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Date: February 19, 1997
Refer to: EM/ER:97-036

Mr. Dennis McQuillan, Program Manager
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SUBJECT: REVISION OF CORRECTIVE ACTION REPORT FOR TA-18, PRS 18-003(d)

Our letter of December 3, 1996, documented agreements reached regarding revision of the subject document and of the proposed correction action at Potential Release Site 18-003(d). Item 1 of that letter stipulated the corrective action report would be revised and reissued to reflect the agreed upon changes. The enclosed Revision 1 of the subject document incorporates those changes.

If you have any questions regarding this revised Corrective Action Report, please contact Gene Gould at (505) 667-0402 or Everett Trollinger at (505) 667-5801.

Sincerely,

Jorg Jansen, Program Manager
LANL/ER Project

Sincerely,

Theodore J. Taylor, Program Manager
DOE/LAAO

JJ/TJT/rfr

Enclosure: Corrective Action Report for TA-18, PRS 18-003(d), Rev. 1

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18-003(d)

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Corrective Action Report for TA-18

(located in former Operable Unit 1093)

Field Unit 2

Environmental Restoration Project

Revision 1
January 1997

A Department of Energy
Environmental Cleanup Program

Los Alamos
NATIONAL LABORATORY

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TA-18 GROUNDWATER CONTAMINATION CORRECTIVE ACTION REPORT

1.0 Introduction

This corrective action report is being submitted in compliance with the New Mexico Water Quality Control Commission Regulations (NMWQCCR, December 1, 1995). The report addresses groundwater contamination observed as part of a RCRA Facilities Investigation (RFI) at Technical Area (TA)-18 at the Los Alamos National Laboratory (Laboratory). A water sample from a monitoring well installed adjacent to a septic system drainfield contained 1-2 dicloroethane at a concentration of 13 mg/L, which is in excess of the water quality standard of 10 µg/L (NMWQCCR, Section 3103). The septic system that is connected to the drainfield is known to have received organic solvents. This plan summarizes information in the RFI report and its addendum (Environmental Restoration Project 1995, 1283), describes corrective actions already accomplished, and proposes additional investigation to better characterize the nature and extent of the observed contamination.

2.0 Site Description

TA-18 is located on Pajarito Road in Pajarito Canyon approximately 5 miles west of White Rock (Figure 2-1). TA-18 has been the location of nuclear criticality experiments since the early 1940s. In the 1950s, three facilities were constructed specifically to perform these experiments. The facilities were remote from the central portion of the technical area, and each was served by a septic tank and drainfield. These septic systems were designated as potential release sites (PRSs) in the HSWA module of the Laboratory's RCRA permit. Potential contaminants at these PRSs included organic solvents and oils, as well as uranium and plutonium

The septic system at Nuclear Criticality Facility 3 is designated as PRS 18-003(d) (Figures 2-2 and 2-3). This septic system has been in use since 1960. The tank is constructed of reinforced concrete and has approximately a 500-gallon capacity. The bottom of the tank is approximately 5 ft below grade. The drainfield, constructed from perforated clay tile pipe, is similarly about 5 ft below grade. The exact location of the pipes in the drainfield is not known (the locations indicated in Figure 2-3 are based on available drawings). Ground-penetrating radar was used in an unsuccessful attempt to better define the location of the pipes.

3.0 Results of RCRA Facilities Investigation

The RFI, conducted from 1993 to 1996, investigated potential soil and groundwater contamination at the septic systems in TA-18. Samples were collected from the tanks, from soil adjacent to the tanks and within the drainfield, and from underlying shallow alluvial groundwater. Monitoring wells were left in place at several locations. Water samples were also collected from previously constructed monitoring wells within and adjacent to TA-18. The following information is based on the RFI.

3.1 Site Geology

TA-18 is located in Pajarito Canyon, which is formed in the Tshirege Member of the Bandelier Tuff. The canyon floor is composed of alluvial material consisting of sands, clayey sands, sandy clays, and clays, as well as pebbles and cobbles of Bandelier Tuff and older formations. Significant deposits of volcanic gravels have also accumulated in the canyon east of TA-18. These tuff gravels and cobbles are typically subrounded to rounded, indicating streambed deposition. The sediment layers are poorly to well sorted. The sand and clay lenses are laterally discontinuous, highly variable, and range from a few inches to more than 1 foot thick. The alluvium varies in thickness up to approximately 50 ft, with the greatest thickness near the center of the canyon. The alluvium is underlain by units of the Tshirege, the Otowi Member of the Bandelier, basalt, and the Puye formation (Figure 3-1). The alluvium thins progressively down-canyon from TA-18.

