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Los Alamos
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memorandum

Chemical Science and Technology
Responsible Chemistry for America
Environmental Restoration Project/CST-7
Los Alamos, New Mexico 87545

To/MS: Memo to the File, OU 1129, MS M321
From/MS: Gabriela Lopez Escobedo, CST-7, MS E525
Phone/FAX: 5-7352/5-4632
Symbol: EM/ER-RAFA: 98-111
Date: June 16, 1998

SUBJECT: SAP DOCUMENTATION FOR ADDITIONAL SAMPLING ACTIVITIES AT PRSs 04-003(a) AND 04-004

This memorandum documents modifications to the sampling and analysis plan (SAP) for potential release sites (PRSs) 04-003(a) and 04-004. The currently approved SAP for these PRSs is located in the June 1994 addendum to the RFI Work Plan for Operable Unit 1129 (Chapter 7.9, Section 7.21, "SWMU Aggregate Q, Phase I").

Description of Modifications

The SAP for PRS 4-003(a) is being modified as follows:

- Two sample locations (4-2033 and 4-2034) are being added to characterize the nature and extent of contamination. Samples will be collected from the 0- to 6-inch depth interval and every foot thereafter until tuff is encountered.
- Seven locations (04-2001, 04-2002, 04-2003, 04-2004, 04-2008, 04-2009, and 04-2010) will be resampled to obtain fixed-laboratory confirmation of mobile lab results and to fill data gaps.
- High explosives tests are being added to the analyses performed.

The SAP for PRS 4-004 is being modified as follows:

- One sample location (04-2032) is being added to extend the sampling area because of poor confidence as to the location of former building 4-7.

Supporting Information

<u>PRSs 4-003(a), 4-004</u>

Site History

PRS No. 4-004 is soil contamination beneath former darkroom and laboratory building TA-4-7. The building was relocated from TA-20 to TA-4 in 1948 and was used to develop film of firing tests performed at TA-4. PRS No. 4-003(a) is a photo-processing outfall that discharged through a short pipe into a shallow trench on the south side of TA-4-7.

The photo-processing laboratory operated in the TA-4 location from 1948 until 1955. In 1955, TA-4 structures, including TA-4-7, were surveyed for radioactivity. Portions of the floor of TA-4-7 were found to be contaminated (2 mR/hr beta), and the contaminated portions were removed in 1955. The rest of the building was demolished and removed in December 1956. Building debris remaining after decontamination and decommissioning (D&D) was removed in 1985 during Los Alamos Site Characterization Project (LASCP) activities, and no radioactive contamination was detected at that time.

PRS Nos. 4-004 and 4-003(a) lie within the current boundaries of TA-52. The exact location of the building and outfall was unknown; however, probable locations have been established through the review of several series of oblique and aerial photographs and review of engineering drawings. A portion of the path of the former outfall trench extends under current buildings TA-52-114 and TA-52-115 and the associated paved parking lot, which were installed in about 1991. The remainder of the lower portion of the outfall extends into a natural drainage channel outside the current TA-52 fence.

Phase I Data Summary

Health and Safety (H&S) radiation surveys were performed on November 30, 1994. Beta/gamma radiation measurements ranged from 214 to 286 cpm; the average was 244 cpm, which is within background values.

A radiation grid survey was performed on May 25, 1995. Radiation measurements at PRS Nos. 4-003(a) and 4-004 were obtained from 49 grid locations spaced at approximately 10-ft intervals. Beta/gamma radiation measurements ranged from 151 to 299 cpm; the average was 237 cpm, which is within background values.

Phase I sampling was performed on June 27, 1995. Ten hand-auger holes were drilled to a depth of 3 ft (Location ID Nos. 04-2001 through 04-2010). Three samples were collected from each hand-auger hole—one at each 1-ft interval. X-ray fluorescence (XRF) data were collected at all ten locations and at all depths. Sample locations are indicated on the map, Figure 1. A summary of the samples taken, with the analyses performed, is provided in Table 1. The maximum values for contaminants detected above background values in fixed-lab analyses are listed in Table 2. The Phase I sampling results can be summarized as follows:

- Soil and tuff samples collected at former building location and top of outfall.
- Soil and tuff samples collected at lower outfall on southeast side of current parking lot.
- As (fixed lab) above background value (BV) at surface, photo lab site.
- Cr, Pb (fixed lab) above 0.1 SAL at surface, photo lab site.
- Pentachlorophenol detected (below SAL), 12-24 inches deep, lower outfall.
- ^{235}U, ^{239}Pu above BV's at surface, upper outfall and photo lab site.
- XRF metals (Ba, Cr, Cu, Ni, Pb, Th, Zn) 2-4 times BVs throughout PRSs.

Beta/gamma radiation measurements obtained during field screening of the samples ranged from 90 to 140 cpm, which are within background values.

