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Date: August 30, 1999
Refer to: E/ER:99-242

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ENTERED

Mr. John Kieling
NMED-HRMB
P.O. Box 26110
Santa Fe, NM 87502

SUBJECT: SUBMITTAL OF PLANS AND REPORTS FOR PRS 49-001 (a, c, d, and g)

Dear Mr. Kieling:

In accordance with our Response to Request for Supplemental Information (RSI) for the Stabilization Plan for Implementing Interim Measures (IMs) and Best Management Practices (BMP) at Potential Release Sites (PRSs) 49-001(b, c, d, and g) (EM/ER:98-339, dated September 11, 1998), the Laboratory's Environmental Restoration Project is submitting the following documents:

- "Stabilization Plan for IMs and BMP at PRSs 49-001(b, c, d, and g);"
- "IM Report for Potential Release Sites 49-001;" and
- "BMP Report for Installation of Stabilization Measures at PRS 49-001 (b, c, d, and g)."

All comments received from the New Mexico Environment Department Hazardous and Radioactive Materials Bureau on the "Stabilization Plan for IMs and BMP at PRSs 49-001(b, c, d, and g)" have been incorporated. The IM Report and BMP Report are being submitted for the first time in accordance with our RSI Response described above. Also included with this deliverable are updates to the "Reference Set for Material Disposal Areas, Technical Area 49." These new references should be added to those previously provided.

If you have any questions, please contact Deba Daymon at (505) 667-9021 or Joe Mose at (505) 667-5808.

Sincerely,

Julie A. Canepa, Program Manager
LANL/ER

Sincerely,

Theodore J. Taylor, Program Manager
DOE/LAAO

4033

JC/TT/PB/ev

Enclosures:
1) Stabilization Plan for IMs and BMP at PRSs 49-001(b, c, d, and g
2) IMs Report for Potential Release Sites 49-001
3) BMP Report for Installation of Stabilization Measures at PRS 49-001(b, c, d, and g)

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E/ER File, MS M992
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LA-UR-99-2169
Final Report
August 1999

Interim Measures Report for Potential Release Sites

49-001(b)
49-001(c)
49-001(d)
49-001(g)

Environmental Restoration Project
A Department of Energy Environmental Cleanup Program
ER19990068

Los Alamos
NATIONAL LABORATORY
Los Alamos, NM 87545

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1.0 INTRODUCTION

This interim measures report addresses activities at Potential Release Sites (PRSs) 49-001(b,c,d, and g) in Technical Area (TA) 49 of Los Alamos National Laboratory (the Laboratory) (Figure 1-1). These PRSs are also known as Material Disposal Area (MDA) AB, Areas 2, 2A, and 2B. For purposes of this report, Areas 2, 2A, and 2B will be collectively referred to as Area 2. Stabilization activities at this site were implemented as both interim measures and best management practices (BMPs); this report provides as-built descriptions of those activities that were considered by the New Mexico Environment Department (NMED) to be interim measures. The principal objective of this stabilization effort was to reduce the moisture content of near-surface soils at Area 2.

The principal activities implemented as interim measures included

- plugging and abandonment of Corehole 2 (CH-2);
- removing asphalt pavement from Area 2;
- regrading the site with clean, crushed tuff to eliminate surface water ponding;
- spreading topsoil over the regraded site;
- reseeding the topsoil with shallow-rooting grasses;
- placing gravel on the topsoil for erosion protection; and
- covering part of the site and the vicinity with a biointrusion barrier.

The work was completed by reinstalling the chainlink security fence. These activities were implemented to temporarily stabilize the site pending identification of a permanent remedy within the next 5 to 10 yr. The design of these interim measure activities is described in "Stabilization Plan for Implementing Interim Measures and Best Management Practices at Potential Release Sites 49-001 (b,c,d, and g)" (LANL 1998, 59641). Deviations identified in this report from planned activities are based on the scope of the stabilization effort as described in the stabilization plan. Deviations include (1) additional boreholes drilled on the north slope of Area 2 and (2) a larger amount of crushed tuff.

The construction activities were performed by KEERS Environmental of Albuquerque, New Mexico, under the direction of the Morrison Knudsen/Program Management Company (MK/PMC) Los Alamos Project Team.

The principal activities implemented as BMPs included construction of a surface water diversion channel upgradient of Area 2 and construction of erosion control structures in both upgradient and downgradient surface water drainage channels. These activities were described in the BMP report (Environmental Restoration Project 1998, 63041). BMPs implemented at Area 2 include a silt fence, the stabilization of the upgradient and downgradient channels, and a surface water diversion channel. The detailed results of screening and sampling activities conducted in support of the stabilization activities will be described in a data summary report being prepared for MDA AB, Area 2.

Acronyms defined in this report are listed in Appendix A.

