CDFB 91

State of New Mexico
ENVIRONMENT DEPARTMENT
HAZARDOUS AND RADIOACTIVE MATERIALS BUREAU
RADIATION LICENSING AND REGISTRATION SECTION
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December 16, 1991

Mr. Jim Richards
27 CSG-DEV
Cannon Air Force Base
Cannon Air Force Base, New Mexico 88103

RE: Post-Closure Care Permit Application

Dear Mr. Richards:

As we discussed in our meeting on November 19, 1991 held in Santa Fe, New Mexico the Hazardous and Radioactive Materials Bureau (HRMB) has completed an administrative review of your post-closure care permit application dated December 20, 1988. Based on the review we have determined the application to be incomplete. The enclosed deficiencies are provided to assist you in developing a complete application in view of the current status of Landfill 5. Your post-closure care permit application should be submitted as a stand-alone document which addresses all of the enclosed deficiencies. Your response to the enclosure must be submitted within 60 days of receipt of this letter.

After we have received your complete post-closure permit application a technical review of the information will be conducted. Additional information may be requested to clarify, modify, or supplement previously submitted material. Failure to supply the requested information in a timely manner may be grounds for permit denial or enforcement action.

Please contact Herb Grover at (505) 827-4300 if you have any questions or if you need further assistance.

Sincerely yours,

Edward L. Horst
Program Manager

Enclosure

cc: William K. Honker, (6H-P), U.S. EPA, Region 6
Guanita Reiter, (6H-H), U.S. EPA, Region 6

NOTICE OF DEFICIENCY

Cannon Air Force Base Landfill No. 3

Post Closure Care Permit Application

1. Post-Closure Inspection Schedule
HWMR-6, Part IX, Section 40 CFR 270.14(b)(5)

The application should include provisions for routine inspections as well as inspections after storm events to detect any evidence of deteriorations or malfunctions or improper operation of run-on/run-off control systems and security systems. Frequency of routine inspections should be specified along with a list of the structures and facilities to be inspected. Appropriate responses to potential problems identified during inspections should be described. Include appropriate inspections for ground water monitoring system components. Also supply the name, address, and phone number of the person or office to contact about the landfill during the post-closure care period.

2. Floodplain Information
HWMR-6, Part IX, Sec. 270.14(b)(11)(iii)-(iv)

Cannon AFB needs to incorporate the information from Section B.3.b. of the Cannon AFB RCRA Part B Application, dated October 1986 into the post-closure care permit application.

3. A Copy of the Post-Closure Plan
HWMR-6, Part XI, Sec. 270.14(b)(13)

The post-closure plan should specify a post-closure care period of 30 years. The post-closure plan must describe how Cannon AFB plans to:

A. Maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events;

B. Maintain and monitor the ground water monitoring system and comply with all other applicable requirements of Subpart F of Sec. 264;

C. Prevent run-off and run-on from eroding or otherwise damaging the final cover;

D. Protect and maintain surveyed benchmarks;

E. Maintain security of the landfill during the post-closure care period.

The post-closure plan should also include a description of all

closure activities which have not been completed. At a minimum this includes providing a description of the plans for locating the boundaries of cell No. 3 (i.e. a description of geophysical and geotechnical techniques), and include provisions for placing a final cover on Cell No. 3. Design and construction specifications for the final cover should be as complete as possible for Cell No. 3.

The final cover design and construction proposal should be able to provide a cover which will:

F. Provide long-term minimization of migration of liquids through the closed landfill cell;

G. Function with minimum maintenance;

H. Promote drainage and minimize erosion and abrasion of the cover;

I. Accommodate settling and subsidence so that the cover's integrity is maintained; and

J. Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.

4. Documentation of the Notice in Deed
HWMR-6, Part IX, Sec. 270.14(b)(14)

The post-closure permit application must include provisions for recording on the deed to the facility a notification that the land has been used to manage hazardous waste, and that its use is restricted under 40 CFR 264 Subpart G regulations. The survey plat and record of the type, location, and quantity of hazardous waste disposed of within Cell No. 3 must be filed with the local zoning authority and a certified copy provided to the Secretary of the NMED.

5. Ground Water Monitoring System
HWMR-6, Part IX, Sec. 270.14(c)

The post-closure applications must address all information requirements for a detection monitoring program according to Sec. 264.98. Design and construction details for proposed monitoring wells L and M must be included in this program. Point of Compliance wells surrounding the Landfill 5 waste management area may be considered appropriate for purposes of detection monitoring of Cell No. 3 in view of ongoing investigations at Landfill 5 through the HSWA permit requirements.

The detection monitoring program portion of the application shall at a minimum include the following information:

A. A proposed list of indicator parameters to be measured

at the point of compliance which are capable of indicating the presence of hazardous constituents in the ground water. The indicator parameters should take into account the information available on the nature of the wastes in Cell No. 3 to determine those constituents which are most mobile and persistent.

B. Cannon must establish background ground water quality values that are to be used in the statistical comparison with the values measured at wells located at the point of compliance. The criteria used in establishing background values must be clearly explained since they may be determined on a theoretical basis or from ground water monitoring. Proposed statistical comparison procedures must be documented.

C. The ground water monitoring program which includes detailed descriptions of program elements such as number, location, and depths of monitoring wells, design and construction details for monitoring wells, drilling and installation methods, and well development methods. Wells for measurement of background ground water quality and for measurement of ground water quality at the point of compliance must be delineated.

D. The application must include a sampling and analytical program which includes detailed protocols for the following procedures:

Sample collection and (parameter specific) analysis methods

Sample preservation, shipment, and chain-of-custody procedures

Statistical procedures for comparison of background and point of compliance monitoring values

POST-CLOSURE PLAN

Table of Contents

Introduction	2
Pending Closure Activities	2
Post-Closure Maintenance and Inspection	3
Post-Closure Groundwater Monitoring	5

List of Figures

1 - Inspection and Maintenance Schedule	4
2 - Landfill 5 Site Plan	6

Appendices

I - Well Design and Construction Details
II - Sampling and Analysis Plan
III - Groundwater Assessment Plan Outline

INTRODUCTION

The Post-Closure Plan for Landfill 5, Cell 3 is designed to satisfy all federal and state regulatory requirements. Cell 3 is subject to closure requirements because it received hazardous waste for a short time after the effective date of RCRA. The post-closure care program will consist of an inspection and maintenance program and a groundwater monitoring program. The inspection and maintenance program is designed to ensure the integrity of the protective cover. The groundwater monitoring program is designed to detect contaminant migration from the landfill into the aquifer.

The post-closure care activities will continue for 30 years following the receipt of the final closure certification for Landfill 5, Cell 3. The base Environmental Management Office is responsible for the post-closure care of the cover. The office is located on Cannon AFB and the phone number is (505) 784-4639.

PENDING CLOSURE ACTIVITIES

In 1989 a clay and flexible membrane cap was constructed over cell 3 according to the closure plan dated October 1988. Following completion of the cap it became apparent that the cap did not adequately cover cell 3. Landfill 5 was investigated in March 1991 in order to determine the exact location of all cells within the landfill. The results indicated that the cells are much longer than the Cannon AFB Landfill Management Plan, dated 1977, allows. A more detailed excavation of Cell 3 was conducted from 14-17 Jan 92. The results indicate that the cell is approximately 800 feet long and 45 feet wide.

Based on these results the Corps of Engineers will design a cap which will satisfy all state and federal closure regulations. The new cap will be designed to address the following requirements:

Provide long-term minimization of migration of liquids through the closed landfill cell

Function with minimum maintenance

Promote drainage and minimize erosion and abrasion of the cover

Accommodate settling and subsidence in order to maintain the integrity of the cover

Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.

The following is the design schedule for the new cap:

	Start Date	Completion Date	Duration (Calendar Days)
Predesign Conference (at Cannon AFB)	12 Feb 92	12 Feb 92	1
30% Design	13 Feb 92	18 Mar 92	34
Review 30% Design	19 Mar 92	27 Mar 92	8
95% Design	27 Mar 92	18 May 92	52
Review 95% Design	19 May 92	1 Jun 92	13
100% Design	1 Jun 92	8 Jul 92	37

POST-CLOSURE COVER INSPECTION AND MAINTENANCE

Inspecting and maintaining the cover over Cell 3 is an integral part of minimizing the potential for a release of contaminants into the groundwater. The inspection schedule is outlined in Figure 1.

The cover on Cell 3 will be visually inspected quarterly and after heavy precipitation, a prolonged drought, and/or a high wind. Rill erosion, damage to the vegetative cover or minor settling will be corrected with common borrow patching or seeding of the damaged area. The fencing will be inspected to ensure that access to the landfill is limited to authorized personnel only. The drainage system will be checked for blockage and deterioration.

CANNON AFB
LANDFILL 5 POST CLOSURE CARE INSPECTION SCHEDULE

Structure	Frequency	Potential Problems	Corrective Maintenance
Soil Cap	Quarterly and after storm events	Settling, subsidence, erosion	Backfill eroded soil
Drain Trough	Quarterly and after storm events	Deterioration of joint sealant	Apply joint sealant as specified in closure plan
		Cracks or breaks in trough	Patch cracks with concrete or determine need for replacement
		Blocked troughs or drainage path	Remove debris from trough and drainage area
Test Cap	Quarterly and after storm events	Settling, subsidence, erosion	Backfill eroded soil
		Insecure walls	Reinforce existing walls
Benchmarks	Quarterly	Covered over with dirt or debris	Remove obstacles and provide protective case
		Damaged or illegible	Replace benchmarks
Cell 3 Fencing	Quarterly	Unlocked gate	Install new lock
		Failure of a support	Straighten and pour concrete around affected support
		Severe rusting or corrosion	Paint or replace as appropriate
Landfill 5 Fencing	Quarterly	Unlocked gate	Install new lock
		Broken barbed wire	Replace barbed wire
Groundwater Monitoring Wells	Semi-annually	Well head damage	Repair as needed
		Broken pumps	Replace pumps

POST CLOSURE GROUNDWATER MONITORING

The groundwater monitoring program is designed to monitor for contaminant migration from the landfill. Four monitoring wells, one upgradient (A) and three downgradient (I, L & M), were installed based on knowledge of the water elevations. The location of these wells is shown in Figure 2. Wells B, J, C and D will only be used to determine the water elevations around the landfill. The downgradient RCRA wells are screened into the uppermost portion of the uppermost aquifer at a depth of approximately 260 to 280 feet. Design and construction details for wells A, I, L & M are included in Appendix I.

The sampling and analysis of each well will occur on the schedule discussed below. The procedures and techniques for sample collection, preservation, and shipment, as well as specified analytical procedures and chain of custody, are described in the Cannon AFB Groundwater Sampling and Analysis Plan (Appendix II). Initially, the samples will be analyzed for volatile organics, total organic halogen (TOX), total organic carbon (TOC), semi-volatile organics, total metals, phenol, pesticides, cyanide, sulfates, chlorides, flourides, nitrates, radionuclides, coliforms, and turbidity.

The analytical data obtained during the first year's quarterly monitoring will be used to establish initial background concentrations against which subsequent results will be assessed. Arithmetic means and variances based on four replicate measurements of each sample will be calculated for each of the indicator parameters, pH, conductivity, TOC, and TOX over the four quarters of the first year's sampling. Subsequently, each well's sample analysis for an indicator parameter will be compared to the initial background concentrations by calculating the arithmetic mean and variance for the parameter based on four replicate measurements and using the Student's t-test at the 0.01 level of significance to determine statistically significant increases (or decreases) over the initial background concentration. The GC/MS scans for priority pollutants will be evaluated on a present/nonpresent basis at the limit of detectability in all cases.

Analyses will be performed annually for chloride, iron, manganese, phenols, sodium, and sulfate. Analyses will be performed semi-annually for pH, conductivity, TOC and TOX. The groundwater elevations in all the monitoring wells will be measured during each sampling event. The elevations will be reviewed annually to ensure that the monitoring well placement is correct with respect to groundwater flow. Additional wells will be installed if problems develop.

The New Mexico Environment Department (NMED) will be notified if the comparisons of the indicator parameters in the upgradient well show a significant deviation from initial background concentrations after a sampling event or if the GC/MS scan in the upgradient well is positive. If the comparisons of the indicator parameters in any of the downgradient wells show a significant deviation from initial background concentrations after a sampling event, or if the GS/MS scan is positive, split samples will be immediately taken from the deviant wells. The NMED will be notified within seven days if either of the split samples confirms the significant deviation. Otherwise, the deviation will be attributed to laboratory error, documented and reported as such.