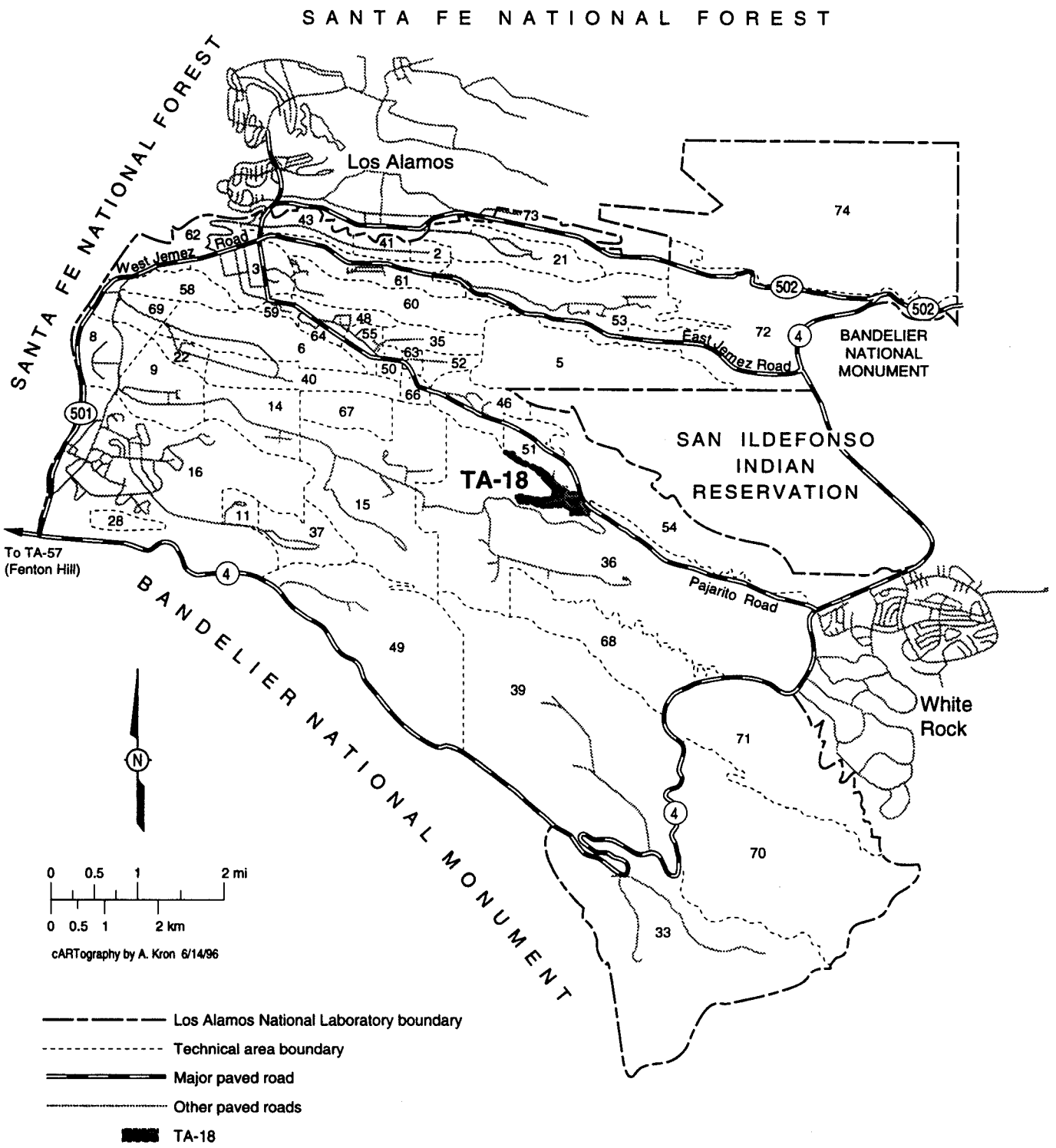


Figure 2-1. Location of TA-18.

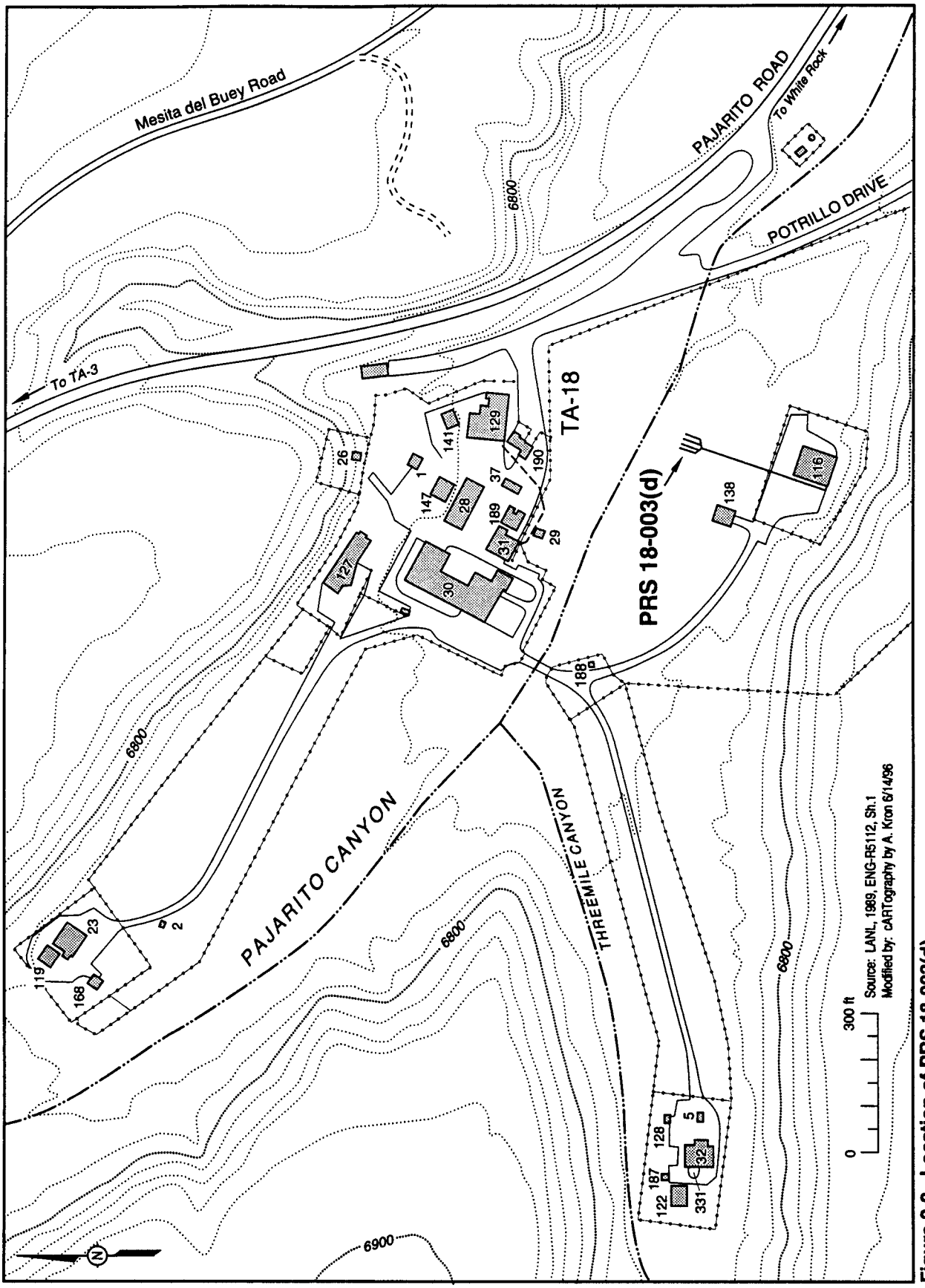


Figure 2-2. Location of PRS 18-003(d).

