5.0 SWMU CHARACTERIZATION

This section relates SWMU site descriptions and waste generation histories, local soil and hydrogeological conditions and the results of soil and groundwater sampling. Analytical results are included from all previous investigations and the RFI-Phase I investigation. A contamination assessment of each SWMU and recommendations for additional investigation are presented. These recommended investigations across the site are summarized and prioritized in Section 6.0.

Waste generation at the 27 suspected releases SWMUs at TEAD-S was researched in several previous reports (Section 3.0), through an August 1989 site visit, and from interviews and site visits with former and current installation personnel. Information from site employees was used to resolve conflicting information presented in previous reports.

Soil and hydrogeological conditions at each SWMU were determined from regional studies and from lithologic data collected during the RFI-Phase I and previous field investigations. For SWMUs where soil samples were not collected or monitoring wells were not installed, soil and hydrogeological information was inferred from the nearest investigated location yielding such information. The information summarized in the site hydrogeology sections includes types of soil and aquifer material, depth to groundwater, groundwater flow characteristics, and locations of any upgradient and downgradient monitoring wells. Lithologic data are commonly summarized parenthetically using abbreviations corresponding to the Unified Soil Classification System. These abbreviations are defined in Table 5.0-1. Summary diagrams of the logs of all boreholes drilled at TEAD-S are presented in Appendix A. Groundwater elevations and flow directions are discussed using data from July 1990, after the RFI-Phase I wells and piezometers were installed, and during the approximate time of sampling for chemical analysis (Figure 5.0-1).

Analytical results for soil, soil gas, groundwater, and product samples collected during previous and RFI-Phase I investigations are presented for each SWMU in tables and figures showing sampling locations and detections only. Complete results, including nondetects, are found in Appendix F. In some cases, figures and text include abbreviations of the names of organic compounds. These abbreviations are defined in the data tables for each SWMU and a complete list of Installation Restoration Data Management Information System (IRDMIS) abbreviations in Table F-1, Appendix F. The methods used in the analyses of all groundwater samples in the RFI-Phase I program were the same at each well. Analyses of soil samples were selected according to the history of each SWMU. All of the analytical method numbers used are listed in Section 3.10.10 of this report, but are not repeated in the following contamination assessments of each SWMU.

Recommendations of additional investigations at some of the SWMUs are discussed generally in Section 5.0 at the conclusion of each contamination assessment. The actual expected depths of borings and wells, analytical methods to be used, and other details of the investigation are compiled in Section 6.0 since much of this information is the same at each SWMU where additional information will be collected.

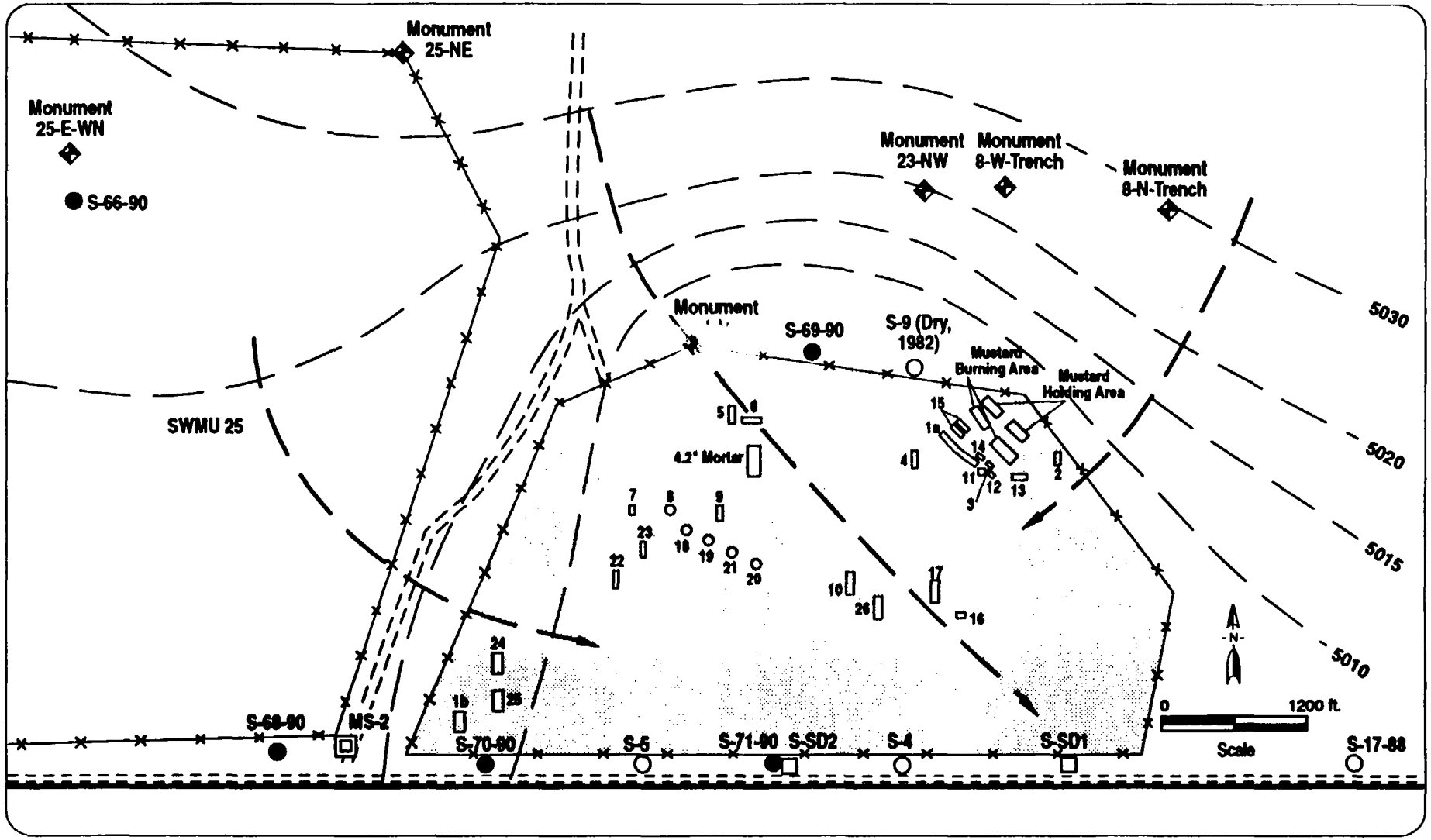
Unified Soil Classification Chart

(The No. 200 (75 µm) sieve size is about the smallest particle visible to the naked eye.)

