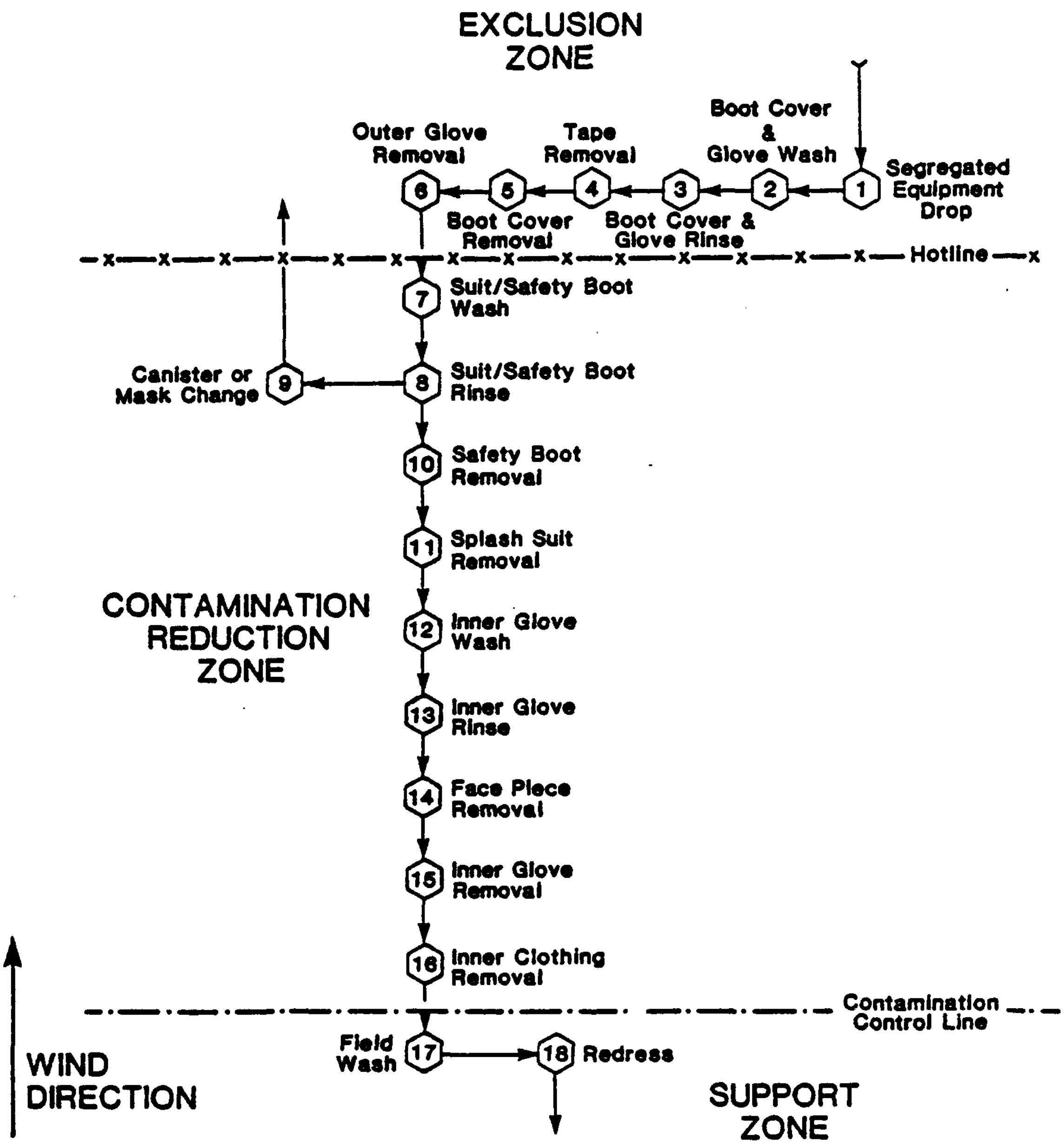


FIGURE H.5

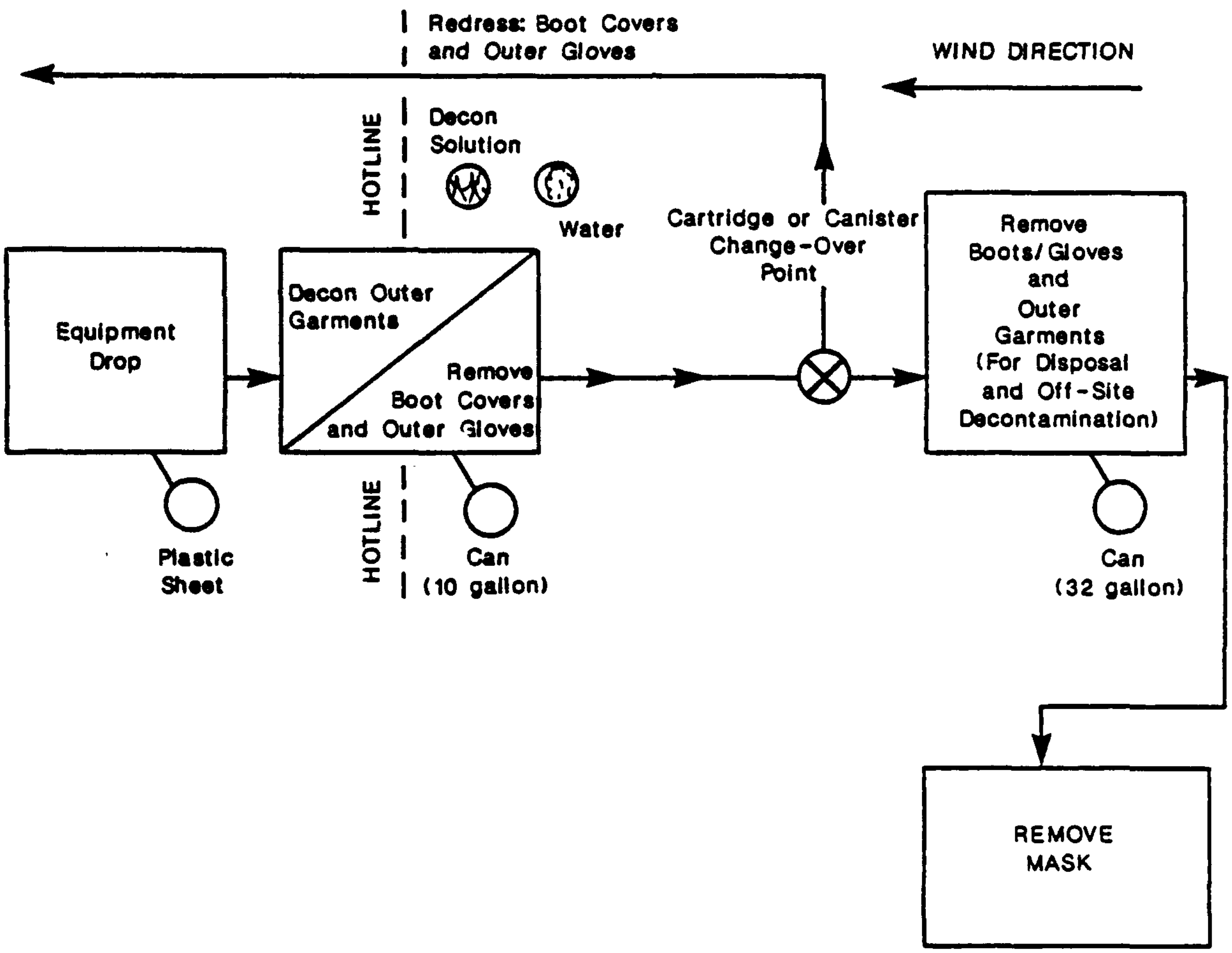
## COMPLETE DECONTAMINATION LAYOUT FOR LEVEL C PROTECTION




SOURCE: USEPA 1983. Material Hazards Incidents Training Manual.