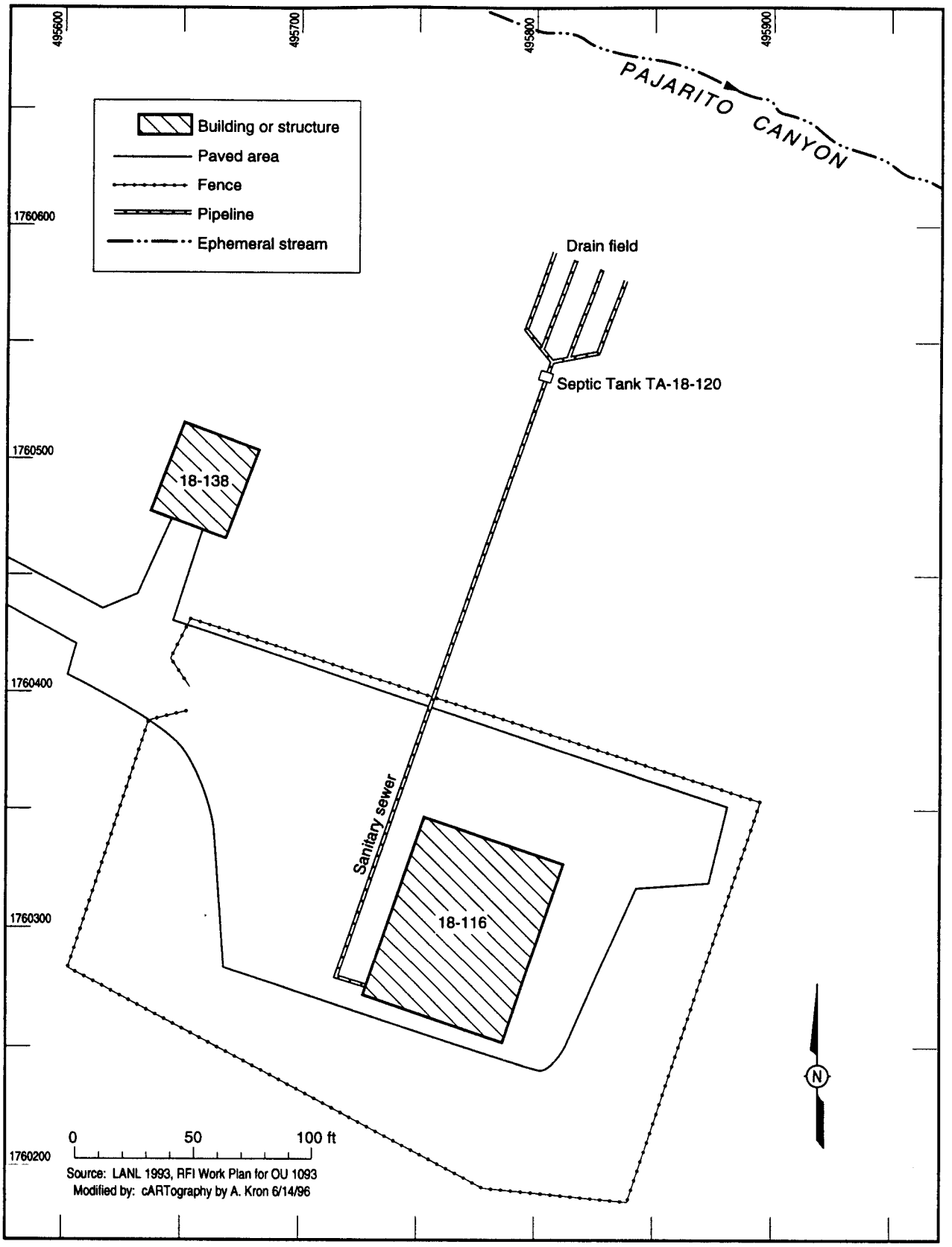


Figure 2-3. PRS 18-003(d), Septic System.

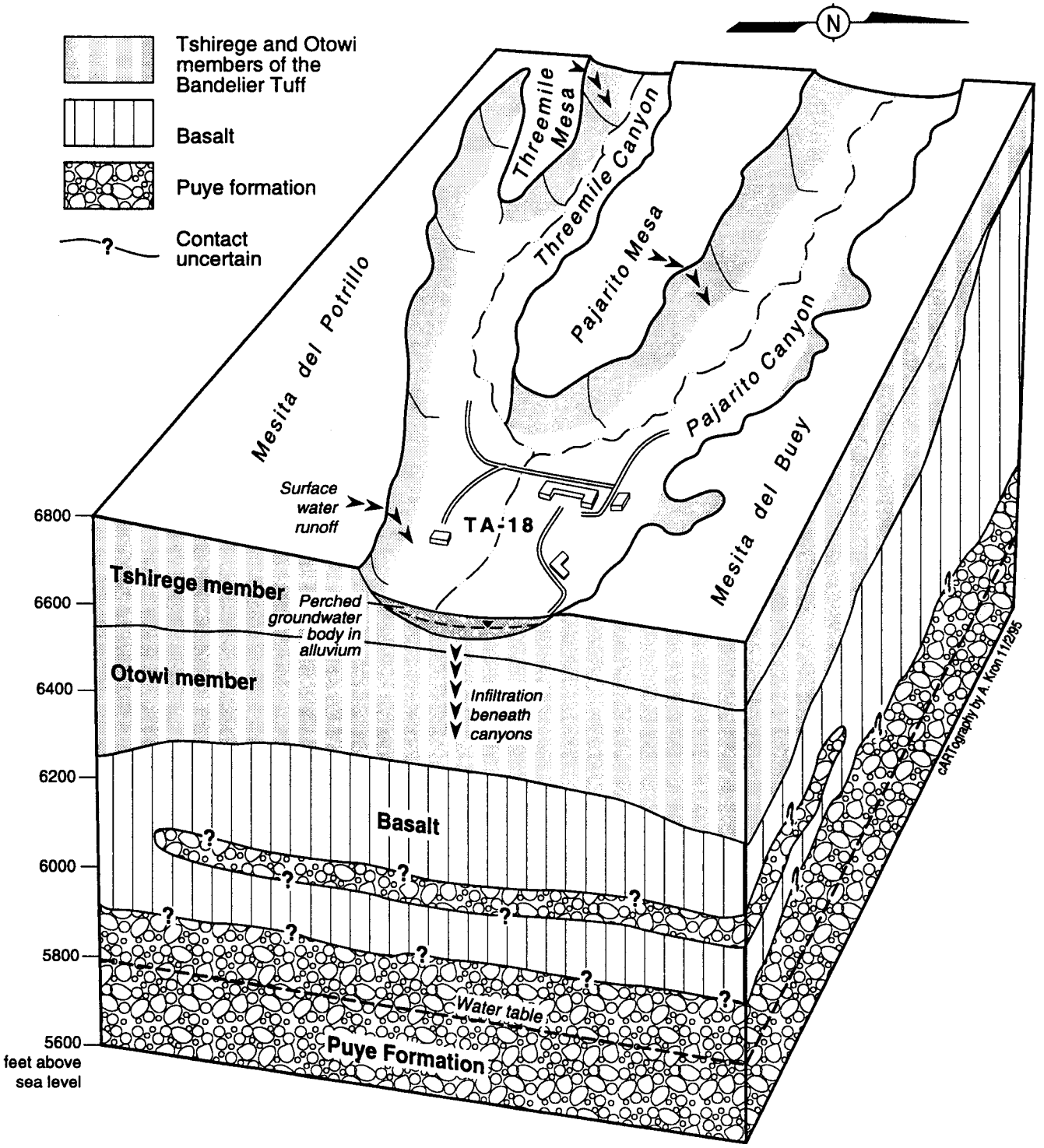


Figure 3-1. Hydrogeologic setting.

3.2 Soils

Canyon bottom soils of Pajarito Canyon are typically well-drained soils of the Totavi series (Nyhan et al. 1978, 0161). At OU 1093, the primary erosional process is the movement of sediments through the canyon bottom during periods of stream flow. Rates of erosion and sediment transport and deposition in the canyon bottoms are not clearly defined. Minor amounts of wind erosion may also occur in the area.

3.3 Hydrology

3.3.1 Surface Water

Pajarito Canyon surface water originates on the flanks of the Sierra de los Valles west of the Pajarito Plateau. The drainage basin area from the headwaters in the canyon to the Laboratory's eastern boundary is approximately 10.6 square miles. Stream flow in short sections of the canyon is perennial on the mountain flanks and the western portion of the plateau and ephemeral across the eastern plateau, where the canyon passes through TA-18 to the Rio Grande. Storm water runoff drains into the canyon from the flanks of the mountains and the surrounding mesas. During peak flow events, stream flow in Pajarito Canyon may reach the Rio Grande. A significant volume of surface flow recharges the unconfined perched groundwater body in the canyon, and the remainder is lost through evapotranspiration (Purtymun and Kennedy 1971, 0200; LATA 1991, 16-0005).

Gravel pits east of TA-18 have been excavated into the top of the perched water table and frequently contain ponded water. Semi-permanent wetlands have developed in the abandoned pits. It appears that the water surface in these depressions is a reflection of the adjacent groundwater surface.