Field Identification Procedures (Excluding particles larger than 75 mm and basing fractions on estimated weights)						Group Symbols[1]	Typical Names
Coarse Grained Soils More than half of material is larger than No. 200 (75 µm) sieve size[2]	Gravels More than half of coarse fraction is larger than No. 4 (4.75) sieve size (For visual classifications, 5 mm may be used as equivalent to the No. 4 (4.75 mm) sieve size.)	Clean Gravels (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.			GW	Well graded gravels, gravel-sand mixtures; little or no fines.
			Predominantly one size or a range of sizes with some intermediate sizes missing.			GP	Poorly graded gravels, gravel-sand mixtures; little or no fines.
		Gravels with Fines (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).			GM	Silty gravels, poorly graded gravel-sand-silt mixtures.
			Plastic fines (for identification procedures see CL below).			GC	Clayey gravels, poorly graded gravel-sand-clay mixtures.
	Sands More than half of coarse fraction is smaller than No. 4 (4.75 mm) sieve size	Clean Sands (Little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.			SW	Well graded sands, gravelly sands; little or no fines.
			Predominantly one size or a range of sizes with some intermediate sizes missing.			SP	Poorly graded sands, gravelly sands; little or no fines.
		Sands with Fines (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).			SM	Silty sands, poorly graded sand-silt mixtures.
			Plastic fines (for identification procedures see CL below).			SC	Clayey sands, poorly graded sand-clay mixtures.
Fine Grained Soils More than half of material is smaller than No. 200 (75 µm) sieve size	Identification procedures on fraction smaller than No. 40 (425 µm) sieve size						
			Dry Strength (Crushing Characteristics)	Dilatancy (Reaction to Shaking)	Toughness (Consistency Near Plastic Limit)		
	Silts and Clays Liquid limit less than 50		None to low	Quick to slow	None	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with low plasticity.
			Medium to high	None to very slow	Medium	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			Low to medium	Slow	Low	OL	Organic silts and organic silt-clays of low plasticity.
	Silts and Clays Liquid limit greater than 50		Low to medium	Slow to none	Low to medium	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			High to very high	None	High	CH	Inorganic clays of high plasticity, fat clays.
			Medium to high	None to very slow	Low to medium	OH	Organic clays of medium to high plasticity.
Highly Organic Soils			Readily identified by color, odor, spongy feel and frequently by fibrous texture.			PT	Peat and other highly organic soils.

1 Boundary classifications: Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GM-GC, well graded gravel-sand mixture with clay binder.

2 All sieve sizes on this chart are USA Standard Sieves in accordance with ASTM designation F-11.



Legend

- Monitoring Well
- Previously Installed Monitoring Well
- Previous Soil Sample
- Tooele Army Depot - South Area Boundary
- 19 Pit or Trench No. (Contents referenced in Table 5.1-1)
- Surveyed Monument
- Meteorological Station
- Area of SWMU
- Groundwater Flow Direction, July 1990
- 5030 Groundwater Level Contour (MSL), July 1990
- Fence
- Unimproved Road

Source:

ERTEC 1982
EBASCO Field Measurement
USATHAMA 1979

Figure 5.1-1

Site Map
SWMU 1 - East Demilitarization Area/ Disposal Pits

Tooele Army Depot - South Area
Prepared by: Ebasco Services Incorporated

EBASCO

Table 5.1-1 • SWMU 1 - Demilitarization Area and Disposal Pits
Documented Pit/Trench Contents

Documented Pit/Trench No.	Contents
1a	M-70 Mustard Bombs
1b	Mustard Bombs; M-42A Smoke Pots; White Phosphorus Grenades; Trash
2	Thermite
3	Smoke Pots
4	M-20 Bomb Clusters
5	Smoke Pots
6	Smoke Pots
7	Smoke Pots
8	M-50XA3 Bombs
9	Smoke Pots
10	Thermite
11	Smoke Pots
12	Smoke Pots
13	M-70 Mustard Bombs; 1 German Tabun Gas Bomb
14	M-70 Mustard Bombs
15	M-70 Mustard Bombs
16	M-70 Mustard Bombs
17	M-50XA3 Bombs
18	M-50XA3 Bombs
19	M-50XA3 Bombs
20	M-50XA3 Bombs
21	M-50XA3 Bombs
22	M-70 Mustard and M-470 Bombs
23	M-70 Mustard Bombs
24	Trash Pit
25	Boosters
26	"Poison Gas" (probably Mustard)

Source: USATHAMA 1979

A 4.2-inch mortar disposal pit within SWMU 1 contains approximately 59,000 empty projectiles that were burned in 15 other pits within this SWMU before 1954. The pits were numbered 31 through 45, but are no longer identified. In 1971, the projectiles were moved to their current location. A 1972 document stated that some of these projectiles may be contaminated with mustard (H). The pits in SWMU 1 from which the projectiles were removed were reportedly treated with hypochlorite-based decontamination powder. This powder was probably the solid component of decontaminating agent-noncorrosive (DANC), a mixture of 1,3-dichloro-5,5-dimethylhydantoin in acetylene tetrachloride (Barnes 1992). Empty 55-gallon drums were also present in SWMU 1. They may have contained the decontamination powder used to treat disposal pits. Demilitarization and disposal of approximately 59,000 4.2-inch mortar projectiles reportedly occurred outside of SWMU 1, at an unidentified site in the southeastern portion of TEAD-S designated SWMU 4. During the RFI-Phase I, SWMU 4 could not be located at the site by evaluating historical records or through interpretation of aerial photographs. Since a similar number of 4.2-inch mortar projectiles are present in a SWMU 1 disposal pit, these projectiles were probably demilitarized and disposed of at SWMU 1.

5.1.2 Site Hydrogeology

SWMU 1 is located in a low-lying area at the base of a plateau, approximately 5,075 ft above msl in the south central part of TEAD-S. No significant stream beds or gullies cross this site. However, open pits in this SWMU create a potential for ponding of local runoff that may leach contaminants to the subsurface.