Conceptual Model

Documentation of processes and potential contaminants associated with TA-4-7 are sketchy. Whereas the most likely chemicals of potential concern (COPCs) include photo-processing chemicals (organic and inorganic) and associated metals, the detection of radionuclide contamination suggests that other unknown processes may have contributed to the waste stream from TA-4-7. Although high explosive (HE) constituents would not normally be associated with photo-processing activities, the film processed was from TA-4 firing sites, and the presence of HE contaminants, therefore, cannot be ruled out on the basis of process knowledge alone.

Previous sampling results provide adequate characterization of the extent of radionuclides, with the exception of the lower end of the outfall drainage. However, the two inorganic samples and three organic samples do not clearly show the distribution of those contaminants. XRF data are abundant but may not be reliable. The additional sampling is designed to provide fixed-lab inorganic and organic data to ensure that the extent of these contaminants is known. Samples will also be analyzed for HE and pentaerythritol tetranitrate (PETN) to determine whether those contaminants are present in the PRSs. Assumptions used to design the sampling plan include

- Photo-processing chemicals may have been disposed of by pouring them through drainpipes in the darkroom or onto the ground outside the building.
- No radioactive contamination was detected during removal of building debris in 1985 (LASCP activities).
- The portion of the drainage channel currently underneath buildings TA-54-114 and -115 and the parking lot provides no pathway for contaminants to reach human or biological receptors.
- Current and foreseeable future land use is industrial, since the sites are located within the current TA-52.
- Potential receptors could include office workers at TA-52, construction workers, and possibly recreationalists in the canyon below the outfall.

COPCs for the additional sampling include:

Inorganics:	target analyte list (TAL) metals
Organics:	pentachlorophenol, photo-processing chemicals, unspecified laboratory chemicals, HE (including Composition B, 2,4,6-trinitrotoluene, sucretol, primacord)

Sampling Objectives

The objectives of the additional sampling are to

- Provide fixed-lab confirmation of existing XRF metals data.
- Obtain additional surface and subsurface data for semivolatile organic compounds (SVOCs), volatile organic compounds (VOCs) (subsurface only), and metals in order to better bound the lateral and vertical extent of contamination.
- Check for presence/absence of HE, including PETN, which were not included as analytes in Phase I sampling.

- Obtain sediment samples from the lower outfall drainage that, on the basis of a field geomorphic screening, are most likely to be associated with the historic operations of TA-4-7.

Sampling Design

This sampling effort will include resampling at the surface and subsurface of the following locations: 04-2001, 2003, 2004, 2008, 2009, and 2010. Location 04-2002 will be resampled only in the subsurface. These samples will be analyzed for metals, VOCs, SVOCs, and high explosives. Radiological analyses for these locations were obtained in Phase I.

Two new locations, based on field geomorphic evaluation of sediments (Davenport 1998, 58092), will be sampled at the surface and subsurface. One location will be to the north of the mapped location of former building TA-4-7, but inside the current TA-52 fence, in order to provide confirmatory data for the accuracy of that location. The other new sample location will be in the most likely historic sediments in the lower outfall drainage, below location 04-2010. Locations of these two samples are shown on the map in Figure 1. All locations will be sampled in the 0- to 6-inch depth interval and at 1-foot intervals thereafter until the soil/tuff interface is reached. Location IDs, depths, and analyses to be performed for all samples are shown in Table 3. The actual number of samples and depths will vary depending upon the depth to the soil/tuff interface.

All samples will be collected in accordance with Los Alamos National Laboratory Environmental Restoration Program standard operating procedures, and field activities will be conducted in accordance with the approved project site specific health and safety plan (SSHASP) for RCRA (Resource Conservation and Recovery Act) facility investigation (RFI) activities at TAs-4, -5, -52, and -63. Surface and/or shallow soil samples will be collected in accordance with LANL-ER SOP-06.09, R.0, "Spade and Scoop Method for Collection of Soil Samples." Shallow boreholes and hand auger holes (generally less than 10 ft deep) will be drilled and samples will be collected in accordance with LANL-ER-SOP-06.10, R.0, "Hand Auger and Thin-Wall Tube Sampler." Decontamination of field and sampling equipment will be performed in accordance with LANL-ER-SOP-1.08, R.0, "Field Decontamination of Drilling and Sampling Equipment." All investigative derived waste (IDW) will be managed in accordance with the approved project Waste Characterization Strategy Form for TAs-4 and -5 and LANL-ER-SOP-1.06, R.1, "Management of Environmental Restoration Project Wastes."

Attachments:

1. Figure 1. Sample location map for PRS 4-003(a) and 4-004
2. Table 1. Samples taken during Phase I at PRSs 4-003(a) and 4-004
3. Table 2. Maximum levels for all contaminants present above BVs at PRSs 4-003(a) and 4-004
4. Table 3. Sampling summary for PRS 4-003(a) and 4-004
5. Davenport, D.W., May 22, 1998, "Field Geomorphic Screening for Additional Sample Locations," Daily Activity Log, LANL ER ID 58092.

