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EG&G - ROCKY FLATS PLANT
ENVIRONMENTAL MANAGEMENT
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DOCUMENT CLASSIFICATION REVIEW WAIVER
PER R.B. HOFFMAN, CLASSIFICATION OFFICE
JUNE 11, 1991

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	Earth Work Plan and Details D 27038-3	A	03/06/74
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APPG	Historical Air Quality Data for OU-6	0	06/01/92
*APPH	Appendix H Technical Memorandum No. 1	0	02/08/93

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DOCUMENT NUMBER Manual No. 21100-WP-OU6.01, Section 7.0, Rev. 0

TITLE	DATE	DCN NUMBER
Section 7.0, Field Sampling Plan	2-5-93 ~~February 1, 1993~~	93.03

EXPIRES: ~~Upon Incorporation~~ 2/3/93 2/5/94 Procedure Revision Required [ ] Yes [X] No

SCOPE LIMITATION: None

Item Number	Page	Step or Paragraph	Changes (Use DCN CONTINUATION SHEET for additional space)
(1)	Page 7-20	Section 7.2.3, Stage 1, Paragraph 2	Delete the fourth sentence of the paragraph: 'One sample will be collected from the top of the prefill surface to 2 inches below the prefill surface (discussed previously).' Revise the fifth sentence to read "One sample will be collected from the top of the prefill surface to 24 inches below the prefilll surface."

Justification (Reason for change - Provide numbers to reference corresponding items above.)

The referenced sentence that is deleted describes surface soil sampling that is previously described as the confirmatory surface soil characterization data in the first paragraph of Stage 1, and is not applicable to a sample being collected at some depth below the surface. As described in the fifth sentence, samples will be collected from the top of the prefill surface to 24 inches below the prefill surface to characterize contamination in the soils of the Old Outfall.

Concurrence	Organization	Req.	Date	Concurrence	Organization	Req.	Date
	QAPM	X	2/03/93		User		2/2/93

13. Approval of Responsible Manager	14. Date	15. Is Posting Required	16. If Yes, by what date	17. Date Posted
	2/2/93	yes	upon receipt	

(4036-111)(02-01-93)SMB

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JUNE 11, 1991

APPENDIX H
TO

PHASE I RFI/RI WORK PLAN
OPERABLE UNIT 6

TECHNICAL MEMORANDUM NO. 1

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Category NSR

Approved By:

Work Plan Manager — Date 2/3/93

Division Manager — Date 2/3/93

Environmental Quality Support Manager — Date 2/4/93

Effective Date: 2/8/93

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Well Logs

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REVIEWED FOR CLASSIFICATION/UCNI
By C. M. Pascua UNU
Date 2-8-93

1.0 INTRODUCTION

The purpose of this Technical Memorandum is to eliminate unnecessary effort presently specified in the Interagency Agreement (IAG) and/or the OU 6 Work Plan. Additionally, surface water sampling along streams and surface water flow measurements at gauging stations are proposed to enhance the Human Health Risk Assessment and contaminant fate and transport modeling which will be provided in the RFI/RI report.

2.0 BEDROCK MONITORING WELLS

The five bedrock monitoring wells specified in Section 7.2.2 Stage 3 - Monitoring Wells, OU 6 Work Plan are to be deleted. The alluvium and bedrock in the vicinity of the ponds have been adequately characterized by ten borings and monitoring wells along the A series ponds and by eight borings and monitoring wells along the B series ponds (Figure 1).

Examination of the well logs in the Appendix shows occurrence of discontinuous sand lenses scattered among 7 of the 18 borings and monitoring wells. Of those seven occurrences of san lenses, monitoring wells intersect five. Sands were logged in borings TH046792 and TH046892 but did not occur in four adjacent borings (two near each location). Each sand lense that has been encountered has several, or all of the following attributes:

Minimal thickness
Very fined grained with a high clay content
Overlain by clay
Discontinuous

Information in Table 1 shows that the 18 existing borings and monitoring wells have penetrated to a sufficient depth below the ponds to provide data for the evaluation of the sediments and bedrock beneath the ponds. Although ponds B-2 and B-4 do not have borings immediately adjacent, three borings near B-1 extend from seven to eleven feet below B-2 and three borings near B-3 extend three to eleven feet below B-4.

3.0 ALLUVIAL MONITORING WELLS

A single alluvial monitoring well will be installed immediately downstream of each dam at ponds A-4 and B-5 as opposed to the two that are specified for each dam in Section 7.2.2 Stage 3 of the Work Plan. Two wells would provide redundant sampling of groundwater.

The two wells would be in the same drainage and would likely be drilled through the same lithology. Groundwater samples would be obtained from the same aquifer in essentially the same area.

SUMMARY OF BORINGS NEAR PONDS

Table 1

POND	POND BOTTOM ELEVATION (ft)	BOTTOM OF BORING (ft)	BORING INTERVAL BEYOND BOTTOM OF POND (ft)	BORING ID
A-1	5823	5822	1	13-86
A-2	5799	5791	8	40991
A-3	5776	5762	14	12-86
		5759	17	TH046192
		5750	26	TH046292
		5758	18	TH046392
		5749	27	TH046492
A-4	5731	5697	34	11-86
		5707	24	41091
		5714	17	38-86
B-1	5875	5872	3	36-86
		5853	22	TH046592
		5849	26	TH046692
		5852	23	TH046792
B-2	5860	N/A	-	-
B-3	5846	5830	16	TH046892
		5825	21	TH046992
		5822	24	TH047092
B-4	5833	N/A	-	-
B-5	5773	5779	-6	37-86

Data for the above table were obtained from: Work Plan for Geotechnical Analysis of Earthen Dams B-1, B-2, A-3 and Landfill Dam, EG&G Rocky Flats, July 29, 1992 and Geologic Characterization Report, Appendix G, EG&G Rocky Flats, September 1992.

A bedrock monitoring well will be nested with the single alluvial well if sandstone is encountered within the first bedrock unit, as required in the Work Plan. The wells will be installed as specified in the Work Plan.

4.0 AMBIENT AIR MONITORING STATIONS

The three proposed ambient air samplers specified in Section 7.2.9 of the Work Plan are deleted. Short term and worker protection air sampling will be performed as indicated in the Plan for Prevention of Contaminant Dispersion (PPCD) and site specific health and safety plans.

Baseline ambient data for this OU will be obtained from the existing plant site Radiological Ambient Air Monitoring Program (RAAMP), which includes samplers in the Walnut Creek drainage and units at downwind locations S-35, S-36, S-37, S-38, and S-39 (Figure 2). In addition to the RFP sampling effort, CDH operates ambient air samplers in the vicinity of this OU and at downwind locations (D-5, D-6, E-2 and E-3, X-1 and X-2). Data from these sources will be used to evaluate the radioactive ambient emissions and perform an air pathway analysis.

5.0 SURFACE WATER SAMPLING ALONG STREAMS

Surface water and sediment sampling stations selected jointly by EG&G, DOE-RFO, CDH, and USEPA in a field reconnaissance meeting will replace those specified or implied in the Work Plan for IHSS142. The sampling stations will be located at positions along the Walnut Creek drainage and at positions immediately downstream from significant tributaries. By sampling major tributaries to Walnut Creek and locations where the tributary water is mixed with the main stream water, contaminant loading through the Walnut Creek drainage will be readily quantified. The surface water quality and discharge data collected at each stations will be used to identify stream segments where contaminants potentially are loaded into Walnut Creek.

The selected sampling stations are either presently monitored under existing storm water monitoring programs or were once part of the site-wide monitoring program. The site-wide monitoring program provided data for assessing the nature and extent of contamination in surface water and sediments at the RFP, but fate and transport were not addressed.

The approach to the entire OU6 surface-water and sediment investigation is to quantify physical and chemical processes by which potential contaminants are transported through the Walnut Creek watershed. The results of this mechanistic study will provide a data set and corresponding interpretation for risk assessment.

To adequately characterize the Walnut Creek Drainage, surface water samples will be obtained concurrently with sediment samples from the streams and at gauging stations shown on Figure 3. Contemporaneous flow measurements, and aquatic toxicity samples will also be obtained.

One sediment sampling event and two water sampling events will take place. One of the water sampling events will be during base flow conditions in the areas where flowing water can be measured and sampled. The second water sampling event will take place during a storm event or substantial snow melt of sufficient magnitude to provide measurable runoff. The sediment sampling event will be performed during the base flow conditions.

Surface water and sediment sampling will be performed according to EMD Operational Procedures Manual No. 5-21000-OPS-SW Volume IV: Surface Water. The sampling locations and the data to be acquired are summarized in Table 2.

The water and sediment samples will be analyzed according to Table 7-11 of the Work Plan following the EG&G General Radiochemistry and Routine Analytical Services Protocol (GRAASP). In order to augment the toxicity data, water samples will also be analyzed for the following parameters according to GRAASP:

Dissolved Organic Carbon
Alkalinity
Sulfate
Chloride
Bicarbonate
Silicon

Toxicity Screens will be performed according to Methods for Measuring the Acute Toxicity of Effluent to Freshwater and Marine Organisms, USEPA 600/4-85/013, March 1985 and Requirements for Whole Effluent Toxicity Testing, EG&G Rocky Flats, EMD, September 1992.

6.0 RADIATION SURVEY

The OU 6 Work Plan requires that a radiation survey be performed over IHSS 165, the Triangle Area (Figure 7-1 of the Work Plan). The radiation survey will be limited to the eastern most portion of the IHSS which is located east of the PSZ fence where the soil is not covered with gravel.

The remainder of IHSS 165 is covered with gravel. The gravel has been compacted and there are no noticeable voids within the covered area. Compacted gravel of minimal thickness forms an effective barrier to gamma radiation. Therefore, a radiation survey over the gravel covered area would be futile and costly.

IHSS 165 has had radionuclide contaminated soil excavated and removed from the area. The last known excavation of contaminated soil in IHSS 165 occurred during 1973 and perhaps 1974. A radiation survey (FIDLER) performed in April 1975 indicated no hot spots and no contaminated soil (Historical Release Report, June 1992).

Walnut Creek Characterization

Data Acquisition

Table 2

Station ID	Flow Measurement	Water Chemistry	Sediment Chemistry	Aquatic Toxicity
SW116	SB	SB	B	SB
SW118	SB	SB	B	SB
SW093	SB	SB	B	SB
GS13	SB	SB	B	SB
SW091B	SB	SB	B	SB
GS12	SB	SB	B	SB
GS11	SB	SB	B	SB
GS03	SB	SB	B	SB
GS09	SB	SB	B	SB
GS10	SB	SB	B	SB
SW103	B	B	B	SB
SW022	SB	SB	B	SB
#1	SB	SB	B	SB
#2	SB	SB	B	SB
#3	SB	SB	B	SB

S = Storm event or pond discharge event sampling.

B = Base flow sampling if sufficient water exists.

The gravel was placed sometime after 1978. A FIDLER survey on a 100 foot grid, performed over the gravel for the purpose of clearing the soil gas survey probe locations, was performed during October 1992. The survey showed no radioactivity above background. Because of the contaminated soil removal (and implied placement of uncontaminated fill), the gravel covering, and the negative results of the radiation surveys, it is doubtful that an additional radiation survey would provide evidence of surficial radiation.

The potential for radiation contamination beneath the gravel, and outside of the excavated areas will be addressed by sampling from four random soil cores and nine soil borings as specified in the Work Plan. Although the nine soil borings will be located based upon the results of the soil gas survey; the contaminants were mixed waste and likely followed similar paths.

The Work Plan specifies that six to fifteen surface soil samples be collected. To supplant the lack of a radiation survey, fifteen samples will be collected at random grid nodes of a 70 foot grid over the portion of the IHSS that are outside of the Protected Security Zone (PSZ). The 70 foot grid cell size is estimated to provide approximately 50 grid nodes on which the fifteen soil sample locations will be randomly distributed. The soil samples will be obtained from native soil beneath the gravel and/or identifiable fill material. The samples will be collected according to SOP GT,08 and analyzed as specified in Table 7-11 of the Work Plan.

7.0 ALTERNATE RADIATION SURVEY INSTRUMENT

Presently the Work Plan specifies that an HPGe instrument be used for all the radiation surveys. The HPGe is a replacement for the FIDLER instrument originally specified. Although the HPGe is the preferred instrument it may be necessary to substitute the FIDLER instrument to avoid delays. In the event that the FIDLER instrument be used the grid spacing will be reduced to 25 feet. Either instrument will provide the Level 2 EPA data quality objectives.

APPENDIX 1

Boring and Monitoring Well Logs

Log No. 11-86	2 pages	Dated	9/5/86
Log No. 12-86	2 pages		9/6/86
Log No. 13-86	2 pages		8/20/86
Log No. 36-86	2 pages		8/25/86
Log No. 37-86	2 pages		9/22/86
Log No. 40991	2 pages		11/11/91
Log No. 41091	2 pages		11/11/91
Log No. 38-86	2 pages		9/8/86
Log No. TH046192	1 page		10/2/92
Log No. TH046292	2 pages		10/5/92
Log No. TH046392	1 page		10/1/92
Log No. TH046492	1 page		10/26/92
Log No. TH046592	2 pages		10/7/92
Log No. TH046692	3 pages		10/6/92
Log No. TH046792	1 page		10/22/92
Log No. TH046892	2 pages		10/13/92
Log No. TH046992	2 pages		10/12/92
Log No. TH047092	1 page		10/23/92

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 15	GROUND ELEVATION (FT)	5712.19	PROJECT NUMBER	667.11	LOG OF BORING NUMBER
NORTH:	753323	AREA BUFFER EAST	CASING DIAMETER (IN)	2 ID	GEOLOGIST:	DCB	11-86
EAST:	2090035	LOCATOR NUMBER R13	BOREHOLE DIAMETER (IN)	7.5	DATE DRILLED:	9/05/86	

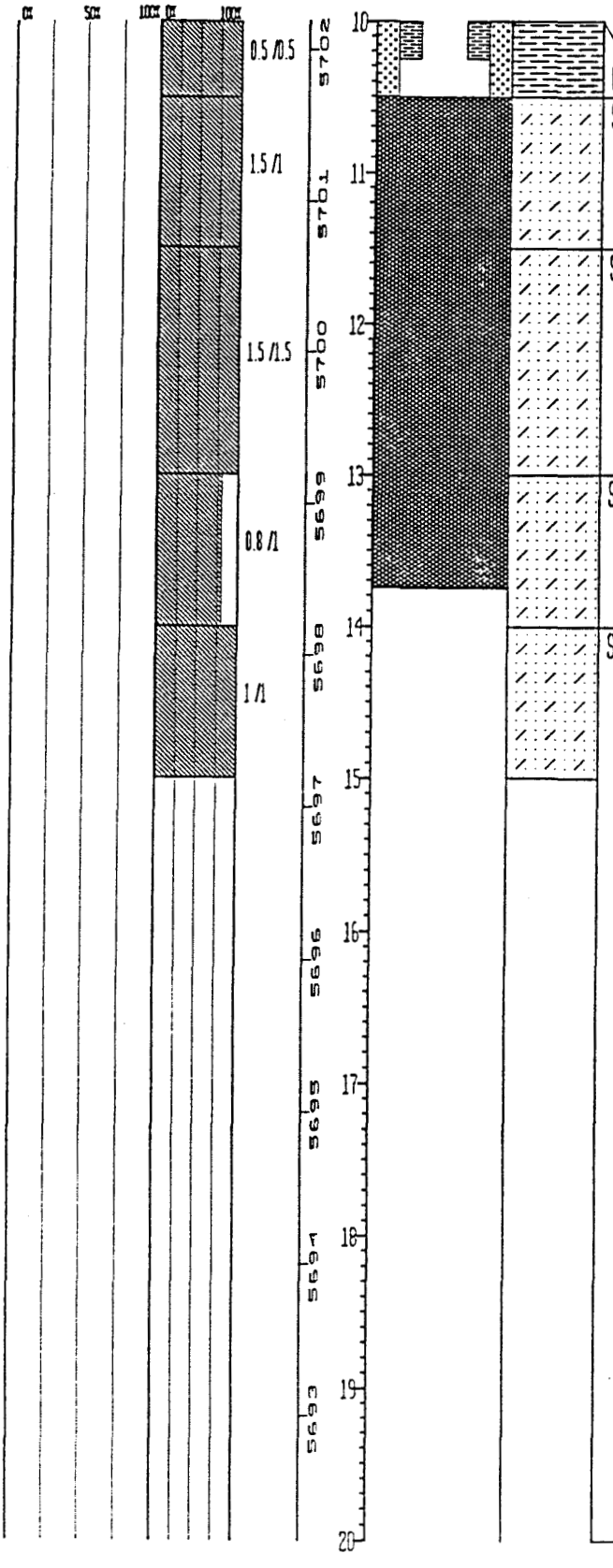
REMARKS: Hollow Stem Auger.

SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
			2/2	5712	0			CH:	Clay, pale brown, (5YR 5/2), high plasticity, some silt and roots.
			1/1	5711	1			GC:	Clayey Gravel, dominantly light grey (N7), matrix is pale brown (5YR 5/2), sub-angular, moderately graded, max. size, 4 cm., some silt, trace of roots.
			0.3/4.2	5710	2			GC:	1 cobble, very light gray (N7), rounded, approx. 7 cm. diam. NOTE: Lithology is inferred.
			0.8/0.8	5709	3			CL:	GRAVELLY CLAY, dark yellowish brown (10YR 4/2), moderate to low plasticity (est.), some silt, trace of sand.
			0/0.5	5708	4			NO SAMPLE:	
			0.5/1	5707	5			CL:	CLAY, dark yellowish brown (10YR 4/2) moderate plasticity, some silt, color grades to yellowish grey (5 YR 7/2) below 9.5 ft.
			0.5/0.5	5706	6			CLAYSTONE:	Top of Bedrock Dark yellowish brown (10YR 4/2) moderate plasticity, some silt, color
				5705	7				
				5704	8				
				5703	9				
					10				

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 15	GROUND ELEVATION (FT)	5712.19	PROJECT NUMBER	667.11	LOG OF BORING NUMBER
NORTH	753323	AREA BUFFER EAST	CASING DIAMETER (IN)	2 ID	GEOLOGIST	DCB	11-86
EAST	2090035	LOCATOR NUMBER R13	BOREHOLE DIAMETER (IN)	7.5	DATE DRILLED	9/05/86	

REMARKS: Hollow Stem Auger.

GRADATIONAL SAMPLE DEPTH | SAMPLE NUMBER | SAMPLE GRAIN SIZE (0% 50% 100%) | PERCENT RECOVERY (0% 100%) | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION



grades to yellowish gray (5 YR 7/2) below 9.5 ft.

CLAYSTONE: Same as above

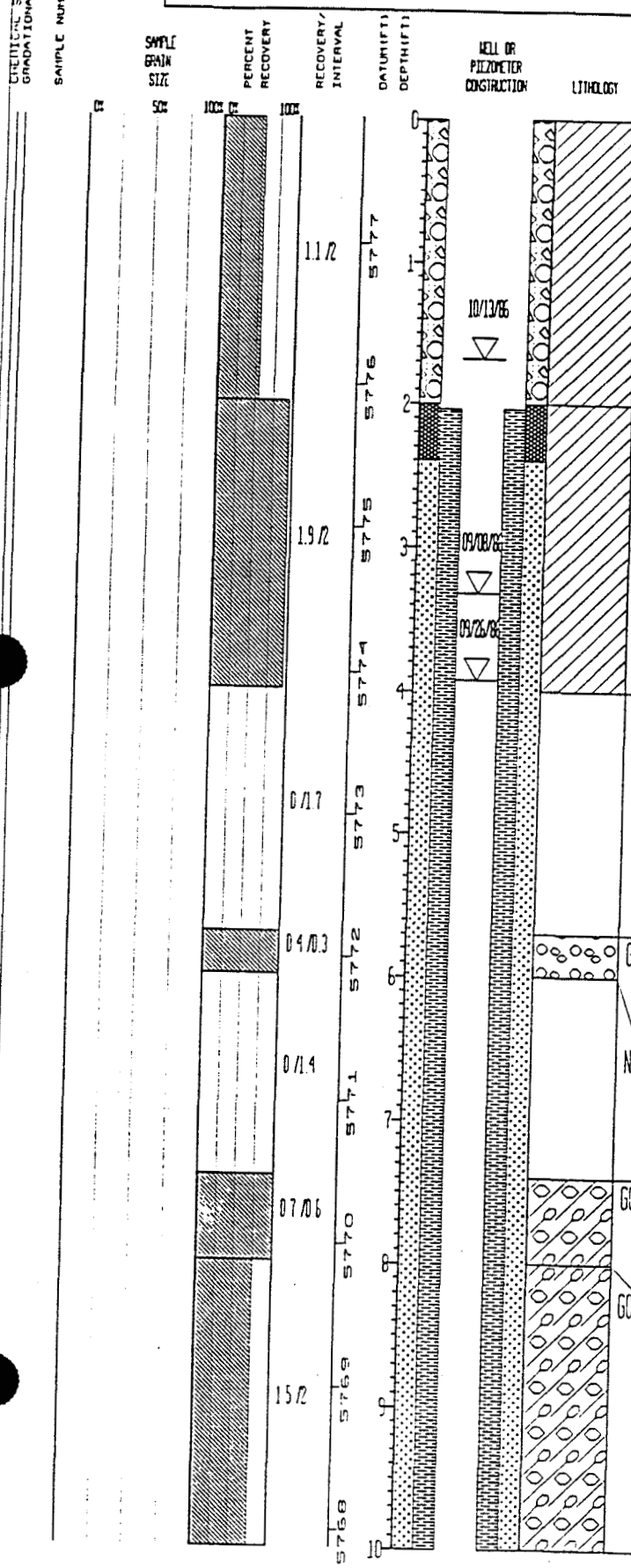
SILTY SANDSTONE: Interval grades to Silty Sandstone, very light gray (N8), bedding not apparent, well weathered, moderate to slightly friable, very fine grained sand, abundant silt, iron staining both locally and on fractures.

SILTY SANDSTONE: Same as above.

SILTY SANDSTONE: Same as above.

SILTY SANDSTONE: Same as above.
NOTE: No water encountered while drilling.

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 16	GROUND ELEVATION (FT)	5777 86	PROJECT NUMBER	667 11	LOG OF BORING NUMBER
NORTH	752345	AREA BUFFER EAST	CASING DIAMETER (IN)	2 ID	GEOLOGIST	LAA	12-86
EAST	2087894	LOCATOR NUMBER 012	BOREHOLE DIAMETER (IN)	7 1/4	DATE DRILLED	09/06/86	
REMARKS	Hollow Stem Auger						



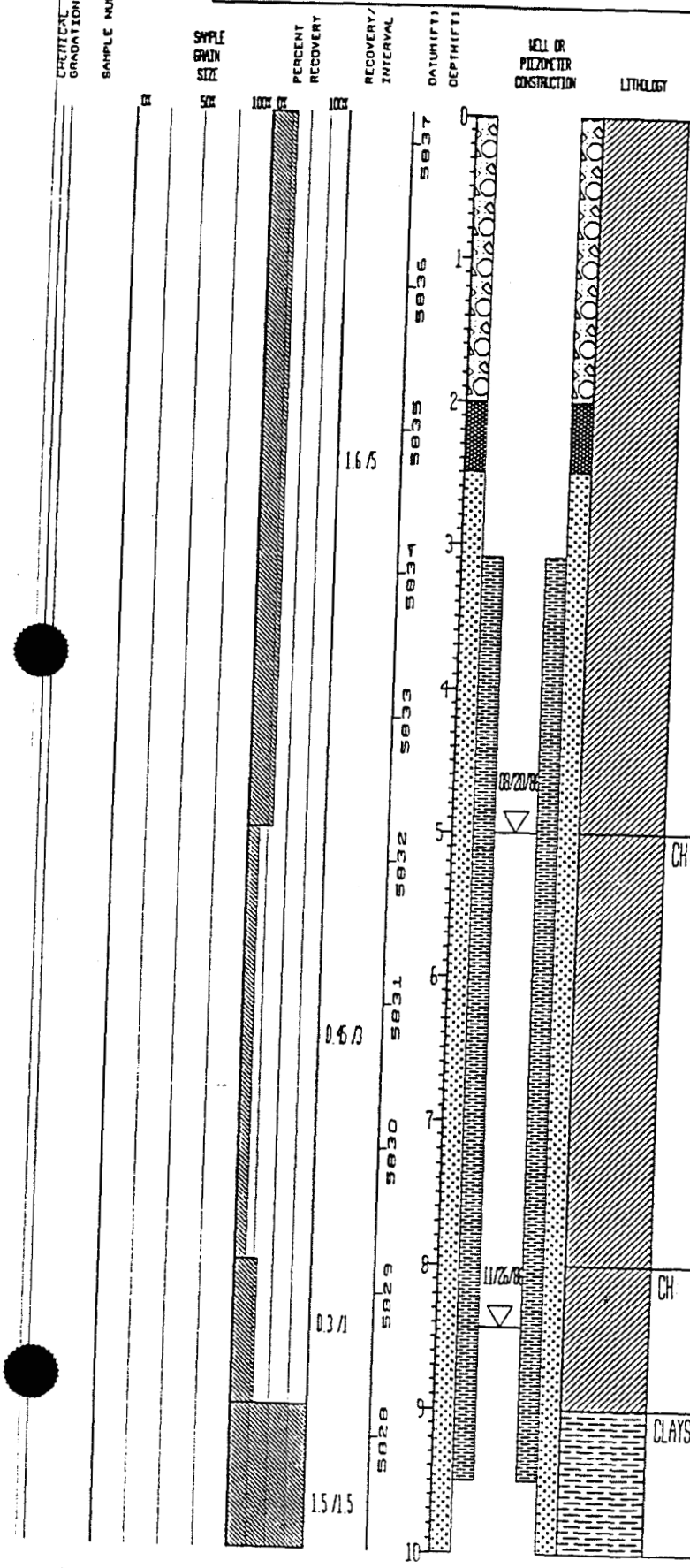
UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CL	SILTY CLAY, dark yellowish brown (10 YR 4/2), est plast mod Abundant surficial grass and root material Some VF to FG sand
CL	SILTY GRAVELLY CLAY, dark yellowish brown (10 YR 4/2), est plast mod Gravel angular to sub-rounded, mod. well graded, (1 cm to 5 cm), some spotty iron staining. More gravel toward bottom. Trace root material
NO SAMPLE	
GW	Clayey Gravel, cannot determine gravel color. Mod. well graded granules to 6.5 cm sub-angular to sub-rounded Matrix mod. yellowish brown (10 YR 5/4) Some silt
NO SAMPLE	
GC	Clayey Gravel, no predom gravel color Angular to sub-angular Poorly graded Max size 5 5 cm Matrix dark yellowish brown (10 YR 4/2). Some silt and VFG sand
GC	Clayey Gravel, no predom gravel color sub-angular to rounded Mod well graded Granules to 6 cm Matrix grayish orange (10 YR 7/4) Est plasticity mod to high Some silt and sand VFG to VCG

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 16	GROUND ELEVATION (FT)	5777 88	PROJECT NUMBER	667 11	LOG OF BORING NUMBER
NORTH	752345	AREA BUFFER EAST	CASING DIAMETER (IN)	2 ID	GEOLOGIST	LAA	12-86
EAST	2087894	LOCATOR NUMBER 012	BOREHOLE DIAMETER (IN)	7 1/4	DATE DRILLED	09/06/86	
REMARKS	Hollow Stem Auger						

CHEMICAL STRIP / GRADATIONAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		0% 50%	100% 0% 100%	14/1	5767	10			GC	Clayey Gravel, no predom. gravel color sub-angular to rounded Mod well graded Granules to 6 cm. Matrix grayish orange (10 YR 7/4) Est. plast. mod., some silt and sand, VFG to VCG
				14/1	5766	11			SILTY CLAYSTONE	Top of Bedrock Light olive gray (5 Y 6/1) to dark yellowish orange (10 YR 6/6) Est. plast. mod. Possible highly weathered claystone Some iron staining.
				15/2	5765	12			SILTY CLAYSTONE	Same as above.
				19/2	5764	13			CLAYSTONE	Light brownish gray (5 YR 6/1) to light brown (5 YR 5/6). Est plast mod. to high. Some iron staining and iron concretions Some carb. material.
					5763	14				
					5762	15				
					5761	16				
					5760	17				
					5759	18				
					5758	19				
						20				

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 15.5	GROUND ELEVATION (FT)	5837.22	PROJECT NUMBER	667.11	LOG OF BORING NUMBER
NORTH	751869	AREA SOLAR POND	CASING DIAMETER (IN)	2 ID	GEOLOGIST	DCB	13-86
EAST	2086055	LOCATOR NUMBER N11	BOREHOLE DIAMETER (IN)	7 1/4	DATE DRILLED	08/20/86	

REMARKS: Hollow Stem Auger



CH:	Clay, light brownish gray (5 YR 6/1), moderately high plasticity, some sand and gravel.
CH:	Same as above. Two larger pebbles occur at approx. 7.8 ft.
CH:	Clay, light gray (N 7), high plasticity, some silt, possibly highly weathered bedrock
CLAYSTONE:	Top of Bedrock Light gray (N 7), high plasticity, some silt, possibly highly weathered bedrock.

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 15.5	GROUND ELEVATION (FT)	5837.22	PROJECT NUMBER	667.11	LOG OF BORING NUMBER
NORTH	751869	AREA SOLAR POND	CASING DIAMETER (IN)	2 ID	GEOLOGIST	DCB	13-86
EAST	2086055	LOCATOR NUMBER N11	BOREHOLE DIAMETER (IN)	7 1/4	DATE DRILLED	08/20/86	

REMARKS: Hollow Stem Auger.