In Pajarito and Threemile canyons, the 100-year flood plain occupies an area more or less centered on the stream channel; PRSs near or adjacent to the stream channel are, therefore, within the 100-year flood plain (McLin 1992, 0825). Nearly all of the TA-18 structures and their associated PRSs are above the 100-year flood plain.

3.3.2 Groundwater

3.3.2.1 Alluvial Aquifer

A shallow alluvial aquifer is located in the alluvium in Pajarito Canyon, extending from approximately 1 mile west to approximately 5 miles east of TA-18. The source of recharge to the shallow aquifer is primarily infiltration of stream flow from the upper reaches of the canyon, with some from infiltration of local precipitation. The only known groundwater discharges in the TA-18 area are the wetlands, a sump that collects groundwater beneath Building TA-18-30 and discharges through an outfall, and any losses from evapotranspiration. An unknown amount of water percolates downward from the base of the aquifer. However, no perched aquifers have been observed between the shallow alluvial aquifer and the main aquifer. The depth to the main aquifer is approximately 800 ft in the vicinity of TA-18.

Shallow groundwater elevations were measured periodically from 1993 through 1996 as part of the RFI, and before that in the Pajarito Canyon Observation (PCO) wells, which were drilled and monitored by the Laboratory's Environmental Surveillance Program. Water table elevations are highly variable, both seasonally and annually, in Pajarito Canyon, varying as much as 13 ft in some wells during the period of study.

The water table tends to be lowest from November through February. This is reasonable, given that most precipitation as snowfall would not be available for infiltration, and recharge from upstream areas is at a minimum. Water level elevations are highly variable during the spring and summer months, primarily as a function of variability in recharge from stream flow. In addition, the stream channel in the eastern portion of TA-18 probably serves as a discharge point when groundwater levels are high, and as a recharge point

when groundwater levels are low and the stream is flowing. As a result, local groundwater gradients may be away from the stream at some times, and towards it at others.

Measurements of the depth to the water table during drilling, performed as part of the RFI investigation, were from 6 to 22 ft below ground surface. Groundwater elevation at permanent and temporary wells was measured in June through August 1995 (Table 3-1). This included measurements in two wells located upgradient from TA-18. In addition, elevation of the surface of the wetlands and any stream flow was measured at selected locations. Figure 3-2 presents water level contours based on these measurements. Because of the well spacing, these contours only reflect canyon-scale conditions in the shallow groundwater. The canyon-scale gradient on the water table is relatively uniform, at approximately 0.015 ft/ft. No permeability measurements have been made in this aquifer.

3.3.2.2 Main Aquifer

At TA-18, the main aquifer lies at an elevation of 5,870 to 5,900 ft. Approximately 800 ft of Bandelier Tuff and underlying formations lie between the alluvial groundwater body in Pajarito Canyon and the main aquifer. Well PM-2, completed in the main aquifer and located just east of TA-18, is the closest production well to TA-18 (Figure 3-2). Although it is believed that a hydraulic connection does not exist between the alluvial aquifer and the main aquifer, no conclusive data support this contention (Devaurs 1985, 0046; Purtymun and Kennedy 1971, 0200). No perched water is known to exist between the shallow alluvial groundwater body and the main aquifer below OU 1093 (Devaurs 1985, 0046).

3.4 Nature of Observed Contamination

The samples collected at PRS 18-003(d) are summarized in Table 3-2. Surface soil samples were collected above the drainfield. Subsurface samples were collected adjacent to the septic tank and within

TABLE 3-1

MONITORING WELLS AT TA-18

Well Description	Location ID	Elevation (ft)	Casing Size (in.)	Well Depth (ft)	Water Level Elevation (ft) July 1995
BG-1	18-1060	6,776.45	2	37	6,769.76
MW-1	18-2013	6,758.8	2	25.6	6,750.33
MW-2	18-2014	6,758.3	2	27.6	6,748.95
MW-3	18-2015	6,758.3	2	23.4	6,748.95
MW-4	18-2016	6,758.5	2	26.2	6,749.08
MW-5	18-2023	6,736.7	2	29.5	6,724.49
MW-6	18-2024	6,730.1	2	25	6,723.15
MW-7	18-1135	6,776.45	2	32	6,748.36
MW-8	18-1166	6,747.79	2	37.9	6,740.37
MW-9	18-1234	6,732.91	2	23	6,722.66
MW-10	18-1255	6,735.9	2	28.7	6,729.86
MW-11	18-1275	6,740.13	2	49	6,725.32
PCO-1	36-2020	6,687	4	13	6,786.32