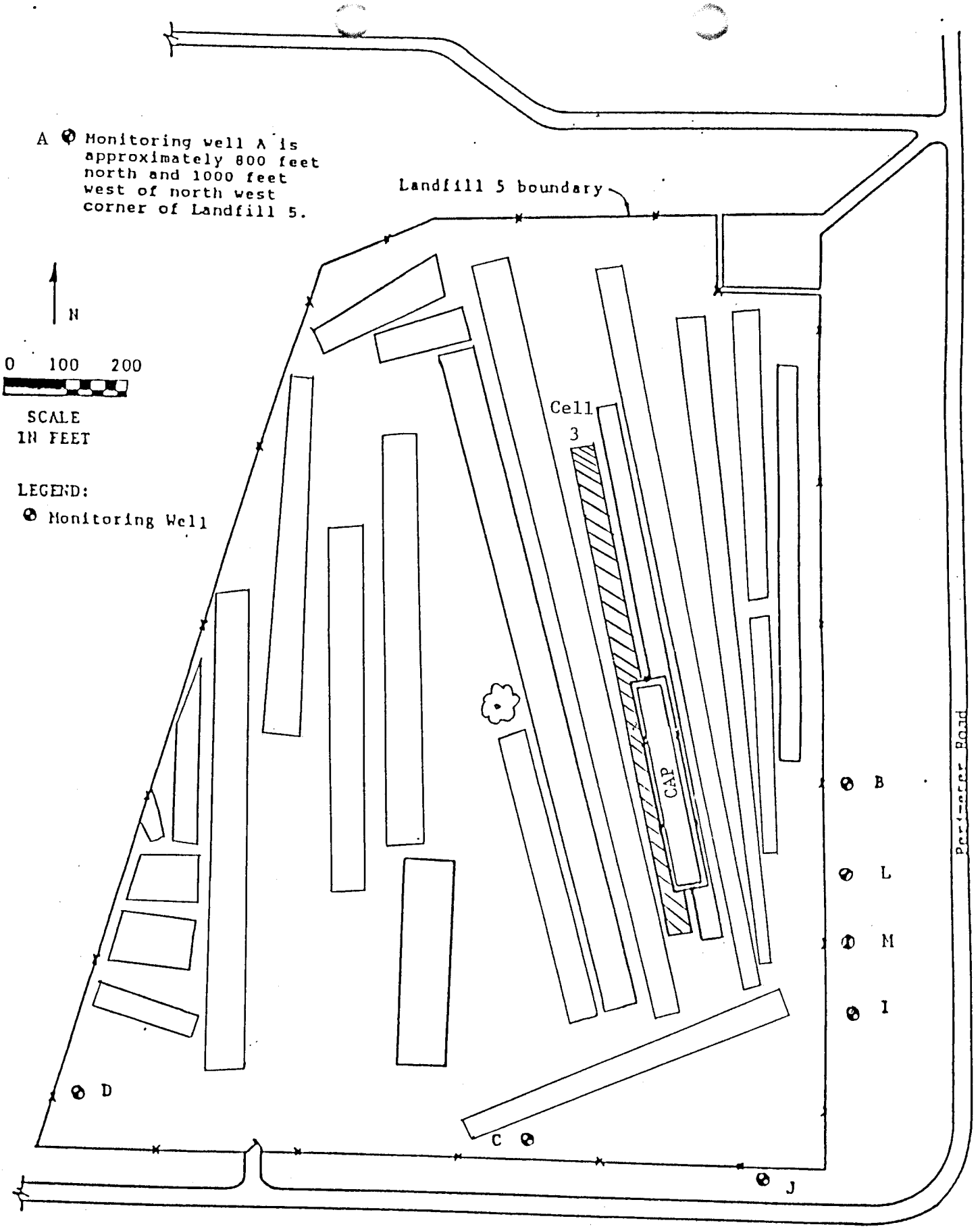


Figure 2 - Site Plan

CANNON AFB
LANDFILL 5, CELL 3

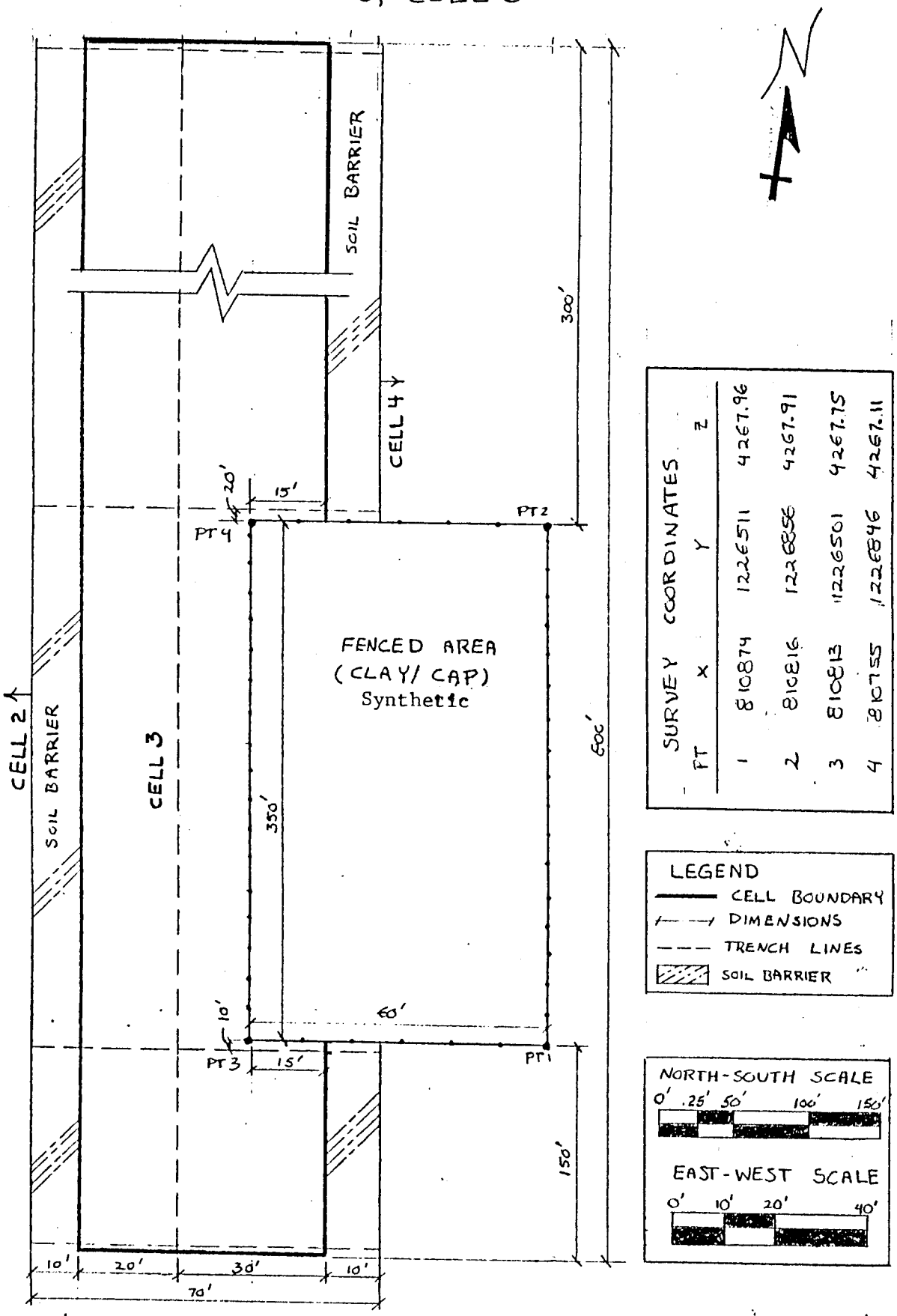
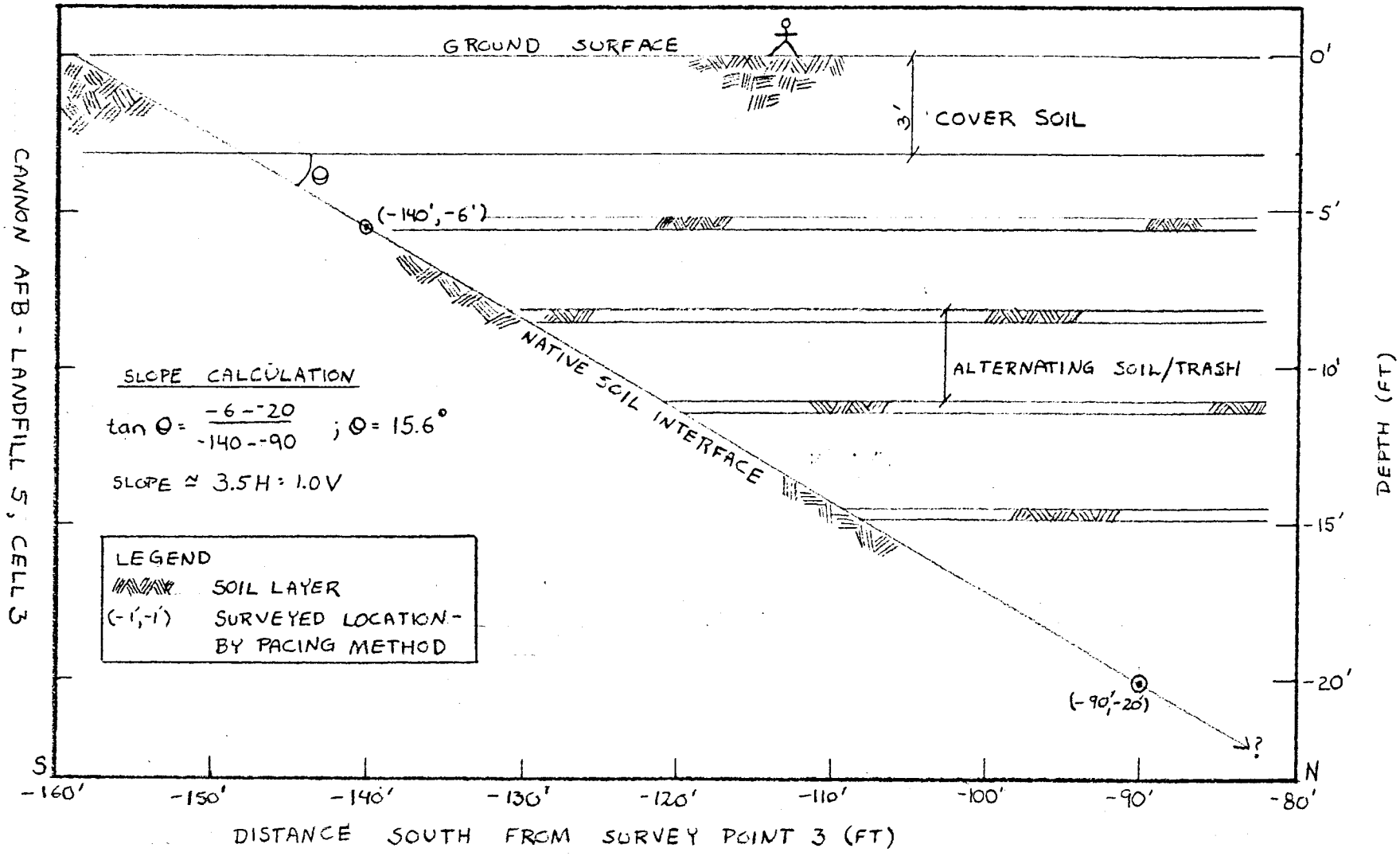


Figure 1

Figure 2

CANNON AFB - LANDFILL 5, CELL 3

PARTIAL CROSS SECTION



A Groundwater Assessment Plan will be submitted to the NMED within 15 days of the confirmation of a significant deviation. An outline of the Groundwater Assessment Plan is provided in Appendix III. The plan will help confirm or refute the presence of contaminants in the groundwater, determine the concentration of contaminants, and describe the extent of contamination. The findings will be submitted to the NMED within 15 days after the completion of the program. Remediation procedures will be developed if landfill contaminants have entered the aquifer and the NMED will be notified. If the groundwater quality assessment program indicates landfill contaminants have not entered the aquifer the NMED will be notified and the groundwater program described above will be reinstated.

Appendix I

DESIGN AND CONSTRUCTION DETAILS FOR GROUNDWATER MONITORING WELLS

- hollow-stem auger 6-1/2 inch -- test holes to a depth of approximately 60 feet;

- split-spoon samples of soil materials were taken above the top of the caliche; 5 feet into the caliche and just below the caliche at about 60 feet;

- after reaching total depth, the soil boring was sealed to land surface using cement as prescribed for the monitor wells. Grout (Type 1) was poured from land surface once the hollow-stem augers were withdrawn.

Two sites were drilled using a portable hand-held auger with 2 inch OD auger flights. Surficial soil samples were taken from one to five feet (top of caliche) maximum using the portable auger and saved for analyses at Radian. The shallow boreholes were backfilled with cuttings once completed.

3.1.2 Monitor Well Installation

Ground-water monitor wells were installed immediately upon completion of the drilling operations. Usually, the borehole was observed for a period of time, as necessary, to determine the approximate static water level. Monitor well construction specifications, summarized in Table 3-1, were consistent with the specifications provided in the Scope-of-Work. Appropriate changes in the final well depth were made on a site-by-site basis. Decisions regarding the setting of screen and casing, were made on the basis of the hydrogeology of the formation. If appropriate, the borehole was allowed to remain open overnight; there were no difficulties related to the integrity of the borehole or caving problems.

Monitor well installation followed a similar procedure at each well. Screen and casing sections were cleaned and assembled on the ground then lowered carefully into the borehole. As the string of screen and casing were

TABLE 3-1. MONITOR WELL CONSTRUCTION SPECIFICATIONS

- Casing: four-inch diameter, flush joint, threaded schedule 80 PVC, plugged at bottom with a permanent plug.
- Screen: four-inch diameter, flush joint, schedule 80 PVC, 0.010-inch mill slot, screen length = 15 feet.
- Sand Pack: 8-40 mesh silica, tremmied from bottom of hole to one foot above top of screen.
- Bentonite Seal: No. 50 Volclay brand bentonite tablets, to two feet above top of sand pack.
- Grout: neat cement (Type I Portland cement) grout tremmied from the top of the bentonite seal to the land surface.
- After each well was installed, it was developed for several hours by air development methods. Water was discharged by this process until the well produced no more fine material when surged and backwashed.
- Cuttings from well drilling activities were contained in 10' x 10' x 8' mud pits and covered. No hazardous or toxic forming materials were disposed of in the mud pits.
- All drill pipe and equipment was steam cleaned (under high pressure) before mobilizing to the next monitor well location.
- Surface Completion: The PVC casing was cut off to provide a two foot stick-up. A protective 5' steel guard pipe 6 inches in diameter with a locking cap was set in a 24" x 24" x 4" concrete pad over the PVC stickup. Each pipe extended about three feet above land surface.
- Guard Posts: Three 3" diameter steel posts 6' in length with a minimum of 2 feet below ground, were emplaced radially 4 feet from the well head, and set in concrete. The guard posts consisted of 2 sections of pipe, fitted together at land surface by keyed-alike locks, for easy removal for well and pump access.
- Pumps: each well was equipped with a submersible pumping apparatus, consisting of a Standard 1/2 HP pump (Model 20X4P 050 - 2.W. Type 20X4P). Each well pump contained a 600-TAX5 motor starter with a P-36-overload and lightning arrestor. Accessory items installed with pumps included a brass check valve, 1" schedule 80 threaded drop pipe, 12 x 2-2 conduction pump wire, 1/8" stainless steel safety cable, 1" stainless steel worm clamps, a three-prong electric plug, 1/4" cable clamps, #10 wire terminals 1 x 3/4" galvanized bushings, and a 3/4" brass hose connector.
- After all wells were in place, each was sampled for the chemical analyses specified in the Scope of Work.

lowered, additional sections of casing were added until the bottom of the screen reached the total depth of the borehole. Normally, enough casing was attached so as to leave a 2 foot stick-up at the ground surface. Clean, coarse sand was carefully tremmied down the annular space until the level of the top of the gravel pack was at least 2 feet above the top of the screen, as directed by the supervising geologist. (See individual well completion logs in Appendix E). Bentonite pellets (Volclay) were added to form a 2-foot thick seal above the saturated zone. Neat cement (Type I) grout was then prepared and tremmied from the top of the bentonite seal to the land surface. The grout was allowed to cure for at least 24 hours prior to well development.