A Quaternary pediment capped with alluvium underlies the site. The subsurface lithology has been evaluated using field boring logs of each monitoring well in SWMU 1 (S-4, S-5, S-69-90, S-70-90, S-71-90). Surficial soil is loose, light gray to pale brown, organic rich (e.g., roots and rootlets), silty and gravelly sand (SM, SP). The unsaturated zone is composed of interbedded sand, silt, and clay and varies from 30 to 55 ft in thickness. The sand is hard, white to light gray, with some silt and a trace of clay (SP, SC, SM). The silt is dry, stiff, pale brown to brown, with some sand and a trace of clay (ML). The clay is dry to slightly moist, stiff, light olive gray to brown, with some silt (CL). Based on bore log descriptions, the saturated zone was characterized from approximately 30 to 125 ft below ground surface. It is composed of stiff to dense, white to light gray, silty or clayey sand and sandy silt (SP, SC, ML). The screened interval was 10 ft in Wells S-69-90, S-70-90, and S-71-90. Wells S-4 and S-5 have 20-ft screens.

During the RFI-Phase I, one upgradient monitoring well was installed north of SWMU 1 (S-69-90). In addition, two wells were installed along the southern site perimeter (S-70-90, S-71-90) to monitor groundwater downgradient from the site. Existing wells S-4 and S-5 were also believed to be downgradient wells. However, July 1990 groundwater levels from the new and previously installed wells indicate that groundwater flows to the southeast across SWMU 1 and not to the south, as had been expected. According to the July 1990 groundwater levels in SWMU 1, well S-69-90 may be upgradient of the disposal pits in the northeast portion of SWMU 1, and well S-4 may be the only monitoring well downgradient of the northeastern

disposal pits. The other monitoring wells located along the southern perimeter are actually downgradient of SWMU 25, off-post areas, and the disposal sites located in south central portions of SWMU 1. Based on estimates from the potentiometric surface map for July 1990 (Plate 3), the depth to groundwater is 70 ft below ground surface, and the groundwater elevation is approximately 5,005 ft msl. Groundwater flows southeast from SWMU 1 past the TEAD-S southern boundary.

5.1.3 Previous Sampling and RFI-Phase I Sampling Results

Soil and groundwater samples were collected during the RFI-Phase I and historical sampling programs to evaluate potential releases of contaminants from the demilitarization and disposal of munitions and Army agents in the SWMU 1 area. Previous investigation of SWMU 1 included chemical analyses of two soil samples and groundwater samples from each of two monitoring wells located along the southern border of the SWMU. The two sediment samples were collected in 1982 from a ditch which runs along the southern border of SWMU 1. These sediment samples were intended to assess the possibility of transport of contaminants by runoff. These samples were collected from 0 to 6 inches below the ground surface. Groundwater samples were collected during three investigations from the two previously installed monitoring wells located on the southern border of SWMU 1 and evaluated to assess the possibility of groundwater transport of contaminants toward and across the TEAD-S boundary.

Previously collected sediment samples were analyzed for semivolatile organic compounds, explosive compounds, metals, anions, and radiological parameters (gross alpha and gross beta). Previously collected groundwater samples were analyzed for volatile organic compounds, semivolatile organics, explosives, agent breakdown products, metals in filtered and unfiltered samples, anions, and radiological parameters throughout the three sampling rounds.

During the RFI-Phase I, three additional monitoring wells were installed at SWMU 1. Groundwater samples were collected from the previously installed and new wells. The RFI-Phase I groundwater samples were analyzed by the methods listed in Table 3.10-3, Section 3.10.10. The sample from well S-71-90 was analyzed for anions after the holding time for the sample had expired.

Tables 5.1-2 and 5.1-3 present compounds and concentrations detected in historical samples and RFI-Phase I samples, respectively. Figures 5.1-2 through 5.1-5 illustrate the sampling locations, detected compounds, and their concentrations.

5.1.4 Contamination Assessment

During the RFI-Phase I, the only organic compounds identified in SWMU 1 wells were benzyl alcohol and hexahydro-1,3,5-trinitro-1,3,4-triazine (RDX). No organic compounds were detected in groundwater sampled at upgradient well S-69-90. However, organic compounds including toluene and benzyl alcohol were detected in upgradient well S-66-90, which is located downgradient from the windrows in the northeastern part of SWMU 25. As discussed in Appendix D, benzyl alcohol may be a hydrolysis product of toluene. Toluene was previously

TABLE 5.1-2 **Summary of Previous Analytical Investigations for SWMU 1: East Demilitarization Area/Disposal Pits**

Analytical Groups and Analytes Detected	SOIL (µg/l) *S-SD1 (0.5ft) 1982	SOIL (µg/l) *S-SD2 (0.5ft) 1982	GROUNDWATER (µg/l) S-4 1982	S-4 1987	S-4 1988	S-5 1982	S-5 1987	S-5 1988
Volatile Organics:								
Toluene (MEC6H5)	NA	NA	NA	3.0 (u)	LT (5.0)	NA	LT (u)	LT (5.0)
Semivolatile Organics:								
Benzyl alcohol (BZALC)	NA	NA	NA	7.0 (u)	LT (10)	NA	LT (u)	LT (10)
Bis(2-ethylhexyl) phthalate (B2EHP)	NA	NA	NA	90[a] (3.0)	LT (10)	NA	30[a] (3.0)	LT (10)
Butylbenzyl phthalate (BBZP)	NA	NA	NA	20[a] (3.0)	LT (10)	NA	2.0[a] (3.0)	LT (10)
Unknowns[c]					74			90
Metals (total or total/dissolved):								
Antimony (Sb)	NA	NA	NA	LT (7.0)	8.5/9.1 (3.0)	NA	LT (7.0)	3.9/LT (3.0)
Arsenic (As)	9.0 (4.0)	8.0 (4.0)	430 (4.0)	370 (2.5)	460/470 (5.0)	170 (4.0)	150 (2.5)	160/170 (5.0)
Barium (Ba)	NA	NA	NA	140 (3.4)	NA	NA	34 (3.4)	NA
Cadmium (Cd)	LT (u)	LT (u)	LT (u)	LT (12)	8.6/9.7 (5.1)	LT (u)	LT (13)	LT (5.1)
Chromium (Cr)	LT (u)	LT (u)	LT (20)	16 (11)	LT (38)	LT (20)	16 (11)	LT (38)
Copper (Cu)	LT (u)	LT (u)	LT (6.0)	29 (21)	13/2.8 (1.8)	LT (6.0)	23 (21)	9.0/LT (1.8)
Lead (Pb)	LT (u)	LT (u)	LT (30)	3.7 (1.5)	LT (2.5)	LT (30)	LT (1.5)	5.8/LT (2.5)

* Soil leach concentration
a Probably due to laboratory contamination
c The identity or concentrations of these compounds cannot be conclusively determined and reporting limits have not been established.
NA Not analyzed

LT Less than
µg/g Microgram per gram
µg/l Microgram per liter
u Detection limit unavailable
( ) Detection Limit