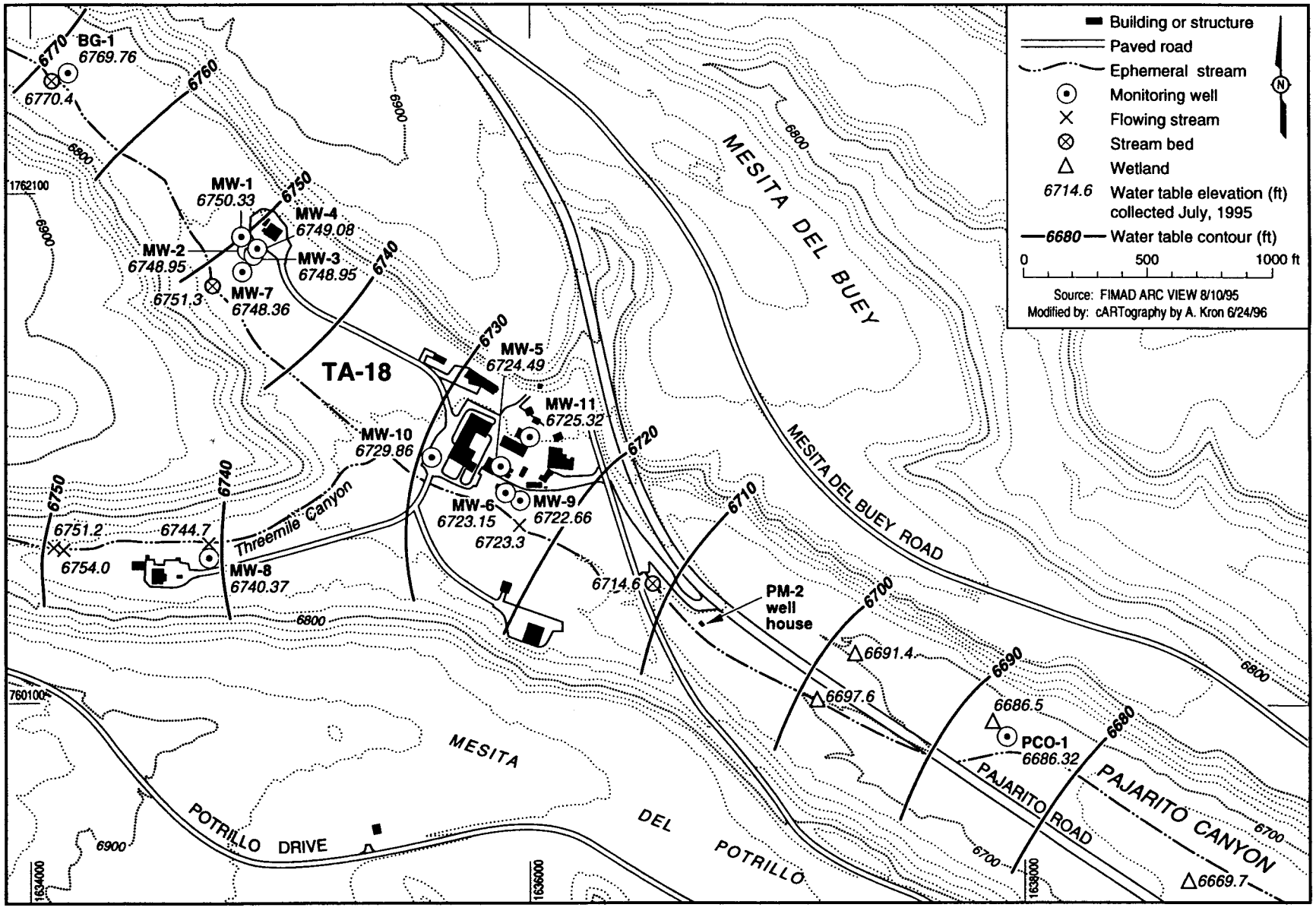


Figure 3-2. Monitoring wells and water level elevations at TA-18.

TABLE 3-2
SAMPLING AND ANALYSIS
AT PRS 18-003(d)

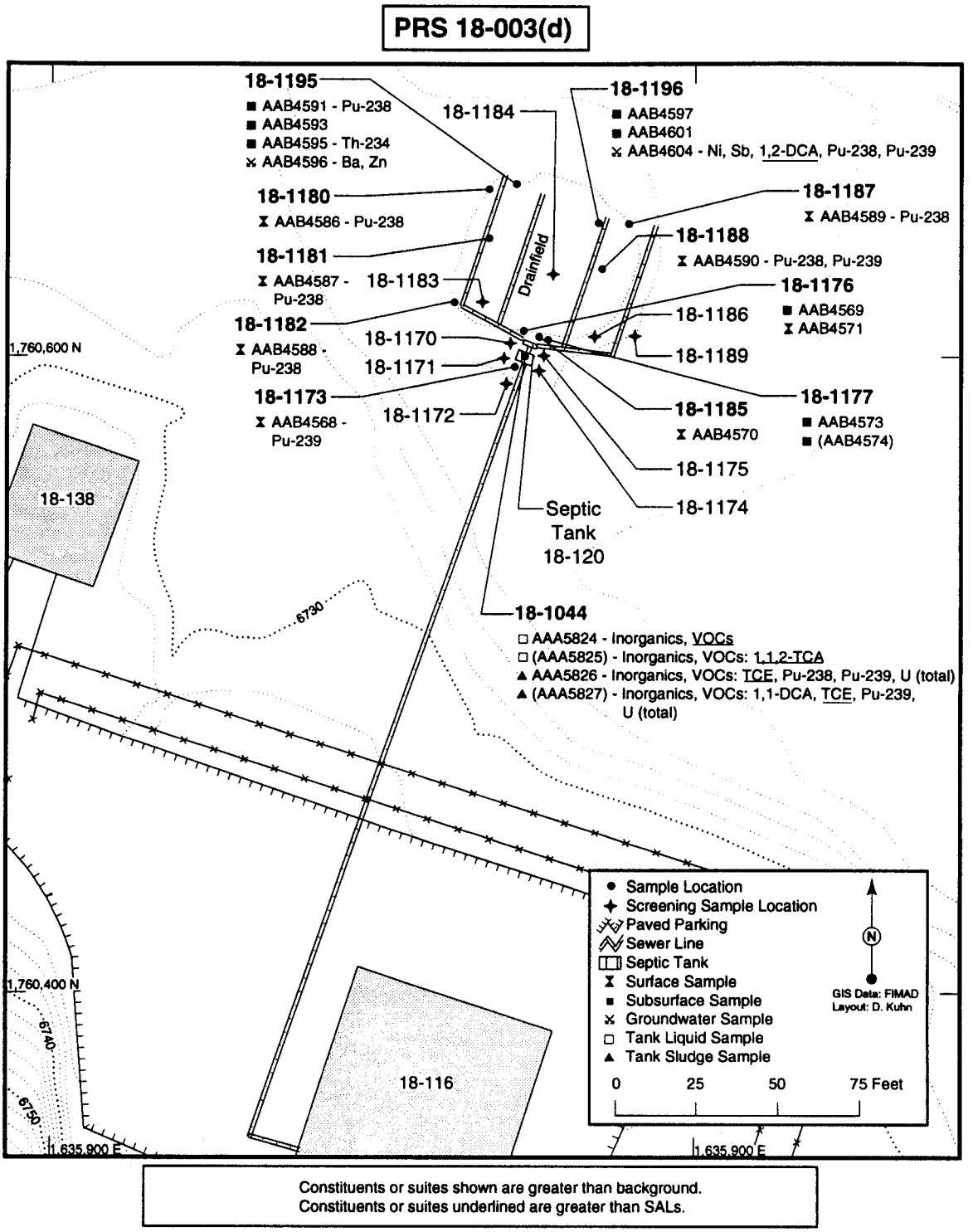
			Analytical Methods									
PRS Number	**PRS Description**	**Sample Description**	No. of samples taken	VOCs (EPA 8240)	SVOCs (EPA 8270)	Inorganics	General mineral (std.)	Chloride - soils (EPA 300)	Nitrate - soils (EPA 300)	Uranium (total) (DOE)	Plutonium (isotopic) (DOE)	Gamma spectroscopy (DOE)
18-003(d)	Septic tank (inactive)	Liquid	2	X		X				X	X	
		Sludge	2			X				X	X	
		Groundwater	2	X	X	X	X			X	X	X
		Soils-subsurface	8	X	X	X		X	X	X	X	X
		Soils-surface	8		X	X				X	X	X

the drainfield. Groundwater samples were collected from two temporary wells located near the outer edge of the drainfield. After completion of the RFI sampling, the temporary well casings were removed and the boreholes were backfilled with bentonite.

The results of the RFI at PRS 18-003(d) are summarized in Figure 3-3 and Table 3-3. The figure and table present reported concentrations of inorganics above background in soil and groundwater, detected inorganics in septic tank sludge or water, and reported concentrations of organics in all media. Site-specific background concentrations of inorganics in soils and groundwater were measured at the upgradient sampling locations BG-1 and two nearby boreholes (Figure 3-2). Comparisons were made with site-specific soil background concentrations whenever the site-specific values were less than the site-wide values. Only site-specific background values were used for groundwater. The reported concentrations were also compared with health-based screening action levels (SALs).

Concentrations of some metals were reported above site background values in groundwater samples. The volatile organic compound (VOC) 1-2 dicloroethane (EDC) was detected in one of the temporary wells. Several volatile organic solvents, including trichloroethene (TCE), were detected in the liquid and sludge in the septic tank. However, no VOCs (including EDC) were detected in any soil samples. It is presumed that the EDC is a result of chemical or biological breakdown of TCE. However, various solvents were used in the criticality facility and EDC could have been present. The detection limits for EDC in the sludge in the two samples from the tank were 25 and 130 ppb, much higher than the detection limit in groundwater (5 ppb).