FIGURE H.6

# MINIMUM DECONTAMINATION LAYOUT FOR LEVEL C PROTECTION



long-handle brushes are used to remove contaminants. Buckets of water or garden sprayers are used for rinsing. Large galvanized wash tubs, stock tanks, or children's wading pools can be used as containers for wash and rinse solutions. Large plastic garbage cans or containers lined with plastic bags are useful for the storage of contaminated clothing and equipment, and metal or plastic cans or drums are useful for the storage of contaminated liquids. Other gear includes paper or cloth towels for drying protective clothing and equipment.

Heavy equipment such as bulldozers, trucks, backhoes, and drilling equipment are difficult to decontaminate. The method generally used is to wash them with water under high pressure and scrub accessible parts with detergent/water solution, also under pressure if possible. Particular attention should be given to tires, scoops, and other components that directly contact contaminated areas. Provisions should be made to collect rinsate for treatment or disposal.

Protective equipment is usually decontaminated by scrubbing with detergent water using a soft-bristle brush followed by rinsing with copious amounts of water. While this process may not be fully effective in removing some contaminants (in some instances the contaminants may react with water), it is a relatively safe option compared to the use of a decontaminating solution. The contaminant must be identified before a decon chemical is used, and reactions of such a chemical with unidentified substances or mixtures could be especially troublesome. Some suggested decontaminating solutions are outlined in Table H.1.

Sampling devices and tools may required special cleaning depending on the specific contaminants found at the site. General decontamination procedures should typically be followed.

<u>Extent of Decontamination Required</u>

The project health and safety plan must be adapted to specific conditions. These conditions may require more or less personnel decontamination than was incorporated into the initial plan, depending on the following factors:

TABLE H.1

SUGGESTED DECONTAMINATING SOLUTIONS

| | Decon Solution | Mixing Solutions | Uses/Remarks |
|---|---|---|---|
| A. | An aqueous solution containing a low-sudsing detergent. | Follow the mixing instructions written on the particular product label. | Generally has the widest range of use. Best choice on sites where contaminants exists. |
| B. | An aqueous solution containing 5% sodium carbonate ($Na_2CO_3$) washing soda. | To ten gallons of water, add four pounds of sodium carbonate. | Decon solution of choice for base labile compounds such as the organophosphate pesticides. Effective in neutralizing inorganic acids. Because sodium carbonate is a water softening agent, this characteristic is an aid in physical removal of contaminants. |
| C. | An aqueous solution containing 5% sodium bicarbonate ($NaHCO_3$) baking soda. | To ten gallon of water, add four pounds of sodium bicarbonate. | Sodium bicarbonate can be used to neutralize either base or acid contaminants. Good decon for base labile compounds. |
| D. | An aqueous solution containing 2% tri-sodium phosphate ($Na_3PO_4$) TSP/ | To ten gallons of water, add two pounds of tri-sodium phosphate. | See uses/remarks for Decon Solution B above. |
| E. | An aqueous solution containing 10% calcium hypochlorite ($CaCl_2O_2$) HTH. | To ten gallons of water, add eight pounds of calcium hypochlorite. | Cyanide salts. |
| F. | Ethylenediaminetetraacetic acid (EDTA, versene, sesquesterene). | Commercial product, follow product label. | EDTA is a chelating agent and is decon of choice for heavy metal contaminants. |

TABLE H.1 (Continued)

| | Decon Solution | Mixing Solutions | Uses/Remarks |
|---|---|---|---|
| G. | An aqueous solution containing 3% to 5% citric, tartaric, oxalic acids, or their respective sodium salts. | To ten gallons of water, add four pounds citric, tartaric, or oxalic acid. | These compounds are chelating agents and are a decon of choice for heavy metal contaminants. |

- Type of contaminant - The extent of personnel decontamination depends on the effects the contaminants have on the body. Whenever it is known or suspected that personnel can come in contact with highly toxic or skin-destructive substances, full decontamination procedures should be followed. If less hazardous materials are involved, the procedure can be downgraded.

- Amount of contamination - The amount of contamination on the protective clothing is usually determined visually. If the clothing is badly contaminated, a thorough decontamination is generally required. Gross materials remaining on the protective clothing for any extended period of time may degrade or permeate it. This likelihood increases with higher air concentrations and greater amounts of liquid contamination. Gross contamination also increases the probability of personnel contact.

- Level of protection - The level of protection and specific pieces of clothing worn determine, on a preliminary basis, the layout of the decontamination line. Each level of protection incorporates different problems in decontamination such as the harness straps and backpack assembly of the self-contained breathing apparatus. A butyl rubber apron worn over the harness makes decontamination easier. Clothing variations and different levels of protection may require adding or deleting stations in the original decontamination procedure.

- Work function - The work each person does determines the potential for contact with hazardous materials. In turn, this dictates the layout of the decontamination line. For example, observers, photographers, operators of air samplers, or others in the Exclusion Zone performing tasks that will not bring them in contact with contaminants may not need to have their garments washed and rinsed. Others in the Exclusion Zone with a potential for direct contact with the hazardous material will require a more thorough decontamination. Different decontamination lines could be set up for different job functions, or certain stations in a line could be omitted for personnel performing certain tasks.
- Location of contamination - Contamination on the upper areas of the protective clothing poses a greater risk to the worker because volatile compounds may generate a hazardous breathing concentration both for the worker and for the decontamination personnel. There is also an increased probability of contact with skin when removing clothing from the upper body.

Testing the Effectiveness of Decontamination

Decontamination methods vary in their effectiveness for removing chemicals. The decontamination method chosen for a site should be assessed at the beginning of the program and periodically throughout the program by the Project Health and Safety Officer. If contaminants are not being removed or are permeating protective clothing, the decontamination program should be changed. The following methods may be useful in assessing the effectiveness of decontamination:

- Natural light. Discolorations, stains, corrosive effects, visible dirt, or alterations in clothing fabric may indicate that contaminants have not been removed. Not all contaminants leave visible traces; many contaminants can permeate clothing and are not easily observed.
- Ultraviolet light. Certain contaminants, such as polycyclic aromatic hydrocarbons, which are common in many refined oils and solvent wastes, fluoresce and can be visually detected when

exposed to ultraviolet light. Ultraviolet light can be used to observe contamination of skin, clothing, and equipment. However, the use of ultraviolet light can increase the risk of skin cancer and eye damage; therefore, a qualified health professional should assess the benefits and risks associated with ultraviolet light before its use at a waste site.

- Photoionization detector. A photoionization detector can be used to determine the effectiveness of the decontamination procedure in removing many volatile organic compounds. However, this method would be ineffective in determining the extent of residual pesticides or metal on personal protective equipment because these substances are not volatile.

- Wipe testing. This method provides after-the-fact information on the effectivenss of decontamination. In this procedure, a dry or wet cloth, glass fiber filter paper, or swab is wiped over the surface of a contaminated object and then analyzed in a laboratory. Both the inner and outer surfaces of protective clothing should be tested. Skin may also be tested using wipe samples.

## Decontamination During Medical Emergencies

The project health and safety plan should establish methods for decontaminating personnel with medical problems and injuries. It is possible that decontamination may aggrevate or cause more serious health effects. If prompt life-saving first aid and medical treatment is required, decontamination procedures should be omitted. Whenever possible, response personnel should accompany contaminated victims to the medical facility to advise on matters involving decontamination.

### Physical Injury

Physical injuries can range from a sprained ankle to a compound fracture, from a minor cut to massive bleeding. Depending on the seriousness of the injury, treatment may be given at the site by trained response personnel. For more serious injuries, additional assistance may be required at the site or the victim may have to be transported to a medical facility.

When protective clothing is grossly contaminated, contaminants may be transferred to treatment personnel or the wearer and cause injuries. Unless severe medical problems have occurred simultaneously with splashes, the protective clothing should be washed off as rapidly as possible and carefully removed.

Closure of the CRC

When the Contamination Reduction Corridor (CRC) is no longer needed, it must be closed down by the operators. All disposable clothing and plastic sheeting used during the operation must be double-bagged and either contained on site or removed to an approved off-site disposal facility. Decon and rinse solutions should be discarded on site if approved by regulatory agencies or it must be removed to an approved disposal facility. Reusable rubber clothing should be dried and prepared for future use (if gross contamination had occurred, additional decontamination of these items may be required). Cloth items must be bagged and removed from the site for final cleaning. Commercial laundries or cleaning establishments that decontaminate protective clothing or equipment shall be informed of the potentially harmful effects of exposures to hazardous substances. All wash tubs, pails, containers, etc., must be thoroughly washed, rinsed, and dried before removal from the site.