GLE/nr

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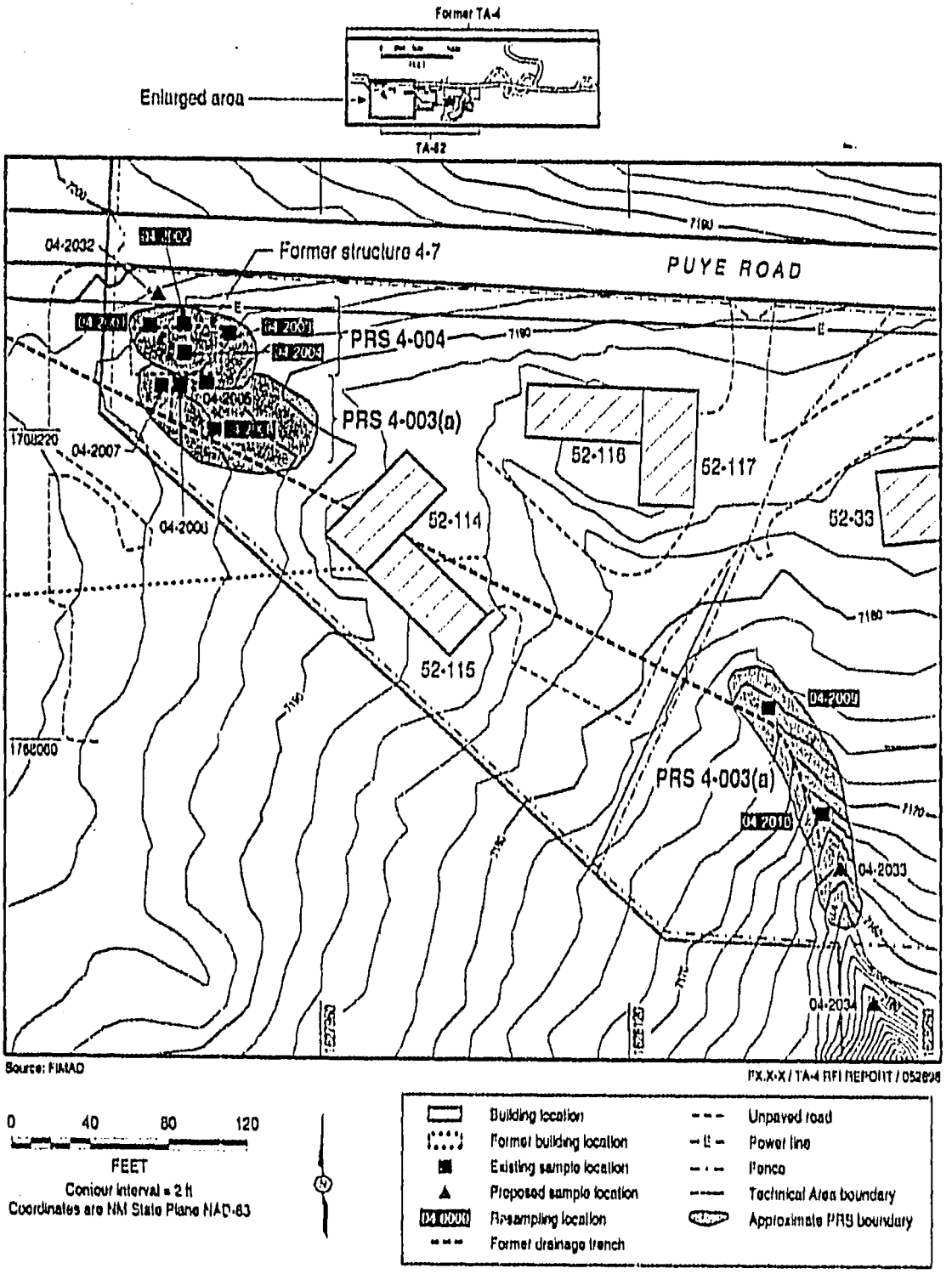


Figure 1. Sample location map for PRS 4-003(a) and 4-004.