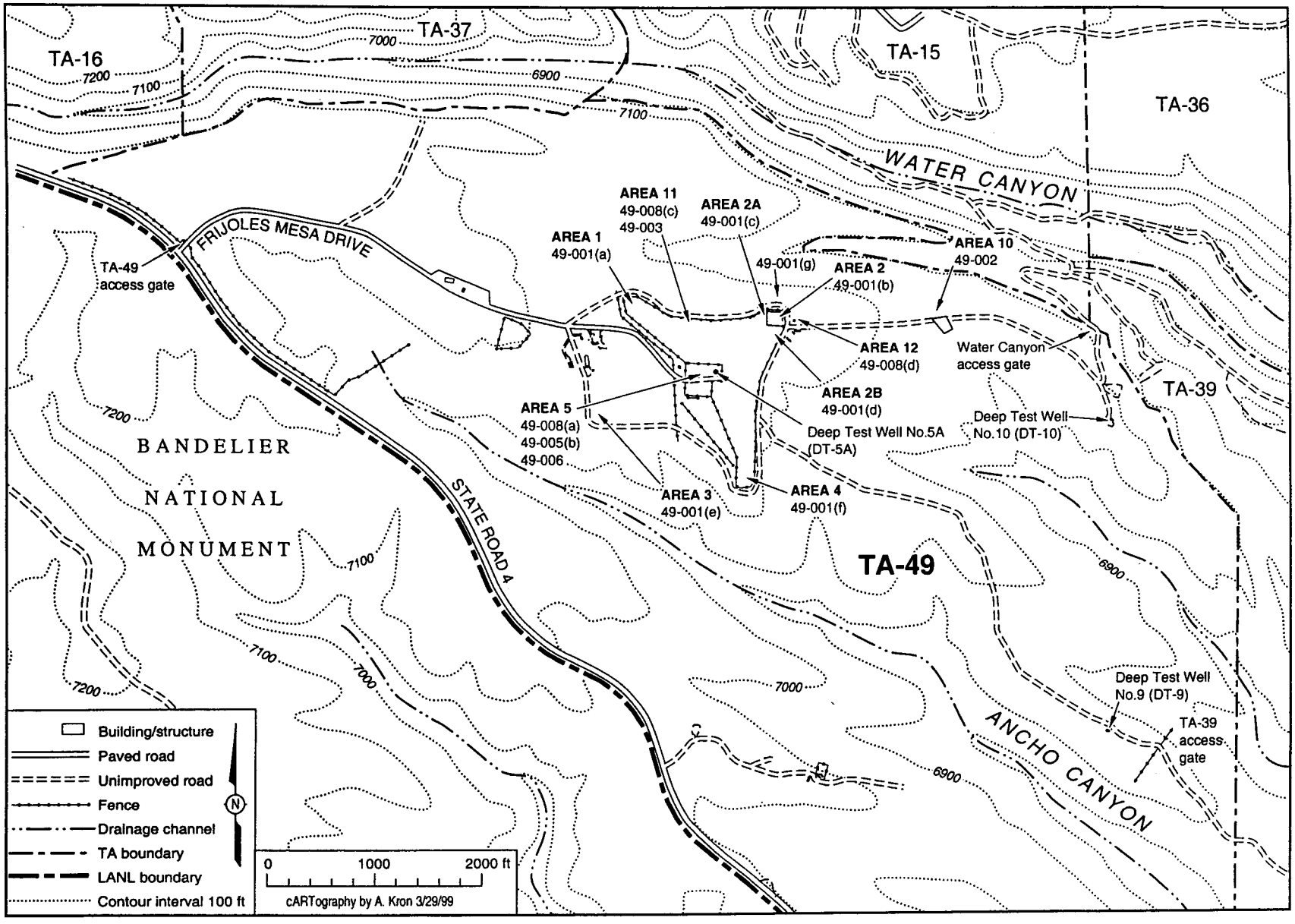

Figure 1-1. Map of MDA AB TA-49

2.0 INTERIM MEASURES AND RELATED ACTIVITIES

All work was performed in accordance with the site-specific health and safety plans for these activities (Environmental Restoration Project 1998, 63112; Environmental Restoration Project, 1998, 63114).

2.1 Air Quality Monitoring

Air quality monitoring was conducted at locations to the northeast and northwest of the stabilized area (Figure 2-1). The monitoring was part of ESH-17's site-wide air quality program. Three air quality monitoring stations were operated continuously during the stabilization activities; two are shown in Figure 2-1, and the other is located in Area 5 (southwest of Area 2). No elevated levels of airborne contaminants were detected. Air-monitoring data will be presented in the summary data report, which will be completed in September 1999.

2.2 Borings to Competent Tuff

Up to 20 shallow borings to competent tuff with a hand auger were planned around the western and southern perimeter of MDA AB, Area 2. The purpose of these holes was to provide information on subsurface stratigraphy. Of particular interest was the possible presence of deep erosion features in the competent tuff that could affect the movement of interflow. Because indication of deep erosion features was found, only 13 of the original 20 planned borings were installed. The boreholes were drilled on April 30, 1998, and May 1, 1998. The cuttings were logged, and the general moisture conditions were noted. The boring locations are shown in Figure 2-1. All borings were drilled to the depth of refusal. After completing the borings, the cuttings were used to backfill the holes.

The depth to competent tuff varied from 25 in. near the northern end of the perimeter to 42 in. near the eastern end. The thickness of overlying soil was generally less than the expected 36 to 48 in. The surface strata were characterized as a brown silty to clayey soil overlying weathered tuff. The weathered tuff was a soft, reddish brown material that transitioned to a light gray to white competent tuff with increasing depth. An approximately 1-in.-thick clay-rich layer was occasionally noted between the soil and weathered tuff. The upper soil layer of El Cajete pumice common to TA-49 appeared to be missing in most holes, suggesting that much of the area had previously been reworked. The site may have been graded in 1959 before nuclear safety tests were conducted at Area 2. In addition, local surface soils may have been the source of the clayey, silty fill material placed over Area 2 in 1960 to cover contaminated soils.

The moisture content in the boreholes was visually characterized as ranging from dry to moist with no particular pattern identified because no laboratory tests were conducted. The highest moisture levels were found in Holes t11 and t14. No saturated conditions were found in any hole.