# APPENDIX B

# COMMUNITY RELATIONS PLAN

## APPENDIX B
## COMMUNITY RELATIONS PLAN

The purpose of the Community Relations Plan is to outline procedures which will be followed to keep the Base Public Affairs Office apprised of the status of the Installation Restoration Program. The Plan includes addresses and phone numbers, of project participants, local media, key political figures and interested regulatory agency representatives.

<u>Study Participants</u>

| | |
|---|---|
| Rickenbacker Public Affairs Office | 1-614-492-3400 |
| Public Affairs Officer: | Tom Foley |
| Engineering-Science: | 1-216-486-9005 |
| Project Manager | Chris Raddell |
| Deputy Project Manager | Bill Hughes |
| Martin Marietta Energy Systems | 1-615-576-0531 |
| Project Manager | Paula Pritz |

**REGULATORY AGENCIES**

The regulatory agencies concerned with IRP activities at Rickenbacker are the Ohio Environmental Protection Agency (OEPA) and the U.S. EPA - Region V. Both agencies will be provided with opportunities to review the Draft Work Plans and Reports. The draft documents will be transmitted to the Agencies by the NGB. Review meetings with the Agencies will be held at the base prior to preparation of the final documents. The Ohio EPA will assume lead jurisdiction over the investigation.

**MEDIA CONTACT**

The media should be informed of the overall objectives of the program, the general scope of the IRP, and the schedule of implementation of the project prior to the start of the Site Inspection field work. Copies of the current Work Plan and most recent Final Report should be made available to the public and the media at the Public Affairs Office. Reports of the progress of the investigation will be supplied to the Public Affairs Office upon request. Inquiries from the media to ES personnel will be directed to the Public Affairs Office. ES will assist in providing information to respond to any inquiries. At no time will data which has not been reviewed and verified be released to the press.

| | |
|---|---|
| Newspaper: | The Columbus Dispatch<br>34 South 3rd Street, Columbus, OH<br>614-461-5271 |
| Television: | WBNS Channel 10, CBS<br>770 Twin Rivers Drive, Columbus, OH<br>614-460-3950 |
| | WCMH Channel 4, NBS<br>3165 Olentangy Road, Columbus, OH<br>614-263-5555 |
| | WTVN Channel 6, ABS<br>1261 Dublin Road, Columbus, OH<br>614-481-6397 |
| Radio: | WCOL-AM-1230<br>22 South Young Street, Columbus, OH<br>614-221-2588 |
| | WBNS-AM-1460<br>175 South 3rd Street, Columbus, OH<br>614-460-3850 |
| | WTVN-AM-610<br>42 East Gay Street, Columbus, OH<br>614-224-1271 |

## PUBLIC AND POLITICAL INTEREST

The Village of Lockbourne has expressed an interest in the results of the landfill investigations being conducted by the U.S. Army Corps of Engineers concurrent with this project, and would likely be equally interested in the RI/FS/RD. Copies of Work Plans and Reports will be made available to interested parties for review at the Base Public Affairs Office.

Public meetings are not anticipated. However, if the local community requests a meeting during the comment period on the Draft Work Plans or Reports, the meetings should be held to assure that the IRP addresses local concerns. ES will assist in preparation of presentation materials for public meetings and will attend public meetings at the request of the base, the NGB, or Energy Systems.

Legislators:

State Senator Eugene Watts
Ohio Senate - State House
Columbus, OH 43215
614-466-5981

State Representative John Gilmore
Ohio House - State House
Columbus, OH 43215
614-466-8130

U.S. Representative John R. Kasick
200 North High Street, Room 400
Columbus, OH 43215
614-469-7318

U.S. Senator Howard Metzenbaum
200 North High Street, Room 405
Columbus, OH 43215
614-469-6774

U.S. Senator John Glenn
200 North High Street, Room 600
Columbus, OH 43215
614-469-6697

Mayor-Elect., Lockbourne, Ohio
Hilda Lazier
38 Mechanic Street
Lockbourne, Ohio 43137

**IMMEDIATE THREAT TO PUBLIC HEALTH OR THE ENVIRONMENT**

If during the course of the project, data indicate that conditions exist that constitute an immediate threat to public health or the environment, the base in coordination with the NGB, Energy Systems and ES will notify the impacted parties, and concerned regulatory agencies. After these notifications, a press release will be prepared to inform the general public concerning the problem and steps which will be taken to mitigate the hazard.

Discharge to Sewer:

City of Columbus, OH
Sewerage and Drainage Division
Ms. Mary Jakeway
614-222-7175

Discharge to Surface Streams:

OEPA
Larry Korecko
614-481-2055

# APPENDIX C

# RESPONSE TO OHIO EPA COMMENTS

## APPENDIX C

## RESPONSE TO COMMENTS OF OHIO EPA ON "DRAFT FINAL" SI/RI/FS/RD WORK PLAN FOR RICKENBACKER AIR NATIONAL GUARD BASE, COLUMBUS, OHIO

The comments submitted by Ms. Deborah J. Berger of Ohio EPA, on 20 April 1988, have been sequentially numbered and are addressed in the following discussion in ascending order. A copy of the numbered comments is attached for reference.

| COMMENT NUMBER | RESPONSE |
|---|---|
| 1. | The text has been corrected. |
| 2. | The text has been corrected. |
| 3. | The revised figure includes an extended spill area outline which intersects the fuel line. |
| 4. | There are only four 50,000 gallon tanks at Pumping Station #5, the text has been changed accordingly. |
| 5. | As described in the text, the spill was a tank overfill. The outline on revised Figure 1.7 surrounds the area of interest for this site. |
| 6. | The revised text details the history of the leaking tanks. |
| 7. | The revised text explains that the two new tanks (as shown) are located in the tank pit which contained the three old tanks. |
| 8. | The text has been corrected. |
| 9. | Revised Figure 1.12 includes the ditch. |
| 10. | Taxiway F is labeled in the revised figure. |
| 11. | UV has been changed to Underground Vault and the triangles have been identified as electric transformers in the revised Table 1.2 |
| 12. | The text has been corrected. |
| 13. | The legend designations for the dashed lines has been changed to "Diked Area". |
| 14. | Better reproduction quality will be used for the final Work Plan. |
| 15. | Figure number in the text has been corrected. |
| 16. | The slop oil tank has been labeled on the revised figure. |

17. The underground storage tank investigation is incorporated into the IRP as Site 28.

18. Comment noted and considered.

19. The text has been corrected.

20. The sentence has been broken into two sentences.

21. Geophysical surveys may be used more extensively in the Remedial Investigation when determination of pathways and extent of contamination is of greater interest.

22. As stated in the first full sentence of this page, "Detailed descriptions of investigation and sampling techniques are included in Sections 5 and 6..."

23. The upper aquifer will be determined in the field by the drill-site geologist as the shallowest saturated sediments with physical properties conducive to transmitting water.

24. Evaluation of the lower aquifer will be done as part of the RI if contamination is detected in the shallow aquifer.

25. See Section 6 - SOIL SAMPLING.

26. The text has been corrected.

27. Descriptions of compositing rationale and methods are included in Sections 5 and 6.

28. Volatilization is assumed for surface samples. The Plan has been changed to include volatile analysis of hand-boring samples.

29. The revised figure clearly labels the contents of the underground storage tanks.

30. Sampling protocol is detailed in Sections 5 and 6.

31. The drainage ditch is included in the revised figure.

32. Ten soil-gas survey points will be taken.

33. The text has been corrected.

34. The text has been changed to "A twenty point soil-gas..."

35. A total of ten hand borings will be collected from around the end of the building and near the site of the burned building.