Nitrate and chloride concentrations were measured in the background wells and in wells sampled within TA-18. Elevated nitrate or chloride concentrations, as compared with background concentrations, in water samples collected from wells at the septic systems could provide an indication that the samples



Constituents or suites shown are greater than background.
Constituents or suites underlined are greater than SALs.

Figure 3-3. Results of RFI sampling at PRS 18-003(d).

TABLE 3-3

DATA COMPARISON FOR PRS 18-003(d)

Inorganics									
Analyte	Location No.	Sample ID	Depth (in.)	Medium	Result	Background	SAL	Units	>SAL
Antimony	18-1196	AAB4604	Below WT	groundwater (F)	3.8	ND	32	mg/kg	
Barium	18-1044	AAA5824	N/A	water	24	na	2000	µg/L	
		AAA5825	N/A	water	3	na	2000	µg/L	
		AAA5826	N/A	sludge	57	na	5600	mg/kg	
		AAA5827	N/A	sludge	58	na	5600	mg/kg	
	18-1195	AAB4596	Below WT	groundwater (F)	374	214[1]	2000	µg/L	
Beryllium	18-1044	AAA5826	N/A	sludge	1.6	na	na	mg/kg	No SAL
		AAA5827	N/A	sludge	1.9	na	na	mg/kg	No SAL
Cadmium	18-1044	AAA5826	N/A	sludge	6.6	na	80	mg/kg	
		AAA5827	N/A	sludge	5.1	na	80	mg/kg	
Chromium	18-1044	AAA5824	N/A	water	4	na	100	µg/L	
		AAA5825	N/A	water	12	na	100	µg/L	
		AAA5826	N/A	sludge	14.8	na	400[2]	mg/kg	
		AAA5827	N/A	sludge	8.1	na	400[2]	mg/kg	
Lead	18-1044	AAA5824	N/A	water	9	na	50	µg/L	
		AAA5825	N/A	water	13	na	50	µg/L	
		AAA5826	N/A	sludge	138	na	400	mg/kg	
		AAA5827	N/A	sludge	71.1	na	400	mg/kg	
Mercury	18-1044	AAA5826	N/A	sludge	15	na	24	mg/kg	
		AAA5827	N/A	sludge	17	na	24	mg/kg	
Nickel	18-1044	AAA5825	N/A	water	16	na	100	µg/L	
		AAA5826	N/A	sludge	21	na	1600	mg/kg	
		AAA5827	N/A	sludge	14	na	1600	mg/kg	
	18-1196	AAB4604	Below WT	groundwater (F)	2.8	ND	100	µg/L	
Silver	18-1044	AAA5826	N/A	sludge	170	na	400	mg/kg	
		AAA5827	N/A	sludge	3.6	na	400	mg/kg	

WT: water table N/A: not applicable (F): filtered sample na: not available ND: not detected [1] Site-specific background values obtained from background wells
[2] SAL used for chromium is SAL for hexavalent chromium, the most toxic form of this organic

TABLE 3-3

DATA COMPARISON FOR PRS 18-003(d) (continued)

Analyte	Location No.	Sample ID	Depth (in.)	Medium	Result	Background	SAL	Units	>SAL
Zinc	18-1044	AAA5826	N/A	sludge	390	na	24000	mg/kg	
		AAA5827	N/A	sludge	270	na	24000	mg/kg	
		AAA5824	N/A	water	200	na	10000	µg/L	
		AAA5825	N/A	water	210	na	10000	µg/L	
	18-1195	AAB4596	Below WT	groundwater (F)	307	64.3[1]	10000	µg/L	

Organics								
Analyte	Location No.	Sample ID	Depth (in.)	Medium	Result	SAL	Units	>SAL
Acetone	18-1044	AAA5826	N/A	sludge	260	3500	µg/L	
n-Butylbenzene	18-1044	AAA5826	N/A	sludge	30	na	µg/L	No SAL
Chloroethane	18-1044	AAA5824	N/A	water	87	14000	µg/L	
		AAA5825	N/A	water	110	14000	µg/L	
		AAA5826	N/A	sludge	670	14000	µg/L	
		AAA5827	N/A	sludge	2000	14000	µg/L	
1,1-Dichloroethane		AAA5824	N/A	water	220	3500	µg/L	
	18-1044	AAA5825	N/A	water	240	3500	µg/L	
		AAA5826	N/A	sludge	220	3500	µg/L	
		AAA5827	N/A	sludge	4100	3500	µg/L	X
1,2-Dichloroethane	18-1196	AAB4604	Below WT	groundwater (NF)	13	5	µg/L	X
cis-1,2-Dichloroethylene	18-1044	AAA5824	N/A	water	100	na	µg/L	No SAL
		AAA5825	N/A	water	100	na	µg/L	No SAL
		AAA5826	N/A	water	740	na	µg/L	No SAL
1,1,2-Trichloroethane	18-1044	AAA5825	N/A	water	19	5	µg/L	X
Trichloroethene	18-1044	AAA5826	N/A	sludge	41	5	µg/L	X
		AAA5827	N/A	sludge	1000	5	µg/L	X
Trichlorofluoromethane	18-1196	AAB4597	0-60	subsurface soil	0.027	24000	mg/kg	
	18-1196	AAB4601	60-120	subsurface soil	0.024	24000	mg/kg	
Xylenes (mixed)	18-1176	AAB4571	24-48	subsurface soil	0.012	160000	mg/kg	

WT: water table N/A: not applicable (F): filtered sample (NF): nonfiltered sample na: not available [1] Site-specific background values obtained from background wells

TABLE 3-3

DATA COMPARISON FOR PRS 18-003(d) (concluded)

Radionuclides									
Analyte	Location No.	Sample ID	Depth (in.)	Medium	Result	Background UTL	SAL	Units	>SAL
Plutonium-238	18-1044	AAA5826	N/A	Sludge	0.425	N/A	27	pCi/g	
	18-1180	AAB4586	0-6	Surface soil	0.06	0.014 (max)*	27	pCi/g	
	18-1181	AAB4587	0-6	Surface soil	0.1	0.014 (max)*	27	pCi/g	
	18-1182	AAB4588	0-6	Surface soil	0.09	0.014 (max)*	27	pCi/g	
	18-1187	AAB4589	0-6	Surface soil	0.02	0.014 (max)*	27	pCi/g	
	18-1188	AAB4590	0-6	Surface soil	1.0	0.014 (max)*	27	pCi/g	
	18-1195	AAB4591	0-60	Surface soil	0.02	0.014 (max)*	27	pCi/g	
	18-1196	AAB4604	0-120	Groundwater	0.02	nd	15	pCi/L	
Plutonium-239	18-1044	AAA5826	N/A	Sludge	0.97	N/A	24	pCi/g	
		AAA5827	N/A	Sludge	0.88	N/A	24	pCi/g	
	18-1173	AAB4568	0-6	Surface soil	0.06	0.052 (max)*	24	pCi/g	
	18-1188	AAB4590	0-6	Surface soil	0.7	0.052 (max)*	24	pCi/g	
	18-1196	AAB4604	0-120	Groundwater	0.02	nd	15	pCi/L	
Thorium-234	18-1195	AAB4595	120-180	Subsurface soil	2.44	1.82	na	pCi/g	No SAL
Uranium	18-1044	AAA5826	N/A	Sludge	25	N/A	29	mg/kg	
		AAA5827	N/A	Sludge	50	N/A	29	mg/kg	X

* Maximum measured value from environmental surveillance reports (Environmental Protection Group 1994, 1779).
N/A not applicable
na not available
nd not detected in background wells

were taken from a region that had been affected by waste disposal. Results for chloride were inconclusive. However, the data clearly showed elevated nitrate concentrations in groundwater and, to some extent, in soils within and below the drainfield. The observed and background values for PRS 18-003(d) are presented in Table 3-4. It is concluded that EDC is present in the groundwater as a result of historical discharges of organic solvents to the sanitary waste system.