Figure 2-2 is a vertical section along the line of borings. The elevation of competent tuff generally conformed with the surface topography. An apparent low point in the competent tuff that could channel subsurface interflow drainage toward Area 2 was identified north of Hole T-6. This is also the location of the principal channel feeding surface water run-on to Area 2.

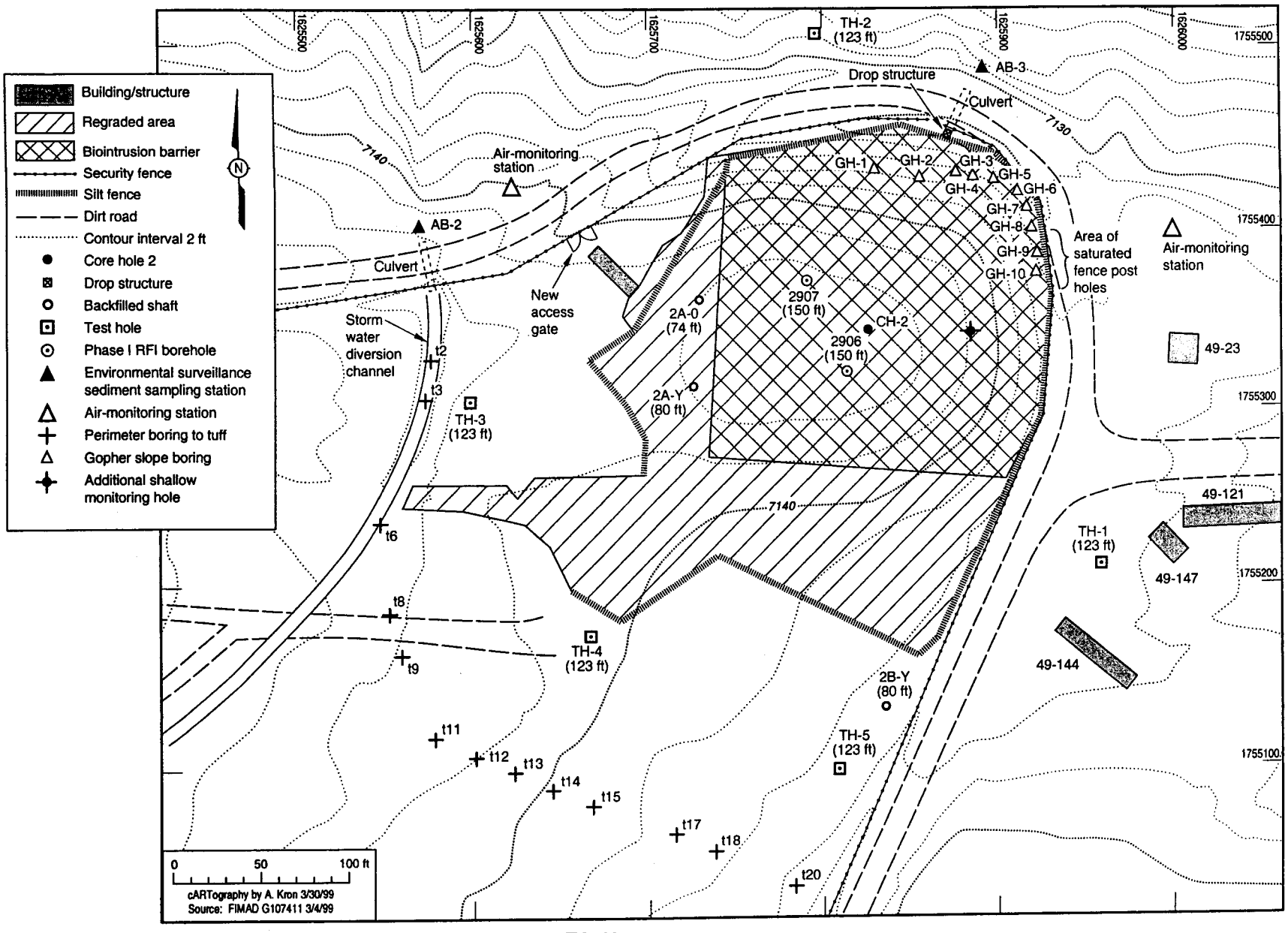

Figure 2-1. Locations of structures, samples, and areas at TA-49

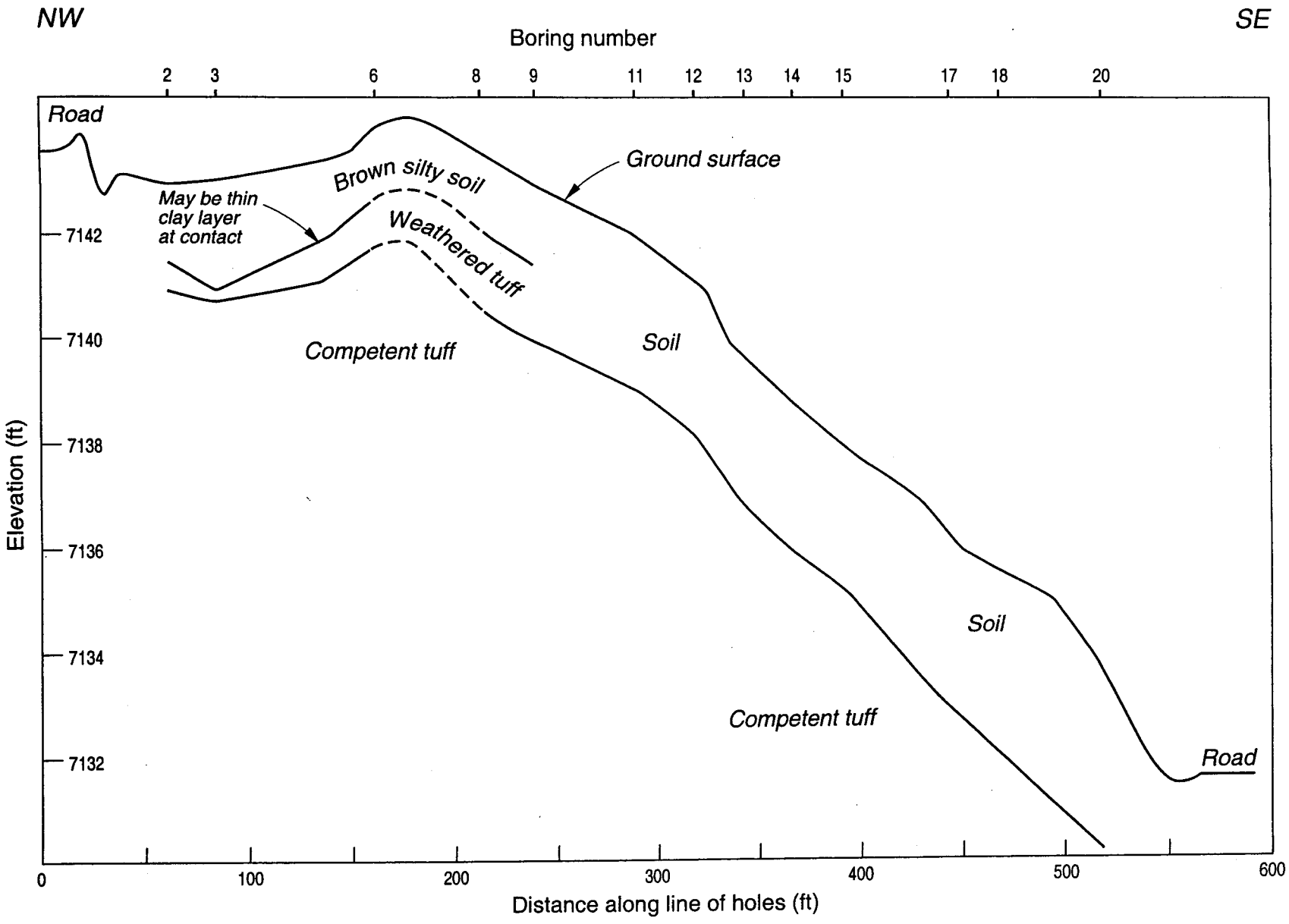

Figure 2-2. Vertical section along line of borings to tuff

2.3 Plugging and Abandonment of CH-2

In 1959, CH-2 was drilled to a depth of about 500 ft to provide geologic and hydrologic information on MDA AB, Area 2, before selecting the site for nuclear safety tests. The hole is located near the center of the array of shafts used in the safety tests and is within the area that was subsequently filled and paved with asphalt. The location of the hole is shown in Figure 2-1. Before the asphalt was removed, the old casing was removed, and the hole was plugged and abandoned in August 1998 because of concern that it could elevate moisture content of the near-surface soils and tuff at the site. The hole was plugged and abandoned in accordance with NMED Ground Water Bureau's guidelines (NMED 1992, 53805.16), the Laboratory Environmental Restoration (ER) Project Standard Operating Procedure 5.03, R0, "Monitor Well and RFI Borehole Abandonment," and the "Monitoring Well and Borehole Abandonment Plan" included as Attachment 3 to the stabilization plan (LANL 1998, 59641). The work was performed by Stewart Brothers Drilling Company of Grants, New Mexico, under direct contract to the Laboratory. Field direction for drilling operations, site safety and health, waste management, and radiological monitoring were provided by the MDA AB team of Laboratory and MK/PMC team personnel. A detailed description of the plugging and abandonment of CH-2 is presented in Appendix B.