36. Table 3.1 has been changed to indicate four ditch bottom sediment samples.

37. Table 3.1 has been changed to indicate five sludge samples.

38. Comment has been noted and considered.

39. The revised text explains that the two additional samples will be located based on field observation of possible point sources.

40. The legend has been corrected.

41. The numbering has been corrected.

42. No soil-gas survey will be conducted at this site.

43. The recommended location was chosen because it is centrally located in the Base well field, and is on Base property (unlike a location on the other side of "C" Avenue). If results of soil and water analyses do not meet OEPA requirements for background, a new background well location will be designated.

44. To sample three distinct depth intervals (0 1-1/3 ft, 1-1/3 - 2-2/3 ft and 2-2/3 - 4 ft).

45. The text has been corrected.

46. A 4.25" ID hollow-stem auger creates a 6-1/2 to 7-inch boring, allowing 4 to 4-1/2 inches for filter pack and sealant installation.

47. The text has been corrected.

48. The 17 initial monitoring well borings will be continuously sampled. Subsequent wells will be sampled at five foot intervals or at stratigraphic changes.

49. Mud-rotary techniques will not be used. If drilling conditions warrant rotary methods, air rotary will be utilized.

50. A mix of 94 pounds cement, 4 pounds bentonite plus water will be used (4.2 percent bentonite).

51. Five foot sampling intervals will be used while making 15' borings.

52. PVC casing and screen is an appropriate well construction material for short-term monitoring of water contaminated with organic compounds and is probably appropriate if total volatile concentrations are less than 1 ppm. The SI is designed to determine whether or not contamination exists and not as a long-term monitoring program, consequently PVC well construction is appropriate.

53. A steel (not stainless steel) outer casing will be used to isolate the upper aquifer to prevent contamination of the second aquifer from the shallow aquifer before installation of the well sealant. The upper aquifer is defined in the response for Comment #23. If no underlying clay layer is identified, then a distinct second aquifer will not exist and the well will be installed as a deeper penetration of the shallow aquifer with no outer casing.

54. The concrete pad will extend below the frost line (approximately 36-inches).

55. All wells will be fitted with a water-tight cap with a 1/8-inch vent hole.

56. Airlifting will not be used as a development technique.

57. A ±10 percent variation will be acceptable.

58. Comment will be considered.

59. The revised text includes a more detailed discussion of soil-gas survey design.

60. These terms are of common usage in hydrogeologic literature.

61. The comment is noted.

62. Falling head tests must be adjusted to account for wetting of the previously unsaturated filter pack (if any exists) above the water table.

63. Yes, pump test data will be used to calculate hydraulic conductivity.

64. See response to Comment #44.

65. Laboratory permeability tests are not very reliable and are not within the scope of an SI.

66. See response to Comment #48.

67. The comment has been noted and considered.

68. The comment has been noted and considered.

69. A minimum of one Total Well Water Volume (TWWV) will be purged and conductivity, pH and temperature monitored for stability (±10 percent). See text for further discussion on this subject.

70. A bladder pump with Teflon® and stainless steel wetted parts may be used for purging, developing and sampling. A PVC positive displacement hand pump may be used for well developing.

71. See response to Comment #57.

72. The text has been corrected.

73. Temperature, pH and conductivity will be measured before and after sample collection.

74. New bailer line will be used for each well sampling event. Dedicated bailers are not appropriate when long-term monitoring is not being proposed.

75. The comments have been noted and considered.

## RESPONSE TO COMMENTS ON HEALTH AND SAFETY PLAN

Comments #1, #2 and #8 through #21 have been addressed by changing grammatical or spelling errors in the text. Other, more technical comments are addressed individually below.

| COMMENT NUMBER | RESPONSE |
|---|---|
| 3. | Evacuation plan for field team members will be established in the field for each work site. |
| 4. | The Base emergency response plan will take effect. |
| 5. | The location of the nearest telephone will be determined before work is begun at a site. Each field crew will be equipped with a radio set on the Base emergency frequency. |
| 6. | If atmospheric chemical concentrations increase, the level of respiratory protection utilized will be re-evaluated based on limits outlined in Chapter 5 and guidelines in Attachment E. |
| 7. | If screening methods indicate hazardous levels of containments (Chapter 5), the level of personnel protection will be re-evaluated based on Attachments E, F and G. |

# OhioEPA

State of Ohio Environmental Protection Agency
Central District Office
P.O. Box 1049, 1800 WaterMark Dr.
Columbus, Ohio 43266-0149

Fac 2-10-27

2 6 APR REC'D

Toward A Cleaner Environment
15 Year Anniversary 1972 - 1987

Richard F. Celeste
Governor

April 20, 1988

RE: RICKENBACKER ANGB

Lt. Col. Michael C. Washeleski
Chief, Bioenvironmental Engineering
ANGSC/SGB (Building 3500)
Andrews Air Force Base
Maryland 20331-6008

Dear Lt. Col. Washeleski:

Enclosed are Ohio EPA's written comments on the "Draft Final" SI/RI Work Plan for Rickenbacker Air National Guard Base (ANGB), Columbus, Ohio.

Although I am unable to, Mr. Lundy Adelsberger and Ms. Pam Doerner plan to attend the Work Plan review meeting at Rickenbacker scheduled for May 4, 1988, at 9:00. They will be prepared to discuss Ohio EPA's written comments at this meeting.

If you have any question, please contact me at (614) 644-2055.

Sincerely,

Deborah Berger

Deborah J. Berger
Division of Solid & Hazardous Waste Management
Central District Office

DJB/sc

Enclosure

cc: Alan Friedstrom, Rickenbacker ANGB

0006m/3

COMMENTS ON THE SI/RI/FS/RD WORK PLAN DRAFT FOR RICKENBACKER ANGB

COLUMBUS, OHIO

No.

1. Page 1-5, Section Soils, Paragraph 1, Sentence 3: The "%" sign should be written out as "percent".

2. Page 1-5, Section Groundwater, Paragraph 1, Sentence 2: There should be an apostrophe after the s in the word "drillers". It is possessive.

3. Page 1-14, Figure 1.6, Site 3 Pumping Station No. 4: This spill is allegedly from a ruptured pipeline, however there is no fuel pipeline in the vicinity of the fuel spill area shown on Figure 1.6. From which fuel pipeline did this spill originate?

4. Page 1-16, Figure 1.7, Site 4 Pumping Station No. 5: According to the description for Site 4 (Page 1-15) there are eight 50,000 gallon underground tanks at this pumping station, however Figure 1.7 shows only four 50,000 gallon underground tanks. Where are the other four 50,000 gallon underground tanks located?

5. This figure also does not show where the spill occurred in relation to the pumping station.

6. Page 1-18, Figure 1.9, Site 6 Base Filling Station: From which tank did approximately 100 gallons of unleaded fuel leak in 1985? Where did the line connection rupture? Which of the three storage tanks was determined to be leaking by ANGB personnel?

7. According to the description for Site 6 (Page 1-15) there were three tanks at this site prior to 1987, however Figure 1.9 shows only two tanks. Where is the third tank located? Does this figure show the locations of the new tanks rather than those of the removed tanks? If so, a figure showing the locations of the removed tanks will be needed.

8. Page 1-20, Section Site 12: Old Drum Storage Area, Paragraph 2, Sentence 4: There is a typo in this sentence, "onto" should read "into".

9. Page 1-22, Figure 1.12, Site 12 Old Drum Storage Area: Where is the drainage ditch that is adjacent to the paved drum storage area?

10. Page 1-23, Figure 1.13, Site 14 and 16 KC-135 Crash Site and Northeast Fuel Dump Pit: According to the description for Site 14 (Page 1-20) the crash took placed on Taxiway F, however this taxiway is not shown on Figure 1.13. Taxiway F should be labeled as such on this figure.

11. Page 1-26, Figure 1.15, Sites 19 and 22 North Coal Pile and Lube Oil Drum Storage: What do the initials UV stand for? What do the triangles stand for? Figure 1.15 needs a legend to identify the symbols that are not addressed by table 1.2 (Page 1-10).