CHEMICAL SAMPLE DEPTH / GRADATIONAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% – 50%)	PERCENT RECOVERY (100% OR – 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				1.7/2.5	5827	10			CLAYSTONE	Same as above.
					5826	11				
					5825	12				
				2.5/2.5	5824	13			CLAYSTONE	Moderate yellowish brown (10 YR 5/4), moderate plasticity, some silt, some iron staining locally. Silt fraction increases at 13.0 ft.
					5823	14				
					5822	15				
					5821	16				
					5820	17				
					5819	18				
					5818	19				
						20				

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 10.2	GROUND ELEVATION (FT)	5881.94	PROJECT NUMBER	667.11	LOG OF BORING NUMBER
NORTH:	750397	AREA EAST TRENCHES	CASING DIAMETER (IN)	2 ID	GEOLOGIST:	DAT	36-86
EAST:	2066819	LOCATOR NUMBER: N10	BOREHOLE DIAMETER (IN)	7.25	DATE DRILLED	08/25/86	

REMARKS: Hollow Stem Auger.

SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
			0.3/0.3	5881	0			CH:	Sandy Clay, Pale yellowish brown (10 YR 6/2), mod-high plast., some roots, trace of gravel, slightly calc.
			1.8/4	5880	2			CL:	SANDY CLAY, multicolored- grayish brown (5 YR 3/2), moderate yellowish brown (10 YR 5/4), light gray (N8), mod. plast., some calc. material, trace of gravel increasing to some gravel at bottom of interval, bottom 2 in. with abundant iron staining and concretions, some iron staining in top part of interval.
			0.3/1	5877	5			CL:	Same as above; floury texture.
			0.25/0.2	5876	6			CL:	Same as above.
			2.9/2.2	5875	7			CLAYSTONE:	Top of Bedrock Light olive gray (5 Y 8/1), est. mod. plast., some calc. material, some iron staining as mottles, trace of sand.
			0.8/0.3	5874	8			CLAYSTONE:	Same as above, slightly calcitic.
			1.6/1.2	5873	9			CLAYSTONE:	Same as above; yellowish gray (5 Y 8/1), some silt, some VFG sand, floury texture, increased iron staining.
			1.4/1	5872	10			CLAYSTONE:	Same as above.

STATE PLANE COORDINATE	TOTAL DEPTH (FT) 10.2	GROUND ELEVATION (FT)	5881.94	PROJECT NUMBER	667.11
NORTH: 750397	AREA EAST TRENCHES	CASING DIAMETER (IN):	2 ID	GEOLOGIST:	DAT
EAST: 2086819	LOCATOR NUMBER: N10	BOREHOLE DIAMETER (IN):	7.25	DATE DRILLED:	08/25/86
REMARKS: Hollow Stem Auger.					

LOG OF BORING NUMBER

36-86

GRADATIONAL SCALE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		0% 50%	100% 0% 100%		5871	10				
					5870	11				
					5869	12				
					5868	13				
					5867	14				
					5866	15				
					5865	16				
					5864	17				
					5863	18				
					5862	19				
						20				

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 13	GROUND ELEVATION (FT)	5792.02	PROJECT NUMBER	667.11	LOG OF BORING NUMBER
NORTH:	751563	AREA: BUTTER EAST	CASING DIAMETER (IN):	2.10	GEOLOGIST:	LAA	37-86
EAST:	2088862	LOCATOR NUMBER: P11	BOREHOLE DIAMETER (IN):	7.5	DATE DRILLED:	09/22/86	
REMARKS: Hollow Stem Auger.							

GRADATIONAL SCALE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				1.85/2	5792	0			CH:	Silty Clay, pale yellowish brown (10 YR 6/2), Est. plast. mod. to high, some roots and grass, trace gravel, granule size
				1.75/1	5791	1			CL:	Same as above, with color change to dusky yellowish brown (10 YR 2/2). Trace roots.
				0.2/1	5790	2			CH:	Silty Clay, olive gray (5 Y 4/1). Est. plast., mod.-high, some sand VFG to FG.
				2.35/2	5789	3			CL:	SANDY CLAY, olive gray (5 Y 4/1) and dark yellowish orange (10 YR 6/6). Mottling. Est. plast. mod., sand VFG to CG, Trace gravel to 3.5cm, trace CaCO3.
				0.8/1.5	5788	4			CL:	Same as above, lg. piece of gravel 6.5cm.
				0.8/0.5	5787	5			CLAYSTONE:	Top of Bedrock. Same as above, some CaCO3.
				0.9/2	5786	6			CLAYSTONE:	Same as above, some CaCO3.
					5785	7			CLAYSTONE:	Same as above, no gravel.
					5784	8				
					5783	9				
						10				

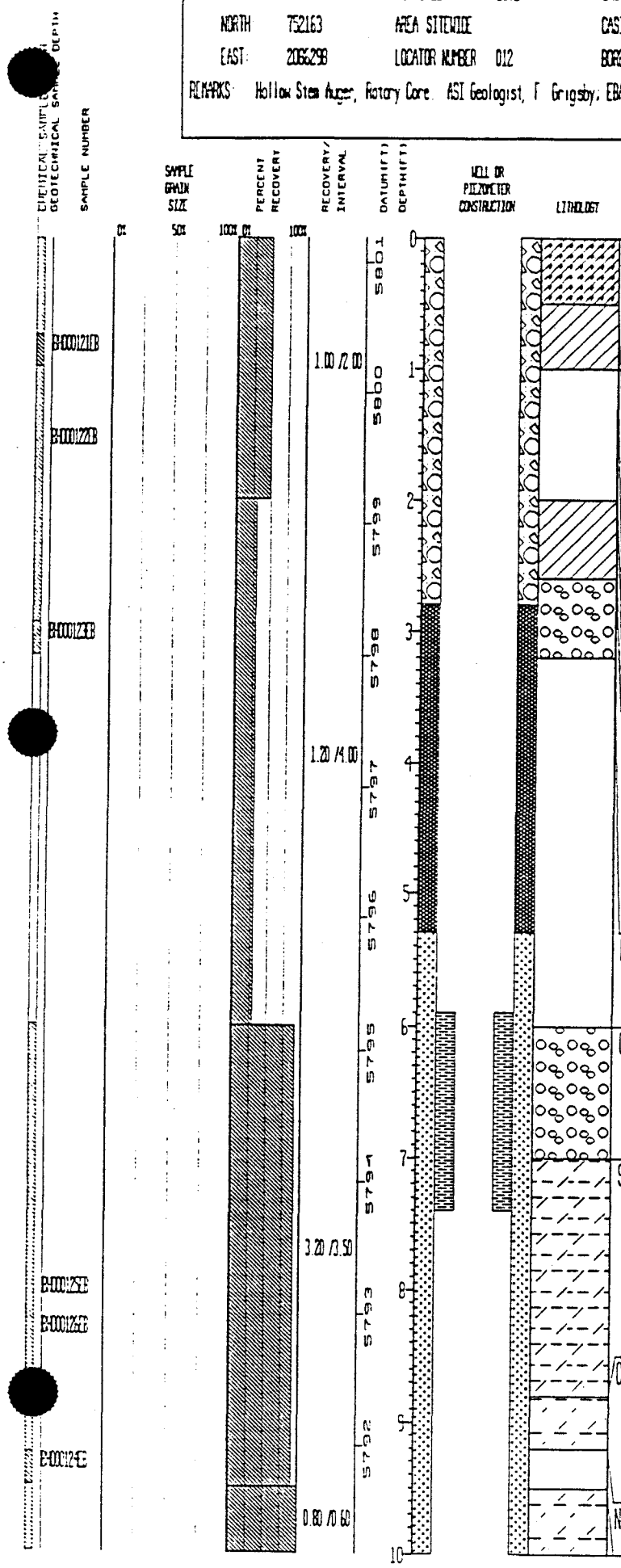
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 13	GROUND ELEVATION (FT)	5792.02	PROJECT NUMBER	667.11	LOG OF BORING NUMBER
NORTH	751563	AREA BUFFER EAST	CASING DIAMETER (IN)	2 ID	GEOLOGIST	LAA	37-86
EAST	2089862	LOCATOR NUMBER P11	BOREHOLE DIAMETER (IN)	7.5	DATE DRILLED	09/22/86	

REMARKS Hollow Stem Auger.

GRADATIONAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				0.65/2	5782	10			CLAYSTONE:	Yellowish gray (5 Y 8/1), Est. plast. mod., trace CaCO3.
					5781	11				
					5780	12			CLAYSTONE:	Same as above with color change to light olive gray (5 Y 6/1). Trace carb. material. Note: No water encountered during drilling.
				0.4/1	5779	13				
					5778	14				
					5777	15				
					5776	16				
					5775	17				
					5774	18				
					5773	19				
						20				

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 10.1	GROUND ELEVATION (FT) 5801.19	PROJECT NUMBER	SITEWIDE	LOG OF BORING NUMBER
NORTH	752163	AREA SITEWIDE	CASING DIAMETER (IN) 2.0 I.D.	GEOLOGIST	G. GRIGSBY	40991
EAST	2066298	LOCATOR NUMBER 012	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED	11/11/91	

REMARKS: Hollow Stem Auger, Rotary Core. ASI Geologist, F. Grigsby; EBASCO Geologist, R.T. Canon.



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
SC	Clayey Sand with some Gravel and Silt. Yellowish brown (10 YR 4/2) to dusky yellowish brown (10 YR 2/2) with some mod. yellowish brown (10 YR 5/4) mottling. Med. plasticity, poorly graded. Gravel small, pred. angular to sub-angular quartzite. Sand pred. sub-angular quartz; some quartzite and feldspar. Dry, weathered, slightly calcareous. Good root development. 8% gravel, 54% sand, 11% silt, 27% clay.
CL:	Silty Clay with some Sand. Dark yellowish brown (10 YR 4/2). Med. plasticity, poorly graded. Slightly calcareous. One 2-1/2 in. granodiorite pebble in sample. Assumed atypical for this interval. Dry, weathered. 17% sand, 34% silt, 49% clay.
NO SAMPLE:	No recovery, lost core.
CL:	Silty Clay with some Sand. Same as above (reference interval 0.5' to 1.0').
GW:	Sandy Gravel with trace Silt and Clay. Grayish orange (10 YR 7/4) to pale yellowish brown (10 YR 6/2). Matrix slightly calcareous, low plasticity. Gravel pred. quartzite and quartz, angular to sub-angular, max. pebble size 2.0 in., well graded. Sand pred. quartz and quartzite in coarser fractions, sub-angular. Finer fraction pred. quartz, sub-angular to sub-rounded. Interval dry, weathered. 60% gravel, 35% sand, 3% silt, 2% clay.
NO SAMPLE:	No recovery, lost core.
GW:	Sandy Gravel with trace Silt and Clay. Same as above (reference interval 2.6' to 3.2'). Entire interval sieved. 60% gravel, 35% sand, 3% silt, 2% clay.
SILTY CLAYSTONE:	Top of Bedrock at 7.4' (unconsol. sample). Silty Claystone with some Sand. Grayish orange (10 YR 7/4) to light olive gray (5 Y 5/2) with some dark yellowish orange (mottling (Fe staining). Some silty to sandy intervals/gradational contacts. Core mod. indurated, mod. friable, slightly damp. Sand v.f.g., sub-angular quartz. 13% sand, 20% silt, 67% clay.
CLAYEY SILTSTONE:	Clayey Siltstone with some Sand. Same as above (reference interval 7.0' to 8.8') with more sand and dom. Siltstone. Max. porosity estimated at 20% plus. Very friable, no bedding. 21% sand, 48% silt, 31% clay.
NO SAMPLE:	No recovery, lost core.

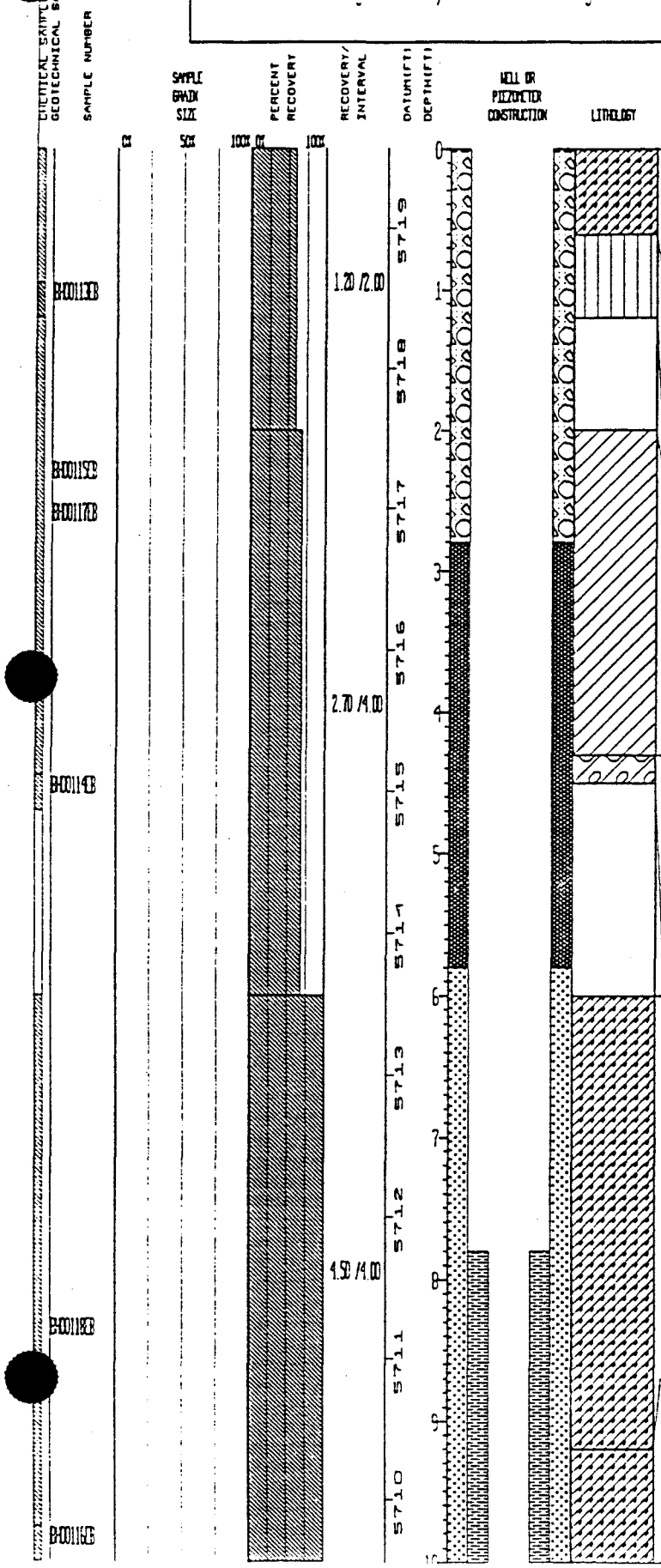
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 10.1	GROUND ELEVATION (FT) 5801.19	PROJECT NUMBER	SITEWIDE	LOG OF BORING NUMBER
NORTH	752163	AREA SITEWIDE	CASING DIAMETER (IN) 2.0 I.D.	GEOLOGIST	G. GRIGSBY	40991
EAST	2066298	LOCATOR NUMBER 012	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED	11/11/91	

REMARKS: Hollow Stem Auger, Rotary Core. ASI Geologist, F. Grigsby, EBASCO Geologist, R.T. Canon

GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
					5791	10			CLAYEY SILTSTONE	Clayey Siltstone with some Sand. Same as above (reference interval 8.8' to 9.2') 21% sand, 48% silt, 31% clay NOTE: 0.2' extra core recovery.
					5790	11				Total Drilled Depth = 10.1' NOTE: Total Depth of Casing = 9.73' Bottom Depth of Filter Pack = 10.1' Top of 16-40 sand Backfill = 10.1'
					5789	12				
					5788	13				
					5787	14				
					5786	15				
					5785	16				
					5784	17				
					5783	18				
					5782	19				
						20				

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 13.0	GROUND ELEVATION (FT) 5719.56	PROJECT NUMBER	SITEWIDE	LOG OF BORING NUMBER
NORTH	753241	AREA: SITEWIDE	CASING DIAMETER (IN): 2.0	GEOLOGIST	F.G.	41091
EAST:	2089994	LOCATOR NUMBER: 013	BOREHOLE DIAMETER (IN): 7.25	DATE DRILLED	11/11/91	

REMARKS: Hollow Stem Auger and Rotary Core Drill. ASI Geologist Fred Grigsby, EBASCO Geologist, R.T. Conan. ASI Log.