As the borehole advanced, grab samples were taken of the cuttings at five-foot intervals or whenever a change in lithology occurred. Drilling conditions, such as relative rate and ease of penetration, were noted by the driller.

Selection of the screened interval in the monitor wells was governed in part by assessment of the likely zones of contaminant migration. In general, the uppermost occurrences of ground water are considered most likely to show the effects of contaminant infiltration from near surface sources. The method of introduction of contaminants is by dissolved constituents moving with downward migrating infiltration. Once these contaminants reach the ground-water body they are entrained in the flow and move with it. So long as no density effects operate, there will be no tendency for contaminants to plunge or sink in the ground-water system. Common causative agents of density effects, including concentrated brines or nearly pure streams of industrial chemicals denser than water (such as TCE) do not exist at Cannon AFB, so this phenomenon may safely be ignored.

Well Development

Development was done by the utilization of a single pipe air pumping system using the casing itself as the eductor line. The compressors, air lines, hoses, fittings, etc. were of adequate size to pump the well by the air lift principle at 1 1/2 to 2 times the design capacity of the well. The driller initially pumped the well with air until the well was developed to the point that it yielded clear, sand-free water. The driller then shut off the air and allowed water in the well to return to a near-static level. The driller reopened the valve and reintroduced air into the well then closed the air valve to allow water to drop back to a static condition. He repeated this lifting and dropping of the column of water until the water in the well became turbid. At this time, the well was continuously pumped with air until it again yielded clear sand-free water. The driller repeated the above operations until the well no longer produced fine material when surged and backwashed.

The bottom of the air line was placed at different levels in order to facilitate development of all intake areas along the screen length. The process was repeated until the well yielded water free of turbidity when surged and backwashed.

All down-hole equipment used during the purging of the monitor wells was carefully washed with a high pressure steam rinse to prevent cross-contamination.

Table 3-2 summarizes the elevations and depths of the monitor wells installed at Site No. 5 (Landfill No. 5). Water level elevations are presented in Appendix F.

TABLE 3-2. SPECIFICATIONS FOR LANDFILL NO. 5 MONITOR WELLS

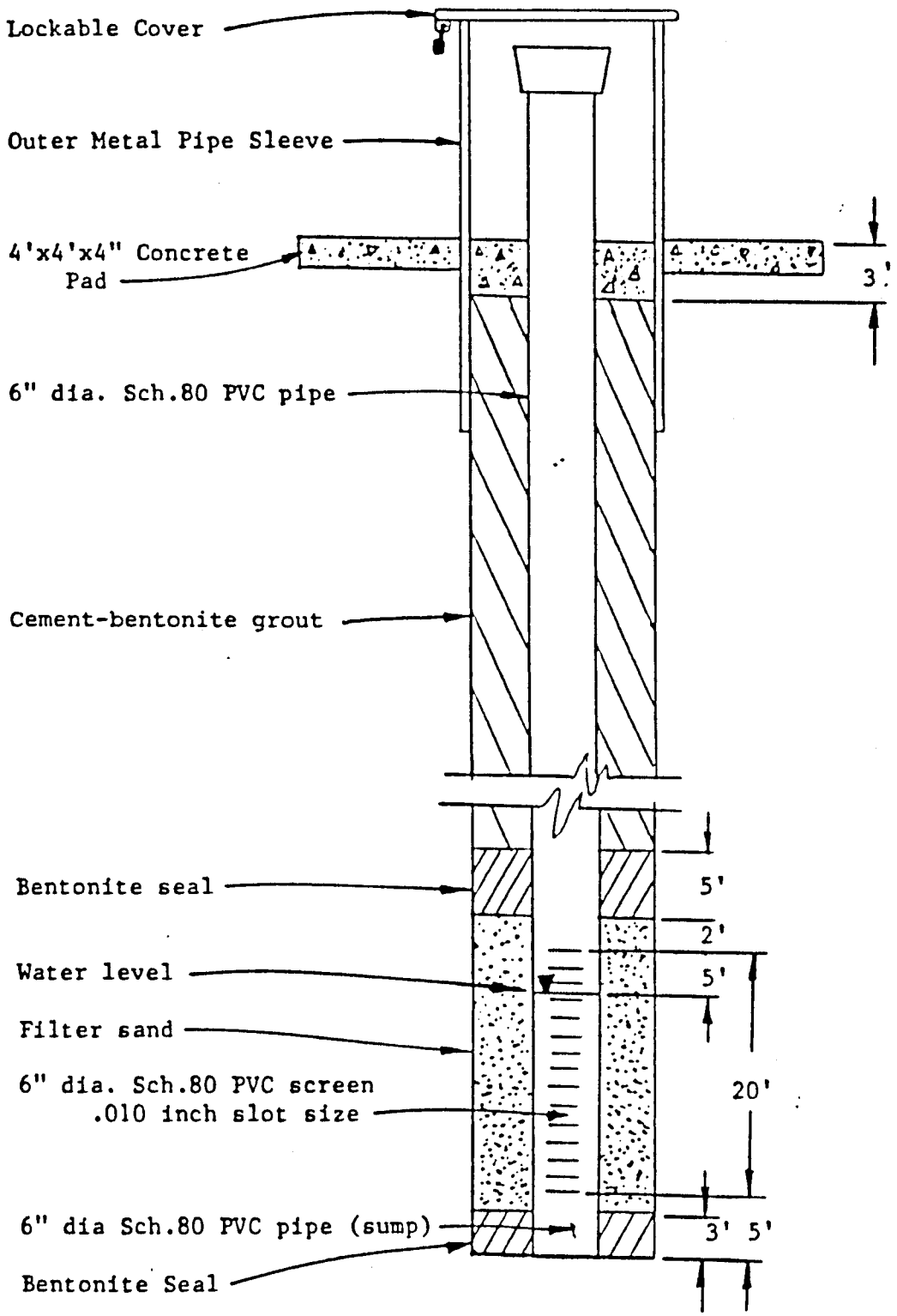
Monitor Well	Measuring Point Elevation[1]	Measuring Height	Point Ground Level Elevation[2]	Screened Interval[3]	Screened Elevation[4]	Total Depth (ft.)
A	4,267.46	2.35	4,265.11	343 - 328	3922.11-393.11	343.00
B	4,266.04	2.80	4,263.24	362.3 - 347.3	3900.94-3915.94	362.3
C	4,267.90	2.96	4,264.94	362 - 347	3902.94-3917.94	362.0
D	4,265.90	2.67	4,263.23	356.75 - 341.75	3906.48-3921.48	356.75

[1] Top of protective guard post. Mean sea level elevations determined by Pettigrew and Associates, licensed surveyors.

[2] Ground level elevation above mean sea level taken from brass cap nearest to Well A

[3] Feet below ground level

[4] Feet MSL



Schematic showing construction details for wells L and M

On the 1982 groundwater contour map (Figure 2), the high in the 4010 contour to the east of the northwest-southeast runway and the high in the 4000 contour to the east of the base could represent recharge from the playa lakes on base. The 1984 map (Figure 3) shows a distinct high in the vicinity of the playa lake near the runway while the 4000 contour to the east of the base remains relatively constant. The groundwater contour map (Figure 4) indicates the complex nature of the local ground water system on a large scale.

6. Investigations. The locations for the two new monitoring wells were discussed during telephone conversations with the staff of the New Mexico Environmental Division. The selected locations were staked in the field by the drill crew and drilling was commenced on 8 August 1988. A map showing the monitoring wells at Landfill 5 is included as Figure 5. The contractor for the drilling was Roman Well Service, 1300 Piedmont, Clovis, NM. The field supervision was provided by the Tulsa District U.S. Army Corps of Engineers. The physiography and general geology are described largely from permit applications for Cannon AFB, also reports prepared for the Air Force by the Radian Corporation of Austin TX. The existing monitoring wells at Landfill 5, designated A-D, were installed in ____. The new wells designated "I" and "J" are located near the southeast corner of the landfill. Soil samples for the new wells were not taken as sufficient information is available from the nearby previously drilled holes. Geophysical logs consisting of spontaneous potential, point resistivity and gamma ray were run on the new wells. The geologic logs and geophysical logs for holes "I" and "J" are included (Appendix A).

7. Well Construction. Wells were drilled into the upper most saturated zone of the Ogallala aquifer which is encountered at a depth of between 260 and 270 feet. Both of the 9 7/8-inch diameter wells were drilled with a tricone rockbit to 305 feet in depth, thus providing space for the cavings while the approximately 300 feet o well casing and screens were installed. The well casing consisted of 6-inch diameter thread joint PVC casings amd screems. A 20-feet length of screen with a 10-foot blank casing and plug was set at the water table. A gravel filter pack about 50 feet in length from the bottom of the hole was placed. A 10-feet thick bentonite seal was placed above the gravel pack zone. A cement grout was used to backfill the annulus from the bentonite seal to the surface. Copies of the well schematics are included (Appendix A).

8. Well Development. The wells were developed using a bailor slightly smaller in diameter than the well casing. The bailer was lowered into the water and surged rapidly up and down creating changes in flow direction through the screen. The wells were bailed and developed about 3 hours each and until the water became clear. After the pumps were installed 500 to 1000 gallons of water was pumped from each well. The flow was about 10 gallons per minute and was clear.

9. Summary. As proposed in the Cannon AFB Monitoring Plan for Landfill 5, Cell 3 two new down gradient groundwater monitoring wells were completed and pumps installed. The comments from NM/EID concerning the installation plan were received after the wells had been installed. The following discussion is an explanation of the installation procedures and materials used for the wells and to answer comments about the adequacy of the plan:

Concerns about the material comprising the casing and pumps causing false positives in the water tests. This was not a problem in the four wells previously installed using the same PVC material for the casing. See the chemical analysis of the water from the original monitoring wells A-D (Appendix B).

Sampling pump flow rate. The installed pumps are designed for volume and high water lift. The maximum capacity of more than 10 gallons per minute for the pumps is necessary to remove the required volume of water from the wells before sampling. The flow rate can however, be regulated to any lower volume by a valve located at the outlet of the pump riser pipe.

Well development method. The wells were developed, as described in section Well Development, using a bailor to remove the drill cuttings from the well and to clean the water bearing zone. Once the drill fluid was removed from the well the bailor, which was slightly smaller than the casing was raised and lowered rapidly causing surging through the screen and gravel pack. This washed the fines from the gravel pack until the inflowing water was clear. This process was done for about three hours or until the water bailed was clean.

Drilling fluids. The drilling fluids consisted almost entirely of water from the base water system and clay from the cuttings. Very little bentonite was added during the drilling. The water from the new wells was sampled the week following development of the wells. Results of the anvlisis have not been received.

Water sampling. Water samples have been recovered from the new wells and they will be included in the quarterly sampling program.

Groundwater flow direction. Water level measurements are made at the time of sampling and the groundwater flow direction can be determined. The groundwater flow direction is as indicated on the water table contour map. Figure 4. Wells C and D are still in place and can be sampled should that be required.

Well Installation. The new wells were installed as shown in the well schematics (Appendix A).

Hole No. "I"

DRILL LOG	DIVISION SOUTHWESTERN	INSTALLATION CANNON AFB	SHEET 1 OF 2 SHEETS

1. PROJECT: LANDFILL "5"
2. LOCATION (Coordinates or Station): 250' N. of SE FENCE CORNER
3. DRILLING AGENCY: ROMAN WELL SERVICE
4. HOLE NO. (As shown on drawing title and file number): "I"
5. NAME OF DRILLER: JIM ROMAN
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK: 0
9. TOTAL DEPTH OF HOLE: 305.0
10. SIZE AND TYPE OF BIT: 9 5/8
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: FAILING
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED —; UNDISTURBED —
14. TOTAL NUMBER CORE BOXES: —
15. ELEVATION GROUND WATER
16. DATE HOLE: STARTED 8/10/88; COMPLETED 8/12/88
17. ELEVATION TOP OF HOLE: 4262.3
18. TOTAL CORE RECOVERY FOR BORING: 0.0 %
19. SIGNATURE OF INSPECTOR: Ed Gilbert

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0 – 0.5 SAND (SM), Topsoil silty, brown.			DRILLING — Start 8/10/88 Finish 8/12/88 9⅝ Rockbit 0.0 – 305
	10		0.5 – 6.0 SAND (SM) silty, reddish brown.			
	20		6.0 – 12.0 CALICHE silty, light tan.			Set 273' of Blank 6" PVC Schedule 80 Flush Joint Casing with 20' of 6" SCHEDULE 80 (.020 slot) PVC SCREENS with 10' of Blank pipe below screens for Sediment trap. Bottom plug installed.
	30		12.0 – 23.0 SAND (SM) fine, tan			
			23.0 – 33.0 GRAVEL (GC) sandy, clayey.			
	40		33.0 – 48.0 SAND (SM) fine			
	50		48.0 – 55.0 CLAY (CL), sandy			
			55.0 – 63.0 CLAY (CL) silty.			
	60		63.0 – 125.0 SAND (SM) with sandy clay zones.			SAND PACK of small pea gravel From 255-305 Bentonite 245-255 Concrete from Clovis Concrete Company above 255.
	70		125.0 – 198.0 SAND (SM) with less clay content.			
	80					
	90					
	100					
	110					
	120					
	130					4X4 PAD, cover fire, and 4 guard posts installed.
	140					
	150					Hole bailed and developed 8/13/88
	160					Pump installed 8/18-19/88
	170					1 HP 220 volt Red jacket. CAPACITY ABOUT 10 gpm.
	180					
	190					Pumped approximately 500 gallons at about 10 gpm.
	200					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT: LANDFILL 5 | HOLE NO. "I"

REPRODUCED AT GOVERNMENT EXPENSE

Hole No. "I"

DRILL LOG	DIVISION SOUTHWESTERN	INSTALLATION CAM AFB	SHEET 2 OF SHEETS

1. PROJECT: LANDFILL "5"
2. LOCATION (Coordinates or Station): 250' N of SE FENCE CORNER
3. DRILLING AGENCY: ROMAN WELL SERVICE
4. HOLE NO. (As shown on drawing title and file number): I
5. NAME OF DRILLER: JIM ROMAN
6. DIRECTION OF HOLE: ☑ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 305
10. SIZE AND TYPE OF BIT
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: FAILING
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED —; UNDISTURBED —
14. TOTAL NUMBER CORE BOXES: —
15. ELEVATION GROUND WATER
16. DATE HOLE: STARTED 8/10/88; COMPLETED 8/12/88
17. ELEVATION TOP OF HOLE: 4262.3
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR: Gilbert