12. Page 1-29, Section Site 23: Fire Training Area, Paragraph 2, Sentence 2: The word "area" should be plural.

13. Page 1-30, Figure 1.18, Site 23 Fire Training Area: Do the dashed lines of the fire rings represent the locations of the earth dikes described on Page 1-29? If so, they should be labeled as such. If not, the locations of these dikes should be shown on this figure.

14. Page 1-32, Figure 1.20, Sites 25 and 27 Drainage Ditch Network and Ditch Near Landfill Gate: Figure 1-20 is of poor quality. In some cases it is difficult to distinguish the open drainage ditches from roads and streams. Very little detail can be obtained from this figure.

15. Page 1-33, Section Site 26: Electrical Transformer Storage: The site is shown on Figure 1.10 and not Figure 1.9.

16. Page 1-38, Figure 1.24, Site 28d Abandoned UST's Behind Base Filling Station: According to the description for Site 28d (Page 1-37) there are three tanks, however only two are shown on Figure 1.24. Where is the third tank located? Which tanks are the abandoned gasoline tanks and which is the abandoned slop oil tank?

17. Page 2-1, Section TASK 1 - PREPARE PROJECT WORK PLAN, Paragraph 1, Sentence 2: This document does not appear to have a plan for implementation of an Abandoned Underground Storage Tank Investigation.

18. Page 2-2, Section Develop Detailed Alternatives, Bullets 1 and 4: In both cases, it would make better sense to place the word "incorporated" before the noun rather than after ("incorporated technologies" and "incorporated management methods").

19. Page 2-3, Section Evaluate Detailed Alternatives, Bullet 4: To be consistent with the other listed criteria, "Assessment" should not be capitalized.

20. Page 2-5, Section Technical Support During Remediation, Paragraph 1, Sentence 3: This is a run-on sentence, its meaning would be much clearer if it was broken into two separate sentences.

21. Page 3-2, First Full Paragraph, Sentence 1: Surface geophysical surveys (resistivity, electromagnetic conductivity, seismic reflection, etc.) should also be considered. Geophysical surveys can yield valuable information on the depth to the confining unit, the types of unconsolidated material present, the presence of fracture zones or structural discontinuities, and the continuity of formations between bore holes. This type of information is necessary to identify the potential pathways of contamination and their affects on the environment.

22. Page 3-2, First Full Paragraph, Sentence 4: At what depths will these samples be collected?

23. Page 3-2, Second Full Paragraph, Sentence 2: How will the "upper aquifer" be defined?

24. Why will no wells be installed in the lower aquifer at this time? Wells should be installed in the lower aquifer at this stage to further characterize the geology, determine the direction of groundwater flow in the lower aquifer, and detect any contaminants in the lower aquifer.

25. Page 3-2, Second Full Paragraph, Sentence 4: How will the sample for chemical analysis be chosen?

26. Page 3-4, Section Site 1 - Hazardous Waste Storage Area, Paragraph 1, Sentence 3: The words "Pesticides" and "Herbicides" do not need to be capitalized.

27. Page 3-5, Table 3.1, SUMMARY OF SITE INSPECTION PROGRAM: What does "composite by 2's" mean? Why will it only be done to samples from Sites 1, 12, 17 and 24?

28. Page 3-12, Section Site 1 - Hazardous Waste Storage Area, Paragraph 1 (Continued from Page 3-4), Sentence 7: Why has it been assumed that volatilization has probably occurred at these sampling depths?

29. Page 3-12, First Full Paragraph, Sentence 1: Which of these tanks contained hazardous waste?

30. Page 3-12, First Full Paragraph, Sentence 5: From what depths will these "selected soil samples" be collected?

31. Page 3-13, Figure 3.3, Site 2 Bulk Storage Tank Farm: The drainage ditch on the south side of the cell (Page 3-12) is not shown on Figure 3.3.

32. Page 3-15, Section Site 6 - Underground Storage Tanks at the Base Filling Station, Paragraph 1, Sentence 2: The number of soil-gas survey points to be conducted here does not agree with the number given in Table 3.1 for this site.

33. Page 3-20, Section Site 12 - Old Drum Storage Area, Paragraph 2, Sentence 2: The word "Halogenated" does not need to be capitalized.

34. Page 3-24, Section Sites 15 and 16 - Fuel Dump Pits, Paragraph 1, Sentence 2: The number of soil-gas survey points to be conducted does not agree with the number given in Table 3.1 for these two sites.

35. Page 3-25, Figure 3.12, Site 17 Old Entomology Laboratory: According to the description of Site 17 (Page 3-24) eight hand borings will be collected around the exterior of the end of the building where the laboratory was located, however only seven hand borings are shown on Figure 3.12. Where will the eighth boring be located?

36. Pages 3-26 and 3-27, Figures 3.13 and 3.14, Sites 19 and 22 North Coal Pile and Lube Oil Drum Storage and Site 20 South Coal Pile: Table 3.1 indicates that three ditch bottom samples will be collected from Sites 19 and 20, however Figures 3.13 and 3.14 show that a combined total of four samples will be collected.

37. Page 3-31, Figure 3.17, Site 24 Sewage Treatment Plant Sludge Beds: The number of sludge samples given in Table 3.1 does not agree with the number given in Figure 3.17. According to Figure 3.17 there are ten sludge beds. If each sample is composited with a sample from the adjacent beds, there will be five samples rather than the four given in Table 3.1.

38. Page 3-32, Section Site 25 - Storm Drainage Ditch System, Paragraph 1, Sentence 1: The word "and" is unnecessary and should be removed. A comma should be placed between "extensive" and "although".

39. Page 3-33, Figure 3.18, Sites 25 and 27 Drainage Ditch Network and Ditch Near Landfill Gate: According to the description for Site 25 (Page 3-32) thirty ditch bottom sediment samples will be collected, however only 28 ditch bottom sediment sample locations are shown on Figure 3.18. Where will the other two samples be located?

40. There is a typo in the legend, the word "seperator" should read "separator".

41. Pages 3-34 and 3-38, Sections Site 28c - Abandoned UST's at Base Filling Station and Site 28d - Abandoned Diesel Fuel Tanks Near Site 1: The numbers for these two sites are reversed. Site 28c is the location of the abandoned diesel fuel tanks and Site 28d is the location of the abandoned UST's at the Base filling station.

42. Page 3-38, Section Site 28d - Abandoned Diesel Fuel tanks Near Site 1: There is no mention of a soil-gas survey for this site. However Table 3.1 indicates that a five point soil-gas survey will be conducted at this site.

43. Page 3-38, Section Additional Hydrogeologic Control, Paragraph 2, Sentence 1: Soil and groundwater samples collected from this location to establish "background conditions" will not be acceptable to the Ohio EPA due to the railroad line. In order to establish background conditions for the Base's soil and groundwater from the shallow and lower aquifer, this well cluster should be installed hydrologically upgradient from the site and as far as possible from any potential sources of contamination.

44. Page 5-1, Section HAND-BORING AND SURFACE SOIL SAMPLING, Paragraph 2, Sentence 1: Why will the soil samples be divided into three equal segments?

45. Page 5-1, Paragraph 5: The sentence heading "DRILLING PROGRAM" should be in bold type.

46. Page 5-2, Section Drilling Procedures, Paragraph 1, Sentence 1: According to the RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, U.S. EPA, 1986, the differential between the inner diameter of the auger and the outer diameter of the well casing should ideally be at least three to five inches to permit effective placement of filter pack and annulant sealant. If the well casing has an inner diameter of two inches, a hollow-stem auger with an inside diameter of six inches or six and one-quarter inches would be better than one with an inside diameter of four and one-quarter inches.

47. Page 5-2, Section Drilling Procedures, Paragraph 1, Sentence 2: The word "installed" does not belong in this sentence.

48. Because little is known about the geology or the presence of contaminants in the soils of this site, continuous sampling or a smaller sampling interval (for example, 2.5 feet) would provide more information than a 5 feet sampling interval.

49. Page 5-2, Section Drilling Procedures, Paragraph 1, Sentence 3: Why will mud-rotary drilling techniques replace hollow-stem auger drilling techniques at a depth of 60 feet? In unconsolidated material, hollow-stem auger drilling can be used to a depth of about 150 feet. Furthermore, the use of mud rotary drilling techniques to install monitor wells is not recommended. Mud rotary can adversely affect the assessment of aquifer characteristics, the chemistry of groundwater samples, and the operation of the well itself.