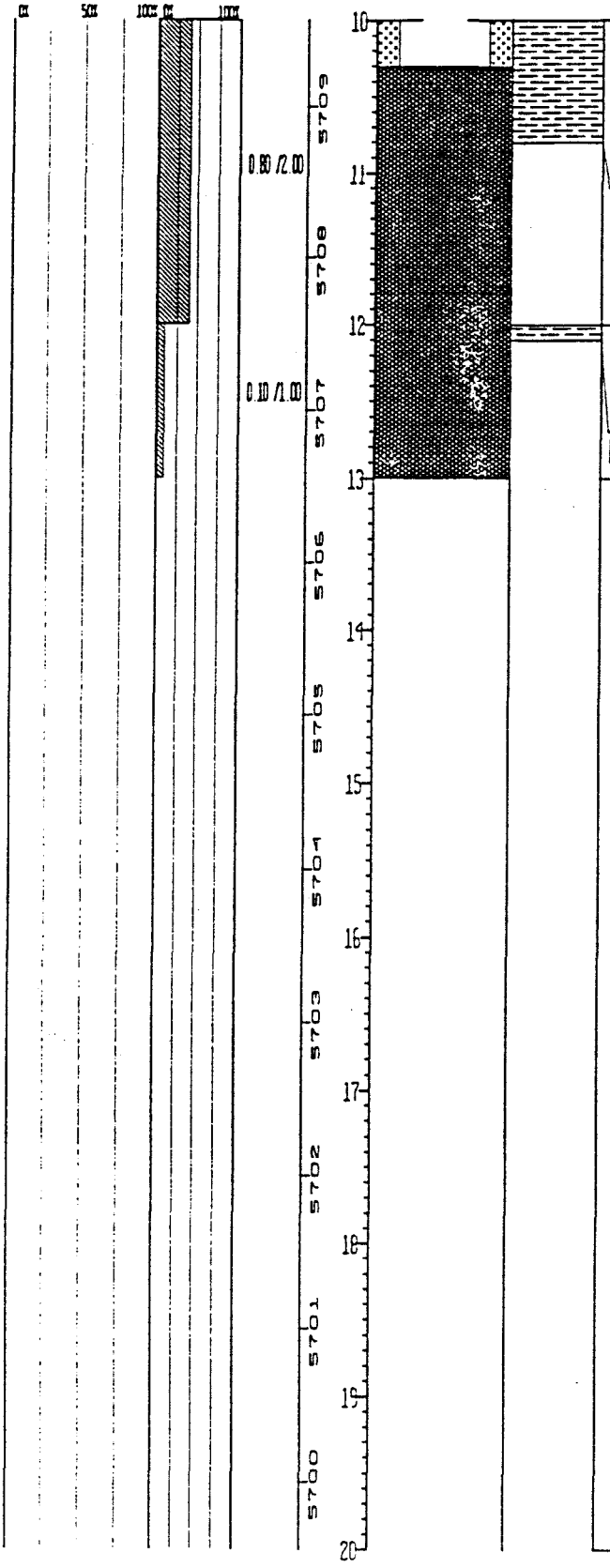


UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
SC:	Clayey Sand to Silty Sand with some Gravel. Dark yellowish brown (10 YR 4/2). Well graded. Good root development, non-calcareous, med. plasticity. Dry, weathered. (sc-sm). 20% gravel, 30% sand, 25% silt, 25% clay
ML:	Sandy Silt with some Clay. Dark yellowish brown (10 YR 4/2). Non-calcareous, med plasticity. Sand f.g., sub-angular, pred. quartz, some feldspar. Dry, weathered, some roots. 35% sand, 40% silt, 25% clay.
NO SAMPLE:	No recovery, lost core.
CL:	Silty Clay with some Sand and trace Gravel. Dusky yellowish Brown (10 YR 2/2). Gravel pebbles sparse but large (max. size 2.0 in.), poorly graded, quartzite, sub-rounded. Core dense, med. plasticity, some carbon. Non-calcareous, non-friable. Interval damp, slightly weathered. <5% gravel, 15% sand, 25% silt, 55% clay.
GC:	Clayey Gravel with some Sand and trace Silt (poor sample). Poorly graded, one (1) large pebble (2.25 in.). Matrix grayish brown (5 YR 3/2), some pale yellowish brown mottling (10 YR 6/2). Sample dry, weathered, non-friable, well cemented. 55% gravel, 10% sand, 5% silt, 30% clay.
NO SAMPLE:	No recovery, lost core.
SC:	Clayey Sand with some Gravel and Silt. Dark yellowish brown (10 YR 4/2). Some very clayey intervals. Core dense, damp, well cemented (angillaceous). Mod. friable, med. plasticity. Gravel fraction pred. quartzite, some granite fragments, sub-rounded to sub-angular. Sand pred. f.g., sub-angular, some sub-rounded, pred. quartz. Poorly graded. Slightly weathered. +/-12% gravel, 62% sand, +/-6% silt, 20% clay.
SC:	Clayey Sand with some Silt. Dark yellowish brown (10 YR 4/2). Sand f.g., sub-angular to sub-rounded, pred. quartz. Poorly graded. Gravel at top and bottom of interval. Interval appears permeable. Damp, mod. friable, low to med. plasticity, non-weathered (?) 52% sand, 12% silt, 36% clay

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 13.0	GROUND ELEVATION (FT)	5719.56	PROJECT NUMBER	SITEWIDE	LOG OF BORING NUMBER
NORTH	753241	AREA SITEWIDE	CASING DIAMETER (IN)	2.0	GEOLOGIST	F.G.	41091
EAST	2089994	LOCATOR NUMBER 013	BOREHOLE DIAMETER (IN)	7.25	DATE DRILLED	11/11/91	

REMARKS: Hollow Stem Auger and Rotary Core Drill. ASI Geologist Fred Grigsby, EBASCO Geologist, R.T. Conon. ASI Log

CHEMICAL SAMPLE
GEOTECHNICAL SAMPLE
SAMPLE DEPTH
SAMPLE NUMBER
SAMPLE GRAIN SIZE
PERCENT RECOVERY
RECOVERY/INTERVAL
DATUM (FT)
DEPTH (FT)
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY
UNIFIED SOILS CLASSIFICATION OR ROCK TYPE
DESCRIPTION



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CLAYSTONE:	Top of Bedrock at 10.0' Claystone with some Silt and trace Sand. Pred. yellowish gray (5 Y 7/2), damp, mod. friable. Badly broken (drilling induced), mod. indurated. Trace sand, +/-15% silt, +/-85% clay.
NO SAMPLE:	No recovery, lost core.
CLAYSTONE:	Claystone with some Silt. Same as above (reference interval 10.0' to 10.8'). Trace of sand, +/-15% silt, +/-85% clay.
NO SAMPLE:	No recovery, lost core.
	Total Drilled Depth = 13.0'. NOTE: Total Depth of Casing = 12.3'. Bottom Depth of Filter Pack = 10.3'. Top of bentonite Backfill = 10.3'.

STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 14	GROUND ELEVATION (FT): 5728.13	PROJECT NUMBER: 667.11	LOG OF BORING NUMBER
NORTH: 752826	AREA BUFFER EAST	CASING DIAMETER (IN): 2 ID	GEOLOGIST: LAA	38-86
EAST: 2090281	LOCATOR NUMBER: R12	BOREHOLE DIAMETER (IN): 7 25	DATE DRILLED: 09/08/86	

REMARKS: Hollow Stem Auger. Core from TD to 13.0'.

SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	CL SIL SAND GRAVEL COBBLE BOULDER	100% 0% 100%	1.6/2	5728	0			CH:	Silty Clay. Dark yellowish brown (10YR 4/2), surface grass and roots present. Moderately high plasticity. Trace sand.
			0/0.8	5727	1			NO SAMPLE:	
			1.3/1.2	5726	2			CL:	Same as above. Less roots and grass, some sub-rounded gravel, up to 2cm.
			1.6/2	5725	3			GC:	Large cobbles and gravel in sandy clay matrix. Gravel grayish red (10R 4/2) to medium gray (N5). Angular to sub-angular. Moderately graded. Sandy clay matrix, moderately yellowish brown. (10YR 5/4). Moderate plasticity.
			1.8/2	5724	4			CLAYSTONE:	Top of Bedrock. Dusky yellowish brown (10YR 2/2). High plasticity, some silt, trace sand. One large cobble at top (7 cm.). Some iron staining. Some thin carbonaceous layers.
			0.2/0.2	5723	5			SILTY CLAYSTONE:	Dark yellowish brown (10YR 4/2). Highly weathered. Slightly friable. Massive (?) bedding. Some carbonaceous material.
			1.5/1.2	5722	6			SILTY CLAYSTONE:	Same as above.
			0.6/0.6	5721	7			SILTY CLAYSTONE:	Same as above.
				5720	8				
				5719	9				

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 14	GROUND ELEVATION (FT) 5722.13	PROJECT NUMBER 667.11	LOG OF BORING NUMBER
NORTH	752826	AREA BUFFER EAST	CASING DIAMETER (IN) 2 ID	GEOLOGIST LAA	38-86
EAST	2590281	LOCATOR NUMBER R12	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED 05/08/86	

REMARKS: Hollow Stem Auger. Cave from TD to 13.0'.

CHEMICAL OR GRADATIONAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				0.7 /1.3	5718	10			CLAYEY SILTSTONE	Dark yellowish brown (10YR 4/2). Highly weathered. Slightly friable. Massive bedding (?), some carbonaceous material. Some iron stains.
				0.9 /0.7	5717	11			CLAYEY SILTSTONE	Same as above.
				0.65 /0.65	5716	12			CLAYEY SILTSTONE	Same as above, moderately friable.
				0.5 /0.35					CLAYEY SILTSTONE	Same as above.
				0.9 /1	5715	13			CLAYEY SILTSTONE	Same as above, slightly friable. NOTE: No water encountered while drilling.
					5714	14				
					5713	15				
					5712	16				
					5711	17				
					5710	18				
					5709	19				
						20				

A-3 N

BOREHOLE LOG

BOREHOLE NO.: TH@46192 PROJECT NAME: B1, R3, A3, and Landfill Dams Analysis PAGE 1 OF 1

RIG GEOLOGIST: LVS SUBCONTRACTOR: Woodward-Clyde

DEPTH TO BEDROCK (FT): 24.5' DEPTH TO WATER TABLE (FT): 24.1' DATE: 10/2/92

CLASSIFICATION OF LAYERS

DEPTH (FT) FROM	DEPTH (FT) TO	SOIL SYMBOL	SOIL DESCRIPTION
0	5	FILL	GRAVEL, ANGULAR TO SUBROUND, FINE TO COARSE, SANDY, ANGULAR,
			FINE TO COARSE SILTY, MED PLASTICITY, MOIST, BROWN
5	~~19~~ 8	FILL	CLAY, MEDIUM ~~TO HIGH PLASTICITY~~ PLASTICITY, STIFF ~~TO VERY STIFF~~ LVS, SANDY,
			FINE TO COARSE, ANGULAR, GRAVELLY, FINE TO MEDIUM, ANGULAR TO
			SUBROUND, MOIST, BROWN
8	24	FILL	CLAY, MEDIUM TO HIGH PLASTICITY, STIFF TO VERY STIFF, SANDY
			FINE TO MEDIUM, SUBANGULAR TO ANGULAR, DECREASING TO TRACE @ 20', MOIST, BROWN
24	36	CS	CLAYSTONE, MEDIUM HARD TO VERY HARD, SLIGHTLY MOIST, DK GREY
			TD @ 36.0'

CLASSIFICATION OF INDIVIDUAL SAMPLES

TOP DEPTH (FT)	BLOW COUNT	SAMPLE TYPE	SOIL SYMBOL	MOISTURE: DRY	MOISTURE: MOIST	MOISTURE: VERY MOIST	MOISTURE: WET	% SAND	GRADING: FINE	GRADING: MEDIUM	GRADING: COARSE	GRADING: GRAVEL	% FINES (-#200)	BEDROCK: SANDSTONE	BEDROCK: SILTSTONE	BEDROCK: CLAYSTONE	COLOR	HARDNESS: VERY SOFT	HARDNESS: SOFT	HARDNESS: FIRM	HARDNESS: HARD/STIFF	HARDNESS: VERY HARD/STIFF	CONDITION: CEMENTED	CONDITION: MASSIVE	CONDITION: STRATIFIED	CONDITION: POROUS	CONDITION: FRACTURED	CONDITION: CALCAREOUS	OTHERS	RECOVERY (FT)
0-3	–	BAG	FILL		X			10	3	3	3	80	10				BROWN													1
4.7	24/25	CAL	FILL																											0
6-7	–	BAG	FILL		X			30	6	10	10	5	70 CS				BROWN													1
8.4	8/9	CAL	FILL		X			10	10				90				BROWN GREY				X									.3
10.0-13.3	–	ST	FILL																											0
14.2	12/13	CAL	FILL																											0
13.5-15.0	–	BAG	FILL		X			10	5	5			90				BROWN													1
16.8	9/12	CAL	FILL		X												BROWN GREY				X								DK GRY	.2
17-20.0	–	BAG	FILL		X				5				95				BROWN													1
21.0	15/15	CAL	FILL		X												BROWN					X								3
24.6	11/21	CAL	FILL/CS		X								100			X	DARK BLUE GREY				X									.3
28.6	22/30	CAL											100			X						X								.3
35.7	35/50	CAL											100			X							X							.3