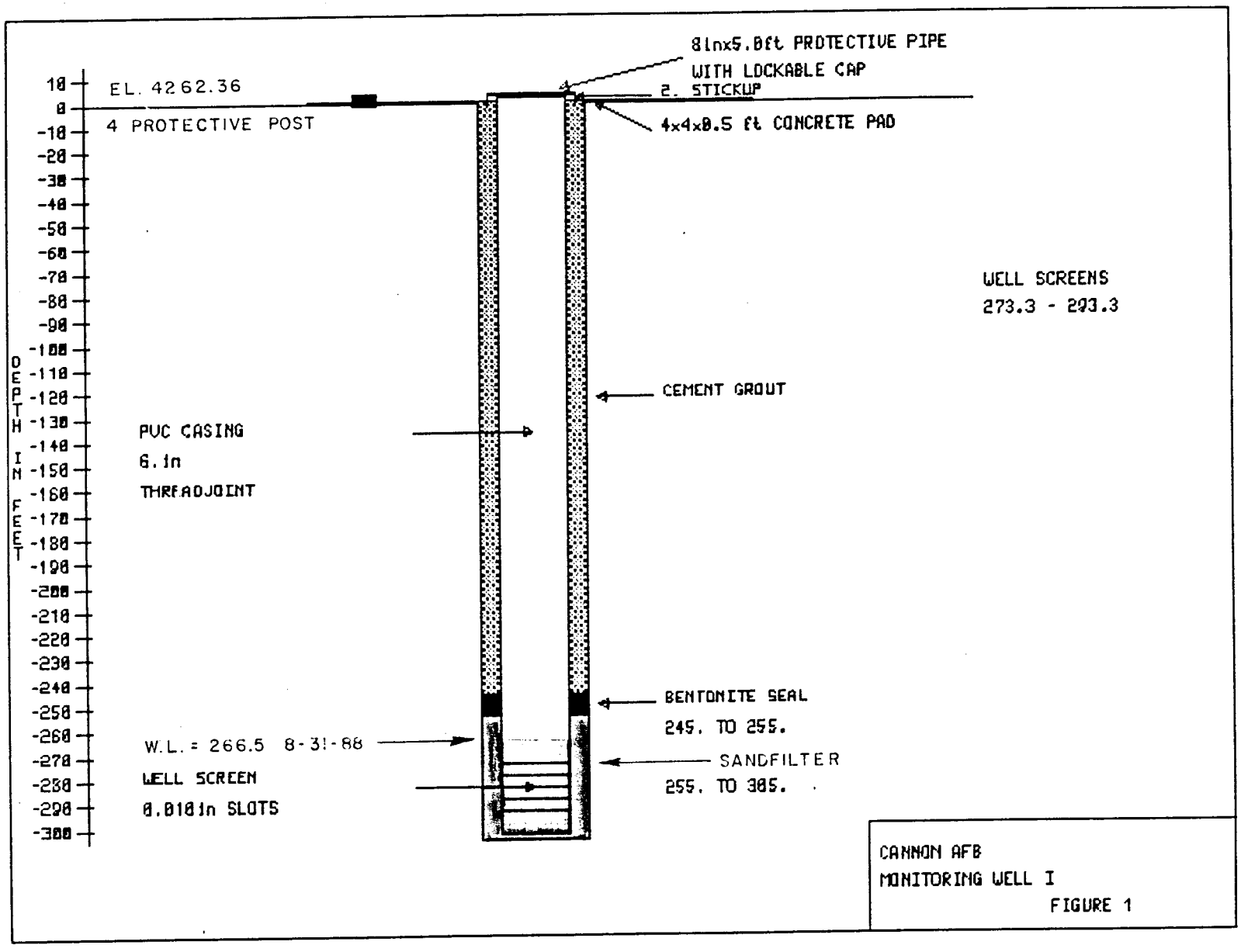
ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			198–209 CALICHE, sandy, clayey.			
	210		209–215.0 GRAVEL, (GP) slightly clayey, sandy.			
	220		215.0–225.0 GRAVEL, (GM) clayey sandy,			
	230		225.0–300 SAND, (SM) silty with occ. gravels. SATURATED BELOW 265'. CUTTINGS BELOW 300' NOT Logged.			
	240					
	250					
	260					
	270					
	280					MATERIAL DESCRIBED FROM INTERPRETATION OF GEOPHYSICAL LOGS AND DRILL MOTIONS.
	290					
	300					
	305					
	310		BOTTOM OF HOLE.	305/4265		

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT: LANDFILL "5" HOLE NO. "I"

REPRODUCED AT GOVERNMENT EXPENSE

REPRODUCED AT GOVERNMENT EXPENSE



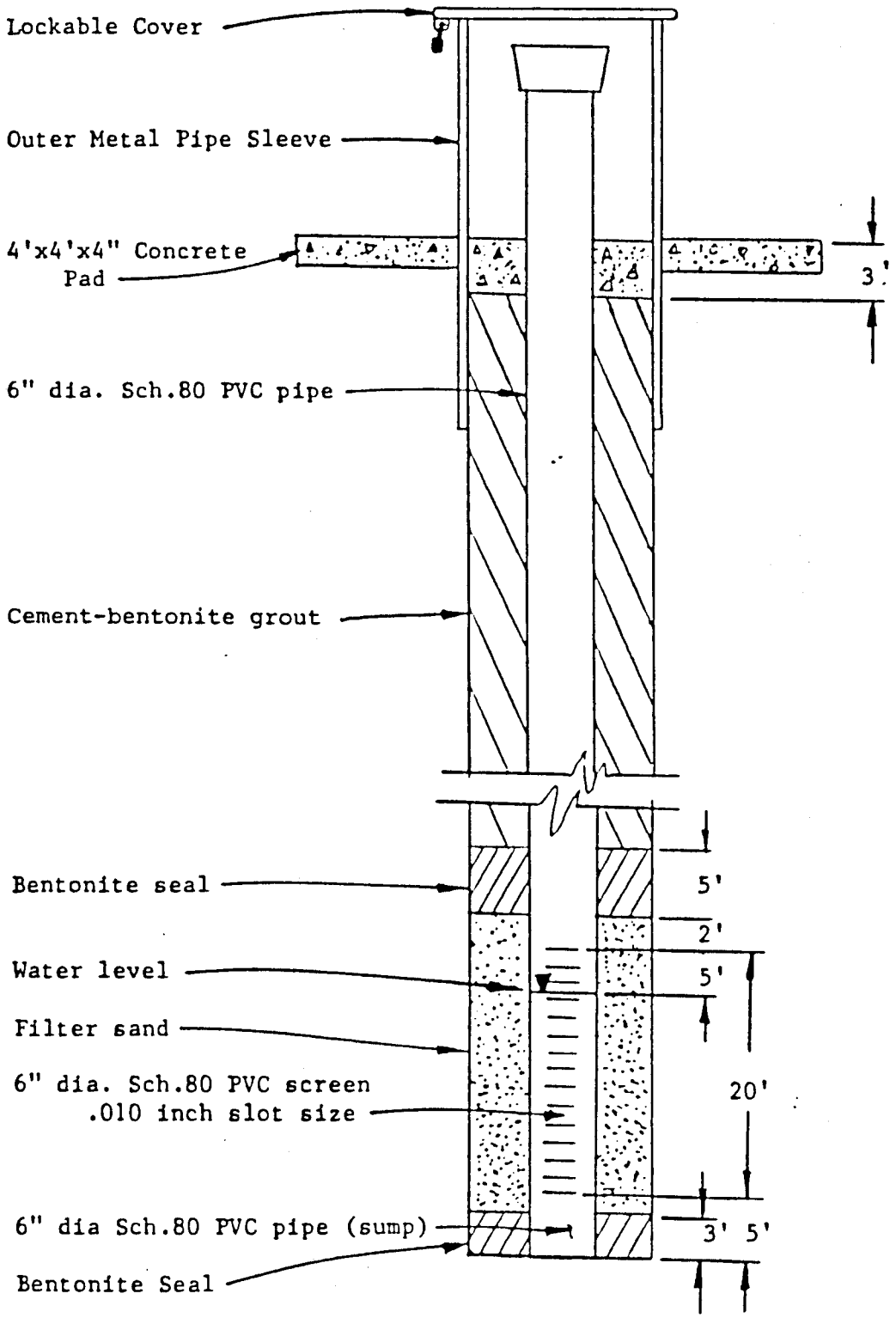


Figure 3 - Schematic showing construction details for wells L and M

Appendix II

GROUNDWATER MONITORING SAMPLING AND ANAYLSIS PLAN

CANNON AIR FORCE BASE GROUNDWATER MONITORING SAMPLING AND ANALYSIS PLAN

The purpose of this plan is to ensure that groundwater monitoring samples are representative of the groundwater in the aquifer and to ensure that the samples are collected, analyzed, and reported in a consistent manner. Refer to the TEGD methodologies where appropriate and when questions of correct procedure arise.

I. Detection of organic vapors.

Upon opening, the wellhead will be checked for the presence of organic vapors with an organic vapor analyzer. The person performing this will wear at least a half-face respirator with organic vapor cartridges. If organic vapors are detected at 1 ppm or more, the wellhead will be allowed to air out for at least an hour before continuing the sampling event. The air in the wellhead will be rechecked before continuing the sampling.

II. Water Elevation and Total Depth Measurement

Water elevation and total depth measurements will be made from a visibly marked, surveyed point on the top of the well casing rim. The top of the well casing will be surveyed by a licensed surveyor to determine its elevation to the 0.01 foot. The surveyed elevations of the points will be entered into the field log book maintained for each well. The materials of construction for the measuring device will be recorded in the equipment log book. These measurements will be taken prior to purging the well. These will be used to determine purge time and/or volume for achieving stability.

A. A baseline number of wetted well volumes will be determined. Since Cannon has high yielding wells, measurements of pH, specific conductance, and temperature will be taken before, during, and after purging to get an accurate determination of stability. This baseline number will be used to determine purge time and volume before checking stability.

B. Depth to the bottom of the well will be measured every event unless the well has a dedicated permanently installed pump. If the pump prevents the measurement of well depth, these measurements will be taken every five years, or when the pump is pulled, whichever is more frequent. Total depth measurements will be taken and recorded to the nearest 0.25 foot. Total depth will be determined using a steel tape with a weight on the bottom. To measure total depth of the well a weighted steel tape will be lowered into the well casing until the bottom is felt. The slack in the tape must be taken out while the tape remains on the bottom of the well. The total depth will be recorded on the sampling event sheets. The total depth measurement must be adjusted to reflect the length of the weight which is attached to the end of the tape.

C. Water elevation will be taken at the time of each sampling event. All static water elevations must be taken within a twenty-four hour period or less. The depth to water will be measured to the nearest 0.01 foot.

Measurements will be taken until three consecutive readings are within one quarter of an inch of each other. The field person must note which of the three measurements appears to be the correct measurement. This depth will be recorded. Depth to the water will be recorded by a permanently installed, dedicated digital electronic meter - see attachment 1 for specifications. In the event that the electronic meter is inoperable, a portable electronic water level probe will be used to determine depth to water. Water elevation will be determined by subtracting depth to water from the surveyed elevation of the top of the well casing rim.

If a plastic or PTFE measuring tape is used then this tape must be checked annually against a steel tape to determine if the tape has stretched. This will be recorded in the equipment log. If the synthetic tape has stretched more than 0.01 foot then the tape must be calibrated with the steel tape.

It must be noted in the applicable field log book (for the particular well) whether any wells that are being pumped could potentially impact the water elevations measured at the RCRA wells.

D. If the portable probe is used to determine depth to water, it will have to be decontaminated between wells. If wells have not evidenced contamination, a distilled, deionized water rinse is appropriate. If wells have evidenced contamination, a non-phosphate detergent wash followed by a tap water rinse is appropriate. A hexane rinse may be added if the wells evidence organic contamination. These procedures are also appropriate for the device used to determine total depth of the well.

III. Detection of Immiscible Layers

Cannon AFB will test for the detection of immiscible layers if it is believed that there is a layer of immiscible material or if the state requests the base to do so. Use the guidelines in the TEGD for determining the presence, measuring the thickness, and collecting a sample of any immiscible layer. This will be done prior to purging the well. Detection will be accomplished using an interface probe. If a layer of light phase immiscibles is detected, a sample will be collected using a clear bailer. If there is a sufficiently thick dense phase present, a teflon double check valve bailer must be use to obtain a sample.

IV. Field Log Book

A field logbook will be maintained for each well. Each logbook will have a separate O&M section which will be used to track the operation and maintenance of the well and the sampling equipment. These logbooks will be available for review. These logbooks will be used to record visits to the wells, any problems with the wells, any maintenance performed, and the occurrence of all sampling events. The well condition will be annotated in these logbooks to include security of the cap, presence of cracks in or standing water around the concrete pad, condition of protective posts, and condition of the well casing. An example of the field logbook format is shown in Attachment 1. The logbook will be used to record the following information:

- Identification of the well
- Well depth and measurement technique

- Depth to water and static water elevation and measurement technique
- Presence of immiscible layers and detection method
- Collection method for immiscible layers
- Time needed for recovery after after purging
- Purge volume, purge rate, and time of purge
- Purge equipment
- Sample withdrawal equipment
- Date and time of sample collection and flow rate
- Parameters to be analyzed, sample container, and preservative
- Sample identification numbers
- Field parameter (pH, temp, specific conductance) data and method of analysis; pH calibration data
- Name of collector
- Field observations
- Climatic conditions
- Method of transportation
- Purpose of sampling (detection, assessment, ect.)
- Order in which the samples were collected
- Any problems

V. Equipment Decontamination

The only non-dedicated pieces of equipment that will be used are the portable static water level meter (when needed) and the pH/specific conductance meter.

In the unlikely event that non-dedicated equipment will be used, the following decontamination procedures will be used:

A. For inorganic analysis:

- Nonphosphate detergent wash
- Tap water rinse
- Dilute acid rinse (HNO_3 or HCl)
- Distilled or deionized water rinse
- Air dry

B For organic analysis:

- Nonphosphate detergent wash
- Tap water rinse
- Distilled or deionized water rinse
- Pesticide grade hexane rinse
- Air dry

Cannon AFB will not reuse sample collection containers. All containers will be purchased new from a warehouse.