50. Page 5-2, Section Drilling Procedures, Paragraph 2, Sentence 1: According to the RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, the addition of bentonite to the cement mixture should generally be in the amount of 2 to 5 percent by weight of cement content.

51. Page 5-2, Section Drilling Procedures, Paragraph 3, Sentence 2: See comment for Page 5-2, Section Drilling Procedures, Paragraph 1, Sentence 2.

52. Page 5-2, Section Monitoring Well Construction, Completion, and Development, Paragraph 1, Sentence 1: PVC may be used if only trace metals or nonvolatile organics are to be monitored for. Stainless steel (i.e. 304, 316, or 2205 stainless steel) should be used when volatile organics are to be monitored for. Because of the potential existence of aromatic volatile organics in the soil and groundwater at the site, stainless steel casing and screen should be used rather than PVC.

53. Page 5-4, Paragraph 1, Sentence 2: Why is a separate stainless steel casing being used to isolate the upper aquifer? How will the upper aquifer be defined? Where will the casing be installed if there is no underlying clay layer?

54. Page 5-4, Paragraph 2, Sentence 2: Is six inches below the frost line? The concrete pad should extend below the frost line to protect the well from damage due to frost heaving.

55. Page 5-4, Paragraph 2, Sentence 5: In the wells installed below grade, what precautions will be taken to prevent well contamination should the area be flooded or under standing water?

56. Page 5-4, Paragraph 3, Sentence 1: Airlifting should not be used to develop monitoring wells. Air development techniques may expose field crews to hazardous constituents when contaminated groundwater is present. The technique may also cause chemical reactions with contaminants present in the groundwater, especially volatile organic compounds. The injected air must also be filtered to prevent contamination of the well with oil and other lubricants present in the compressor and airlines.

57. What variations in pH, temperature, and conductivity will be acceptable for demonstrating stabilization?

58. Page 5-4, Section Pumping-Well Drilling and Installation, Paragraph 2, Sentence 1: Any "other well drilling techniques" should comply with the RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, U.S. EPA, 1986.

59. Page 5-7, Section SOIL-GAS SURVEYING, Paragraph 1, Sentence 3: Initially, all of the soil-gas samples should be collected from the same depth. The samples can then be directly compared to one another.

60. Page 5-7, Section AQUIFER MONITORING AND TESTING, Paragraph 2, Sentence 1: What is a Falling-Head test? What is a Rising-Head test?

61. It should be remembered that any information obtained from a single well (slug) test is limited in scope to the geologic area directly adjacent to the screen. It can not be used to determine an aquifer's characteristics over a large area. On the other hand, multiple well (pumping) tests can be used to characterize a greater proportion of the subsurface and provide more details about an aquifer's characteristics over a large area.

62. Page 5-7, Section AQUIFER MONITORING AND TESTING, Paragraph 3, Sentence 2: Why is the data from a Falling-Head test less reliable than that from a Rising-Head test?

63. Page 5-7, Section AQUIFER MONITORING AND TESTING, Paragraph 4: Will the data collected during the pumping tests also be used to calculate hydraulic conductivity?

64. Page 6-1, Section SOIL SAMPLING, Paragraph 1, Sentence 2: See comment for Page 5-1, Section HAND-BORING AND SURFACE SOIL SAMPLING, Paragraph 2, Sentence 1.

65. Page 6-1, Section SOIL SAMPLING, Paragraph 2: The collection of Shelby tube samples should also be considered. The undisturbed samples obtained using Shelby tubes can be used to conduct lab tests for permeability. Permeability tests are important in determining how fast contaminants may move through the unconsolidated layers at the site.

66. Page 6-1, Section SOIL SAMPLING, Paragraph 2, Sentence 1: See comment for Page 5-2, Section Drilling Procedures, Paragraph 1, Sentence 2.

67. Page 6-1, Section SOIL SAMPLING, Paragraph 2, Sentence 4: This is a run-on sentence, its meaning would be much clearer if it was divided into at least two separate sentences.

68. Page 6-3, Paragraph 1, Sentence 3: In order to avoid confusion (here and throughout the text), a hyphen should be placed between "organic" and "free" and read as "organic-free".

69. Page 6-3, Section GROUNDWATER SAMPLING, Paragraph 1, Sentence 1: How many well volumes will be removed from the high yield wells? It is recommended that at least three well volumes be removed prior to sampling.

70. Identify the type of pump (and its construction material) that may be used.

71. What variations in pH, temperature, and conductivity will be considered acceptable for demonstrating stabilization?

72. Page 6-3, Section GROUNDWATER SAMPLING, Paragraph 1, Sentence 3: The word "Bailer" does not need to be capitalized.

73. Page 6-3, Section GROUNDWATER SAMPLING, Paragraph 1, Sentence 5: It is not necessary to measure the pH, temperature, and conductivity after the collection of the volatile samples. PH, temperature, and conductivity should be measured before and after sample collection as a check on the stability of the water sampled over time.

74. Page 6-4, First Full Paragraph, Sentence 1: Does decontamination include the bailer cable? Dedicated bailers are recommended for each well.

75. Page 7-8, Section Data Reduction and Validation, Paragraph 4, Sentence 3: The word "Analysis" probably does not need to be capitalized. The word "and" should be placed after the last comma in the sentence and before the phrase "reextraction/redigestion of the affected samples and QC samples".

0006m/4-10

COMMENTS ON THE HEALTH AND SAFETY PLAN FOR RICKENBACKER ANGB

No.

1 Page 4-1, Paragraph 2, Sentence 2: All unfamiliar activities should be rehearsed before work at the site begins.

2 Page 4-2, First Bullet (Continued from Page 4-1), Sentence 4: The "%" sign should be written out as "percent".

3 Page 6-2, Section Evacuation Procedure: To further facilitate emergency evacuations, clearly audible warning signals should be used, well-marked emergency exists located throughout the site, and internal and external communication plans developed.

4 What procedures have been established to evacuate residents who live near the site?

5 Page 6-3, Section EMERGENCY CONTACTS, Paragraph 1, Sentence 3: The locations of the nearest phones should also be posted.

6 Page 6-6, Section Groundwater Sampling, Paragraph 1, Sentence 2: What procedures will be implemented should the atmospheric chemical conditions change from the initial air characterization during groundwater sampling.

7 Page 8-1, Paragraph 1: What procedures will be implemented should hazardous substances be detected in the air during work at the site?

8 Page 8-2, Table 8.2, Section "1. Battery Check", Sentence 2: There are two typos in this sentence, there should be space between "be" and "in" and the word "green" is misspelled.

9 Page 8-2, Table 8.2, Section "3. 0-20 or 0-200 range", Sentence 5: Which step is "step c"? Which step is "step a"?

10 Page 8-3, Table 8.3, Paragraph 1: The phrase "for response for known gas sample" should read "for a response from a known gas sample".

11 Page 10-1, Paragraph 4, Sentence 1: The meaning of this sentence is unclear.

12 Page 11-2, Section 5. FIRE PROTECTION EQUIPMENT/SYSTEMS, Subsection c: The word "streams" should be singular.

13 Page 11-2, Section 5. FIRE PROTECTION EQUIPMENT/SYSTEMS, Subsection e: The phrase "fire hydrant water main control valve" should read either "the fire hydrant water main control valve" or "fire hydrant water main control valves". A comma should also follow the word valve (or valves) of this phrase.

14 Page 11-3, Section 10, Subsection 5, Sentence 4: The word "area" should be plural.

15 Page C-3, Section Organic Vapor/Gases, Paragraph 2, Sentence 1: The word "detection" should read "detector".

16 Page C-6: The margins for the headings "Radiation Survey Instrument" and "Limitations" are reversed. "Radiation Survey Instrument" should not be indented, whereas "Limitations" should be indented.

17 Page D-1, Section GUIDELINE, Paragraph 1, Sentence 3: There is a typo in this sentence, "cotaminated" should read "contaminated".