TABLE 1
SAMPLES TAKEN DURING PHASE I AT PRSS 4-003(a) AND 4-004

SAMPLE ID	LOCATION	DEPTH (in.)	MEDIA	INORG	ORG	RAD
0404-95-0049	04-2005	0-12	ALLH			ISOPU, ISOU
0404-95-0051	04-2005	12-24	ALLH			ISOPU, ISOU
0404-95-0052	04-2005	24-36	QBT3			ISOPU, ISOU
0404-95-0053	04-2006	0-12	ALLH			ISOPU, ISOU
0404-95-0054	04-2006	12-24	ALLH			ISOPU, ISOU
0404-95-0055	04-2006	24-36	QBT3			ISOPU, ISOU
0404-95-0056	04-2007	0-12	ALLH	METTAL		ISOU, ISOPU
0404-95-0058	04-2007	12-24	ALLH			ISOPU, ISOU
0404-95-0059	04-2007	24-36	ALLH			ISOPU, ISOU
0404-95-0060	04-2007	24-36	ALLH			ISOU, ISOPU
0404-95-0062	04-2008	0-12	ALLH			ISOPU, ISOU
0404-95-0063	04-2008	12-24	ALLH			ISOU, ISOPU
0404-95-0064	04-2008	24-36	QBT3			ISOU, ISOPU
0404-95-0065	04-2009	0-12	ALLH			ISOPU, ISOU
0404-95-0066	04-2009	12-24	QBT3			ISOPU, ISOU
0404-95-0067	04-2009	24-36	QBT3			ISOPU, ISOU
0404-95-0068	04-2010	0-12	ALLH		VOAGCMS	ISOPU, ISOU
0404-95-0070	04-2010	12-24	ALLH		SEMIN	GSCAN, ISOPU, GROSSAB, GROSSG, ISOU
0404-95-0073	04-2010	24-36	ALLH			ISOPU, ISOU
0404-95-0075	04-2001	0-12	ALLH			ISOU,ISOPU
0404-95-0076	04-2001	12-24	ALLH		SEMIN	ISOU,ISOPU
0404-95-0078	04-2001	24-36	ALLH			ISOU,ISOPU
0404-95-0081	04-2002	0-12	ALLH	METTAL		ISOU,ISOPU
0404-95-0083	04-2002	12-24	ALLH			ISOPU,ISOU
0404-95-0084	04-2002	24-36	ALLH			GSCAN,GROSSAB,ISOU,GROSSG,ISOPU
0404-95-0085	04-2003	0-12	ALLH			ISOU,ISOPU
0404-95-0087	04-2003	12-24	ALLH			ISOPU,ISOU
0404-95-0088	04-2003	24-36	ALLH			ISOU,ISOPU
0404-95-0090	04-2004	0-12	ALLH			ISOU,ISOPU
0404-95-0091	04-2004	12-24	ALLH			ISOU,ISOPU
0404-95-0092	04-2004	24-36	QBT3			ISOU,ISOPU

TABLE 2
MAXIMUM LEVELS FOR ALL CONTAMINANTS PRESENT ABOVE BVs AT PRSS 4-003(a) AND 4-004

Location ID	Analyte	Maximum Concentration	Unit	Sample Depth (in.)	BVs[a]	SAL[b]
04-2002	As	2.1e+02	mg/kg	0-12	8.17	< BV
	Cr	3.6e+01	mg/kg	0-12	19.3	2.1e+02
	Pb	6.4E+01	mg/kg	0-12	22.3	4.0e+02
	K-40	42	pCi/g	24-36	36.8	12
	Ra-226	2.02	pCi/g	24-36	2.59	0.10
04-2004	U-235	0.22	pCi/g	0-12	0.20	10
04-2006	Pu-239	0.631	pCi/g	0-12	0.054	24
04-2007	Pu-239	0.056	pCi/g	0-12	0.054	24
04-2010	Pentachlorophenol	7.0E-02	mg/kg	12-24	NA	2.6e+00
	K-40	56.2	pCi/g	12-24	36.8	12
	Ra-226	2.65	pCi/g	12-24	2.59	0.10

a. Background values.
b. Screening action level.

TABLE 3
SAMPLING SUMMARY FOR PRSs 4-003(a) and 4-004

Sample ID	Location ID	Depth (ft.)[c]	Matrix	Metals	SVOCs	VOCs	HEXP[a] + HENGPETN[b]	PCBs	Gamma Spectroscopy	Iso-U	Iso-Pu	Gross Alpha/Beta
	04-2001	0-6	SOIL	x	x		x					
		6-18	SOIL	x	x		x					
		18-30	SOIL	x	x		x					
		Interface	SOIL	x	x		x					
	04-2002	0-6	SOIL	x	x		x					
		6-18	SOIL	x	x		x					
		18-30	SOIL	x	x		x					
		Interface	SOIL	x	x		x					
	04-2003	0-6	SOIL	x	x		x					
		6-18	SOIL	x	x	x	x					
		18-30	SOIL	x	x	x	x					
		Interface	SOIL	x	x	x	x					
	04-2004	0-6	SOIL	x	x		x					
		6-18	SOIL	x	x		x					
		18-30	SOIL	x	x		x					
		Interface	SOIL	x	x		x					
	04-2008	0-6	SOIL	x	x		x					
		6-18	SOIL	x	x		x					
		18-30	SOIL	x	x		x					
		Interface	SOIL	x	x		x					
	04-2009	0-6	SOIL	x	x		x					
		6-18	SOIL	x	x		x					
		18-30	SOIL	x	x		x					
		Interface	SOIL	x	x		x					
	04-2010	0-6	SOIL	x	x		x					
		6-18	SOIL	x	x		x					
		18-30	SOIL	x	x		x					
		Interface	SOIL	x	x		x					
	04-2032	0-6	SOIL	x	x		x					
		6-18	SOIL	x	x		x					
		18-30	SOIL	x	x		x					
		Interface	SOIL	x	x		x					
	04-2033	0-6	SOIL	x	x		x					
		6-18	SOIL	x	x		x					
		18-30	SOIL	x	x		x					
		Interface	SOIL	x	x		x					
	04-2034	0-6	SOIL	x	x		x					
		6-18	SOIL	x	x		x					
		18-30	SOIL	x	x		x					
		Interface	SOIL	x	x		x					
Field duplicates				3	3	1	3					
TOTALS				44	44	4	44	0	0	0	0	0