NOTES: 1. SAMPLE TYPES: SS = 2" O.D. SPLIT SPOON CAL = CALIFORNIA SPOON ST = SHELBY TUBE

2. S = SLIGHT M = MODERATE H = HIGHLY

(4035-210-542) (W-C Log Form) (9/4/92 10:59 AM)

6"/4"

A-3 Middle

BOREHOLE LOG

BOREHOLE NO.: TH046292 PROJECT NAME: B1, B3, A3, and Landfill Dams Analysis PAGE 1 OF 2

RIG GEOLOGIST: LVS SUBCONTRACTOR: Woodward-Clyde

DEPTH TO BEDROCK (FT): NE DEPTH TO WATER TABLE (FT): NE DATE: 10/2/92

CLASSIFICATION OF LAYERS

DEPTH (FT) FROM	DEPTH (FT) TO	SOIL SYMBOL	SOIL DESCRIPTION
0	3	FILL	(GC-CL) GRAVELLY CLAY/CLAYEY GRAVEL 40%-60% CLAY,
			40-60% GRAVEL HIGH PLASTICITY CLAY ANGULAR, MEDIUM GRAVEL
		?	DRY TO MOIST, BROWN
3	15	FILL	CLAY, MEDIUM STIFF TO STIFF, HIGH PLASTICITY, MOIST, BROWN/GREY
			GRAVELLY @ 5.0 MEDIUM, SUBROUND TO SUBANG DECREASING TO 0% @ 6'
15	29.2	FILL	CLAY, HIGH PLASTICITY, VERY STIFF, MOIST, BROWN GREY
			FE STAINING THROUGHOUT, TRACE $CaCO_3$ NODULES, TRACE CARBONACEOUS
			STAINING @ 21'
			LVS

CLASSIFICATION OF INDIVIDUAL SAMPLES

TOP DEPTH (FT)	BLOW COUNT	SAMPLE TYPE	SOIL SYMBOL	MOISTURE: DRY	MOISTURE: MOIST	MOISTURE: VERY MOIST	MOISTURE: WET	% SAND	GRADING: FINE	GRADING: MEDIUM	GRADING: COARSE	GRADING: GRAVEL	% FINES (-#200)	BEDROCK: SANDSTONE	BEDROCK: SILTSTONE	BEDROCK: CLAYSTONE		COLOR	HARDNESS: VERY SOFT	HARDNESS: SOFT	HARDNESS: FIRM/MED. STIFF	HARDNESS: HARD/STIFF	HARDNESS: VERY HARD/STIFF	CONDITION: CEMENTED	CONDITION: MASSIVE	CONDITION: STRATIFIED	CONDITION: POROUS	CONDITION: FRACTURED	CONDITION: CALCAREOUS	OTHERS	RECOVERY (FT)
0-3	—	BAG	FILL																												1
3.0	35/50 6" 5"	CAL	FILL																												0
5.7	2/5	CAL	FILL		X			10		10		30	60					BROWN			X										.3
8.6-10.6	—	ST	FILL		X								100					BROWN													2
11.9-12.2	6/9	CAL	FILL		X								100					BROWN GREY				X									.3
17.8-19.8	—	ST	FILL		X								100					BROWN GREY													2
20.9	10/19	CAL	FILL		X								100					BROWN GREY					X								.3
26.2-28.2	—	ST	FILL		X								100					BROWN GREY													6-8 IN
28.9	13/17	CAL	FILL		X								100					BROWN GREY					X								.3

LVS

NOTES: 1. SAMPLE TYPES: SS = 2" O.D. SPLIT SPOON CAL = CALIFORNIA SPOON ST = SHELBY TUBE

2. S = SLIGHT M = MODERATE H = HIGHLY

(4035-210-542) (W-C Log Form) (9/4/92 10:59 AM)

BOREHOLE LOG

BOREHOLE NO.: TW046292 PROJECT NAME: B1, B3, A3, and Landfill Dams Analysis PAGE 2 OF 2

RIG GEOLOGIST: LVS SUBCONTRACTOR: Woodward-Clyde

DEPTH TO BEDROCK (FT): 41.0 DEPTH TO WATER TABLE (FT): 29.2 DATE: 10/5/92

CLASSIFICATION OF LAYERS

DEPTH (FT) FROM	DEPTH (FT) TO	SOIL SYMBOL	SOIL DESCRIPTION
29.2	41.0	FILL	CLAY, VERY STIFF, HI PLASTICITY, ~~FRACE~~ TRACE TO SOME (0-10%) SANDY, FINE TO
			VERY FINE, MOIST, BROWN/GREY TRACE SILT CLASTS
			FE STAINING THROUGHOUT
41.0	48.6	CS	CLAYSTONE BEDROCK, VERY HARD, MOIST, DK GREY

LVS

CLASSIFICATION OF INDIVIDUAL SAMPLES

TOP DEPTH (FT)	BLOW COUNT	SAMPLE TYPE	SOIL SYMBOL	MOISTURE: DRY	MOISTURE: MOIST	MOISTURE: VERY MOIST	MOISTURE: WET	% SAND	GRADING: FINE	GRADING: MEDIUM	GRADING: COARSE	GRADING: GRAVEL	% FINES (-#200)	BEDROCK: SANDSTONE	BEDROCK: SILTSTONE	BEDROCK: CLAYSTONE	COLOR	HARDNESS: VERY SOFT	HARDNESS: SOFT	HARDNESS: FIRM	HARDNESS: HARD	HARDNESS: VERY HARD	CONDITION: CEMENTED	CONDITION: MASSIVE	CONDITION: STRATIFIED	CONDITION: POROUS	CONDITION: FRACTURED	CONDITION: CALCAREOUS	CONDITION: OTHERS	RECOVERY (FT)
35.5	11/20	CAL	FILL		X								100				BROWN GREY					X								.3
39.0	13/18	CAL	FILL		X			10	10				90				BROWN GREY					X								.3
41.8	32/1000	CAL	CS																											0
42.9	68/94	CAL	CS		X								100			X	DARK GREY					X								.3
48.3	29/43	CAL	CS		X								100			X	DARK GREY					X								.3

LVS

NOTES: 1. SAMPLE TYPES: SS = 2" O.D. SPLIT SPOON CAL = CALIFORNIA SPOON ST = SHELBY TUBE

2. S = SLIGHT M = MODERATE H = HIGHLY

(4035-210-542) (W-C Log Form) (9/4/92 10:59 AM)

A-35

BOREHOLE LOG

BOREHOLE NO.: THD46392 PROJECT NAME: B1, B3, A3 and Landfill Dams Analysis PAGE 1 OF 1

RIG GEOLOGIST: LVS SUBCONTRACTOR: Woodward-Clyde

DEPTH TO BEDROCK (FT): 41 DEPTH TO WATER TABLE (FT): 32.0 DATE: 10/1/92

CLASSIFICATION OF LAYERS

DEPTH (FT) FROM	DEPTH (FT) TO	SOIL SYMBOL	SOIL DESCRIPTION
0	5	FILL	GRAVEL, FINE TO MEDIUM, SUBROUND, SANDY, FINE TO COARSE, ANGULAR
			SILTY, MEDIUM PLASTICITY, DRY BROWN
5	14 ~~AT~~ LVS	FILL	CLAY, MEDIUM TO HIGH PLASTICITY, ~~STIFF TO~~ LVS VERY STIFF, GRAVELLY,
			FINE TO COARSE, SUBANGULAR, SANDY, FINE TO MEDIUM, ANGULAR TO
			SUBROUND, MOIST, GREY BROWN w/SOME OLIVE, BLACK, TAN
14	41	FILL	CLAY, STIFF TO VERY STIFF, MEDIUM TO HIGH PLASTICITY, SANDY, COARSE TO FINE,
			SUBROUND TO SUBANGULAR, ~~TRACE SILT~~ LVS, MOIST, BROWN, GREY, OLIVE
			TRACE SILT, SOME Fe STAINING, TOPSOIL AT 28'-29' w/ROOTS
			WATER AT 32.0' POSSIBLE ANHYDRITE IN VOIDS @ 33.0'
41		CS	CLAYSTONE, HARD TO VERY HARD, HIGH PLASTICITY (SHAVINGS)
			SLIGHTLY MOIST, DARK GREY/BLUE

CLASSIFICATION OF INDIVIDUAL SAMPLES

TOP DEPTH (FT)	BLOW COUNT	SAMPLE TYPE	SOIL SYMBOL	MOISTURE: DRY	MOISTURE: MOIST	MOISTURE: VERY MOIST	MOISTURE: WET	% SAND	GRADING: FINE	GRADING: MEDIUM	GRADING: COARSE	GRADING: GRAVEL	% FINES (-#200)	BEDROCK: SANDSTONE	BEDROCK: SILTSTONE	BEDROCK: CLAYSTONE		COLOR	HARDNESS: VERY SOFT	HARDNESS: SOFT	HARDNESS: FIRM	HARDNESS: HARD/STIFF	HARDNESS: VERY HARD/STIFF	CONDITION: CEMENTED	CONDITION: MASSIVE	CONDITION: STRATIFIED	CONDITION: POROUS	CONDITION: FRACTURED	CONDITION: CALCAREOUS	OTHERS	RECOVERY (FT)
5.7	19/14	~~FIT~~ CAL	FILL		X			20	5	5	10	30	50					BROWN					X							BLACK	.3
7.9	53/30	CAL	FILL																												0
11	—	ST	FILL																												0
14	10/10	CAL	FILL																												0
14.7	4/8	CAL	FILL		X			20					80					BROWN													.3
14-16	—	BAG	FILL		X								100					BROWN													2.0
20.6-22.6	—	ST	FILL		X								100					BROWN GREY												OLIVE	2.0
23.7	11/19	CAL	FILL		X			10	10				90					BROWN GREY													.3
28.1	12/14	CAL	FILL		X								100					BLACK												ROOTS	.3
32.5	10/13	CAL	FILL		X								100					BROWN BLACK												WATER	.3
36.7	24/9	CAL	FILL		X			20		20			80					BROWN GREY													.3
40.7	18/33	CAL	CS	X												X		DARK GREY/BLUE													.3
—	50/5"	CAL	CS													X		DARK GREY/BLUE													.3

NOTES: 1. SAMPLE TYPES: SS = 2" O.D. SPLIT SPOON CAL = CALIFORNIA SPOON ST = SHELBY TUBE

2. S = SLIGHT M = MODERATE H = HIGHLY

(4035-210-542) (W-C Log Forms) (9/4/92 10:59 AM)

A-3 Toe

BOREHOLE LOG

BOREHOLE NO.: TH046492 PROJECT NAME: B1, B3, A3, and Landfill Dams Analysis PAGE 1 OF 1

RIG GEOLOGIST: Michael May SUBCONTRACTOR: Woodward-Clyde

DEPTH TO BEDROCK (FT): 14.0 DEPTH TO WATER TABLE (FT): NE DATE: 10-26-92

CLASSIFICATION OF LAYERS

DEPTH (FT) FROM	DEPTH (FT) TO	SOIL SYMBOL	SOIL DESCRIPTION
0	4	Fill	Gravel, fine to coarse, angular to subround, sandy, fine to medium grained, angular to subangular, clay, low plasticity, medium dense, moist, brown, light gray, black.
4	14	Fill	Clay, medium to high plasticity, sandy, fine to medium grained, angular to subangular, moist, light gray, dark gray, brown.
14	19.5	CS	Claystone Bedrock, low to medium plasticity, sandy, fine grained, angular to subangular, moist, light gray, dark gray, brown, hard.

CLASSIFICATION OF INDIVIDUAL SAMPLES

TOP DEPTH (FT)	BLOW COUNT	SAMPLE TYPE	SOIL SYMBOL	MOISTURE: DRY	MOISTURE: MOIST	MOISTURE: VERY MOIST	MOISTURE: WET	% SAND	GRADING: FINE	GRADING: MEDIUM	GRADING: COARSE	GRADING: GRAVEL	% FINES (-#200)	BEDROCK: SANDSTONE	BEDROCK: SILTSTONE	BEDROCK: CLAYSTONE	COLOR	HARDNESS: VERY SOFT	HARDNESS: SOFT	HARDNESS: FIRM	HARDNESS: HARD	HARDNESS: VERY HARD	CONDITION: CEMENTED	CONDITION: MASSIVE	CONDITION: STRATIFIED	CONDITION: POROUS	CONDITION: FRACTURED	CONDITION: CALCAREOUS	OTHERS	RECOVERY (FT)
1	6/10	Cal	Fill		X			30	X			40	30				Brown L. Gray												Black	.3
4	8/18	Cal	Fill		X			10	X				90				L. Gray Brown													0
7	5/8	Cal	Fill		X			10	X				90				Brown Gray												L. Gray	.3
0-5	NA	Bucket	Fill		X	Mixture of clayey gravel and sandy clay																								NA
9	25 50/5"	Cal	Fill		X			30	X				70	All rock in first liner																0
5-10	NA	Bucket	Fill		X			20	X				80				Brown Gray													NA
13	35 50/5"	Cal	Fill/S		X			10	X				90				L. Gray D. Gray												Brown	.3
19	17/50	Cal	CS		X			10	X				90			X	D. Gray Brown				X									.3

NOTES: 1. SAMPLE TYPES: SS = 2" O.D. SPLIT SPOON CAL = CALIFORNIA SPOON ST = SHELBY TUBE

2. S = SLIGHT M = MODERATE H = HIGHLY

(4035-210-542) (W-C Log Form) (9/4/92 10:59 AM)

B-1 NE PZ hole

BOREHOLE LOG

BOREHOLE NO.: TH04592 PROJECT NAME: B1, R3, A3, and Landfill Dams Analysis PAGE 1 OF 2

RIG GEOLOGIST: LVS SUBCONTRACTOR: Woodward-Clyde

DEPTH TO BEDROCK (FT): 25.0 DEPTH TO WATER TABLE (FT): 20.0* DATE: 10/7/92

CLASSIFICATION OF LAYERS

DEPTH (FT) FROM	DEPTH (FT) TO	SOIL SYMBOL	SOIL DESCRIPTION
0	7	FILL	CLAY, MEDIUM PLASTICITY, SANDY, FINE SUBROUND, ~~*~~ SLIGHTLY MOIST, BROWN, GREY, BLACK, WHITE, TRACE FE, TRACE GRAVEL, COARSE SUBROUND, STIFF
7	15.5	FILL	CLAY, MEDIUM TO HI PLASTICITY, STIFF, SANDY FINE SUBROUND MOIST, BROWN GREY IRON STAINING
15.5	20	FILL	CLAY HIGH PLASTICITY, STIFF TO VERY STIFF, MOIST, BROWN GREY BLACK
20	25	FILL	SAND/GRAVEL, WELL GRADED, FINE TO COARSE, ANGULAR TO SUBROUND, VERY WET, BROWN
25	26	CS	CLAYSTONE BEDROCK, MEDIUM HARD TO HARD, MOIST GREY BROWN IRON STAINING
			LVS