2.4 Asphalt Removal

The asphalt was removed during September and October of 1998. Fill was first placed around the southern and western edges of the pad before removing the asphalt to provide a clean working perimeter. Sequential squares with dimensions of about 20 ft by 20 ft were excavated, as originally planned; the asphalt was broken into pieces smaller than 3 ft but was not crushed. A Caterpillar EL300B excavator lifted and turned the asphalt. The asphalt and underlying soil were screened for elevated radioactivity as the asphalt was removed. In accordance with the site's radiation work permit, respiratory protection was worn when removing the asphalt overlying Shafts 2-M and 2-N because of the potential for encountering elevated radioactivity at these locations. Shaft 2-M was the location of an accidental release that contaminated the original ground surface at Area 2, and high levels (129,223 disintegrations per minute [dpm] alpha activity, 20,083 dpm beta activity, and 8,207,127 dpm gamma activity) of radioactivity were found above the adjacent Shaft 2-N during prestabilization sampling. Additional discussion of this release and other releases is presented in Section 2.2 of the stabilization plan (LANL 1998, 59641). However, no elevated radioactivity was found at any location when removing the asphalt. As discussed in Section 5.1, samples of moisture taken beneath the asphalt in April 1998 contained above-background levels of tritium. Because of this, all of the removed asphalt was managed as low-level radioactive waste. After screening was completed, the excavated asphalt was temporarily staged on an unexcavated portion of the pavement, as needed, pending disposal at the Laboratory's low-level radioactive disposal facility, MDA G, at TA-54. A Komatsu WA250 front-end loader stockpiled and loaded the asphalt into trucks. The asphalt was delivered to TA-54 during September and October 1998, in accordance with Department of Transportation and other applicable regulations.