References: 1982 data - Ertec 1982
1987 data - EA Engineering 1988
1988 data - Weston 1991

TABLE 5.1-2 **Summary of Previous Analytical Investigations for SWMU 1: East Demilitarization Area/Disposal Pits**

	SOIL (µg/l)		GROUNDWATER (µg/l)					
Analytical Groups and Analytes Detected	*S-SD1 (0.5ft) 1982	*S-SD2 (0.5ft) 1982	S-4 1982	S-4 1987	S-4 1988	S-5 1982	S-5 1987	S-5 1988
Metals (total or total/dissolved) (continued):								
Nickel (Ni)	LT (4.0)	7.0 (4.0)	LT (4.0)	LT (65)	18/21 (9.6)	LT (4.0)	LT (65)	24/LT (9.6)
Selenium (Se)	NA	NA	NA	LT (u)	17/19 (5.0)	NA	LT (u)	19/16 (5.0)
Silver (Ag)	LT (40)	LT (40)	LT (8.0)	0.40 (0.14)	0.40/0.60 (0.19)	LT (8.0)	0.74 (0.14)	2.4/0.90 (0.19)
Sodium (Na)	3000 (1000)	20,000 (1000)	1,300,000 (1000)	1,000,000 (450)	12,000,000	1,200,000 (1000)	1,000,000 (450)	1,400,000
Thallium (Tl)	NA	NA	NA	3.1 (1.7)	LT (4.7)	NA	3.1 (1.7)	LT (5.0)
Zinc (Zn)	10 (3.0)	40 (3.0)	6.0 (3.0)	160 (14)	590/960 (17)	5.0 (3.0)	80 (14)	640/520 (17)
Anions:								
Bromide (Br)	NA	NA	NA	20,000 (240)	LT (125,000)	NA	28,000 (240)	LT (125,000)
Chloride (Cl)	LT (1000)	3000 (1000)	GT 17,000 (100)	1,600,000 (5000)	1,400,000 (75)	GT 17,000 (100)	2,800,000 (5000)	3,000,000 (76)
Fluoride (F)	LT (1000)	LT (1000)	1500 (1000)	1400 (360)	LT (50)	2400 (1000)	2000 (360)	LT (50)
Orthophosphate (PO_4ORT)	NA	NA	NA	140 (57)	NA	NA	70 (57)	NA
Phosphate (PO_4)	3000 (800)	LT (800)	LT (800)	NA	NA	LT (800)	NA	NA
Sulfate (SO_4)	1000 (1000)	1000 (1000)	GT 19,000 (1000)	2,500,000 (4700)	3,000,000 (130,000)	GT 19,000 (1000)	1,900,000 (4700)	2,200,000 (130,000)
Nitrite (NO_2)	LT (u)	LT (u)	LT (900)			LT (900)		

* Soil leach concentration
NA Not analyzed
GT Greater than
LT Less than
u Detection limit unavailable
( ) Detection limit

µg/g Microgram per gram
µg/l Microgram per liter

References: 1982 data - Ertec 1982
1987 data - EA Engineering 1988
1988 data - Weston 1991

	SOIL (µg/l)		GROUNDWATER (µg/l)					
			S-4			S-5		
Analytical Groups and Analytes Detected	*S-SD1 (0.5ft) 1982	*S-SD2 (0.5ft) 1982	1982	1987	1988	1982	1987	1988
Anions (continued):								
Nitrate (NO_3)	2000 (1000)	2000 (1000)	LT (1000)			5300 (1000)		
Nitrate-nonspecific (NIT)				640 (+24)	LT (5000)		8,100 (+24)	LT (5000)
Radionuclides (pCi/l):								
Gross alpha (ALPHAG)	LT (u)	LT (u)	LT (3.0)	LT 54 (u)	LT 53 (v)	LT (3.0)	LT 53 (u)	LT 11 (v)
Gross beta (BETAG)	LT (u)	LT (u)	36 ± 7.0 (6.0)	98 ± 44 (u)	95 ± 29 (v)	15 ± 6.0 (6.0)	LT 61 (u)	LT 7.5 (v)
Uranium - Total	NA	NA	NA	NA	2.1 (v)	NA	NA	2.3 (v)

* Soil leach concentration
NA Not analyzed
GT Greater than
LT Less than
pCi/l Picocurie per liter
u Detection limit unavailable
v Detection limit for radionuclides varies for each sample
( ) Detection limit
µg/g Microgram per gram
µg/l Microgram per liter

References: 1982 data - Ertec 1982
1987 data - EA Engineering 1988
1988 data - Weston 1991

TABLE 5.1-3 **Summary of RFI-Phase I Investigations for SWMU 1: East Demilitarization Area/Disposal Pits**

GROUNDWATER (µg/l)

Analytical Groups and Analytes Detected	S-4	S-5	S-69-90	S-70-90	S-71-90
Semivolatile Organics:					
Benzyl alcohol (BZALC)	LT 10	29	LT 10	LT 10	LT 10
Unknowns		20			20
Explosives					
Hexahydro-1,3,5-trinitro-1,3,4-triazine (RDX)	LT 0.62	LT 0.62	LT 0.62	LT 0.62	2.2
Metals:					
Arsenic (As)	570	170	24	260	89
Chromium (Cr)	LT 6.0	LT 6.0	LT 6.0	LT 6.0	LT 6.0
Copper (Cu)	LT 8.1	LT 8.1	LT 8.1	LT 8.1	8.7
Lead (Pb)	1.4	2.9	6.1	1.7	1.7
Selenium (Se)	18	13	LT 3.0	17	20
Sodium (Na)	1,300,000	1,200,000	380,000	1,500,000	1,300,000
Zinc (Zn)	LT 21	LT 21	LT 21	LT 21	LT 21
Anions:					
Bromide (Br)	1400	2200	580	2700	2000
Chloride (Cl)	1,400,000	3,200,000	480,000	3,800,000	2,800,000
Fluoride (F)	8300	LT 36,000	2600	LT 14,000	LT 14,000
Radionuclides (pCi/l):					
Gross alpha (ALPHAG)	210	59	68	140	20
Gross beta (BETAG)	100	23	110	0.80	LT 0.30
Uranium (U)	4.0	9.6	25	11	4.5

* Detected in associated method blank
LT Less than
pCi/l Picocurie per liter
µg/l Microgram per liter