CLASSIFICATION OF INDIVIDUAL SAMPLES

TOP DEPTH (FT)	BLOW COUNT	SAMPLE TYPE	SOIL SYMBOL	MOISTURE: DRY	MOISTURE: MOIST	MOISTURE: VERY MOIST	MOISTURE: WET	% SAND	GRADING: FINE	GRADING: MEDIUM	GRADING: COARSE	GRADING: GRAVEL	% FINES (-#200)	BEDROCK: SANDSTONE	BEDROCK: SILTSTONE	BEDROCK: CLAYSTONE	COLOR	HARDNESS: VERY SOFT	HARDNESS: SOFT	HARDNESS: FIRM	HARDNESS: HARD	HARDNESS: VERY HARD	CONDITION: CEMENTED	CONDITION: MASSIVE	CONDITION: STRATIFIED	CONDITION: POROUS	CONDITION: FRACTURED	CONDITION: CALCAREOUS	OTHERS	RECOVERY (FT)
3.7	8/9	CAL	FILL	*				20	X				80				BROWN GREY												BLACK Fe	.3
4.9-6.9	—	ST	FILL	*				30	X			T	70				BROWN GREY												BLACK WHITE Fe	1
0-5	—	BKT	FILL	*				25	X				75				"												"	—
8-10	-	ST	FILL		X			15	X				85				BROWN GREY												Fe	1.5
11.2	6/10	CAL	FILL		X			10	X				90				BROWN GREY												Fe	.3
5-10	—	BKT	FILL		X			10	X				90				"												"	—
13.5-15.5	—	ST	FILL		X			5	X				85				BROWN GREY												Fe	2
16.2	8/13	CAL	FILL		X								100				BROWN BLACK					*									.3
10-15	-	BKT	FILL		X								100				BROWN GREY													—
18.2-20.2	~~ST~~ LVS	ST	FILL			X							100				BLACK													2
23.2-25.2	8/10	CAL	FILL				X	100	17	17	17	50					BROWN												SW/GW	.3
25.7	18/30	CAL	CS		X								100				BROWN GREY			X	X									.3
15-20	~~BKT~~ LVS	BKT	FILL		X	X							100				BROWN BLACK													—

NOTES: 1. SAMPLE TYPES: SS = 2" O.D. SPLIT SPOON CAL = CALIFORNIA SPOON ST = SHELBY TUBE

2. S = SLIGHT M = MODERATE H = HIGHLY

(4035-210-5421) (W-C Log Forms) (9/4/92 10:59 AM)

T - TRACE

* - TOE/LATERAL DRAIN

BOREHOLE LOG

BOREHOLE NO.: 7 HQ 46-592 PROJECT NAME: B1, B3, A3, and Landfill Dams Analysis PAGE 2 OF 2

RIG GEOLOGIST: LVS SUBCONTRACTOR: Woodward-Clyde

DEPTH TO BEDROCK (FT): 25 DEPTH TO WATER TABLE (FT): 20* DATE: 10/8/92

CLASSIFICATION OF LAYERS

DEPTH (FT) FROM	DEPTH (FT) TO	SOIL SYMBOL	SOIL DESCRIPTION
26	32	CS	CLAYSTONE, HARD, moist, BROWN, GREY
			LVS

CLASSIFICATION OF INDIVIDUAL SAMPLES

TOP DEPTH (FT)	BLOW COUNT	SAMPLE TYPE	SOIL SYMBOL	MOISTURE: DRY	MOISTURE: MOIST	MOISTURE: VERY MOIST	MOISTURE: WET	% SAND	GRADING: FINE	GRADING: MEDIUM	GRADING: COARSE	GRADING: GRAVEL	% FINES (-#200)	BEDROCK: SANDSTONE	BEDROCK: SILTSTONE	BEDROCK: CLAYSTONE	COLOR	HARDNESS: VERY SOFT	HARDNESS: SOFT	HARDNESS: FIRM	HARDNESS: HARD	HARDNESS: VERY HARD	CONDITION: CEMENTED	CONDITION: MASSIVE	CONDITION: STRATIFIED	CONDITION: POROUS	CONDITION: FRACTURED	CONDITION: CALCAREOUS	OTHERS	RECOVERY (FT)
30.7	22/30	CAL	CS																											Ⓞ
31.7	25/39	CAL	CS		X								100			X	Brown Grey				X									.3
																	LVS													

NOTES: 1. SAMPLE TYPES: SS = 2" O.D. SPLIT SPOON CAL = CALIFORNIA SPOON ST = SHELBY TUBE

2. S = SLIGHT M = MODERATE H = HIGHLY

(4033-210-542) (W-C Log Forms) (9/4/92 10:59 AM)

* - TOE DRAIN

B-1 Sw upstream side

BOREHOLE LOG

BOREHOLE NO.: TH@A6692 PROJECT NAME: B1, B3, D3, and Landfill Dams Analysis PAGE 1 OF 3

RIG GEOLOGIST: LVS SUBCONTRACTOR: Woodward-Clyde

DEPTH TO BEDROCK (FT): 27.1 NE DEPTH TO WATER TABLE (FT): 8.0 DATE: 10/6/92

CLASSIFICATION OF LAYERS

DEPTH (FT) FROM	DEPTH (FT) TO	SOIL SYMBOL	SOIL DESCRIPTION
0	3.5	FILL	GRAVEL, FINE TO COARSE, ANGULAR TO SUBROUND, CLAYEY, HI PLASTICITY, MOIST, BROWN
3.5	7.0	FILL	CLAY, HIGH PLASTICITY, GRAVELLY, FINE TO MEDIUM, SUBANGULAR TO SUBROUND, SANDY, FINE TO COARSE, ANGULAR TO SUBROUND, MOIST, BROWN & BLACK
7.0	17.0	FILL	CLAY, HI PLASTICITY, SLIGHTLY WET TO WET, STIFF, GREY TO DARK GREY, TRACE ROOTS, 10-20% SAND, FINE @ 17'
17.0	27.1	NATIVE FILL	CLAY/GRAVEL 50% CLAY 50% GRAVEL CLAY HI PLASTICITY GRAVEL SUBANGULAR TO SUBROUND, COARSE VERY WET, BLACK/DARK GREY

LVS

CLASSIFICATION OF INDIVIDUAL SAMPLES

TOP DEPTH (FT)	BLOW COUNT	SAMPLE TYPE	SOIL SYMBOL	MOISTURE: DRY	MOISTURE: MOIST	MOISTURE: VERY MOIST	MOISTURE: WET	% SAND	GRADING: FINE	GRADING: MEDIUM	GRADING: COARSE	GRADING: GRAVEL	% FINES (-#200)	BEDROCK: SANDSTONE	BEDROCK: SILTSTONE	BEDROCK: CLAYSTONE	COLOR	HARDNESS: VERY SOFT	HARDNESS: SOFT	HARDNESS: FIRM	HARDNESS: HARD STIFF	HARDNESS: VERY HARD	CONDITION: CEMENTED	CONDITION: MASSIVE	CONDITION: STRATIFIED	CONDITION: POROUS	CONDITION: FRACTURED	CONDITION: CALCAREOUS	OTHERS	RECOVERY (FT)
4.4	7/8	CAL	FILL		X			10	X				90				GREY BROWN				X									.3
5.0-7.0	–	ST	FILL		X			10	10			20	70				BROWN BLACK													2
0-5	–	BKT	FILL		X								100				BROWN													–
7.3-9.3	–	ST	FILL		X	X							100				BROWN/GREY													2
5-10	–	BKT	FILL		X	X							100				BROWN DK GREY													–
11.0	7/10	CAL	FILL				X	10	10				100 90				DARK GREY													.3
12-14	–	ST	FILL				X						100				DARK GREY													2
14.74	7/8	CAL	FILL				X						100				GREY TO DK GREY													.3
15-17	–	ST	FILL				X						100				DARK GREY													2
10-15	–	BKT	FILL				X						100				DARK GREY													–
18.7	6/9/12/13	CAL	FILL				X	20	X				80				DARK GREY													.3
20-22	–	ST	FILL					30 60	10	10	10	20	40				BLACK													2
22-7	15/30	CAL	FILL									50	50				BLACK DK GREY													0

NOTES: 1. SAMPLE TYPES: SS = 2" O.D. SPLIT SPOON CAL = CALIFORNIA SPOON ST = SHELBY TUBE

2. S = SLIGHT M = MODERATE H = HIGHLY

(4035-210-542) (W-C Log Forms) (9/4/92 10:59 AM)

BOREHOLE LOG

BOREHOLE NO.: TW04692 PROJECT NAME: B1, B3, A3, and Landfill Dams Analysis PAGE 2 OF 3

RIG GEOLOGIST: LVS SUBCONTRACTOR: Woodward-Clyde

DEPTH TO BEDROCK (FT): NE DEPTH TO WATER TABLE (FT): 8.0 DATE: 10/6/92

CLASSIFICATION OF LAYERS

DEPTH (FT) FROM	DEPTH (FT) TO	SOIL SYMBOL	SOIL DESCRIPTION
			LVS

CLASSIFICATION OF INDIVIDUAL SAMPLES

TOP DEPTH (FT)	BLOW COUNT	SAMPLE TYPE	SOIL SYMBOL	MOISTURE: DRY	MOISTURE: MOIST	MOISTURE: VERY MOIST	MOISTURE: WET	% SAND	GRADING: FINE	GRADING: MEDIUM	GRADING: COARSE	GRADING: GRAVEL	% FINES (-#200)	BEDROCK: SANDSTONE	BEDROCK: SILTSTONE	BEDROCK: CLAYSTONE	COLOR	HARDNESS: VERY SOFT	HARDNESS: SOFT	HARDNESS: FIRM	HARDNESS: HARD	HARDNESS: VERY HARD	CONDITION: CEMENTED	CONDITION: MASSIVE	CONDITION: STRATIFIED	CONDITION: POROUS	CONDITION: FRACTURED	CONDITION: CALCAREOUS	OTHERS	RECOVERY (FT)
15-20	–	BKT	FILL			X	X						100				DEEPLY BLACK													1
23.7	8/17	CAL	FILL				X					50	50				DARK GREY													3
														LVS																

NOTES: 1. SAMPLE TYPES: SS = 2" O.D. SPLIT SPOON CAL = CALIFORNIA SPOON ST = SHELBY TUBE

2. S = SLIGHT M = MODERATE H = HIGHLY

(4035-210-542) (W-C Log Forms) (9/4/92 10:59 AM)

BOREHOLE LOG

BOREHOLE NO.: T1/@46692 PROJECT NAME: B1, B3, A3, and Landfill Dams Analysis PAGE 3 OF 3

RIG GEOLOGIST: LVS SUBCONTRACTOR: Woodward-Clyde

DEPTH TO BEDROCK (FT): 27 DEPTH TO WATER TABLE (FT): 8 DATE: 10/7/92

CLASSIFICATION OF LAYERS

DEPTH (FT) FROM	DEPTH (FT) TO	SOIL SYMBOL	SOIL DESCRIPTION
27.1	36	CS	CLAYSTONE, HARD TO VERY HARD, MOIST TO VERY MOIST, GREY TO DARK GREY & BROWN

LVS

CLASSIFICATION OF INDIVIDUAL SAMPLES

TOP DEPTH (FT)	BLOW COUNT	SAMPLE TYPE	SOIL SYMBOL	MOISTURE: DRY	MOISTURE: MOIST	MOISTURE: VERY MOIST	MOISTURE: WET	% SAND	GRADING: FINE	GRADING: MEDIUM	GRADING: COARSE	GRADING: GRAVEL	% FINES (-#200)	BEDROCK: SANDSTONE	BEDROCK: SILTSTONE	BEDROCK: CLAYSTONE	COLOR	HARDNESS: VERY SOFT	HARDNESS: SOFT	HARDNESS: FIRM	HARDNESS: HARD	HARDNESS: VERY HARD	CONDITION: CEMENTED	CONDITION: MASSIVE	CONDITION: STRATIFIED	CONDITION: POROUS	CONDITION: FRACTURED	CONDITION: CALCAREOUS	OTHERS	RECOVERY (FT)
27.9	24/36	CAL	CS		X								100			X	BROWN GREY				X									.3
31.7	30/50	CAL	CS			X							100			X	GREY					X								.3
34.7	30/50	CAL	CS			X							100			X	DARK GREY					X								.3
20-25	—	BKT	FILL			X	X						100				DARK GREY													—

LVS

NOTES: 1. SAMPLE TYPES: SS = 2" O.D. SPLIT SPOON CAL = CALIFORNIA SPOON ST = SHELBY TUBE

2. S = SLIGHT M = MODERATE H = HIGHLY

(4035-210-542) (W-C Log Forms) (9/4/92 10:59 AM)

B-2 Toe

BOREHOLE LOG

BOREHOLE NO.: TH046792 PROJECT NAME: B1, B3, A3, and Landfill Dams Analysis PAGE 1 OF 1

RIG GEOLOGIST: Mike May SUBCONTRACTOR: Woodward-Clyde

DEPTH TO BEDROCK (FT): 14.0 DEPTH TO WATER TABLE (FT): NE DATE: 10-22-92

CLASSIFICATION OF LAYERS

DEPTH (FT) FROM	DEPTH (FT) TO	SOIL SYMBOL	SOIL DESCRIPTION
0	2	Fill	Gravel, fine to coarse, angular to subround, sandy, fine to medium grained, angular to subangular, medium dense, dry to moist, brown.
2	14.0	Fill	Clay, Low to medium plasticity, sandy, fine to medium grained, angular to subangular, stiff to very stiff, moist, brown, gray, dark gray, iron staining
14.0	19.7	CS and SS	Sandstone, Bedrock fine to medium grained, subangular to subround, clayey, moist, brown, dark gray, iron oxide staining, very hard
			Claystone Bedrock, sandy, fine to medium grained, subangular to subround, very hard, moist, brown, gray, dark gray.