The area where asphalt had been removed was covered with a 20-mil high-density polyethylene (HDPE) liner, and excavated asphalt was covered with polyethylene sheeting during potential rain events. To promote drying, the surface of the underlying fill material was scarified by the backhoe to a depth of about 6 in. during excavation. However, because of the potential for exposing buried radiological contamination, no other reworking or excavation of the underlying fill material was performed. The casings of the two 150-ft-deep Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) boreholes (49-2906 and 49-2907) were marked with orange paint for improved visibility and were not damaged during the excavation. A site map showing the extent of the asphalt that was removed is presented in Figure 2-3. Photographs of the asphalt removal process are presented in Figures 2-4 through 2-7.

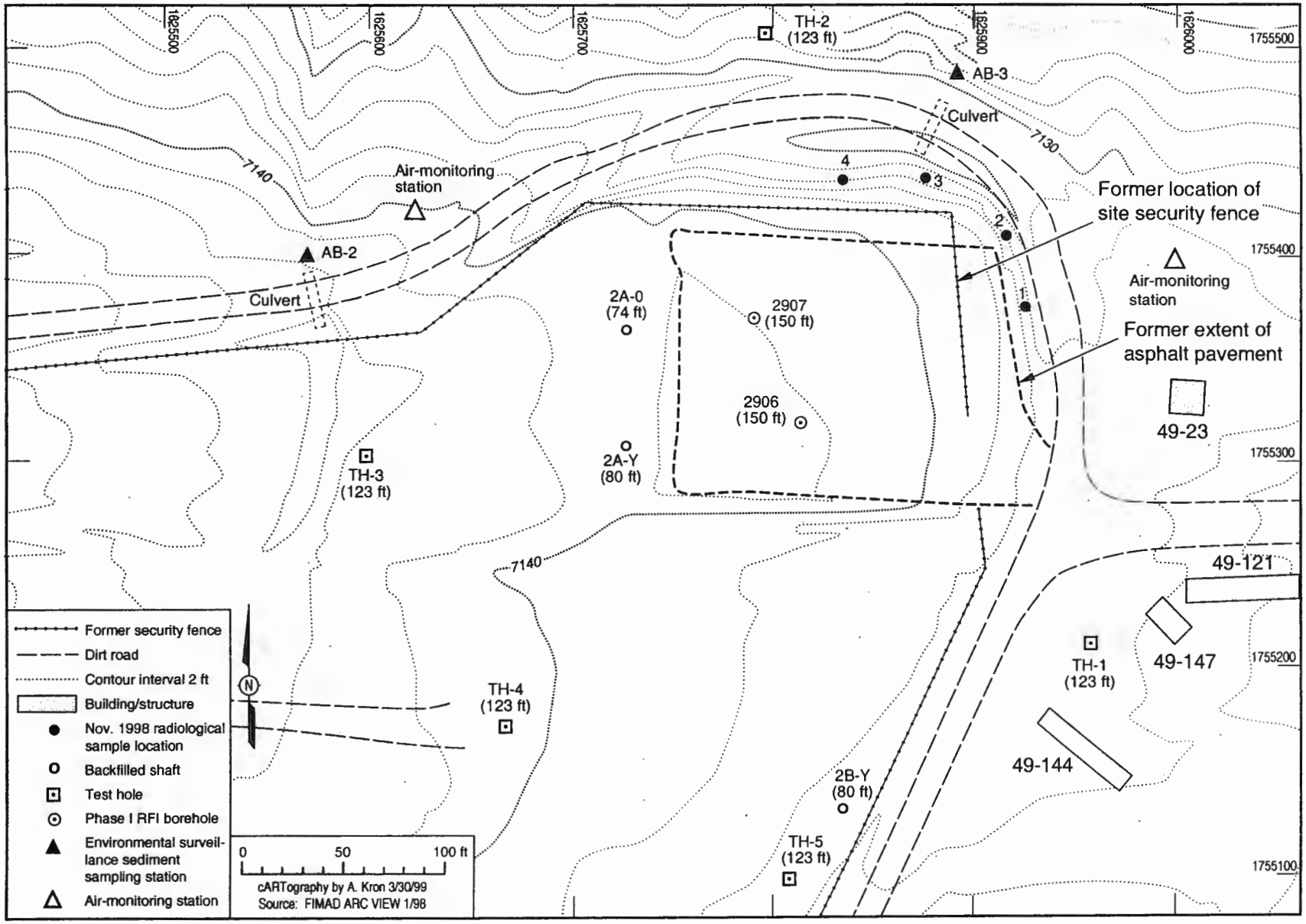

Figure 2-3. Area of asphalt removal and locations of four surface samples

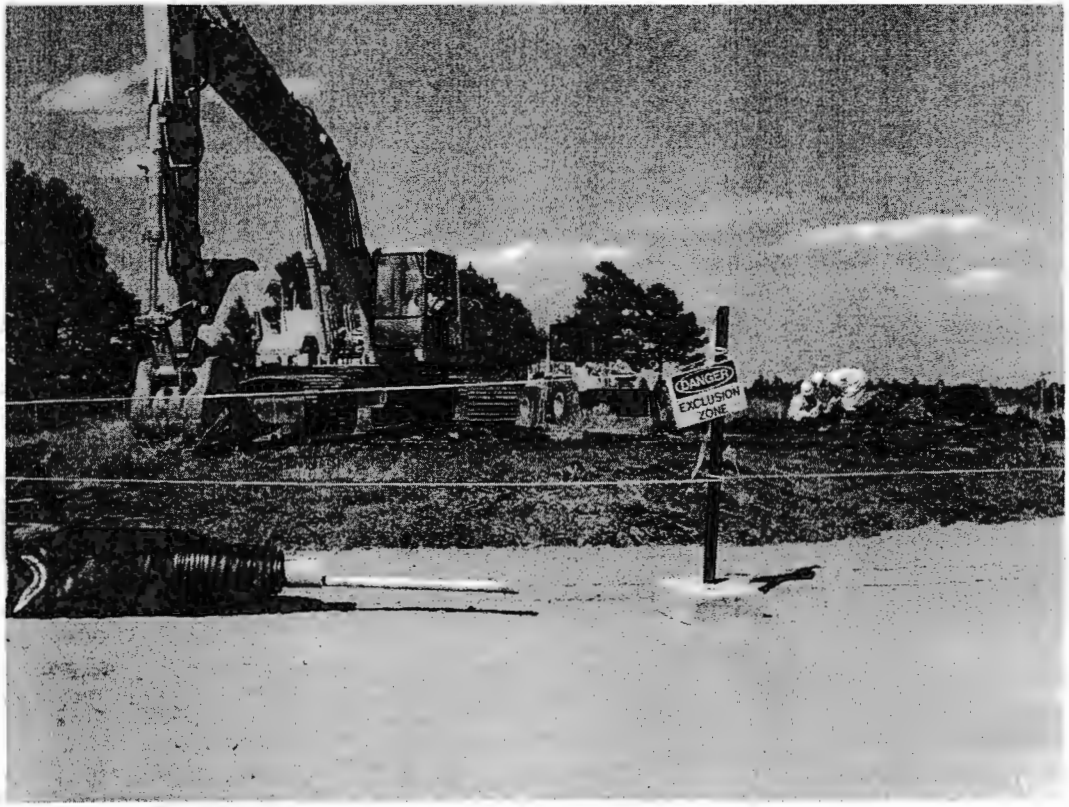