TABLE 3-4

COMPARISON OF DETECTED NITRATE VALUES WITH BACKGROUND WELLS AT PRS 18-003(d)

Matrix	NO3 Range	Background NO3 Range[1]	No. of Detects[2] PRS	No. of Detects[2] Background	Units
Soil	1.3 - 5.8	1.02 - 10.3	4(4)	5(6)	mg/kg
Groundwater	271 - 910	99.7	2(2)	1(2)	µg/L

[1] Nitrate values were from 0-10 ft in depth for soils; groundwater values were from single samples below the water table.
[2] The number in parentheses was the number of samples collected for nitrate analysis at each location.

Two background wells, drilled upgradient from all facilities at TA-18 (Figure 3-2), did not show the presence of any organic solvents. Groundwater samples from a downgradient well (PCO-1) located east of TA-18 (Figure 3-2) do not show the presence of EDC or any other VOC. In addition, repeated sampling of production well PM-2 east of TA-18 (Figure 3-2) did not detect any VOCs in the main aquifer. However, the existing data do not adequately define the extent of the EDC in the near vicinity of PRS 18-003(d).

3.5 Corrective Action

3.5.1 Corrective Action Already Implemented

Following completion of the RFI, a decision was made to remove the contents of the tank for offsite disposal. The RFI had shown the presence of tricloroethane and uranium in the sludge and liquids in the tank. The tank contents were removed during the week of May 27, 1996, and the tank was pressure rinsed to remove residual material. This work was done in accordance with a DOE-approved interim action plan. Before removal, the sanitary facilities that the septic system served were removed from Building TA-18-116, sink drains were plugged, and all water supply was discontinued. There is, therefore, no potential for additional discharge of liquids to this septic system. The septic tank has not been backfilled and the lines have not been plugged, pending final determination on the status of this PRS.

3.5.2 Site Investigation

In order to better define the extent of EDC contamination, five monitoring wells will be drilled (Figure 3-4): MW-12, approximately 75 ft downgradient to the east of the drainfield; MW-13, immediately adjacent to and downgradient from the drainfield; MW-14, midway between the drainfield and the stream channel; MW-15, approximately 50 ft upgradient to the west of the drainfield; and MW-16, approximately 20 ft south of the septic tank. Monitoring well MW-13 will be drilled last. Stabilized water levels in the other four wells will be used to determine the local gradient so as to select the most probable downgradient location for MW-13. Although the source of the EDC detected at this site is believed to be discharges to the septic system [PRS 18-003(d)], the evidence is not conclusive. Monitoring well MW-15 will be used to evaluate the potential for transport of EDC from upgradient locations. Monitoring well MW-16 will provide indication of any movement of contaminants to the south of the drainfield. Gradients at the site are expected to change seasonally, and well MW-16 may occasionally be downgradient from the drainfield.

The wells will be constructed from 2-in. PVC pipe, with screw joints perforated from 5 ft below the ground surface to the base of the aquifer (Figure 3-5). The previous temporary wells at the site encountered

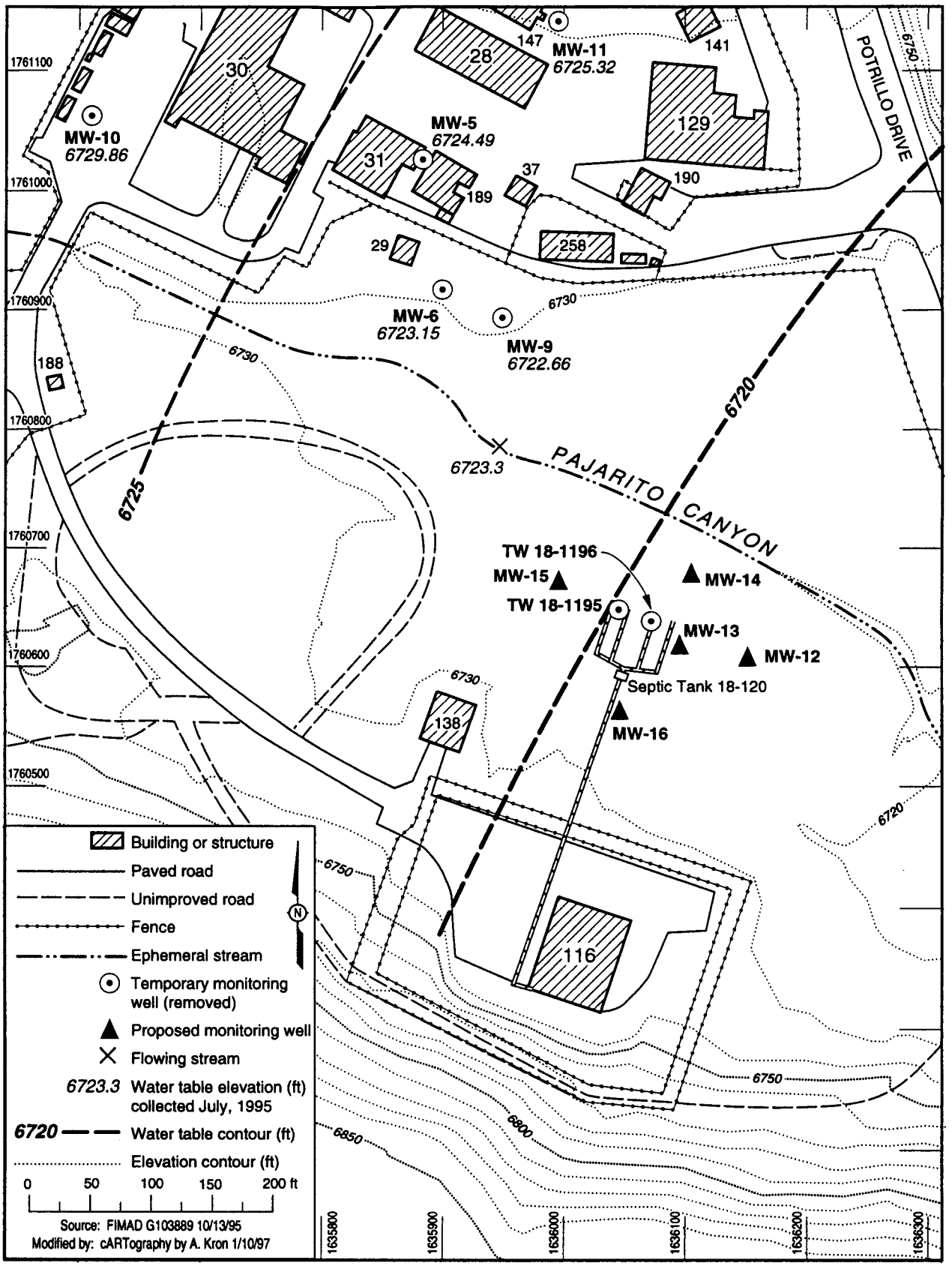


Figure 3-4. Location of proposed monitoring wells.