CLASSIFICATION OF INDIVIDUAL SAMPLES

TOP DEPTH (FT)	BLOW COUNT	SAMPLE TYPE	SOIL SYMBOL	MOISTURE: DRY	MOISTURE: MOIST	MOISTURE: VERY MOIST	MOISTURE: WET	% SAND	GRADING: FINE	GRADING: MEDIUM	GRADING: COARSE	GRADING: GRAVEL	% FINES (-#200)	BEDROCK: SANDSTONE	BEDROCK: SILTSTONE	BEDROCK: CLAYSTONE	COLOR	HARDNESS: VERY SOFT	HARDNESS: SOFT	HARDNESS: FIRM	HARDNESS: HARD	HARDNESS: VERY HARD	CONDITION: CEMENTED	CONDITION: MASSIVE	CONDITION: STRATIFIED	CONDITION: POROUS	CONDITION: FRACTURED	CONDITION: CALCAREOUS	OTHERS	RECOVERY (FT)
1	6/16	Cal	Fill	X				30	X			40	30				Brown													.3
3	NA	ST	Fill		X			20	X				80				Brown													1.0
4.5	8/15	Cal	Fill		X			20		X		20	60				Brown													.3
0-5	NA	Bucket	Fill		X			20	X			10	70				Brown													NA
9	4/10	Cal	Fill		X			10	X				90				Brown, Gray, Black													.3
5-10	NA	Bucket	Fill		X			20	X				80				Brown, Gray, Black													NA
13	9/28	Cal	Fill		X			10	X				90				Brown													.3
10-15	NA	Bucket	Fill BX 14-15		X			10	X				90				Brown													NA
16	27/50/2"	Cal	CS and SS		X			10 / 80	X				90 / 20	X		X	Brown Gray					X								.3
19	40/50/3"	Cal	CS and SS		X			10 / 80	X				90 / 20	X		X	Brown D. Gray					X							Fe Oxide Staining	.3

NOTES: 1. SAMPLE TYPES: SS = 2" O.D. SPLIT SPOON CAL = CALIFORNIA SPOON ST = SHELBY TUBE

2. S = SLIGHT M = MODERATE H = HIGHLY

(4035-210-542) (W-C Log Form) (9/4/92 10:59 AM)

US B-3N (MS)

BOREHOLE LOG

BOREHOLE NO.: TH046892 PROJECT NAME: B1, B2, B3, and Landfill Dams Analysis PAGE 1 OF 2

RIG GEOLOGIST: LVS SUBCONTRACTOR: Woodward-Clyde

DEPTH TO BEDROCK (FT): 21 DEPTH TO WATER TABLE (FT): NE DATE: 10/13/92

CLASSIFICATION OF LAYERS

DEPTH (FT) FROM	DEPTH (FT) TO	SOIL SYMBOL	SOIL DESCRIPTION
0	1	FILL	GRAVEL, FINE TO COARSE, ANGULAR TO SUBANGULAR, DRY, BLUE
1	10	FILL	CLAY, STIFF, LOW TO MEDIUM PLASTICITY, SANDY, FINE TO
			MEDIUM, ANGULAR, SLIGHTLY MOIST, BROWN TO DARK BROWN
10	21	FILL	CLAY, STIFF TO VERY STIFF, HIGH PLASTICITY, MOIST TO VERY
			MOIST, DARK GREY, DARK BROWN, LIGHT GREY, BLACK, TRACE
			GREEN, TAN TRACE TO SOME ROOTS 1/64" TO 1/8"
21	26.5	SS	SANDSTONE BEDROCK, HARD TO VERY HARD, ~~CLAYEY (25%)~~ LVS
			FINE GRAINED, ANGULAR, CLAYEY (25%), SLIGHTLY MOIST
			BROWN TO TAN TO GREY, SOME IRON CONCRETIONS
			LVS

CLASSIFICATION OF INDIVIDUAL SAMPLES

TOP DEPTH (FT)	BLOW COUNT	SAMPLE TYPE	SOIL SYMBOL	MOISTURE: DRY	MOISTURE: MOIST	MOISTURE: VERY MOIST	MOISTURE: WET	% SAND	GRADING: FINE	GRADING: MEDIUM	GRADING: COARSE	GRADING: GRAVEL	% FINES (-#200)	BEDROCK: SANDSTONE	BEDROCK: SILTSTONE	BEDROCK: CLAYSTONE		COLOR	HARDNESS: VERY SOFT	HARDNESS: SOFT	HARDNESS: FIRM	HARDNESS: HARD	HARDNESS: VERY HARD	CONDITION: CEMENTED	CONDITION: MASSIVE	CONDITION: STRATIFIED	CONDITION: POROUS	CONDITION: FRACTURED	CONDITION: CALCAREOUS	OTHERS	RECOVERY (FT)
2	8/12	CAL	FILL	X				40	20	20			60					BROWN													.3
4-6	—	ST	FILL	X				60	20	20	20	10	30					BROWN													0
6	6/7	CAL	FILL																												0
7	5/6	CAL	FILL		X			25	20		5		75					BROWN													.3
0-5	—	BKT	FILL	X				20	←	20	→		80					BROWN													1
11	4/5	CAL	FILL		X								100					DARK GREY													.3
12-14	—	ST	FILL		X								100					DK GREY BLACK													1
5-10	—	BKT	FILL		X			5	5				95					DK BROWN GREY													—
14-16	—	ST	FILL		X								100					GREY													1
15	4/7	CAL	FILL		X	X		15	15				85					GREY BLACK													.3
10-15	—	BKT	FILL		X	X							100					DARK BROWN													—
15-17	—	ST	FILL		X								100					GREY													4"
17	7/11	CAL	FILL		X	X		20	20				80					GREY													.1

NOTES: 1. SAMPLE TYPES: SS = 2" O.D. SPLIT SPOON CAL = CALIFORNIA SPOON ST = SHELBY TUBE

2. S = SLIGHT M = MODERATE H = HIGHLY

(4005-210-542) (W-C Log Forms) (9/4/92 10:59 AM)

BOREHOLE LOG

BOREHOLE NO.: TH04689Z PROJECT NAME: B1, B2, B3, and Landfill Dams Analysis PAGE 2 OF 2

RIG GEOLOGIST: LVS SUBCONTRACTOR: Woodward-Clyde

DEPTH TO BEDROCK (FT): 21 DEPTH TO WATER TABLE (FT): NE DATE: 10/13/92

CLASSIFICATION OF LAYERS

DEPTH (FT) FROM	DEPTH (FT) TO	SOIL SYMBOL	SOIL DESCRIPTION
			LVS

CLASSIFICATION OF INDIVIDUAL SAMPLES

TOP DEPTH (FT)	BLOW COUNT	SAMPLE TYPE	SOIL SYMBOL	MOISTURE: DRY	MOISTURE: MOIST	MOISTURE: VERY MOIST	MOISTURE: WET	% SAND	GRADING: FINE	GRADING: MEDIUM	GRADING: COARSE	GRADING: GRAVEL	% FINES (-#200)	BEDROCK: SANDSTONE	BEDROCK: SILTSTONE	BEDROCK: CLAYSTONE	COLOR	HARDNESS: VERY SOFT	HARDNESS: SOFT	HARDNESS: FIRM	HARDNESS: HARD	HARDNESS: VERY HARD	CONDITION: CEMENTED	CONDITION: MASSIVE	CONDITION: STRATIFIED	CONDITION: POROUS	CONDITION: FRACTURED	CONDITION: CALCAREOUS	OTHERS	RECOVERY (FT)
19	10/11	CAL	FILL		X	X					5		95				DARK GREY													.3
15-20	–	BKT	FILL		X	X					5		95				DARK GREY													1
20-21	–	ST	FILL																											0
21	25/30	CAL	SS	X									25	X							X	X							IRON	.3
26.5	26/50	CAL	SS	X									25	X							X	X								.5
	(6"/1")																													
																	LVS													

NOTES: 1. SAMPLE TYPES: SS = 2" O.D. SPLIT SPOON CAL = CALIFORNIA SPOON ST = SHELBY TUBE

2. S = SLIGHT M = MODERATE H = HIGHLY

(4035-210-5423) (W-C Log Forms) (9/4/92 10:59 AM)

B-3 Crest South

BOREHOLE LOG

BOREHOLE NO.: THOA6992 PROJECT NAME: B1, B3, A3, and Landfill Dams Analysis PAGE 1 OF 2

RIG GEOLOGIST: LVS SUBCONTRACTOR: Woodward-Clyde

DEPTH TO BEDROCK (FT): 25 DEPTH TO WATER TABLE (FT): 20 DATE: 10/12/92

CLASSIFICATION OF LAYERS

DEPTH (FT) FROM	DEPTH (FT) TO	SOIL SYMBOL	SOIL DESCRIPTION
0	2.5	FILL	GRAVEL FINE TO COARSE VERY ANGULAR (BROKEN) TO SUBROUND
			CLAYEY MEDIUM PLASTICITY DRY TO SLIGHTLY MOIST BROWN
			DARK GREY
2.5	13	FILL	CLAY STIFF TO VERY STIFF, MEDIUM PLASTICITY, SANDY
			FINE TO COARSE, ANGULAR TO SUBROUND, DRY TO SLIGHTLY MOIST,
			BROWN, GREY
13	25	FILL	CLAY, STIFF TO VERY STIFF, HIGH PLASTICITY, MOIST TO VERY MOIST,
			DARK GREY, ~~FRAGE~~ SOME GREEN GREY, BLACK, BROWN, SOME GRAVEL 21'-25'
25	31	MS	SILTSTONE, VERY HARD, SLIGHTLY MOIST, BROWN TO DARK BLUE
			LVS

CLASSIFICATION OF INDIVIDUAL SAMPLES

TOP DEPTH (FT)	BLOW COUNT	SAMPLE TYPE	SOIL SYMBOL	MOISTURE: DRY	MOISTURE: MOIST	MOISTURE: VERY MOIST	MOISTURE: WET	% SAND	GRADING: FINE	GRADING: MEDIUM	GRADING: COARSE	GRADING: GRAVEL	% FINES (-#200)	BEDROCK: SANDSTONE	BEDROCK: SILTSTONE	BEDROCK: CLAYSTONE	COLOR	HARDNESS: VERY SOFT	HARDNESS: SOFT	HARDNESS: FIRM	HARDNESS: HARD/STIFF	HARDNESS: VERY HARD/friable	CONDITION: CEMENTED	CONDITION: MASSIVE	CONDITION: STRATIFIED	CONDITION: POROUS	CONDITION: FRACTURED	CONDITION: CALCAREOUS	CONDITION: OTHERS	RECOVERY (FT)
2	29/18	CAL	FILL	X				20	20			80	80				DARK GREY BROWN													.3
4	4/13	CAL	FILL	X				10	10				90				BROWN GREY													.3
0-5	—	BKT	FILL	X				30	10	10	10	30	40				BROWN													—
6	5/18	CAL	FILL	X				30	10	10	10		70				BROWN													.3
5-10	—	BKT	FILL	X				90			10		90				BROWN													—
9	12/10	CAL	FILL																											0
10	11/11	CAL	FILL	X				30	15	15			70				BROWN													0
12	8/10	CAL	FILL		X			20	10	10			80				BROWN DARK BROWN													.3
13-15	—	ST	FILL		X								100				DARK GREY													0"
10-15	—	BKT	FILL		X			10	10				90				BROWN													—
17-19	—	ST	FILL		X	X							100				GREEN GREY BLACK													0"
20	6/6	CAL	FILL			X						10	90				GREEN DARK GREY			X	X									.3
15-20	—	BKT	FILL			X						10	90				↓			X	X									—

NOTES: 1. SAMPLE TYPES: SS = 2" O.D. SPLIT SPOON CAL = CALIFORNIA SPOON ST = SHELBY TUBE

2. S = SLIGHT M = MODERATE H = HIGHLY

(4035-210-542) (W-C Log Form) (9/4/92 10:59 AM)

BOREHOLE LOG

BOREHOLE NO.: TH046992 PROJECT NAME: B1, B3, A3, and Landfill Dams Analysis PAGE 2 OF 2

RIG GEOLOGIST: LVS SUBCONTRACTOR: Woodward-Clyde

DEPTH TO BEDROCK (FT): 25 DEPTH TO WATER TABLE (FT): 20 DATE: 10/12/92

CLASSIFICATION OF LAYERS

DEPTH (FT) FROM	DEPTH (FT) TO	SOIL SYMBOL	SOIL DESCRIPTION
			LVS

CLASSIFICATION OF INDIVIDUAL SAMPLES

TOP DEPTH (FT)	BLOW COUNT	SAMPLE TYPE	SOIL SYMBOL	MOISTURE: DRY	MOISTURE: MOIST	MOISTURE: VERY MOIST	MOISTURE: WET	% SAND	GRADING: FINE	GRADING: MEDIUM	GRADING: COARSE	GRADING: GRAVEL	% FINES (-#200)	BEDROCK: SANDSTONE	BEDROCK: SILTSTONE	BEDROCK: CLAYSTONE	COLOR	HARDNESS: VERY SOFT	HARDNESS: SOFT	HARDNESS: FIRM	HARDNESS: HARD	HARDNESS: VERY HARD	CONDITION: CEMENTED	CONDITION: MASSIVE	CONDITION: STRATIFIED	CONDITION: POROUS	CONDITION: FRACTURED	CONDITION: CALCAREOUS	OTHERS	RECOVERY (FT)
21-23	—	ST	FILL			X						15	85				KHAKI DARK GREY													8.5
23	—	CAL	FILL				X					70	30				BROWN GREY													3
25	62/45	CAL	MS	X									100		X		BROWN					X								.3
30	—	CAL	MS	X									100		X		DARK BLUE					X								.3
													LVS																	

NOTES: 1. SAMPLE TYPES: SS = 2" O.D. SPLIT SPOON CAL = CALIFORNIA SPOON ST = SHELBY TUBE

2. S = SLIGHT M = MODERATE H = HIGHLY

(4035-210-5421) (W-C Log Form) (9/4/92 10:59 AM)

B-3 Toe

BOREHOLE LOG

BOREHOLE NO.: TH047092 PROJECT NAME: B1, B3, A3, and Landfill Dams Analysis PAGE 1 OF 1

RIG GEOLOGIST: Michael May SUBCONTRACTOR: Woodward-Clyde

DEPTH TO BEDROCK (FT): 11.0 DEPTH TO WATER TABLE (FT): 7.0 DATE: 10-23-92

CLASSIFICATION OF LAYERS

DEPTH (FT) FROM	DEPTH (FT) TO	SOIL SYMBOL	SOIL DESCRIPTION
0	2	Fill	Clay, low plasticity, sandy, fine to medium grained, angular to subangular, stiff, dry to moist, brown.
2	11	Fill	Clay, high plasticity, some sand, fine grained, angular to subangular, stiff, moist to wet, brown, dark gray, black.
11	16.5	CS	Claystone Bedrock, some sand, fine grained, angular to subangular, hard to very hard, moist, light gray, dark gray, brown, iron oxide staining.