A. Glass liter bottles - purchased pre-cleaned (lab grade non-phosphate detergent wash and rinse ; acid, deionized water, and solvent rinse, oven drying, capping, and packing under quality controlled conditions).

B Glass vials - purchased pre-cleaned (lab grade non-phosphate detergent wash and rinse; multiple rinse with deionized water, oven drying, capping, and packing under quality controlled conditions).

C. Cubitainers - purchased new, not pre-cleaned.

1. For metals - rinse with tap water, rinse with 1:1 nitric acid, rinse with deionized water; let dry and store capped.

2. For other parameters collected in cubitainers - no cleaning is necessary.

VI. Sample Withdrawal and Collection

A. Purging techniques and field measurements

Based on the depth to water and the purge rate determine the time to purge five wetted well volumes of water. The purge rate should not be faster than the rate used to develop the wells during installation. In addition, if the purge rate is so fast as to create an audible noise, it will be lowered. Low yielding wells should be purged no more than once to dryness. The official field measurements of pH, temperature, and specific conductance and the groundwater samples must be obtained as soon as the well has recovered enough to yield water for a sample. When three to five well volumes have been purged, begin taking unofficial field measurements of pH, temperature, and specific conductance to verify that these parameters have been stabilized. Stability is achieved when two consecutive measurements are +/- 0.01 pH units, 10 umhos, and 1 degree. A digital direct reading meter will be used to take pH, specific conductance, and temperature readings. Specific conductance will be calibration checked the morning of the sampling event. pH will be calibration checked the morning of the sampling event and between wells.

Turbidity measurements will also be taken with the direct reading meter. If turbidity is greater than 5.0 turbidity units, samples will not be collected. The cause of the increased turbidity must be determined and, if necessary, corrected before samples may be collected. If the turbidity problem cannot be resolved within two weeks, then the samples must be collected immediately. A turbidity problem should not delay required sampling events by more than two weeks.

The purge water will be contained in the tank located next to each well. If analytical results indicate that the groundwater is not contaminated, the water may be drained onto the ground. If the results indicate that the groundwater is contaminated, the purge water will have to be treated as hazardous waste. Disposal of contaminated purge water on the ground could result in soil contamination that requires clean up.

Once two consecutive field measurements indicate that the groundwater has stabilized, samples can be collected. Two more sets of field measurements will have to be taken to obtain the required four replicate measurements. These measurements will be recorded to the nearest 0.01 pH units and 10 umhos.

B. Calibration and Decontamination of Hydac Meter

Specific conductance will be calibration checked the morning of the sampling event. This calibration will be recorded in the Equipment Log Book. pH will be calibration checked before the first well and between wells. pH will be calibrated with a pH 7 and pH 10 buffer if the pH is above 7. If the general pH is not known, then use pH paper to determine which buffers to use. This calibration will be recorded on the Sampling Event Sheet. Follow the manufacturer's instructions for calibration procedures. Test batteries before going out to the field. Also bring spare batteries to use whenever the instrument provides unstable readings.

The instrument's cell or sampling cup must be repeatedly flushed (about three times) with distilled water before and after use and in between wells. The rinse water should be thrown in the purge tank. For the sampling, the cup or cell must be flushed three times with the liquid to be sampled before measurements are made. This liquid will also be thrown in the tank.

Follow manufacturer's instructions for cleaning and storage. If the groundwater is visibly contaminated with oil or any other substance, the probe must be cleaned per the manufacturer's instructions and recalibrated.

C Sampling Equipment

Each well will have a dedicated pump for purging and a dedicated positive gas displacement PTFE bladder pump for sample withdrawal. If a bladder is used it will be constructed of inert material with a bottom filling - bottom emptying device. Bailer cord must be inert material. Precautions in using the sampling equipment must be taken to ensure that parts that come in contact with well fluid are constructed of inert material and can be decontaminated or disposed of between uses.

D. Sample Collection Technique

The pump will be operated at a flow rate of 100 ml/minute for the collection of samples requiring the elimination of headspace. The flow rate may be increased for collection of other samples, but may never exceed 1 gpm. The pump must be operated to prevent surging or pulsing, if possible. If a bailer is used, it must be handled in such a way as to minimize agitation and aeration. The contents of the bailer must be transferred to the sample container with minimum agitation and aeration.

Samples will be collected in the following order:

- Volatile Organics (8240)
- Total Organic Halogen (TOX)
- Total Organic Carbon (TOC)

- Semi-Volatile Organics
- Total Metals
- Phenol
- Pesticides
- Cyanide
- Sulfate, Chloride, and Flouride
- Turbidity
- Nitrate
- Radionuclides
- Coliforms

VII. Sample Containers and Preservation

Sample volumes, preservatives, container types, and holding times are at Attachment 2 (SW846 methods were used to develop this attachment).

Sample labels will include the following name, date, sample identification number, parameters to be analyzed, preservative used, and well identification. Unique sample seals will be used to ensure that the seal has not been tampered with. The sample labels will remain legible and firmly attached.

Samples will not be filtered. Samples for TOX, TOC,and Volatile Organics will be filled to eliminate headspace.

Sample containers should be packed in a manner that prevents breakage. Samples will be shipped in sealed ice chests and packed with reusable ice packs. Bottles with septum caps should be packaged and transported upside down and in a plastic "sandwich baggie" to prevent leakage through the septum and prevent cross-contamination through the septum.

VIII. Field QA/QC Program

Field QA/QC samples will be collected and reported to ensure that the groundwater samples are representative of the groundwater quality and to ensure that cross-contamination has not occurred. Duplicate samples are required as an indication of variability in water quality or the precision of the laboratory analysis. Samples will be collected as any other sample.

A. Trip Blanks - OEHL or contract lab will prepare at least one trip blank for each sampling event. Trip blanks will be 40 ml vials of deionized, distilled water. Trip blanks will be requested in advance and will be stored in the water lab refrigerator until the sampling event. This refrigerator will be locked and only authorized persons will have access to the samples. Trip blanks will be transported from the lab to the sampling location and returned to the lab in a manner identical to the handling procedures used for sampling. The trip blanks will be managed in such a way that their holding time does not exceed 14 days. The trip blank will be sent to the lab with a request for Method 8240 analysis for volatiles. If specific sample containers are suspected of causing contamination, trip blanks will be taken for these also. However, these additional blanks will be prepared at the base using deionized water.

Trip blank contamination can be attributed to improperly cleaned containers, contaminated deionized, distilled water, or cross-contamination during the trip or at the lab. If trip blanks evidence contamination, the probable cause must be adequately demonstrated within 60 days of receipt of the lab report. If the contaminant in question is a potential constituent from the site, immediately modify the lab or field procedure to prevent future contamination. Provide documentation to the Secretary of the modification within 60 days of receipt of the lab report. Trip blank data will not be used to correct sample data.

B. Equipment Blanks - will be taken to check the effectiveness of cleaning of nondedicated sampling devices. Currently, all sampling devices are dedicated to specific well, therefore equipment blanks will not be taken.

If nondedicated equipment is used, distilled, deionized water will be poured or pumped through the device and collected. Equipment blanks will be analyzed for Method 8240 (volatiles), Method 8270 (semi-volatiles) and metals (As, Ba, Cd, Cr, Pb, Hg, Se, Ag). At least one equipment blank will be collected per day of sampling or per 10 wells. These blanks will be handled in a manner identical to the procedures used for the samples.

If contamination is detected in the equipment blanks, it must be adequately demonstrated that the contamination was caused by the lab procedure or equipment decontamination within 30 days of receipt of the lab report or use dedicated sampling equipment for future sampling events. If the above mentioned procedures are proven to cause the contamination, then lab procedures and/or the equipment decontamination will be modified to prevent future contamination by the contaminant in question. Provide documentation of the modification to the Director within 60 days of receipt of the lab report. Equipment blank data will not be use to collect sample data.

C. Duplicate Samples - At least one set of duplicate samples must be collected from one well per each day of sampling or per 10 wells sampled. Duplicates will be collected immediately after the "primary". Duplicates will be collected for any Appendix IX parameters and metals. Duplicates will be handled the same way any other sample is handled. Analysis will be the same as for the "primary" sample. Results will not be used to correct groundwater data.

D. Chain of Custody and Sample Request Forms

Chain of Custody tracks the samples from the point of collection to the laboratory. It ensures that the samples are never left unattended unless they are in a secure, locked location and only authorized people have access to them. An example of Chain of Custody can be found at Attachment 3. The sample request form provides the necessary information to the laboratory. Sample request forms will annotate that these are for RCRA purposes - SW 846 methods required. Examples of sample request forms may be found at Attachment 4.

IX. Laboratory QA/QC Program

Cannon AFB will use an EPA approved laboratory for all analyses. Cannon is currently having samples analyzed by the Air Force Occupational and Environmental Health Laboratory (AFOEHL). AFOEHL is EPA certified to perform analysis of drinking water samples. EPA also reviews their procedures for wastewater analysis. Lab data reports will include, at a minimum, the following information: Sample results, sample site identifier (specific for each well and includes the well letter), base sample number, detection limit and method of analysis used for each parameter, date of collection, date received by lab, date sample was extracted (if applicable), date sample was analyzed, percent recovery, surrogate standards, and confidence limits.

A. The laboratory QA/QC program must insure the validity and reliability of data and include the following:

1. Use of EPA approved preparation and analytical methods.
2. Calibration of instruments to within acceptable limits according to EPA of manufacturer specifications before, during, and after use. Reference standards must be used when necessary.
3. Periodic inspection, maintenance, and servicing of all instruments and equipment.
4. Periodic training, testing, and evaluation of personnel to insure accurate performance.
5. The use of reference standards and QC samples (e.g., checks, spikes, blanks, duplicates, and splits) as necessary to determine the accuracy and precision of procedures, instruments, and operators, as well as the identification of potential interference by the samples matrix.
6. QA/QC samples must not be used to correct data.
7. The use of adequate statistical procedures to monitor the precision and accuracy of the data and to establish acceptable confidence limits.
8. The use of the appropriate percentage of reference standards, spiked standards, blanks, and split samples based on EPA standards.
9. If an alternative method for analysis is used, split samples must be run with another lab for comparison purposes and must be included with the lab data.
10. Continuous review of results to identify and correct problems within the measurement system.
11. Documenting the performance of systems and operators.
12. Documenting any deviation from SW-846 or other EPA approved procedures.
13. Use of acceptable sample identification.
14. Maintenance and storage of complete records, charts, and logs of all pertinent laboratory calibration, analytical, and QC activities and data.
15. Insure all data outputs are presented in their prescribed format.
16. A logbook must include the following:

    a. Experimental conditions
    b. Observation of headspace in any sample received for volatile analysis
    c. Results for all QA/QC samples

d. Time, data, and name of person for each processing step
e. Sample preparation technique
f. Instrumental methods
g. Actual holding time information
h. Lab sample number
i. Analysis performed

All laboratory QA/QC data will be maintained at OEHL or contract lab with copies submitted to 27 SG/CEV.

X. Groundwater Quality Data

A. Reporting of Low and Zero Concentration Values

Method Detection Limits (MDLs) and Practical Quantitation Limits (PQL) should be as low as possible consistent with SW-846 and Appendix B of 40 CFR 186. If detection are equal to or greater than the New Mexico Water Quality Control Commission Standards as listed in Section 3-103A, WQCC 82-1 Amendment No. 4 or EPA Drinking Water Standards and the constituent is not detected then the well must be resampled within 14 days and analyzed with lower detection limits. Detection limits that are high or vary from past detection limits must be reduced in future work by lab procedures that remove or control interfering constituents that potentially cause detection limits to be elevated. If the WQCC standard is different than the EPA standard, the more stringent of the two must be adhered to.

Regarding GC/MS analysis, the numerical concentration values of any hazardous constituents found at levels below the practical quantitation limit and above the method detection limit must be reported if these constituents have been detected in samples from the well in question by previous GC/MS or GC analysis.

B. Reporting Raw Data

Lab data sheets include appropriate information as indicated in Section IX.

C. Missing Data Values - When possible, resampling will be accomplished to avoid having missing data. If it is necessary to statistically evaluate data with missing values, it will be done in accordance with the November 1983 EPA memorandum on statistical analysis of indicator parameter data.

D. Outliers - Outliers will be handled and documented in accordance with TEGD, section 4.7.3.

E. Units of Measure - Each parameter will be reported with a consistent, unambiguous unit of measure. Number will be reported in a consistent number of significant digits, at least three. The units must be consistent from one sampling event to the next. Rounding techniques must not be used to alter the apparent precision of a measurement. If a constituent concentration cannot be measured to three significant digits then the reasons must be documented and no more than a 10% error will be allowed in a one unit change in the last significant digit of a data value.

F. Missing Constituent(s) and/or Parameter(s)

Should a lab report be received that does not include the analysis of a required constituent/parameter, the following will occur:

1. The lab will be contacted to see if there are archive samples that can be retrieved and analyzed within holding times.

2. If this is not possible, resample for the missed parameter within 14 days of contacting the lab.

3. These actions will be recorded in the Field Log Book and noted in the annual report.

G. Exceeding Maximum SW-846 Holding Times - Samples should not exceed the max holding times specified in the table at Attachment 2. Should a lab report show that a sample exceeded its holding time, the following will occur:

1. Verbally notify NMED of the occurrence.

2. Resample within 14 days.

H. Unsampled Groundwater Monitoring Wells - If a designated well cannot be sampled due to reasons beyond our control, the following will occur:

1. Contact NMED by phone and in writing, stating the reasons why the well could not be sampled.

2. Sample said well within 14 days unless conditions preventing sampling remain beyond our control and the Secretary accepts the reasons as being beyond our control.

XI. Operation and Maintenance (O&M) Program

A. Once a month, Base Water Plant personnel will check that the pumps are in working condition. Pumped water will be collected in the purge tanks. These checks and any maintenance will be recorded in the field log books maintained for each well. Entries will include date and time of the operational check, name of the person performing the check, any observations made, and the date and nature of any repairs or other remedial action.

B. The base will maintain an Equipment Log Book. This will be used to track O & M of sampling equipment (not to include the equipment physically associated with the well itself - that will be recorded in the field log book for each well).