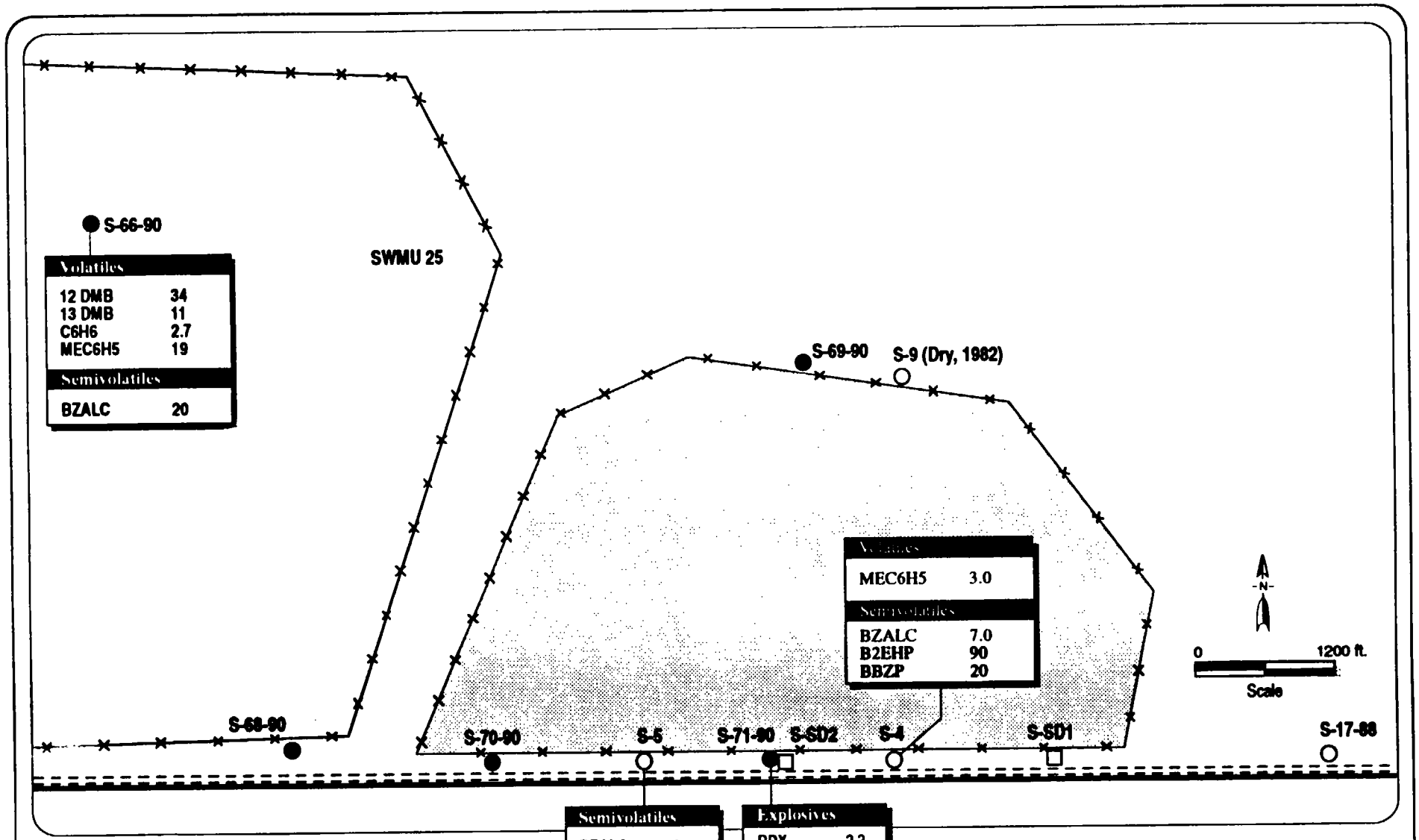


Figure 5.1-2

SWMU 1 - East Demilitarization Area/ Disposal Pits

Organics and Explosives

Tooele Army Depot - South Area

Prepared by: Ebasco Services Incorporated

EBASCO

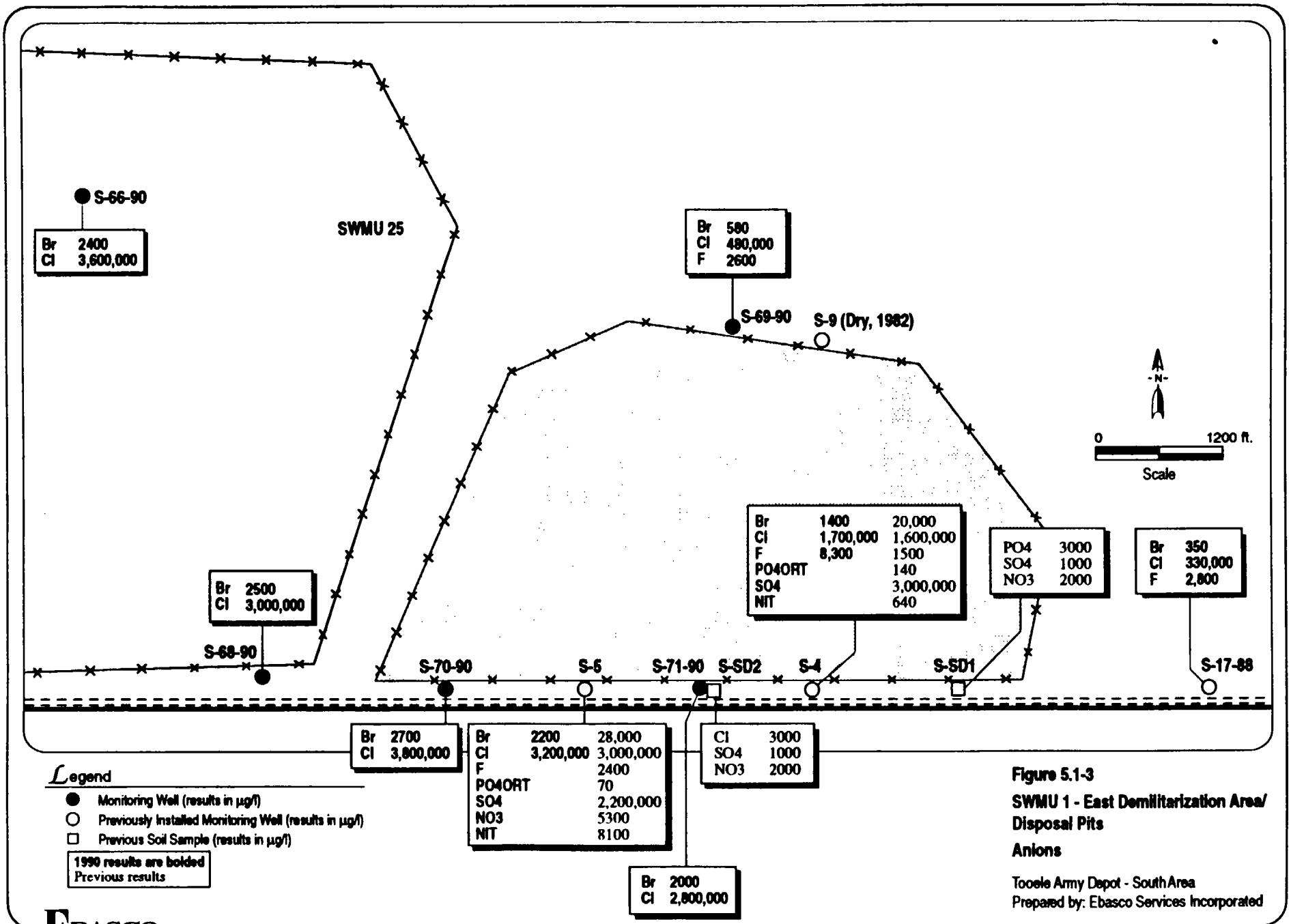


Figure 5.1-3

SWMU 1 - East Demilitarization Area/ Disposal Pits

Anions

Tooele Army Depot - South Area
Prepared by: Ebasco Services Incorporated

EBASCO

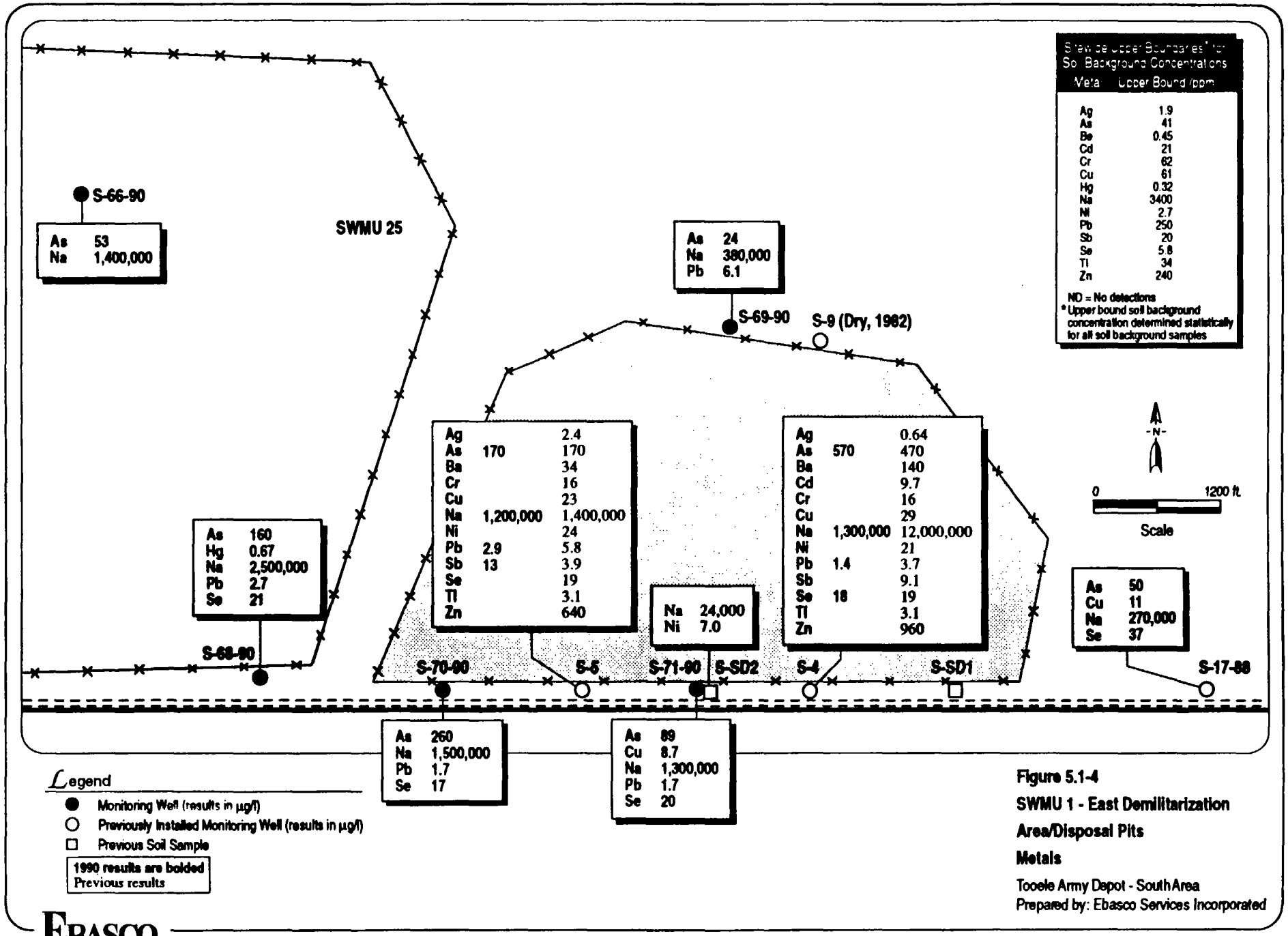


Figure 5.1-4
SWMU 1 - East Demilitarization Area/Disposal Pits
Metals

Tooele Army Depot - South Area
Prepared by: Ebasco Services Incorporated

EBASCO

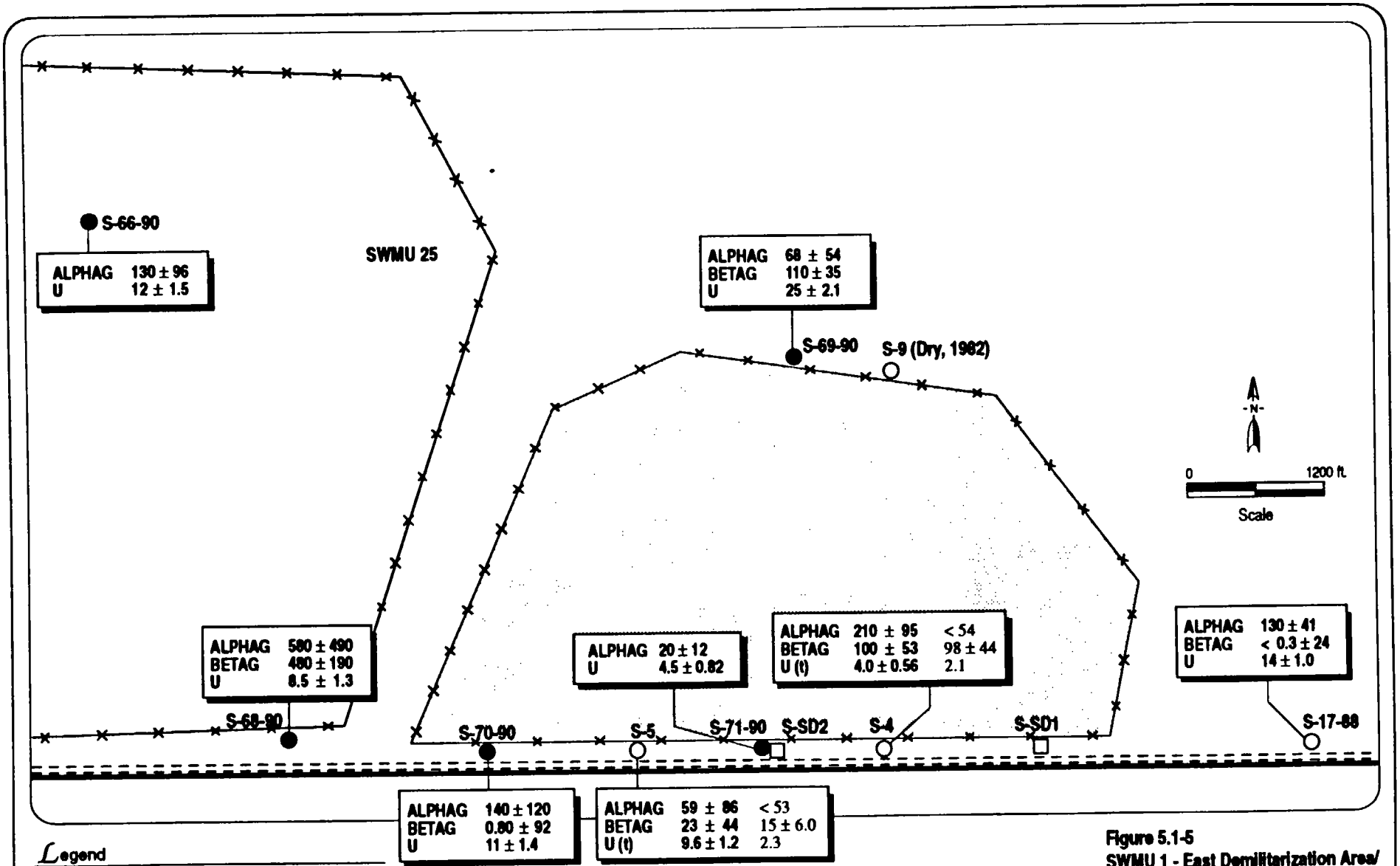


Figure 5.1-5
SWMU 1 - East Demilitarization Area/ Disposal Pits
Radionuclides
Tooele Army Depot - South Area
Prepared by: Ebasco Services Incorporated

EBASCO

detected in groundwater in the southern portion of SWMU 1. However, toluene and benzyl alcohol may both have entered the groundwater from releases of the explosives and fuels used to incinerate and decontaminate munitions in SWMU 1 and SWMU 25. Low concentrations of butyl benzyl phthalate (BBZP) and other phthalates were also detected in groundwater at SWMU 1. These compounds can be attributed to sampling and analytical procedures because of their common occurrence in PVC, other plastics, and rubber gloves.

Inorganic groundwater quality data from each well was compared to concentrations typical of the water quality zone in which the well was located to determine which analytes occurred at elevated concentrations (see Section 4.0). All downgradient wells at SWMU 1 are included in water quality zone II. A wide range of concentrations of inorganic analytes is typical of this zone. Upgradient well S-69-90 is near the boundary between water quality zones I and II.