a. High explosives, Method SW8330 analytes.
b. High explosives (nitroglycerine, pentaerythritol tetranitrate).
c. Actual numbers of samples and depths will vary depending on the depth of the soil/tuff interface.

10 M & 15-M.
5/22/98
S.P95.

LATA
JUN 24 1998

ER ID # 58072
Sheet 1 of 2

REMEDIAL ACTIONS FOCUS AREA DAILY ACTIVITY LOG

DATE: 22 May, 1998

Technical Area: 35, (4), 5 **PRS Nos.:** C-35-007, 35-014(g1), 35-016(n), 5-004, 4-003(a)

Name: David W. Davenport **Title:** Senior Soil Scientist, LATA Inc.

Signature:

SUBJECT: *Field geomorphic screening for additional sample locations.*

Personnel: David W. Davenport, Rick Kelley, Gabriella Lopez-Escobedo, Deborah Carlson
Time: 9:00 am to 12:00 pm

Work Description:

PRSs were visited in order to determine locations for additional sampling following the Decision Peer Review of 5/19/98, in which additional samples were recommended at these PRSs. Mr. Davenport (soil geomorphologist) and Mr. Kelley (geologist) were were to use geomorphic concepts to target locations that are most likely to include sediments corresponding to the time period associated with each PRS.

PRS C-35-007 (sand/gravel piles)
The PRS consists of several sand and gravel piles located within an area apparently excavated in the canyon wall. The piles are associated with the sand filter beds, in that some of the piles clearly contain material that was removed from the filter beds at some time (torn pieces of the plastic filter bed liners, poorly sorted sand and gravel). Other piles appear clean (no debris) and are well sorted by grain size, i.e. coarse sand, pea-size gravel, etc., suggesting that they were stockpiles of clean material to be used in the filter beds.

A spill report from 1988 indicated a spill of an unknown substance that was killing vegetation in this general location to the north of the road. It was later determined that there was probably no spill, but that the *sand/gravel piles provided poor conditions for plant growth. At the time of this visit, vegetation was present* on and around most of the piles, and appeared healthy.

No sample locations were flagged at this time, although up to eight new locations are expected. It was determined that the clean piles are readily distinguished from the used piles, so that sampling can be biased toward the used piles, which are the most likely sites of any contamination. The piles themselves are located, with one or two exceptions, on a relatively flat surface that appears to be nearly level but may in fact slope slightly to the north. If so, erosive transport of material from the piles downslope into the Mortandad Canyon channel is unlikely.

PRSs 35-014(g1) and 35-016(n) (small oil spill site and outfall)
Field observations were made to attempt to determine the extent of area contributing to runoff in the drainage that contains 35-016(n). Two storm drains were found that connect to the corrugated metal pipe (CMP) at the head of the drainage. These drains are located at the southeast corner of the unpaved lot west of building 35-86, and about 6-8 ft. south of the southwest corner of 35-86. These drains probably collect runoff from a limited area of pavement along the south side of the building and a narrow unpaved strip along the west side of the building. It is also probable that the slightly elevated container storage area (location of dumpsters 35-359 and 35-360) contributes a small amount of runoff directly into the drainage below the CMP.

Three new sample locations were marked with pin-flags (dated 5/22/98). One location is about 15 ft. W-SW of existing sample monument 35-2169. This is located in the grassy area north of building 35-207, in the *narrow flat portion about 3-5 ft. from the building. This location is presumed to be upslope of the actual spill* site, which is unknown but presumed to be in the immediate area of sample location 35-2169.

One new location was marked within a sediment accumulation in the channel itself, about halfway between existing locations 35-2577 and 35-2578. Based on the fact that there are virtually no upslope sources of sediment, it is considered likely by Davenport and Kelley that the sediment in the channel predates much of the industrial development of TA-35 (and the oil spill).

One location was marked on the slope approximately 30 ft. north of the new channel location mentioned above, and below the asphalt-paved walkway. This location was chosen to determine whether contaminants from the container storage area are being transported downslope into the channel.