1. An inventory of sampling equipment will be entered in the equipment log book.

2. One month prior to a sampling event, sampling equipment will be inspected to ensure that it is in good condition. Equipment that is found to be deteriorated or malfunctioning must be repaired before the next sampling event. A check will be made to ensure that we have enough of the appropriate sampling collection containers. Any problems with equipment and corrective action will be annotated. Any shortfalls of collection containers and date they were ordered will be annotated.

XII. Maintenance of Monitor Wells

Once every five years (or more often if warranted or if directed by the Secretary), the top of the casing of the well will be resurveyed by a licensed surveyor to elevation above sea level. This will be reported to NMED as part of the annual report.

Wells must be maintained in good working order. Visual or geochemical evidence of physical degradation of casing material, concrete pad, significant increases in turbidity of samples, changes in the recovery rate, and damage to well casing, ect. must be investigated and recorded in the Field Log Book and repaired. Damaged wells will be replaced if they cannot be repaired and if the integrity of the samples is at risk.

Well will be analyzed for turbidity with a digital direct reading meter during each sampling event to determine if the well is structurally stable or to determine if the well needs to be redeveloped.

If redevelopment is necessary, it should not employ a discharge rate that exceeds the recovery rate and should include a surge and flow reversal method to dislodge the fine particles from the filter pack. Air must never be used to redevelop wells. Redevelopment should continue until the turbidity is below 5 turbidity units or until another State-approved standard is achieved. Air jetting must never be used to redevelop the wells.

If redevelpment does not lower the turbidity to acceptable levels, Cannon will determine the reason for the increased turbidity. If the turbidity is caused by damage to the well or incorrect filter pack or screen slot size, then the well must be replaced. If the well evidences high pH that is not caused by a contaminant plume, then the well must be replaced or repaired.

A detailed plan to repair or replace any well will be developed and submitted to NMED. If the plan is acceptable, then it must be implemented within 60 days.

NMED will be provided with "as built" drawings of all recovery, observation, or monitor wells. If the State-approved specifications do not coincide with the "as builts" then these wells will not be used unless the State accepts the alternative specifications.

XIII. Revision of this plan

This plan will be revised and updated according the Hazardous Waste Manangement Regulations, Part 901, Section 270.42 whenever directed by NMED. Cannon may initiate minor modifications if it can be demonstrated to the Secretary's satisfaction that the new procedure will ensure a more representative sample. This plan will be revised and updated whenver directed by the Secretary.

Attachment 1

Field Logbook Format

CANNON AFB, GROUNDWATER FIELD LOGBOOK
SAMPLING EVENT RECORD

Well No._____ Sampling Date and Time_____

Weather Conditions_____

Samplers names_____

Are nearby wells pumping?_____ Total estimated flow_____

Describe dedicated equipment_____

_____

Organic vapors detected?_____ Retest?_____

Elevation top of well (**EW**) _____[1] Depth of well (**DW**)_____[2]

Elevation bottom of well (**EW - DW**)_____

Determination of Phase Levels (as required)

LNAPL[3] measured _____ Method_____

Water Level measured _____ Method_____

DNAPL[4] measured _____ Method_____

Depth to top of LNAPL 1_____ 2_____ 3_____ Ave_____

Depth to top of water 1_____ 2_____ 3_____ Ave_____

Depth to top of DNAPL 1_____ 2_____ 3_____ Ave_____

Reading Water Level Indicator Before Purging

Time	Reading	+	Well Factor[5]	=	Depth of Liquid (feet)
_____	_____		_____		_____
_____	_____		_____		_____
_____	_____		_____		_____

Average Depth in feet before purging (**ADB**) _____

(1) Surveyed top of well elevation.
(2) Total depth of well as determined by sounding cable.
(3) Light Non-aqueous Phase Liquid (LNAPL)
(4) Dense Non-aqueous Phase Liquid (DNAPL)
(5) Well factor is established when the water level indicator is installed. It is the height the indicator is above the bottom of the well.

Date_____ Well No. _____

Determination of Casing Volume and Purge Time

Well Volume (**WV**)_____ gals = **ADB**_____ft x 0.0408[6] x casing dia.(inches)___^{2}(squared)

WV_____gals x baseline volumes = Purge volume(**PV**) _____gals

PV_____ gals divided by pump rate[7]_____ gpm. = Purge Time_____ min.

Purging procedure and equipment: _____

Reading Water Indicator After Purging

Time	Reading	+	Well Factor[5]	=	Depth of Liquid (feet)
_____	_____		_____		_____
_____	_____		_____		_____
_____	_____		_____		_____

Average Depth in feet after purging (**ADA**) _____

Maximum drawdown in feet _____ = **ADB**_____ - **ADA**_____

Well Yield

Low yield well_____(well was pumped dry during purging). Specify time needed for recovery before sampling:_____

High yield well_____ (well was not pumped dry during purging). Annually specify time required for complete recovery to average depth before purging (**ADB**):_____

Sampling and Testing

Purpose of sampling: Detection ____ Compliance ____ Other____

Sampling procedures for LNAPL and DNAPL liquids _____

_____

Sampling procedures for groundwater _____

_____

Flow rate of groundwater during sampling_____

Sample Identification No. _____

[6] 0.0408 is the conversion factor to convert well length in feet and casing diameter in inches to gallons.
[7] Pump rate in gallons per minute to be determined in the field.

Parameters for analysis:
Samples listed in order of collection. Highlighted parameters with **(IX)** following will be collected only in the Appendix IX sampling round. Containers and preservatives required are listed in the Sampling and Analysis Plan. Parameters preceded by (*) will be measured during purging to determine when the groundwater stabilizes. They will then be measured for record using the sampling pump. (S) indicates parameters collected with the sampling pump. (P) indicates parameters which may be collected with the purge/sample pump.

	Container Used	Preservative Used
(*) pH (field analysis)	-	-
(*) Temperature	-	-
(*) Conductivity (field analysis)	-	-
(S) Volatile Organics (IX)	_____	_____
(S) Total Organic Halogen	_____	_____
(S) Total Organic Carbon	_____	_____
(P) Semivolatile Organics (IX)	_____	_____
(S) Total Metals	_____	_____
(S) Total Metals (IX)	_____	_____
(S) Phenol	_____	_____
(P) Pesticides (8080)	_____	_____
(P) Organochlorine Pest/PCB (IX)	_____	_____
(P) N and P Pesticides (IX)	_____	_____
(P) Herbicides	_____	_____
(P) Herbicides (IX)	_____	_____
(S) Cyanide	_____	_____
(P) Sulfate, Fluoride and Chloride	_____	_____
(*) Turbidity (field analysis)	-	-
(P) Nitrate	_____	_____
(P) Radionuclides	_____	_____
(S) Coliforms	_____	_____

Date _____ Well No. _____

Field Analysis Data and Methods for pH, Conductivity, Temperature and Turbidity.

	Time	Meter Type	Calibration	Measurement
pH				
Conductivity				
Temperature				
Turbidity				

Comments: _____

_____

_____

_____

Shipping Information

Number of containers						VOA Count		
Glass	Sterilized Bags	Plastic	Vials	Chest #	Custody Seal #	VOAs	Chest #	Custody Seal #

Bus Bill No.

Samplers Signatures: _____

_____

CANNON AFB, GROUNDWATER FIELD LOGBOOK
OPERATIONS AND MAINTENANCE RECORD
Well and Dedicated Equipment

Well No. _____ Date_____

Name(s) of inspector _____

Purpose of inspection: Pre-sampling _____

Sampling Event _____

Post-sampling _____

Other (describe) _____

Well Condition:

Security of well cap _____

Condition of Protective posts _____

Condition of concrete pad _____

Condition of casing _____

Other (vegetation, animal burrows, etc.)_____

_____

Describe Maintenance/Operation of Well and Dedicated Equipment:_

_____

_____

_____

Problems Encountered/Corrective Action: _____

_____

_____

_____

Conductivity reading: _____

pH reading:_____

Annual turbidity measurement: _____

Annual recharge observation _____ hours.

5 year survey of well elevation_____ feet.

Well factor_____

CANNON AFB, GROUNDWATER FIELD LOGBOOK
OPERATION AND MAINTENANCE RECORD
Sampling Equipment Inspection (non-dedicated)

Date of inspection: _____

Name(s) of inspector: _____

Location of inspection: _____

Purpose of Inspection:

Pre-sampling _____

Sampling event _____

Post-sampling _____

Other _____

Describe Operation/Maintenance of Equipment: _____

_____

_____

_____

_____

_____

_____

Problems Encountered/Corrective Action: _____

_____

_____

_____

_____

_____

_____

Comments: _____

_____

_____

Signature _____

Attachment 2

Sample Preservation

Indicators of Groundwater Contamination

PARAMETER	CONTAINER	PRESERVATION	VOLUME	NOTES
pH	-----	Field Determined	----	A
Specific Conductance	-----	Field Determined	----	A
TOC	Glass amber, T-lined septa cap	Cool, 4 C H_2SO_4 to pH _ 2	4 x 40 ml	B,E
TOX	Glass amber, T-lined septa cap	Cool, 4 C H_2SO_4 to pH _ 2	8 x 130 ml	B,C,D,E

NOTES

A. Four replicate analyses must be done.

B. No headspace allowed in container.

C. TOX samples.

1. Sample containers are 130 ml amber glass screw cap bottles with TFE fluorocarbon faced silicon septa CAPS. These containers will be supplied by USAF OEHL.

2. Collection
   a. Fill the bottle in such a manner to avoid air bubbles passing through the sample as the bottle is overfilled.
   b. Place the bottle on a level surface and position the TFE side of the septum liner on the convex meniscus of the sample. Seal the bottle by screwing the cap on tightly.
   c. Invert the sample bottle and slightly tap the cap on a solid surface. The absence of any entrapped air indicated a good seal. If bubbles are present, open the bottle and collect another sample.

D. Eight sample bottles must be sent to get the four replicate analyses required by RCRA - Method 9020, used to analyze for TOX, requires duplicate samples to be sent for each sample. Each sample which is a set of two bottles will have a separate sample number with one bottle marked "A" and the other marked "B".

E. Maximum holding time is 28 days.

Groundwater Quality Characteristics

PARAMETER	CONTAINER	PRESERVATION	VOLUME	NOTES
Chloride Sulfate	Polyethylene Cubitainer	Cool to 4 C	1 Liter	B
Iron Manganese Sodium	Polyethylene Cubitainer	HNO_3 to pH _ 2	1 Liter	A,C
Phenols	Glass	Cool to 4 C H_2SO_4 to pH _ 2	1 Liter	B,D

NOTES:

A. Cubitainer must be rinsed with HNO_3 1:1 with water.

B. Maximum holding time is 28 days.

C. Maximum holding time is 6 months.

D. Colorimetric Method 9066 will be used.

Drinking Water Characteristics

PARAMETER	CONTAINER	PRESERVATION	VOLUME	NOTES
Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver	Polyethylene Cubitainer	HNO_3 to pH _ 2	1 Liter	A,G
Fluoride	Polyethylene Cubitainer	Cool to 4 C	1 Liter	F
Nitrate	Polyethylene Cubitainer	Cool to 4 C H_2SO_4 to pH _ 2	1 Liter	B
Endrin Lindane Methoxychlor Toxaphene	Amber Glass Teflon-lined cap	Cool to 4 C	1 Liter	C,E
2,4 D 2,4,5 TP Silvex	Amber Glass Teflon-lined cap	Cool to 4 C	1 Liter	C,E
Radium Gross Alpha Gross Beta	Polyethylene Cubitainer	None	1 Liter	G,H
Coliform Bacteria	Polypropylene thio-bag	Cool to 4 C	100 ml	D

NOTES:

A. Cubitainer must be rinsed with HNO_3 1:1 with water.

B. Maximum holding time is 28 days for nitrate-nitrite.

C. Maximum holding time is 7 days until extraction; 40 days for analysis.

D. Maximum holding time is 6 hours. Samples will be analyzed in our BES Water Lab. DD Form 686 will be used to report results.

E. From past sampling, the pH of our samples is between 6 and 8; if at some time this changes, adjust the pH to between 5 and 9 with NaOH.

F. Maximum holding time is 28 days.

G. Maximum holding time is 6 months (28 days for Mercury).

H. OEHL acidifies the sample at the lab before analysis.

APPENDIX IX PARAMETERS

PARAMETER	METHOD	CONTAINER	VOL	PRESERV	HOLD TIME
Semi-Vol	8270	Amber glass	2 x 1L	Cool	7 days ext/ 40 days analysis
Vol	8240	Septum vials	3 x 40ml	HCl	14 days
Pest/PCB	8080	Amber glass	2 x 1L	Cool	7 days ext/ 40 days analysis
Herb	8150	Amber glass	1 x 1L	Cool	7 days ext/ 40 days analysis
Metals	6010				
Mercury	7471	Polyethylene Cubitainer (Acid rinsed)	1 x 1L	HNO_3	6 months (Hg - 28 days)
Arsenic	7060				
Selenium	7740				
Diox/Furans	8280	Amber glass	1 x 1L	NaOH	7 days ext/ 30 days analysis
Cyanide	9010	Polyethylene Cubitainer	1 x .5L	NaOH	14 days
Sulfide	9030	Plastic	1 xlL	**	7 days

** 4 ml Zinc Acetate (2N), adjust pH to _ 9 with NaOH, leave headspace

Attachment 3

Chain of Custody Form

*** RETURN SIGNED, COMPLETED FORM TO 27 MED GP/SGPB CANNON AFB, NM 88103-5300 ***

CHAIN OF CUSTODY RECORD

Project No.