During the RFI-Phase I, arsenic was the only metal detected in groundwater at an elevated level. Previous investigations reported elevated concentrations of zinc and selenium, but these detections were not confirmed by RFI-Phase I data. Sodium and chloride concentrations in upgradient well S-69-90 reflect the well's position near the boundary between water quality zones I and II. Sodium and chloride concentrations in well S-69-90 are higher than typical zone I levels and lower than typical zone II levels.

Several inorganic analytes were detected in sediment samples analyzed during previous investigations at SWMU 1. Sediment sample S-SD-1 was collected near the southeastern corner of the site and contained phosphate, sulfate, and nitrate. Sediment sample S-SD-2 located near the central southern boundary of SWMU 1 contained chloride, sodium, sulfate, nitrate, and nickel. These inorganic compounds are either naturally occurring or may be associated with munitions disposed of at SWMU 1. No background levels of these analytes have been established.

5.1.5 Recommendations

Previous and RFI-Phase I groundwater and sediment sampling south of SWMU 1 has revealed only sporadic and low concentrations of contaminants. However, no groundwater monitoring has been conducted at the southeast corner of the SWMU, where groundwater may leave the SWMU boundary. Furthermore, the site history indicates that many covered or uncovered munitions disposal pits may occur inside the SWMU. Because chemical agent and other munitions have been burned in these pits with the aid of fuels and solvents, significant levels of contamination may remain that could pose a threat to human health and the environment. Therefore, an RFI-Phase II program is proposed at this SWMU.

In order to provide information to support a risk assessment and possible corrective measures study (CMS) at SWMU 1, more information is needed on the number, types, and conditions of burning and burial pits that are the potential sources of contamination there. The Phase II program that is proposed to fill these data gaps consists of the following:

- Development of a pit inventory
- Surficial soil sampling in and between selected open pits
- Excavation and sampling of test pits in munitions disposal areas
- Air monitoring at the perimeter of the SWMU
- Groundwater monitoring upgradient and downgradient of the SWMU
- Determination of present and future use scenarios
- Wildlife habitat mapping and key species identification

These programs will be extended to the west into SWMU 25, where similar pits are found that should be characterized in the same way (see Section 5.15).

The pit inventory will include observations by field crews of which trenches are open or closed, the presence of warning signs, and in open pits, the approximate number, types, and conditions of munitions or other potential contaminant sources, and any evidence of releases. These observations will be used to select sampling locations both inside and outside of disposal features and to locate air sampling stations where worst-case conditions can be monitored.