A location was selected in a sediment accumulation approximately 100-150 ft (horizontal distance) S-SE of the sample monument 35-2578. This location is near the bottom of the steep canyon wall, but above the flood zone of the canyon proper. Few sediment accumulations of any size are present in the path the drainage takes down the canyon wall. There is relatively little confidence that this sediment represents the target period of about 1985 to present, but it is the most likely of very few candidate locations. The location was not marked with a flag, but a pile of stones was placed on the large boulder immediately above the location, so that any of the personnel present (Davenport, Kelley, Carlson) can find the location.

PRS 5-004 (septic tank/outfall)
Sediment distributions were examined in order to target historic sediments associated with the septic tank operational period (1948-1959) and later. The outfall channel bifurcates below sample location 05-2000, with the eastern of the two channels appearing to be the most likely path for runoff under most conditions. During extreme runoff events the western channel probably also carries runoff concurrently. The primary channel was considered the more likely location of any contamination derived from the septic outfall. Because there was no clear evidence sufficient to assign accurate ages to any sediment packets in either drainage, it was determined to sample both channels, and to include a range of channel and near-channel sediment accumulations.

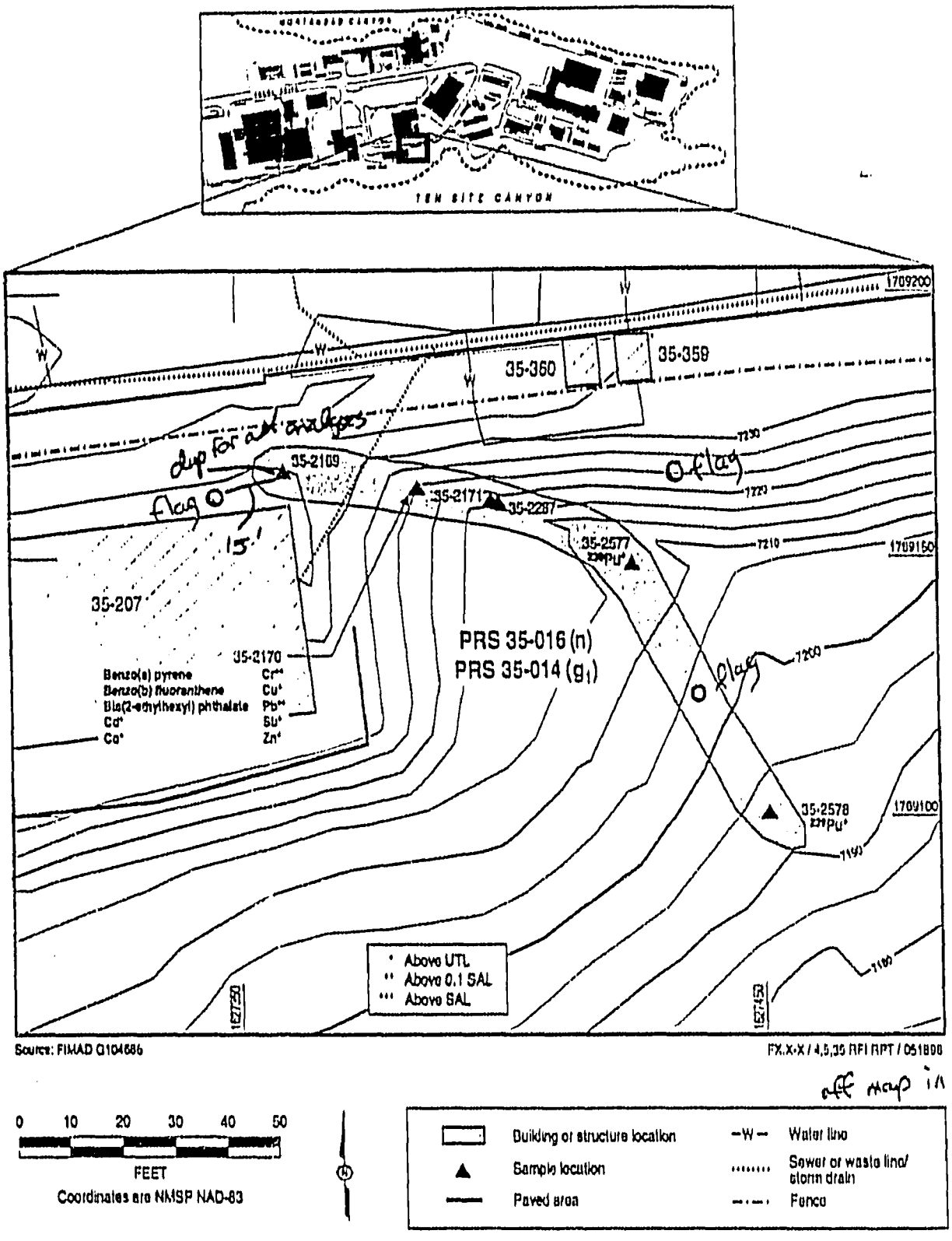
Five new sample locations were marked with pin-flags (dated 5/22/98). One was located in the western of the two channels, about 10-15 ft. from 05-2006, in channel sediment. The other 4 locations are in or near the eastern channel. Two locations are near each other and about 20-30 ft. E-SE of 05-2000. One is in channel sediments and the other is 3-5 ft. to the west in a sediment accumulation blocked by a pinyon pine tree.