18 Page D-5, Section Support Zone, Paragraph 1, Sentence 1: The phrase "is considered noncontaminated or clean area" should read "is considered a noncontaminated or clean area".

19 Page D-5, Section Support Zone, Bullet 2, Sentence 2: The word "along" should read "alone".

20 Page D-8, Second Full Paragraph, Sentence 2: The word "objectives" should probably read "objects".

21 Page H-15, First Full Bullet, Sentence 1: The word "compound" should be plural.

0006m/11-12

# APPENDIX D

# RESPONSE TO USEPA REGION 5 COMMENTS

APPENDIX D

RESPONSE TO U.S. EPA REGION 5 COMMENTS ON "DRAFT FINAL" SI/RI/FS/RD WORK PLAN FOR RICKENBACKER AIR NATIONAL GUARD BASE, COLUMBUS, OHIO

The following is a response to comments submitted by the U.S. EPA Region 5 on 17 May 1988, on the Draft Final Site Inspection/Remedial Investigation/Feasibility Study/Remedial Design Work Plan for Rickenbacker Air National Guard Base. A copy of the comments with paragraph numbers annotated is included for reference.

In general, implementation of the scope of work changes suggested by the EPA reviewer would go beyond the objectives of a Site Inspection, i.e., to establish whether or not contamination exists.

Paragraph 2

Water sampling at each ditch bottom sampling point is necessary to establish whether or not surface water contamination exists in a given ditch segment.

Paragraph 3

Additional sampling emphasis on known spill locations is addressed by the two ditch sampling locations for Site 27 (Table 3.1, Page 3-9) and the two excess ditch sampling points which will be determined in the field based on observed signs of contamination. The 1982 "milky white liquid" contamination was a one time event. Unauthorized dumping was suspected as the source of the contamination.

Analysis of water samples for total suspended solids would not give a reliable indication of total sediment load without correlation with ditch discharge information. A detailed evaluation of ditch hydrology (including sediment load) may be included in the RI if contamination is detected in the ditch sediments.

Paragraph 4

Sampling of each confluence within the drainage system is adequate to identify ditch segments which contain contamination. However, ditch bottom sample points will be located in depositional areas of the confluences as suggested. Further definition of extent of contamination along ditch segments or in receiving streams is more appropriately postponed until the Remedial Investigation when extent of contamination is to be determined.

Paragraph 5

The boring for the initial well installation at Site 23 is proposed for the topograhically low side of the pavement. Subsequent wells and borings will be placed based on soil-gas survey results or, lacking definitive results, in topographic lows.

We feel that the general sampling program for Site 25 will identify potential contamination from Site 24 in the drainage ditches. Locations of ditch-bank seeps and permanently flooded portions of the ditch will be noted as possible ground water/surface water interfaces.

The scope of Site 28 (a, b, c and d) investigations has been changed to include magnetometer survey location of tanks and preparation of plans and specifications for removal of the tanks including appropriate sampling of surrounding sediments.

Paragraph 6

Surface water samples will be collected from mid-depth at each sampling point with water depth less than 3 feet unless a floating hydrocarbon sheen or sinking immiscible layer is detected. The field notes will reflect sampling depth and rationale for selection of depth.

Paragraph 7

Soil-gas probe locations will be determined in the field based on a number of factors including, surface soil/pavement conditions and proximity to utility lines with the objective of defining contaminant plumes. At least one soil-gas profile (samples from 5 foot intervals to water or 15', whichever is shallower) will be collected at each site to evaluate vertical changes in soil-gas concentrations. Additional monitoring wells at the sites mentioned will be recommended in the RI if the soil-gas survey indicates elevated levels of contamination.

Paragraph 8

The soil-gas survey of Site 2 will include the entire area illustrated in Figure 3.3 (Page 3-13). The areas of the soil-gas surveys at each site will be expanded as necessary to determine a soil-gas plume-edge. Monitoring wells at underground storage tank sites will be located downgradient of the tanks or at points of highest soil-gas concentrations.

Paragraph 9

PVC casing and screen is an appropriate well construction material for short-term monitoring of water contaminated with organic compounds or fuel and is probably appropriate if total volatile concentrations are less than 1 ppm. The SI is designed to determine whether or not contamination exists and not as a long-term monitoring program, consequently PVC well construction is appropriate.

Paragraph 10

A wetland inventory is more appropriately included in the Remedial Investigation. The primary purpose of the SI is to determine whether or not contamination exists at the sites.

Paragraph 11

Determination of extent of contamination off-Base is more appropriately included in the RI.

Paragraph 12

Information concerning efficacy and disposal of activated carbon used at Site 27 is not readily available at this time. Further investigation of the clean-up operation will be included in the SI report.

Paragraph 13

There is some doubt about whether present operations include soaking the coal with fuel oil. Further investigations of coal handling practices will be conducted.

Laboratory QA/QC Review Response

The comments not addressed specifically in the following discussion imply a need for greater QA/QC documentation than as required for this project. Because of the lack of proven contamination at the sites and the preliminary nature of a Site Inspection, laboratory QA/QC practices will be employed which will abide by standards set forth in the particular analytical methods specified. If during the course of the SI, significant contamination is identified, a step up in QA/QC will be considered and the Work Plan modified accordingly.

Specific responses to the comments are as follows:

I. There is no title page for the QA/QC sections because they are part of the Work Plan document rather than a stand-alone plan.

II. All of the comments in this section are addressed in Sections 1, 2, 3, 4 and 5 of the Work Plan.

V. A,B,D,H. Sample collection details which address these comments are included in Sections 5 and 6.

C. Total metals will be determined for samples from this project.

E. Sample jars listed in Table 6-2 are for water samples. One liter glass containers with Teflon®-lined caps will be used for herbicide and pesticide samples.

G. Steps have been taken to clarify the sample numbering system.

I. As stated in the "Detection Limits" subsection of Section 6, the detection limits for the GC and GC/MS analyses as detailed in the method description (SW 846) will be used.

VII. A. Table 7.1 lists appropriate sample containers for water samples, not soil samples.

VIII. A paragraph describing internal Engineering-Science and Martin Marietta Energy Systems Audits has been added to Section 7.

5-20-88


UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
230 SOUTH DEARBORN ST.
CHICAGO, ILLINOIS 60604


REPLY TO THE ATTENTION OF:

17 MAY 1988

RECEIVED
MAY 2 1988
CLEVELAND ES

Lieutenant Colonel Michael Washeleski
Chief, Bioenvironmental Engineering
Office of the Air Surgeon
Department of the Air Force
Air National Guard Support Center
Andrews Air Force Base
Washington, D.C. 20331-6008

Dear Colonel Washeleski:

Para. #

1 The Region V Office of the U.S. Environmental Protection Agency (USEPA) has reviewed the Draft Final Site Inspection/Remedial Investigation Work Plan for the Air National Guard (ANG) Installation Restoration Program (IRP) effort scheduled for Rickenbacker Air National Guard Base (ANGB) in Columbus, Ohio. The Rickenbacker ANGB covers approximately 2,100 acres. Our major concerns are related to surface water and drinking water quality as the plan is designed to assure the present and future integrity of the Base water supply.

2 The Work Plan placed appropriate emphasis on the drainage ditch system since surface water runoff from the entire base is thought to be channeled through this system. Our experience suggests that greater emphasis in the sampling program should be placed on sediments and less on surface water samples. Historical contamination is more likely to be detected in the sediments than the overlying water and it is appropriate for the site inspection to sample the sediments most likely to demonstrate elevated contaminant levels.

3 Additional surface water samples are appropriate at locations where ongoing releases to the surface water, other than from contamination in the underlying sediments, are suspected. For example, surface water samples would be appropriate at Site 27, near the landfill, if the discharge is an ongoing leachate seep as opposed to a spill. The source of the "milky white liquid" or other contaminants found in the ditch in 1982 should be determined. Total suspended solids should be measured in all water samples to gauge the sediment load carried in the water for this final determination. Surface water sampling may be scaled back to include one sampling point above, and one below the oil-water separator in each drainage ditch.