Project Name:

Samplers: *(Signature)*

Station No.	Date	Time	Comp	Grab	Station Location	Number of Containers	Container Type(s) & Quantity of each type					Remarks (Specify Preseratives)

Relinquished by: *(Signature)*	Date	Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date	Time	Received by: *(Signature)*
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: SAMPLING RECEIVING PERSONNEL WILL ANNOTATE THE FOLLOWING:

1. Presence of Ice ____Yes ____No
2. Samples Seals Intact ____Yes ____No

*** RETURN SIGNED, COMPLETED FORM TO 27 MED GP/SGPB CANNON AFB, NM 88103-5300

Attachment 4

Sample Request Forms

ENVIRONMENTAL SAMPLING DATA

(Use this space for mechanical imprint)

OEHL USE ONLY

SAMPLING SITE IDENTIFIER (AFR 19-7)

BASE WHERE SAMPLE COLLECTED

SAMPLING SITE DESCRIPTION

DATE COLLECTION BEGAN (YYMMDD)

TIME COLLECTION BEGAN (24 hour clock)

COLLECTION METHOD ☐ GRAB ☐ COMPOSITE _____ HOURS

MAIL REPORTS TO (circle if changed)

ORIGINAL	
COPY 1	
COPY 2	

SAMPLE COLLECTED BY (Name, Grade, AFSC)

SIGNATURE

AUTOVON

REASON FOR SUBMISSION E

A-ACCIDENT/INCIDENT
R-ROUTINE/PERIODIC
C-COMPLAINT
N-NPDES
F-FOLLOWUP/CLEANUP
O-OTHER (specify) _____

BASE SAMPLE NUMBER

OEHL PID

ANALYSES REQUESTED (Check appropriate blocks)

	GROUP A		Hardness	00900		Silica	00955		2, 4, 5-T	39740
	Ammonia	00610	Iron	01045		Specific Conductance	00095		2, 4, 5-TP-Silvex	39760
	Chemical Oxygen Demand	00340	Lead	01051		Sulfate	00945			
	Kjeldahl Nitrogen	00625	Magnesium	00927		Surfactans-MBAS	38260			
	Nitrate	00620	Manganese	01055		Turbidity	00076			
	Nitrite	00615	Mercury	71900						
	Oil & Grease	00560	Nickel	01067						
	Organic Carbon	00680	Potassium	00937						
	Orthophosphate	00671	Selenium	01147			GROUP H			
	Phosphorus, Total	00665	Silver	01077		Aldrin	39330			
			Sodium	00929		BHC Isomers	39340			
	GROUP D		Thallium	01059		a-BHC	39337			
	Cyanide, Total	00720	Zinc	01092		b-BHC	39338			
	Cyanide, Free	00722				d-BHC	34259			
						Chlordane	39350		GROUP J	
	GROUP E			GROUP G		DDT Isomers	39370		Sulfides	00745
	Phenols	32730	Acidity, Total	70508		p, p-DDD	39310			
			Alkalinity, Total	00410		p, p-DDE	39320			
	GROUP F		Alkalinity, Bicarbonate	00425		p, p-DDT	39300			
	Antimony	01097	Bromide	71870		Dieldrin	39380		ON SITE ANALYSES	
	Arsenic	01002	Carbon Dioxide	00405		Dursban	77969		PARAMETER	VALUE
	Barium	01007	Chloride	00940		Endrin	39390		Flow 50050	mgd
	Beryllium	01012	Color	00080		Heptachlor	39410		Chlorine, Total 50060	mg/l
	Boron	01022	Fluoride	00951		Heptachlor Epoxide	39420		Dissolved Oxygen 00300	mg/l
	Cadmium	01027	Residue, Total	00500		Lindane	39782		pH 00400	units
	Calcium	00916	Residue, Filterable (TDS)	70300		Methoxychlor	39480		Temperature 00010	°C
	Chromium, Total	01034	Residue, Nonfilterable	00530		Pramitol (Framoton)	XY4200000		Odor 00086	
	Chromium VI	01032	Residue, Settleable	50085		Toxaphene	39400		Iodide 71865	
	Copper	01042	Residue, Volatile	00505		2, 4-D	39730		Sulfite 00740	

REMARKS

ENVIRONMENTAL SA. .LING DATA
(TRACE ORGANIC

(this space for mechanical imprint)

OEHL USE ONL

SAMPLING SITE IDENTIFIER (AFR 19-7)

BASE WHERE SAMPLE COLLECTED

SAMPLING SITE DESCRIPTION

DATE COLLECTION BEGAN (YYMMDD)

TIME COLLECTION BEGAN (24 hour clock)

COLLECTION METHOD

☐ GRAB ☐ COMPOSITE _____ HOURS

MAIL REPORTS TO (circle if changed)

ORIGINAL

COPY 1

COPY 2

SAMPLE COLLECTED BY (Name, Grade, AFSC)

SIGNATURE

AUTOVON

REASON FOR SUBMISSION: E

A-ACCIDENT/INCIDENT
R-ROUTINE/PERIODIC
C-COMPLAINT
N-NPDES
F-FOLLOWUP/CLEANUP
O-OTHER (specify) _____

BASE SAMPLE NUMBER

OEHL PID

ANALYSES REQUESTED (check appropriate blocks)

VOLATILE HALOCARBONS (VOH)	(10860)
PRES GROUP T1	
Volatile Halocarbon Screen	1001460PH
Bromodichloromethane	32101
Bromoform	32104
Bromomethane	34413
Carbon Tetrachloride	32102
Chlorobenzene	34301
Chloroethane	34311
2-Chloroethylvinyl ether	34576
Chloroform	32106
Chloromethane	34418
Dibromochloromethane	32105
1, 2-dichlorobenzene	34536
1, 3-dichlorobenzene	34566
1, 4-dichlorobenzene	34571
Dichlorodifluoromethane	34668
1, 1-dichloroethane	34496
1, 2-dichloroethane	34531
1, 1-dichloroethene	34501
trans-1, 2-dichloroethene	34546
1, 2-dichloropropane	34541
cis-1, 3-dichloropropene	34704
trans-1, 3-dichloropropene	34699
Methylene Chloride	34423
1, 1, 2, 2-tetrachloroethane	34516
Tetrachloroethylene	34475
1, 1, 1-trichloroethane	34506
1, 1, 2-trichloroethane	34511
Trichloroethylene	39180

Trichlorofluoromethane	34488
Vinyl Chloride	39175

TRIHALOMETHANES (THM)	(10860)
PRES GROUP T1	
Trihalomethane Potential	1001465MT
Total Trihalomethanes	82080

VOLATILE AROMATICS (VOA)	(10850)
PRES GROUP T1	
Volatile Aromatic Screen	1001461PA
Benzene	34030
Chlorobenzene	34301
1, 2-dichlorobenzene	34536
1, 3-dichlorobenzene	34566
1, 4-dichlorobenzene	34571
Ethylbenzene	34371
Toluene	34010

MISCELLANEOUS

VOLATILES

PRES GROUP T1

Xylene	81710
Methylethyl ketone	81595
Methylisobutyl ketone	81596
Total organic halides	10021060H

MISCELLANEOUS

EXTRACTABLES

PRES GROUP T4

PCB's	39516
Phthalate Esters Screen	1000069PH
bis (2-ethylhexyl) phthalate	39100
Butyl Benzyl phthalate	34292
Di-n-butyl phthalate	39110
Diethyl phthalate	34336
Dimethyl phthalate	34341
Di-n-octyl phthalate	34596

REMARKS

RADIOLOGICAL SAMPLING DATA

(Use this space for mechanical imprint)

OEHL USE ONLY

WORKPLACE OR SITE IDENTIFIER

BASE

ORGANIZATION

WORKPLACE OR SITE

DATE COLLECTED (YYMMDD)

TIME COLLECTION BEGAN (24 hour clock)

BLDG NO/LOCATION

ROOM/AREA

MAIL REPORTS TO (circle if changed)

ORIGINAL

COPY 1

COPY 2

SAMPLE COLLECTED BY (Name, Grade, AFSC)

SIGNATURE

AUTOVON

REASON FOR SUBMISSION

A-ACCIDENT/INCIDENT
C-COMPLAINT
F-FOLLOWUP/CLEANUP
N-NPDES
R-ROUTINE BACKGROUND/PERIODIC SURVEY
O-OTHER (specify)

EMPLOYEE NAME

EMPLOYEE SSAN

BASE SAMPLE NUMBER

OEHL PID NUMBER (OEHL use only)

COLLECTION METHOD (enter letter code)

C-Composite
G-Grab
V-Single Void
T-24 Hour Void
W-Wipe/Swipe
O-Other

SAMPLE TYPE (enter letter code)

X-Air, Ambient/Gen. Area
Y-Air, Emission, Source
Z-Air, Breathing Zone
B-Blood
O-Biological, Other
F-Food
G-Gas/Air, Compressed
H-Human
M-Industrial Material
R-Nasal Swab
D-Residue/Ash
L-Sludge
S-Soil
W-Surface Contaminant
C-Unclassified/Other
U-Urine
V-Vegetation
T-Waste, Hazardous, Toxic
N-Water, Nonpotable
P-Water, Potable

PRESERVATION GROUP

R1-NITRIC ACID, pH < 2.0 (plastic container)
R2-HYDROCHLORIC ACID, pH < 2.0 (with $Na_2S_2O_3$ in glass container)
ND-NONE

ANALYSES REQUESTED

- [ ] GROSS ALPHA
- [ ] GROSS BETA
- [ ] GAMMA
- [ ] OTHER (specify)
- [ ] CARBON 14
- [ ] TRITIUM
- [ ] URANIUM
- [ ] PLUTONIUM
- [ ] RADIUM
- [ ] RADON
- [ ] STRONTIUM
- [ ] DRINKING WATER STANDARDS (AFR 161-44)

AIR FILTER DATA

COLLECTION TIME min

FLOW RATE

VOLUME COLLECTED

COMMENTS

AF FORM JAN 81 2753

Appendix III

GROUNDWATER ASSESSMENT PLAN OUTLINE

CANNON AIR FORCE BASE
SOLID WASTE MANAGEMENT UNIT (SWMU) 113, CELL 3

Groundwater Assessment Plan Outline

1. **Introduction**. The Groundwater Assessment Plan (GAP) outline for Cell No. 3, Landfill No. 5, Solid Waste Management Unit (SWMU) 113 has been developed to comply with the requirements of 40 CFR 265.93. The GAP will be developed at a later date if contamination from Cell No. 3 is detected in any of the monitoring wells. The GAP will be designed to determine the rate of migration and extent of contamination in the groundwater and the concentration of the contaminants as required by 40 CFR 265.93 (d) (4).

2. **Description of Unit**. Cell No. 3 is part of Landfill No. 5 which occupies about 40 acres in the southeastern part of Cannon AFB. Cell No. 3, which was closed in 1983, received hazardous waste during 1981. No hazardous wastes were placed into the cell between 1981 and 1983. Wastes received at the cell may have included domestic solid waste, waste oils and solvents, paint, paint removers and thinners, pesticide containers,and various empty cans and drums. Currently, Landfill 5 is still an open facility with only construction rubble and tree limbs being placed into an open cell.

3. **Existing Conditions**.

a. **Monitoring Well Network.** There is currently one upgradient well and five downgradient wells at Landfill 5 as

shown on Figure 3.1. Of these wells one, Well J, has the bottom broken out and three others, Wells B, C and D, are only good for, under RCRA, water level measurements. Wells B, C and D have screens set approximately 40 feet below the top of the water table. The upgradient well is acceptable; however, the well screen does not intercept the water table. Two additional wells (L & M) have been installed - downgradient from Cell 3.

b. **Groundwater Conditions.** There has been no indication of groundwater contamination or degradation of groundwater quality in any of the wells which could be attributed to Cell 3, Landfill 5. The first round of wells was set and sampled in 1985. Additional wells have been set and sampling has taken place periodically since 1985.

4. <u>Contamination Detection</u>. A lists of the parameters currently being analyzed for in the Landfill 5 wells are presented in Tables 4.1 and 4.2. In the event that contamination is detected in the groundwater at the site using the comparison procedures described in 40 CFR 265.93 (b), the following actions must take place.

a. **Upgradient wells.** If the comparisons made show a significant increase in values, or pH decrease, this information must be reported in accordance with 40 CFR 265.94 (a) (2) (ii).

b. **Down Gradient Wells.** If the comparisons made show a significant increase in values, or pH decrease, the wells with the increase or decrease must be immediately resampled. The samples will be split and analyzed to determine if the