Figure 2-4. Removing the asphalt

Figure 2-5. Screening for radionuclides as the asphalt is being removed

Figure 2-6. Prestabilization site conditions at MDA AB Area 2

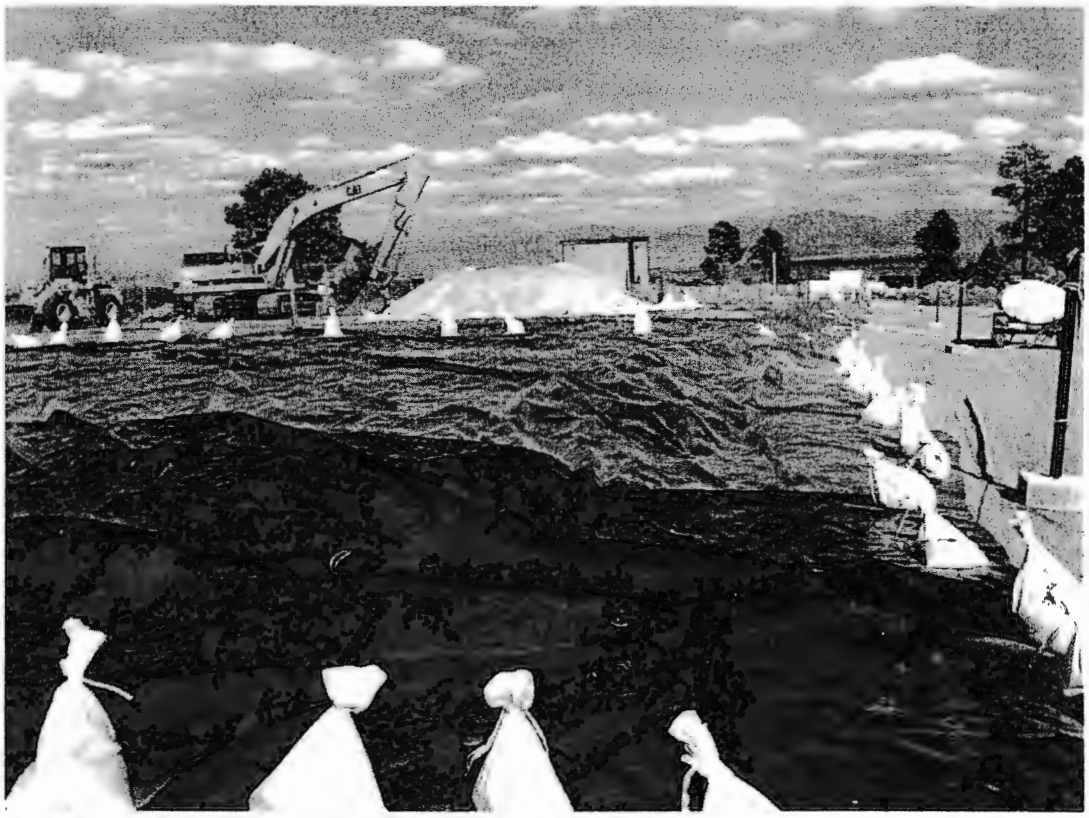

Figure 2-7. Covering the area after the asphalt has been removed

The asphalt varied from 1 to 8 in. in thickness but was generally thinner than the approximately 6 in. that was originally expected. The fill material beneath the asphalt was drier than originally expected, probably because of the lack of significant precipitation during the months preceding excavation and because a surface water diversion channel had previously been installed upstream from the asphalt pad. During the work, the fill material was visually characterized as dry to damp, and none of the wet to saturated conditions observed during the April 1998 RFI coring in the pad area were noted. The fill directly beneath the asphalt was a gravelly sand that was probably used as a base course before paving. The more clayey fill material beneath the base course was not exposed during excavation.