PRS 4-003(a) (photo lab outfall)
The drainage channel identified as the lower portion of PRS 4-003(a) (below the parking lot for current buildings 52-114, 115, 116, and 117) were examined to locate sediment accumulations most likely to be derived from the period of operation of the photo lab (former structure 4-7). New sample locations were needed to extend the sampled area farther downstream of the lowest previous sample location.

It was found that there are very limited areas where sediment accumulations are more than 3 to 4 inches deep. The very shallow sediment areas are considered to be probably younger than 1955, the end of operations at the photo lab. Two locations were selected, on the basis of quantity of sediment and location within the drainage channel, as the most likely to contain sediment from the 1948-1955 time period.

One location was flagged in channel sediment approximately 20 feet SSE of the sample monument at location 04-2010. The second location was flagged in channel sediments approximately 40 feet SSE of the TA-52 fence. The locations were marked with red pin-flags.

It is clear from the topographic map of the area and field observations that other minor drainages may supply runoff and sediment to this larger drainage. For that reason it is possible that any contamination found in the two new sample locations may be derived from sources other than the former photo lab and outfall.



dup for all analytes

flag 0

15'

0 flag

0 flag

off map in sed. trap near base of shoulder slope

Figure X.X-X. Sample locations with elevated concentrations at PRSs 35-014(g_1) and 35-016(n).