4 Additional sediment sampling stations should be established. Specifically, depositional areas should be identified within the drainage system and added to the site sampling list. It would also be useful to add a sediment sampling station in the receiving streams (Walnut Creek and Big Walnut Creek)

Para. #

4 below each drainage ditch outfall, again in depositional areas affected by the outfall. Incorporation of these modifications would necessitate changes to the discussion of Site 25, Storm Drainage Ditch System on page 3-32, Figure 3.18, and possibly discussion of Site 27, Drainage Ditch Near Landfill on page 3-34.

5 We recommend that borings to be taken at Site 23 for examination of the extent of volatile contamination be taken at the topographic low range. This is the area where contamination is likely to concentrate. At Site 24, the ditch near the sludge beds should be checked for possible contamination. This investigation should be included in the sediment sampling plan for the ditch (Site 25). The sediment sampling plan for Site 25 should take into account any surface water/ground water interfaces. At Site 28c, the monitoring well should be placed down-gradient of the USTs. We also recommend taking sediment samples of the nearby ditch, if this area is not already included in the ditch sediment sampling plan for Site 25.

6 The discussion of surface water sampling on page 6-4 also requires modification. In particular, the second sentence contradicts the remainder of the paragraph. The second sentence indicates that sample depth will be based on the contaminant of concern, but the remainder of the paragraph discusses how the sample depth will, instead, be a function of the water depth in the ditch. We recommend that the sampling depth be standardized unless specific circumstances warrant otherwise. For example, it may be appropriate for samples to be taken adjacent to a contaminant source. The field log should specifically record the sample location and depth and the justification for the location and depth.

7 We recommend that soil/gas probes be placed as close as possible to underground utility lines or the points where they intersect since these lines can be paths of contaminant migration. Soil/gas surveys should consist of deep 15 foot probes interspersed among probes of shallower depths in order to avoid the false negatives that may result from using only shallow probes to monitor for volatile compounds. If the surveys indicate elevated, in accordance to regulations and/or background, levels of contaminants, additional monitoring wells should be placed at sites 5, 9, 10, 14, 15, 16, 19, 20, 21, 22, 23, and 25.

8 The Site Inspection Program discussed in Chapter 3 raises the following comments:

a. The intent to conduct a soil/gas survey is mentioned on page 3-12 for Site 2, but it is not indicated on the Site Inspection Plan on page 3-13. This needs to be clarified.

b. A soil/gas survey should be conducted around the underground storage tanks (USTs) southwest of the fuel spill at Site 3. If monitoring wells are placed near USTs, they should be installed down-gradient from the tanks, near the concentration of jet fuel lines.

8 c. If the soil/gas survey at Site 4 shows no contamination, monitoring wells should be placed down-gradient from the USTs.

9 Monitoring wells are described on page 5-3 to be of polyvinyl chloride (PVC) construction. We suggest that stainless steel screens be used. Since many of the sites involve fuel spills, there may be a layer of hydrocarbons floating on the water table. High concentrations of hydrocarbons can be absorbed by the PVC. Further, the PVC may degrade in the presence of organics.

10 The Work Plan identifies 23 potential pollution sources for investigation and remedial action planning. Descriptions suggest that eight of those sites may involve special aquatic sites. A thorough inventory of wetlands on the Base should be provided in the report. A map identifying wetlands sites and potential pollution sources should be included.

11 We recommend off-base sampling sites must address releases to the base storm drain system and whether off-site areas have been affected.

12 The Work Plan described, on page 1-33, a 1982 release of alkyl benzene and olefin hydrocarbon compounds. The spill was corrected using activated charcoal bags to absorb the organic compounds. The efficacy of this treatment and the final disposal method utilized for the activated charcoal should be described.

13 A description of the coal pile management program and its effects are given on page 1-24. However, the method of adding oil to the coal is unclear. If this was performed at the storage site, the impact to the adjacent drainage ditch and its vegetative cover are more readily understood.

A separate review of your Laboratory Quality Assurance/ Quality Control (QA/QC) Plan was performed and we offer the following comments:

I. Title/Signature Page

There is not title page with the provision of an approval signature by responsible parties.

II. Project Description

A. Site Existing Information

The description of the existing information lacks details. The following areas must be addressed and/or expanded:

1. Site Setting

The site setting should include information on site topography, geology, hydrogeology, etc.

2. Summary of Past Data

A summary of data collected from previous activities should be provided. This summary should contain compounds/parameters and measure amounts along with instrument detection limits.

B. Intended Data Usage

The intended usage of data collected from both Site Inspection (SI) and Remedial Investigation (RI) are not clearly addressed. The description of intended data usage should account for all data to be generated including field screening and measurements. It is important to address the intended data usage as it dictates the quality control (QC) requirements for analytical measurements.

III. Project Organization and Responsibility

There is only a brief discussion on responsibility in Section 7 (Laboratory Analytical Quality Assurance/Quality Control Manual). The description of Project Organization and Responsibility should include the following:

A. Management Responsibilities

B. Quality Assurance Organization and Responsibility

C. Field Operations

D. Laboratories Responsibilities

E. Final Data Assessment

F. Field Laboratory

IV. Quality Assurance Objectives

A brief discussion is provided on accuracy and precision in Section 7 and is inadequate. The QA objective should be addressed in terms of accuracy, precision, representativeness, completeness and comparabilities. The description should include the approaches to be implemented to achieve these objectives and the required detection limits for each parameter to be tested.

V. Sampling procedure

A. The description of sample collection must be expanded. For example, the hand boring technique involves collection of soil samples; however, the depth of boring, number of samples (i.e. every 5 feet), composite or grab samples, etc., are not addressed and need to be included in this Section.

B. It is stated that selected soil and ground water samples will be analyzed for specific parameters; however, the criteria to be used for sample selection is not addressed.

C. For the analysis of metals, it is necessary to specify whether total metals or dissolved metals are needed for the project. For the dissolved metals, the samples are required to be field filtered. This should be addressed in appropriate sections. (Groundwater, Surface Water, etc., for example).

D. If composite samples will be collected, then the detailed sample compositing procedure should be clearly addressed.

E. The size of sample containers specified to be used for pesticide and herbicide samples (Table 6-2) are not appropriate. An 8 oz wide mouth glass jar should be used.

F. It is not clear whether total metal or dissolved metals are required for this project. The water samples for dissolved metals are required to be field filtered prior to the addition of preservatives. Please revise Table 6-2 accordingly and make the necessary changes throughout the QAPP where they are appropriate.

G. Under Sample Custody, the description of the sample numbering system is unclear. Please provide a detailed description along with examples.

H. Quality Control Sample Collection

1. The field duplicate samples should be collected as one per group of 10 or fewer samples.

2. The field blank should be collected one per group of 10 or fewer samples.

I. Table 6.4 and 6.5 should be revised to include the required detection limits (RDL). Please include the RDL for both water and soil matrices.

VI. Sample Custody

Only the Field Custody is discussed in Section 6 (Sampling Procedure). The description should include the chain-of-custody procedures for laboratory analysis, and the final evidence file. Please use the attachment for reference.

VII. Laboratory Quality Assurance/Quality Control Manual

A. Table 7.1 should be revised to state 8 oz glass jars for sample containers.

B. The control limits for accuracy and precision are not addressed. They should be project specific.

C. The Internal Quality Control Check should be expanded to include a method blank.

D. The Calibration Procedures and Frequency are not adequately addressed (p 7-5) and should be elaborated.

E. The Preventative Maintenance of both laboratory improvements and field improvements must be addressed.

F. The corrective action is not addressed. The description should include both field measurement and laboratory analysis.

VIII. Performance and System Audits

The Performance and System Audits are not addressed. Please note that the description should include both the internal audits, which can be initiated and implemented by site manager or QA Officer, and the external audits by U.S. EPA.

Thank you for the opportunity to review the doucment. If you have any questions concerning our comments, please contact Ms. Amy Blumberg of my staff at (FTS) 886-7342 or (312) 886-7342.

Sincerely yours,

William D. Franz

William D. Franz, Chief
Environmental Review Branch
Planning and Management Division