Screening of the asphalt and the exposed fill material beneath the asphalt was performed with an Eberline ESP-1 PG-2 instrument rather than a field instrument for detection of low-energy radiation (FIDLER) instrument, as originally planned, because a FIDLER instrument was not available. Because both instruments measure low-level gamma radiation using a sodium-iodide crystal, the results would be comparable, and this modification to the original plan was considered acceptable. Because no elevated radiation levels were found, a comprehensive, documented survey of the exposed surface beneath the asphalt was not considered necessary. After the completion of the asphalt removal with the excavator, the remaining larger chunks of asphalt (about 2 in.) were hand raked and removed for disposal. A total volume of approximately 490 yd^3 of asphalt was removed from the site. The final excavated surface was marked with survey hubs and plastic whiskers to identify the original grade of the fill materials.

2.5 Borings in Northeast Corner of Site

During a field-screening survey in November 1998, locations of above-background radiation were found on the slope at the northeast corner of Area 2. Although samples taken for analysis at the TA-21 count laboratory did not show radiological levels that were of concern for worker health and safety, control of the extensive gopher activity on the slope was necessary to avoid further unearthing of buried contaminants. Reduction of the slope angle would make it easier to install a gopher barrier and would also reduce erosion potential.

The slope was to be reduced by lowering the crest and raising the toe by 1 to 2 ft. Because lowering the crest involved excavating into soil that was potentially contaminated, 10 shallow boreholes were installed along the crest of the slope before excavation. The approximate locations of these borings are shown in Figure 2-1. The holes were numbered Gopher Hole (GH) 1 through 10. The boreholes were advanced with a hand auger on November 17, 1998, on approximately 10-ft spacings. Cuttings were collected in a core barrel from the ground surface to a depth of 3 ft in 6-in. lifts.

All cuttings were immediately field screened for low-level gamma radiation; an Eberline ESP-1 PG-2 instrument was rested on the cuttings, and 1-min. counts were taken. Ground surface background levels were determined from five background locations in the vicinity of the slope; they ranged between approximately 2000 counts per minute (cpm) and 3000 cpm and averaged about 2500 cpm. These readings were comparable to background levels in the vicinity of the Bottle House in Area 12 across the road. Two field measurements exceeded 3000 cpm, and the rest were within the background range. The first measurement (3170 cpm) was taken from a depth of 0 to 6 in. in Hole GH-7. This is sufficiently low that it was considered to be within the background range. The second measurement (4480 cpm) was taken from a depth of 0 to 6 in. in Hole GH-6. Although this is sufficiently elevated that it may be considered outside the background range, it was not high enough to be of concern for worker health and safety.

Based on the results of the surface screening and borings, a radiological work permit was prepared, and contouring of the slope proceeded. Soil was excavated from the crest of the slope with a front-end loader and moved across and down the slope to fill in low spots. The crest of the slope was reduced back to the approximate location of the original site fence. The excavated surface was screened for radiation as it was exposed, and no elevated levels were found.

2.6 Site Regrading

The site was regraded during October and November 1998 with clean, crushed tuff obtained from the Los Alamos County Landfill. The crushed tuff was placed on and in the vicinity of the pad area to create the final graded surface. The deep drainage channel beside the MDA AB perimeter road was also partially filled to reduce the potential for ponding. A Komatsu WA250 front-end loader was used to spread, shape, and compact the fill material. Although the fill material was originally planned to be specially compacted with a self-propelled vibratory compactor, the compaction provided by on-site equipment was found to be sufficient. Photographs of the regrading activities are shown in Figures 2-8 and 2-9.

The thickness of the new fill material ranged between a minimum of about 6 in. and a maximum of about 4 ft. The greatest thicknesses of fill were in the low area between MDA AB Areas 2 and 2B, where ponding formerly occurred, and on an east-west divide running roughly down the middle of the former pad; a greater thickness here encourages precipitation to run off to the north and south. Four-foot extensions were welded to the outer casings to raise the wellheads of the two 150-ft boreholes (49-2906 and 49-2907). A total fill volume of about 2750 yd^3 was required to attain the final fill grade and drain direct precipitation from the site. Because the area to be stabilized and the thickness of the fill were greater than originally planned, the volume of fill was greater. The limits of the regraded area are shown in Figure 2-1. The regrading included filling a low area to the west of the former pad and filling a former drainage swale on the southwest side of the site.

The steep slopes on the northern and northeastern sides of the site were the last portion of the site to be regraded; the regrading took place after cuttings from the borings had been screened. The slopes were reduced to lower erosion potential. These slopes had been a habitat for gophers, and elevated radioactivity levels had historically been found in the gopher diggings (LANL 1998, 59641, Section 3.2.1). A photograph of the slope reduction is shown in Figure 2-10. Before the slopes were reduced, the surface area was surveyed for radiation using an Eberline ESP-1 PG-2 low-level gamma meter; surface soil samples were taken at four above-background locations and submitted to the TA-21 count laboratory for fixed laboratory analysis. The locations of the four surface samples are shown in Figure 2-3. The samples were analyzed for gross alpha, beta, and gamma radiation. The results of those analyses are shown in Table 2-1.