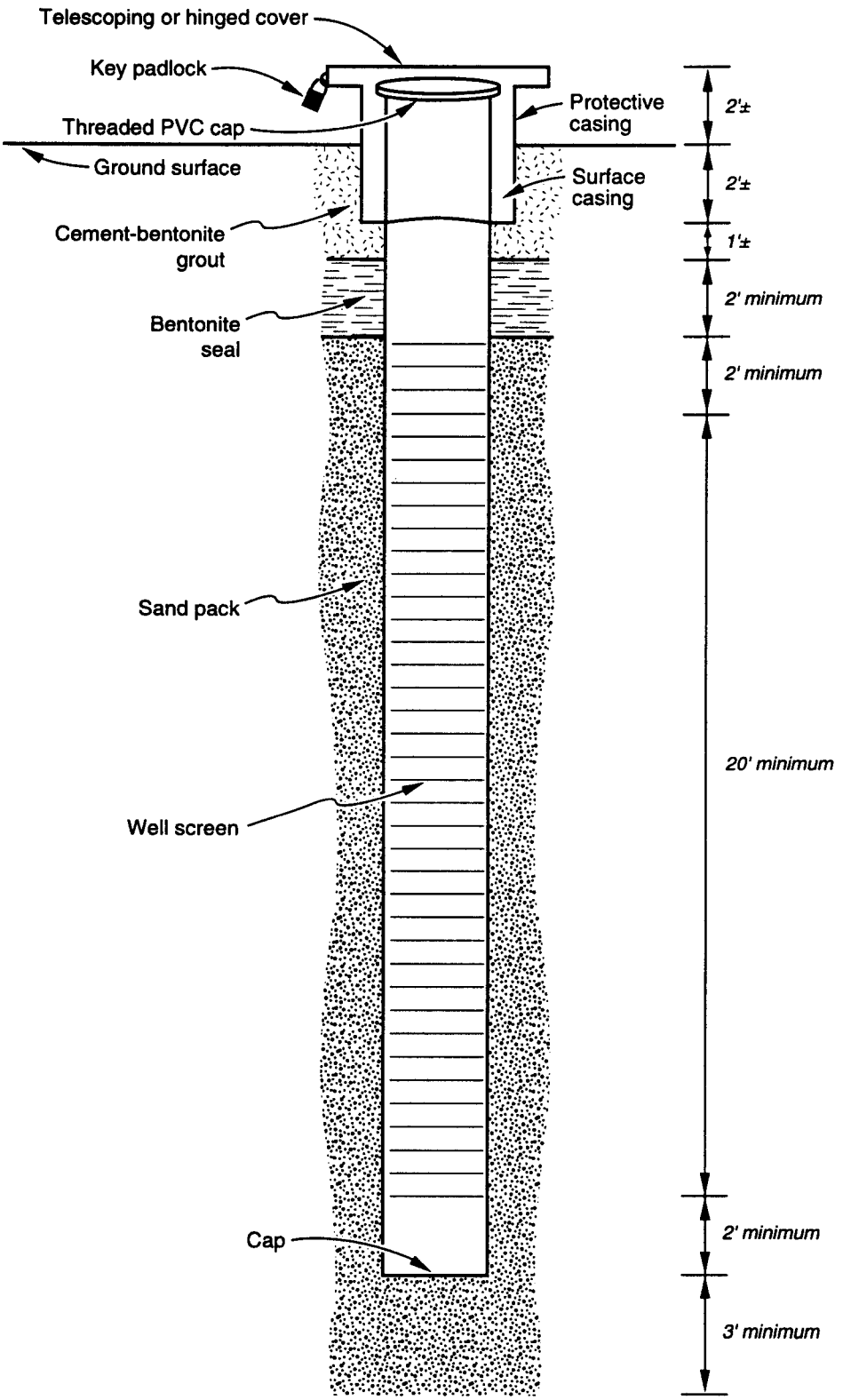


Figure 3-5. Monitoring well construction details (not to scale).

TABLE 3-5

PROPOSED SAMPLING AND ANALYSIS

				Analyses					
Sample Location	**Location ID**	**Sample Depth (ft)**	**Sample Type**	**VOC**	**SVOC**	**TAL Metals**	**General Mineral**	**Nitrates**	**Chlorides**
MW-12		2-4	Soil	X	X	X			
		6-8	Soil	X	X	X			
		Below W.T.	Water	X(nf)	X(nf)	X(f)	X(f)	X(nf)	X(nf)
MW-13		2-4	Soil	X	X	X			
		6-8	Soil	X	X	X			
		Below W.T.	Water	X(nf)	X(nf)	X(f)	X(f)	X(nf)	X(nf)
MW-14		2-4	Soil	X	X	X			
		6-8	Soil	X	X	X			
		Below W.T.	Water	X(nf)	X(nf)	X(f)	X(f)	X(nf)	X(nf)
MW-15		2-4	Soil	X	X	X			
		6-8	Soil	X	X	X			
		Below W.T.	Water	X(nf)	X(nf)	X(f)	X(f)	X(nf)	X(nf)
MW-16		2-4	Soil	X	X	X			
		6-8	Soil	X	X	X			
		Below W.T.	Water	X(nf)	X(nf)	(X)f)	X(f)	X(nf)	X(nf)

nf non-filtered sample
f filtered sample

groundwater at a depth of approximately 6 ft. The proposed screened interval will provide at least 1 ft of screen above the previously recorded water level and allow for seasonal variations. A minimum of approximately 5 ft between the ground surface and the top of the screened interval is required to ensure a proper seal, using bentonite and cement grout. The well screen will be surrounded by an annulus of quartz sand. The upper 3 ft of the annulus will be grouted and a surface casing placed to protect the well casing. All well construction and sampling will be in conformance with ER SOPs 04.01, 05.01, 06.01, 06.02, and 06.03. Samples of soil and groundwater will be collected and analyzed as indicated in Table 3-5. As indicated in the table, samples analyzed for metals and general minerals will be filtered; all others will be non-filtered. The nitrate and chloride analysis of the groundwater samples will permit evaluation of whether the groundwater has been affected by waste disposal (see discussion of previous nitrate analysis in Section 3.4). After well completion, the elevation of the top of each well casing will be determined by survey. The depth to water and water level elevations will be established before each sampling event.

The wells will be sampled at the time of installation and then quarterly (every three months) for up to two years. However, after the second round of sampling, an RFI report will be submitted summarizing the first two rounds of sampling results. The RFI report may propose changes in the analyses that will be conducted for the remaining six quarters or possible cessation of sampling if no contamination is detected.

4.0 Schedule

It is anticipated that the well drilling and initial sampling will be performed in early October 1996. This schedule is consistent with the current baseline under the HSWA corrective action program. A final report on this work is planned for June 1997, which will allow time for analysis of the samples.

5.0 References

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