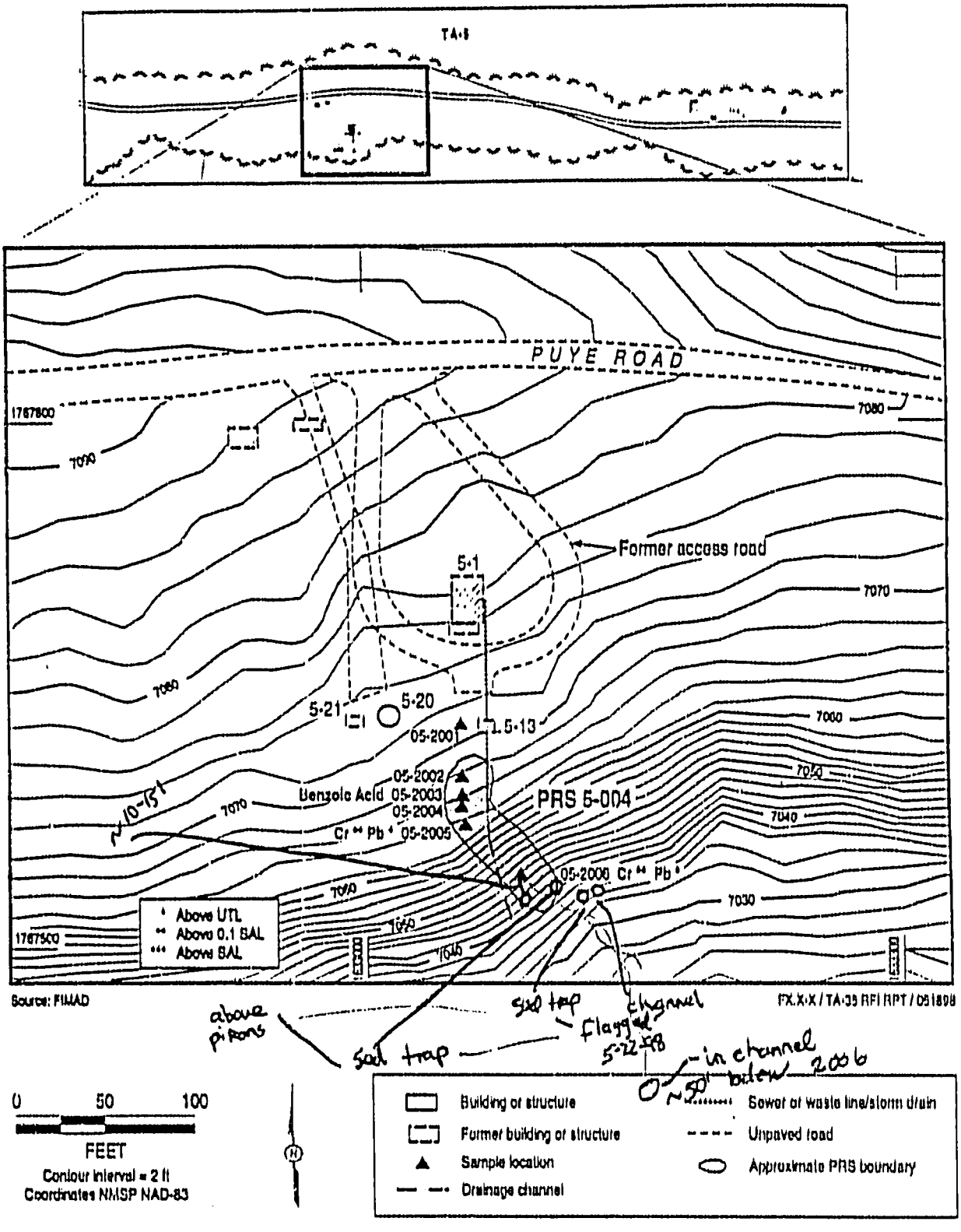


Figure X.X-X. Sample locations with elevated concentrations at PRS 5-004.

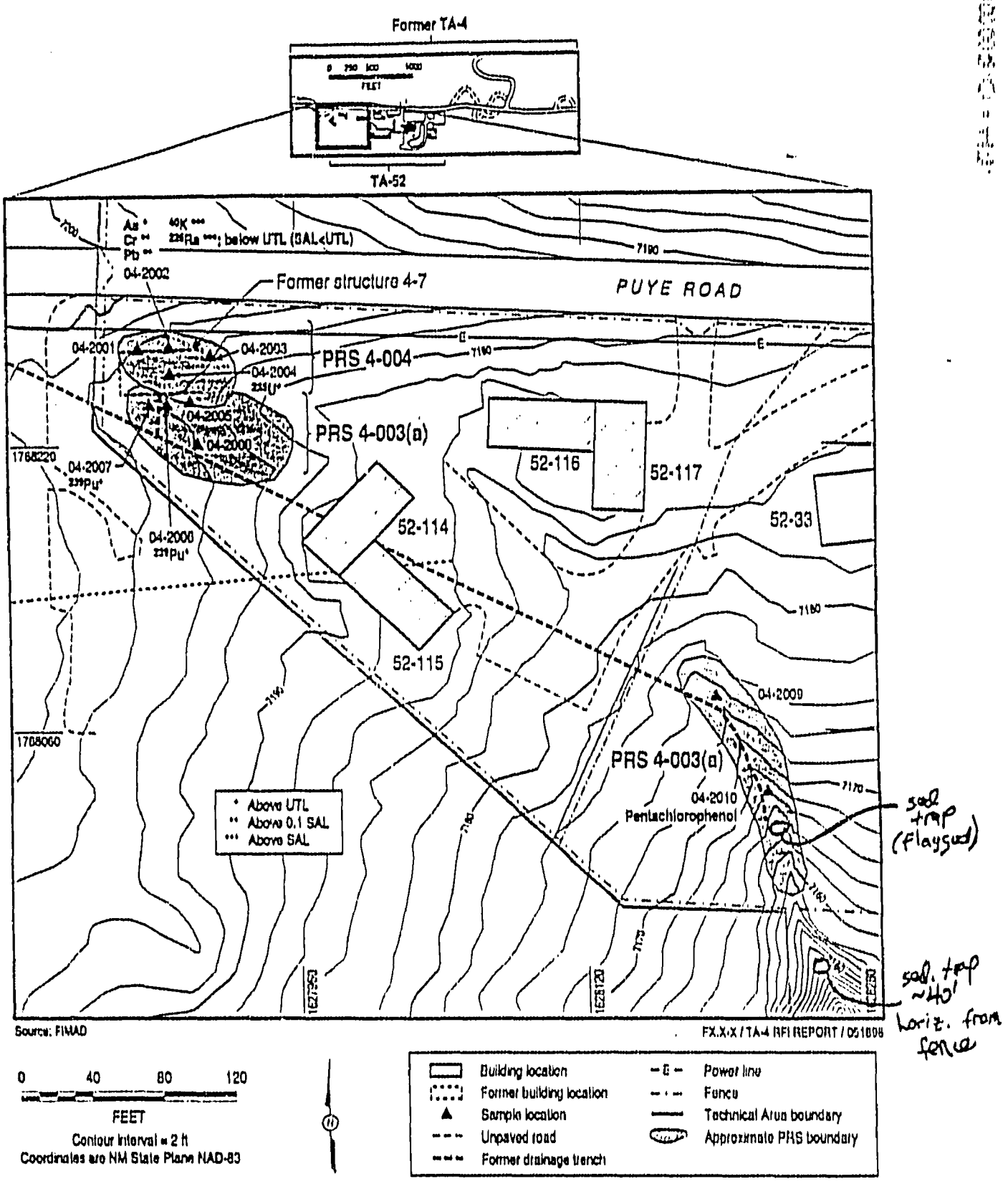


Figure X.X-X. Sample locations with elevated concentrations at PRS 4-003(a) and PRS 4-004.