After the pit inventory is completed, several representative open and closed pits should be selected for surface soil sampling and test pit excavation and sampling. The soil and any waste samples will be collected from open disposal pits, especially where evidence of contaminant releases are found. These samples should be analyzed for volatile and semivolatile organics, explosives, agent breakdown products, and metals. Before release from the installation for analysis by a commercial laboratory, the samples will be analyzed for chemical agents in the TEAD-S laboratory.

A limited number of air samples are recommended to be collected around the perimeter of the SWMU for characterization of the air transport pathway. The locations and the timing of the air sampling should be selected using the results of the trench inventory and site-specific meteorological data to provide data representative of worst-case conditions.

Groundwater monitoring is recommended at existing and additional wells to be installed during Phase II of the RFI. Investigations conducted before the RFI-Phase I indicated north to south groundwater flow at SWMU 1; however, RFI-Phase I groundwater level measurements revealed that groundwater flows southeast across SWMU 1 from the west, northwest, and north. Also, analytical data collected during the RFI-Phase I suggests that releases to groundwater from SWMU 1 disposal trenches may have occurred, and that a contaminant source may also exist to the northwest of SWMU 1 in SWMU 25. Therefore, additional monitoring wells are proposed to better delineate the extent of the groundwater contaminants (Figure 5.1-6). These proposed wells include the following:

- Two additional clustered monitoring wells screened in the shallowest part of the aquifer to monitor groundwater that leaves the southeast corner of the site.

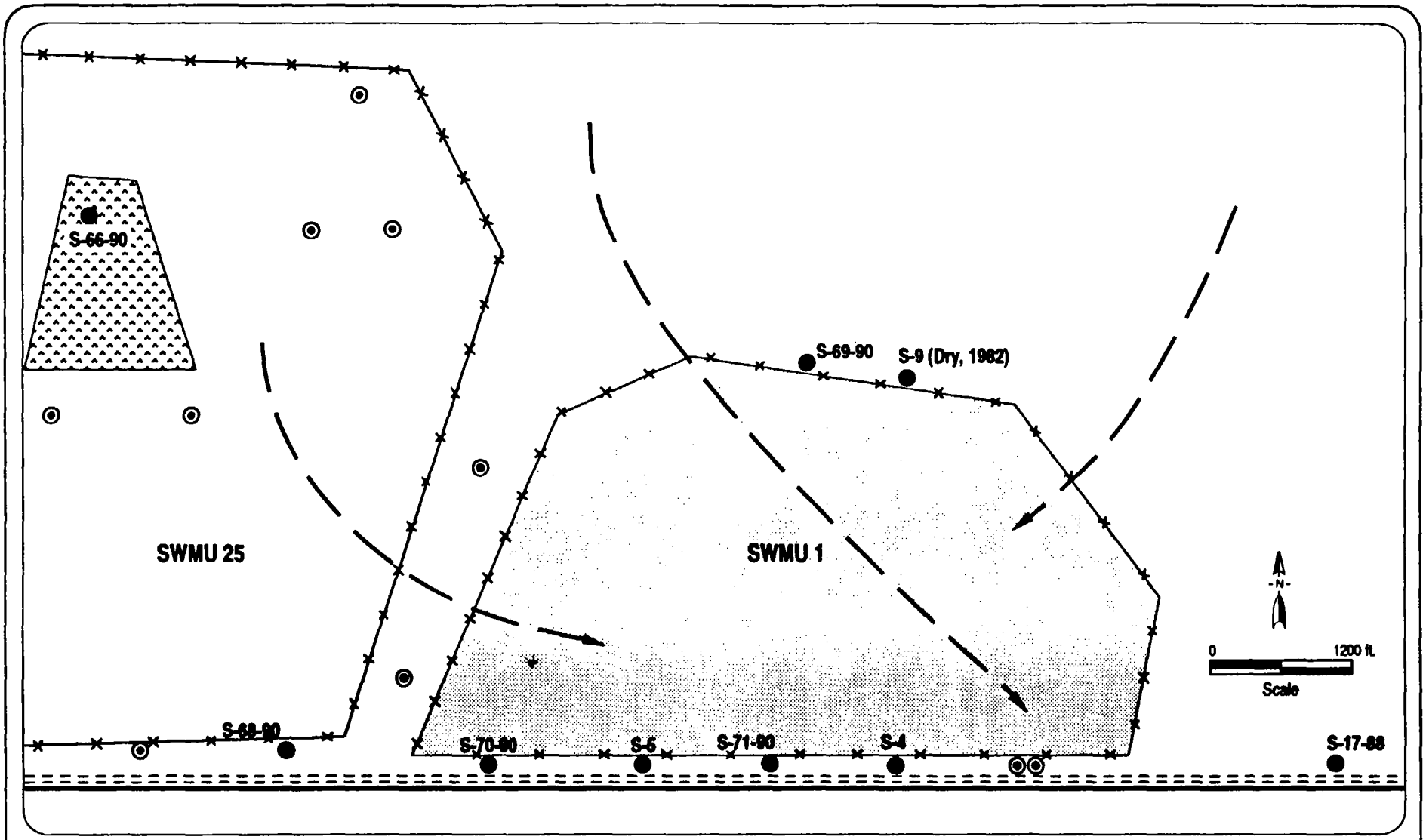


Figure 5.1-6

SWMU 1 - East Demilitarization Area/ Disposal Pits
Proposed Sampling Locations

Tooele Army Depot - South Area
Prepared by: Ebasco Services Incorporated

EBASCO

- Two to three wells screened in the shallowest part of the aquifer between SWMU 25 and SWMU 1 to provide a background concentration of contaminants migrating into SWMU 1 from the west.

All SWMU 1 wells should be analyzed for volatile and semivolatile organic compounds, explosives, agent breakdown products, anions, and metals. Field measurement of pH and dissolved oxygen is recommended. Slug tests should be conducted in wells that have not been tested to aid in predicting contaminant migration rates. Other physical parameters required for this transport estimation include porosity and total organic carbon measurements on core samples collected during drilling of the additional wells.

To provide data for human health risk assessment, data will be collected on present and reasonably expected future uses of the area in and surrounding the SWMU. Habitat mapping and key species identification begun site-wide as part of the RFI-Phase II for known releases units will be expanded to permit an ecological risk assessment at SWMU 1. Threatened and endangered species should be identified in consultation with the U.S. Fish and Wildlife Service. Game species that could be consumed by humans should also be identified. If the trench inspection indicates a potential for exposure to hazardous wastes, or if surface soil and air monitoring indicate contaminant transport, biota sampling should be undertaken. Also, an explosive risk determination will be conducted.