CLASSIFICATION OF INDIVIDUAL SAMPLES

TOP DEPTH (FT)	BLOW COUNT	SAMPLE TYPE	SOIL SYMBOL	MOISTURE: DRY	MOISTURE: MOIST	MOISTURE: VERY MOIST	MOISTURE: WET	% SAND	GRADING: FINE	GRADING: MEDIUM	GRADING: COARSE	GRADING: GRAVEL	% FINES (-#200)	BEDROCK: SANDSTONE	BEDROCK: SILTSTONE	BEDROCK: CLAYSTONE	COLOR	HARDNESS: VERY SOFT	HARDNESS: SOFT	HARDNESS: FIRM	HARDNESS: HARD	HARDNESS: VERY HARD	CONDITION: CEMENTED	CONDITION: MASSIVE	CONDITION: STRATIFIED	CONDITION: POROUS	CONDITION: FRACTURED	CONDITION: CALCAREOUS	OTHERS	RECOVERY (FT)
1	8/12	Cal	Fill	X				30	X	X		20	50				Brown S. White													.3
4	NA	ST	Fill			X		10	X				90				Brown D. Gray												Black	1
0-5	NA	Bucket	Fill		X		X	1mm	Mix of Clay and sandy clay																					NA
6	7/30	Cal	Fill				X	10	X				90				D. Gray Black												Brown	.3
5-10	NA	Bucket	Fill			X		10	X				90				D. Gray Black												Brown	NA
10	13/24	Cal	Fill	X									100				D. Gray Brown												L. Gray	.3
16	7 50 4"	Cal	CS	X				10	X				90			X	L. Gray D. Gray					X							Brown	.3

NOTES: 1. SAMPLE TYPES: SS = 2" O.D. SPLIT SPOON CAL = CALIFORNIA SPOON ST = SHELBY TUBE

2. S = SLIGHT M = MODERATE H = HIGHLY

(4035-210-542) (W-C Log Form) (9/4/92 10:59 AM)

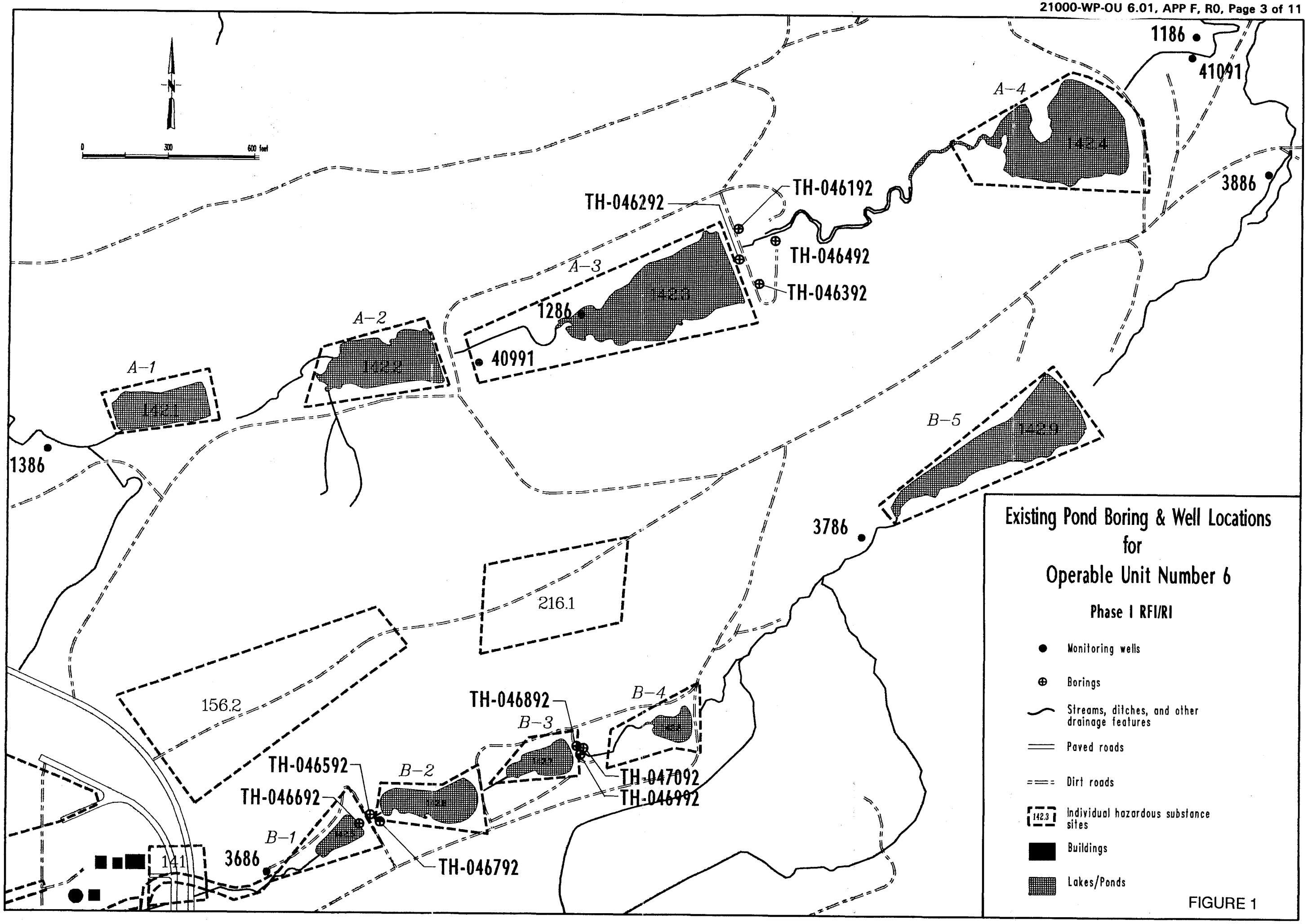

0
300
600 feet
1186
41091
A-4
142.4
3886
TH-046192
TH-046292
TH-046492
TH-046392
A-3
142.3
1286
A-2
142.2
40991
A-1
142.1
1386
B-5
142.9
3786
216.1
156.2
TH-046892
B-4
B-3
TH-046592
B-2
TH-046692
TH-047092
TH-046992
B-1
3686
141
TH-046792
Existing Pond Boring & Well Locations
for
Operable Unit Number 6
Phase I RFI/RI
Monitoring wells
Borings
Streams, ditches, and other drainage features
Paved roads
Dirt roads
142.3
Individual hazardous substance sites
Buildings
Lakes/Ponds

FIGURE 1

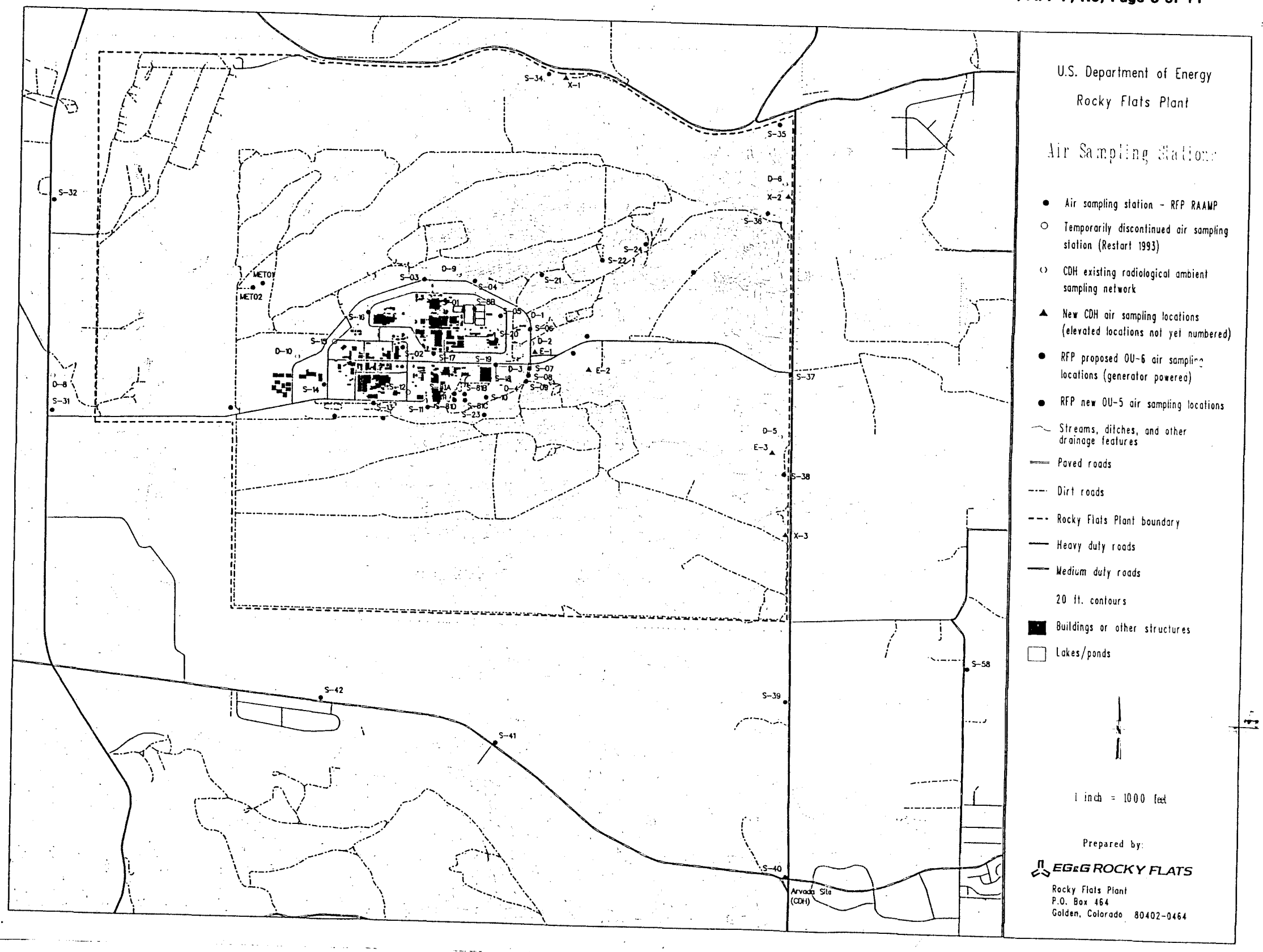

U.S. Department of Energy
Rocky Flats Plant
Air Sampling Stations
Air sampling station - RFP RAAMP
Temporarily discontinued air sampling station (Restart 1993)
CDH existing radiological ambient sampling network
New CDH air sampling locations (elevated locations not yet numbered)
RFP proposed OU-6 air sampling locations (generator powered)
RFP new OU-5 air sampling locations
Streams, ditches, and other drainage features
Paved roads
Dirt roads
Rocky Flats Plant boundary
Heavy duty roads
Medium duty roads
20 ft. contours
Buildings or other structures
Lakes/ponds
1 inch = 1000 feet
Prepared by:
EG&G ROCKY FLATS
Rocky Flats Plant
P.O. Box 464
Golden, Colorado 80402-0464
Arvada Site (CDH)
S-34
X-1
S-35
D-6
X-2
S-36
S-32
S-24
S-22
S-21
D-9
S-03
S-04
METO1
METO2
S-16
S-15
D-10
S-02
S-17
S-19
S-20
D-1
S-06
D-2
E-1
E-2
S-07
S-08
S-09
D-3
D-4
S-14
S-12
S-13
S-11
S-10
S-23
D-8
S-31
S-37
D-5
E-3
S-38
X-3
S-58
S-42
S-39
S-41
S-40

FIGURE 2

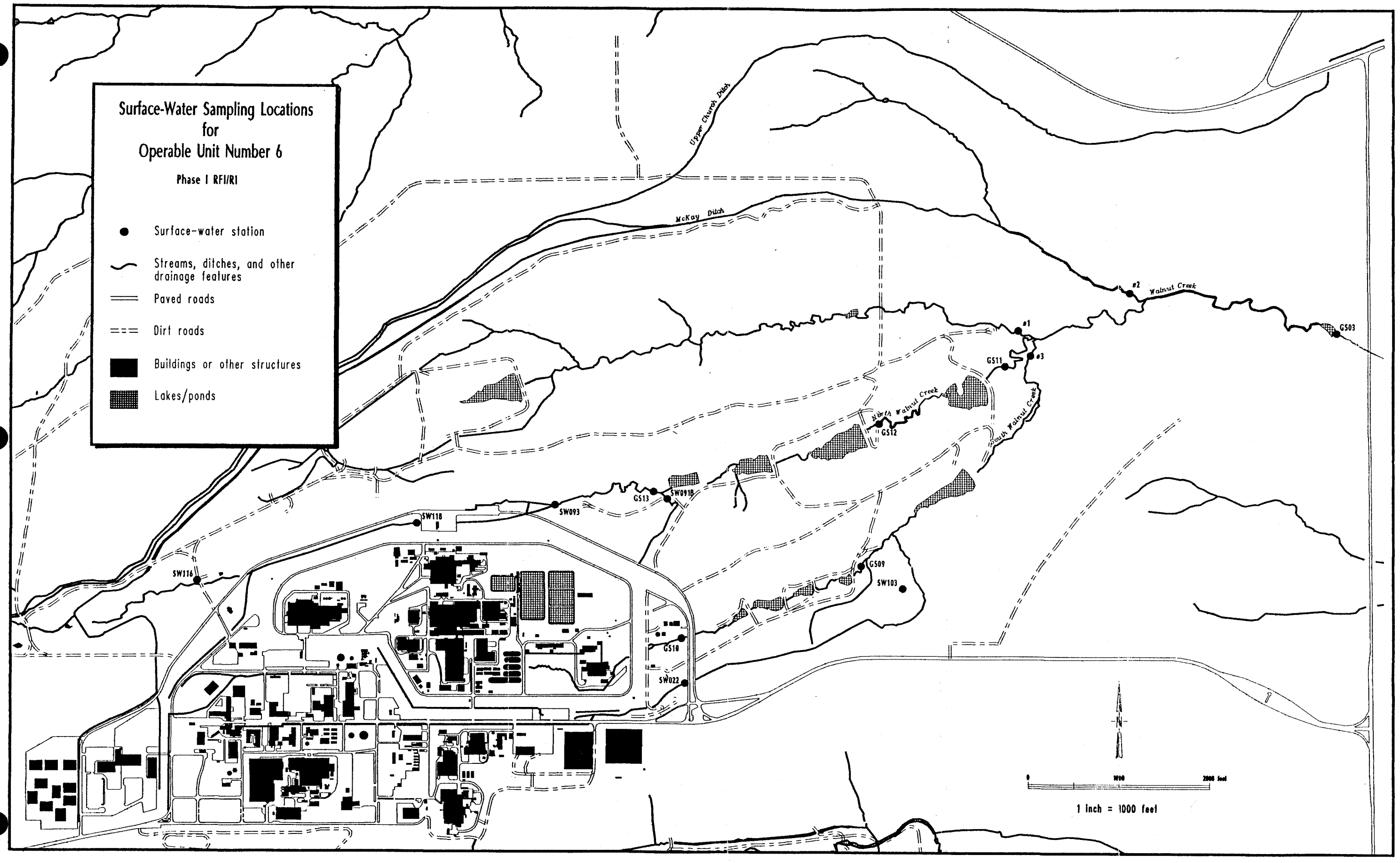

Surface-Water Sampling Locations
for
Operable Unit Number 6
Phase I RFI/RI
Surface-water station
Streams, ditches, and other drainage features
Paved roads
Dirt roads
Buildings or other structures
Lakes/ponds
Upper Church Ditch
McKay Ditch
Walnut Creek
North Walnut Creek
South Walnut Creek
#1
#2
#3
GS03
GS11
GS12
GS13
SW091B
SW093
SW118
SW116
GS09
SW103
GS10
SW022
0
1000
2000 feet
1 inch = 1000 feet

FIGURE 3