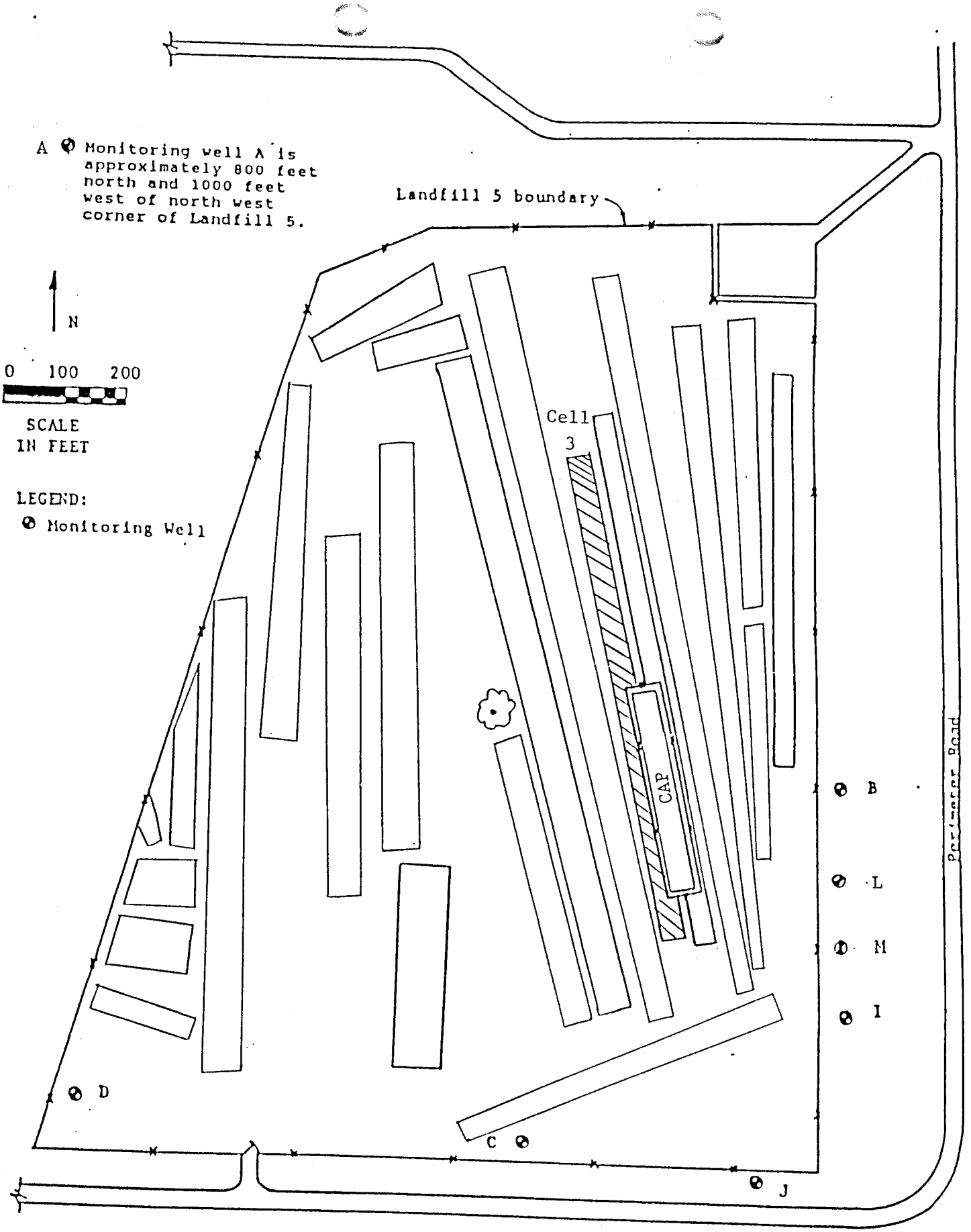


Figure 3.1 - Site Plan

Table 4.1 - Sampling Parameters

Parameter	Method	Container	Preservation
pH (field analysis)	9040	-	-
Temperature (field analysis)	170.1	-	-
Conductivity (field analysis)	9050	-	-
Total Organic Halogen	9020	8 x 130 ml amber glass	H_2SO_4 to pH <2 Cool to 4° C
Total Organic Carbon	415.1	4 x 40 ml amber glass	H_2SO_4 to pH <2 Cool to 4° C
Total Metals	6010, 7060, 7740, 7470	1 liter polyethylene	HNO_3 to pH <2
Phenol	8040	1 Liter glass	H_2SO_4 to pH <2 Cool to 4° C
Pesticides	8080	1 liter amber glass	Cool to 4° C
Herbicides	8150	1 liter amber glass	Cool to 4° C
Cyanide	9010	0.5 liter polyethylene	NaOH to pH >12 Cool to 4° C
Sulfate, Fluoride and Chloride	9035, 340.2, 9250	2 liter polyethylene	Cool to 4° C
Turbidity (field analysis)	180.1	-	-
Nitrate	9200	1 liter Polyethylene	H_2SO_4 to pH <2 Cool to 4° C
Radionuclides	9310	1 liter Polyethylene	None
Coliforms	9131	Polypropylene Thio-bag	Cool to 4° C

Table 4.2 - Appendix IX Sampling Parameters

Parameter	Method	Container	Preservative
Volatile Organics	8240	3 x 40 ml glass septum vials	2 drops HCl each vial Cool to 4° C
Semivolatile Organics	8270	2 x 1 liter amber glass	Cool to 4° C
Total Metals	6010, 7040, 7740, 7470	1 liter polyethylene	HNO_3 to pH <2
Organochlorine Pest/PCBs	8080	2 x 1 liter amber glass	Cool to 4° C
N and P Pesticides	8140	1 liter amber glass	Cool to 4° C
Herbicides	8150	1 liter amber glass	Cool to 4° C

difference was the result of laboratory error. If the resamplingconfirms the significant difference, Cannon AFB must provide written notice, within seven days, to the Regional Administrator of Environmental Protection Agency (EPA) Region VI and the Director New Mexico Health and Environment Department (NMHED) that the facility may be affecting groundwater quality.

5. **Groundwater Assessment Implementation**. Within 15 days of notification of the Regional Administrator EPA Region VI and the Director NMHED, Cannon AFB must develop and submit a specific plan for determining: 1). whether hazardous waste or hazardous waste constituents have entered the groundwater; 2). the rate and extent of migration of the contamination from hazardous waste in the groundwater; and 3). the concentrations of the contamination from hazardous waste in the groundwater. The approved plan must be implemented

a. The plan must be certified by a qualified geologist or geotechnical engineer.

b. The plan must include as a minimum:

1). The number, location, and depth of planned new wells.

2). Sampling and analytical methods for those hazardous wastes or hazardous waste constituents in the facility.

3). Evaluation procedures, including any use of previously gathered groundwater quality information.

4). A schedule of implementation.

6. **Groundwater Assessment Report**. Cannon AFB will make a determination regarding the extent of contamination as soon as technically feasible. Within 15 days of that determination a written report will be submitted to the Regional Administrator of EPA Region VI and the Director NMHED detailing the results of the assessment.

a. **No Contamination Scenario.** In the event that no hazardous waste or hazardous waste constituents from the facility have been found to have entered the groundwater, the facility groundwater monitoring program may be returned to its original status. The Regional Administrator of EPA Region VI and the Director NMHED must be notified in the Groundwater Assessment Report of the return to the original monitoring program.

b. **Contamination Scenario.** In the event that contamination from the facility is determined to be present in the groundwater, quarterly determinations must continue to be made under the provisions of 40 CFR 265.93 (d) (4) until final closure of the facility.

SUMMARY OF FIELD ACTIVITIES
SANITARY LANDFILL 5, CELL 3

1. Purpose:

To determine the areal extent of Cell 3 by excavating trenches in both the East-West and North-South directions.

2. Background:

Between Tuesday, 14 January 1992 and Friday, 17 January 1992 Cannon AFB had a contractor excavate Cell 3 of the Sanitary Landfill 5. Located in the southeastern corner of the base, the landfill has received waste before and after introduction of the "land ban" regulations.

3. Method:

In order to develop an accurate mapping for Cell 3, a series of trenches was dug (see figure 1). The first trench ran North-South and delineated the suspected North and South boundaries. The remaining trenches were dug perpendicular to the North-south trench at various points along its length. These trenches were used to determine the dates when Cell 2, Cell 3, and Cell 4 were used.

4. Results of Investigation:

Excavating to an average depth of 13 feet, Cell 3 was found to contain alternating layers of trash and soil. Typically, the layers of trash were 1 to 2 feet thick and separated by 6 to 12 inches of soil. A top, cover soil 2 to 3 feet thick was placed over the final trash layer. The slope at each end of the North-South trench was found to be 3.5 Horizontal: 1 Vertical (figure 2). The trash consisted mainly of household refuse and office waste and the cell appeared to be filled starting at the South end and working North. Tires and other automotive items were occasionally observed.

In addition to the general layering of trash, a thin layer of trash, 6 to 12 inches thick, was found just below the surface. This veneer of trash was probably placed after the entire cell had been covered.

Based on the trenching the following conclusions were made:

Cell 3

Location		See figure 1
Dimensions	Length	800 feet
	Width	50 feet
Dated Material		1980
Layers	Trash	1 to 2 feet/layer
	Soil	6 to 12 inches/layer
	Surface Cover	3 feet
Slope	North End	3H:1V (Estimated)
	South End	3.5H:1V (Calculated)

Cell 4

Location	East of Cell 3
Separation	10 foot clay layer
Dated Material	1979

Cell 2

Location	West of Cell 3
Separation	10 foot clay layer
Dated Material	1978

CANNON AFB
LANDFILL 5, CELL 3

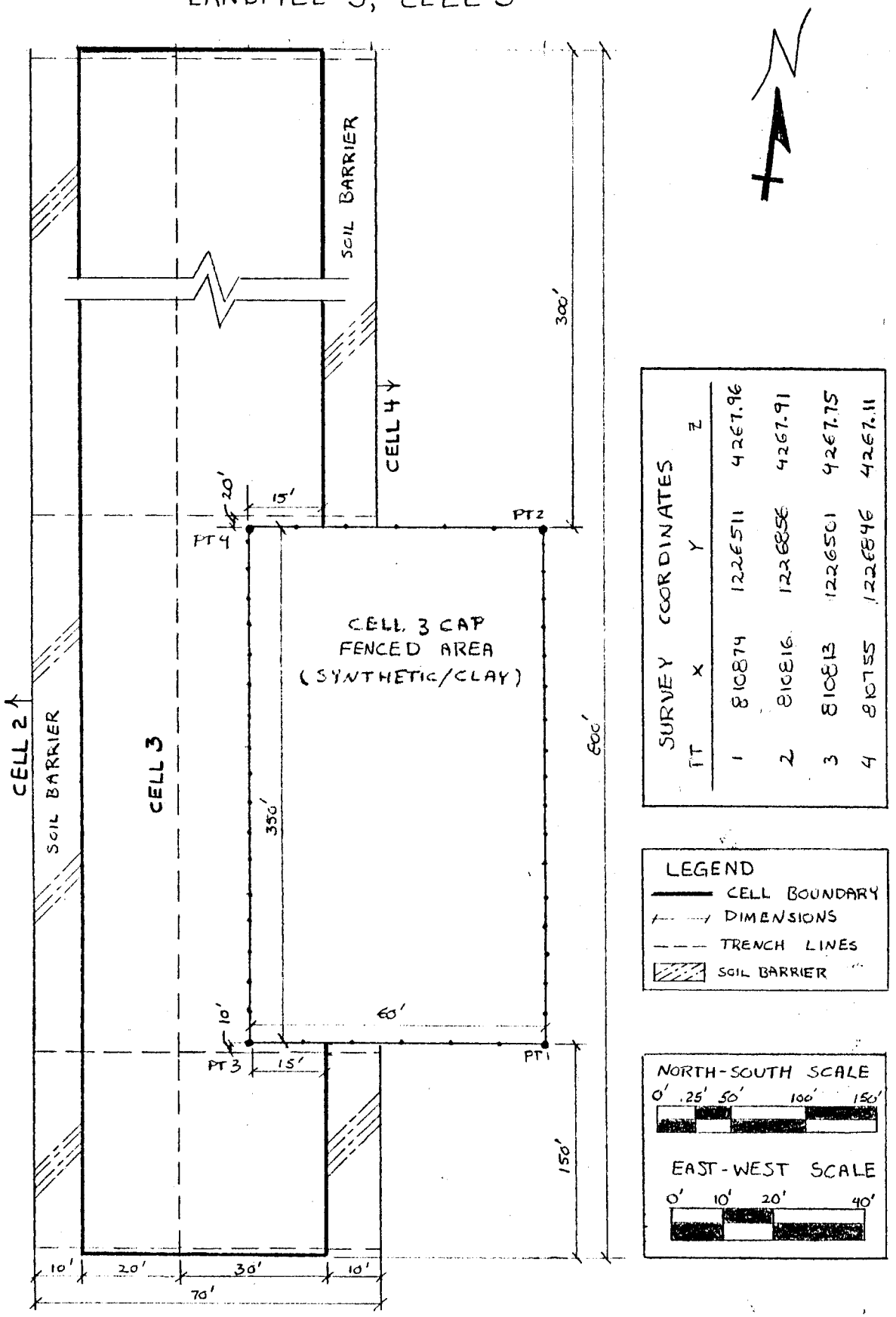
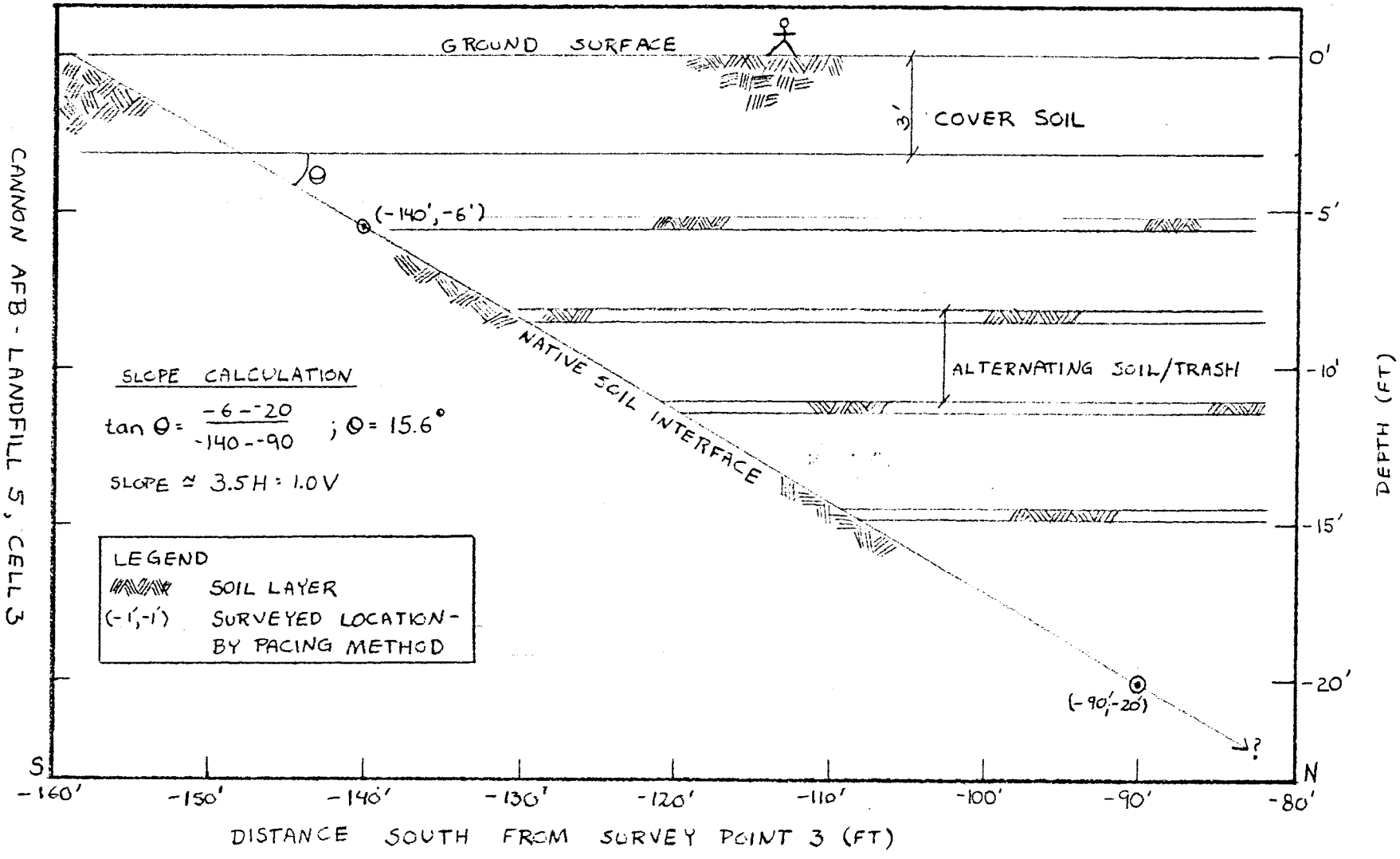


Figure 1

Figure 2

CANNON AFB - LANDFILL 5, CELL 3

PARTIAL CROSS SECTION