Only one measurement (a gross alpha value of 16.2 pCi/g in sample 3) was above the count laboratory's minimum detectable concentration, and none of the results were considered to be of concern to worker health and safety. Radiological screening of subsurface samples from the 10 borings also yielded results that were not of concern to worker health and safety by the ESH-1 staff on site during the work. Based on the results of these surveys, excavation and grading of the slopes was allowed to proceed.

Although no bedrock was encountered when reducing the slopes, an approximately 20-ft-long, 1-ft-wide zone of damp soil was encountered adjacent to the northeast corner of the site about halfway up the slope. This damp area was thought to have resulted from lateral movement of moisture that had accumulated beneath the former asphalt pad, probably within the old fill material. A 4-ft by 4-ft concrete drop structure was placed at the upstream end of the existing culvert at the northeast corner of the site to accommodate the change in grade and reduce erosion potential. The location of the drop structure is shown in Figure 2-1. No changes were made to the existing culvert or to the perimeter road.

Figure 2-8. Regrading the area after asphalt removal

Figure 2-9. Regrading the area after the asphalt was removed

Figure 2-10. Reducing the slope on the northeast corner

Table 2-1
Results of November 1998 Soil Samples taken from Northeast Corner of Site

Sample Number	Gross Alpha (pCi/g)	Gross Beta (pCi/g)	Gross Gamma (pCi/g)
1	<1.41E+00*	<1.43E+00*	<4.74E+01*
2	<1.12E+00*	<1.25E+00*	<5.36E+01*
3	1.62E+01	<1.25E+00*	<5.61E+01*
4	<6.64E-01*	<1.15E+00*	<5.78E+01*

* Minimum detectable concentration is shown; analytical result was less than this amount.

2.7 Placing Topsoil

A 6-in. layer of topsoil was placed over the regraded surface of the site in November and December 1998. Approximately 1260 yd^3 of topsoil was used. This volume was greater than originally planned because of the greater extent of the stabilized area. Because of the scarcity and cost of topsoil from sources near Los Alamos, it was most cost-effective to bring in soil from the Albuquerque area. The soil was obtained from several sources; some loads were mixed with organic soil builder to obtain a more uniform quality. Photographs of the soil placement activity are shown in Figures 2-11 and 2-12.

Figure 2-11. Placing soil on the regraded area

Figure 2-12. Placing soil on the regraded area

The minimum thickness of tuff, along with a minimum 6-in. thickness of topsoil (Section 2.3) was intended to provide a minimum 1 ft of additional cover over the prestabilization surface at the site for erosion protection.

2.8 Site Seeding

The topsoil was hand-seeded with a 48-lb. mixture of 40% blue grama (Bouteloua gracilis), 40% western wheatgrass (Agropyron smithii), and 20% annual ryegrass. The seed was purchased from Plants of the Southwest in Santa Fe, New Mexico. This seed mixture was recommended by ESH-20 personnel and was a modification of the originally planned mixture of 50% blue grama and 50% western wheatgrass. Under environmental conditions at Los Alamos, blue grama and western wheatgrass are shallow-rooted perennial grasses; they are intended to enhance evapotranspiration and provide a stable, long-term cover for the site. The ryegrass is an annual that germinates in early spring and is intended to provide shade and increased soil water retention in the first year, thereby enhancing the germination of the other grasses later in the spring. Shallow-rooted grasses were preferred to minimize contact with radioactive contamination remaining on the original ground surface beneath the former asphalt pad area. After seeding, the site was smoothed with a wood and wire drag to cover the seed with a thin layer of soil and minimize losses to birds and rodents. Additional information on the selection of plants for revegetation is presented in Appendix C.

2.9 Placing Erosion Protection Gravel

Immediately after seeding, the site was covered with a thin layer of gravel to increase erosion protection. The gravel is also expected to protect the seed from animals and act as a mulch to enhance germination. About 160 yd^3 of gravel was used; this volume was greater than originally planned because of the greater extent of the stabilized area. The gravel was placed with a front-end loader and hand raked to achieve the desired final coverage. Over most of the site, the gravel was placed as a single layer with 70% coverage to simulate a natural desert pavement. This simulated desert pavement had been successfully used for erosion protection in landfill cover experimental test plots at Los Alamos (Nyhan et al. 1996, 63111, p. 282). A 2-in. thickness of gravel was placed on the steeper slopes on the north and northeast sides of the site for increased erosion protection. The gravel was obtained from sources in the Española Valley east of Los Alamos. The gravel consisted of nonuniform, angular crushed rock with a D_{50} value of about 0.75 in. and a D_{100} value of 1 in. A specification sheet for the gravel is presented in Appendix D along with documentation of the acceptability of this gravel for protecting the site against a 100-yr, 24-hr storm event. Photographs of the gravel erosion protection layer are shown in Figures 2-13 and 2-14.

2.10 Biointrusion Barrier

The potential for biointrusion is of concern because of the radioactive contamination remaining on the original ground surface at depths of about 4 ft to 7 ft beneath the final stabilized surface. Biointrusion by deep-rooted plants will be controlled by manually removing such plants from the site, as discussed in Chapter 4. Biointrusion by gophers is a more significant concern because gophers are numerous at the site and have in the past unearthed radioactive materials. In cooperation with ESH-20 personnel, a continuous wire mesh barrier was designed to control burrowing gophers. Chainlink fence material fabricated from galvanized, 11-gauge steel with 1/2-in. openings was selected for this purpose. This material was laid directly on the graveled surface over the part of the site where near-surface contamination had been found or was suspected. This included the area where the asphalt pad had been and the slopes on the northern and northeastern sides of the site where gophers had unearthed radioactive materials. Additional information on the design and installation of the biointrusion barrier is presented in Appendix E.

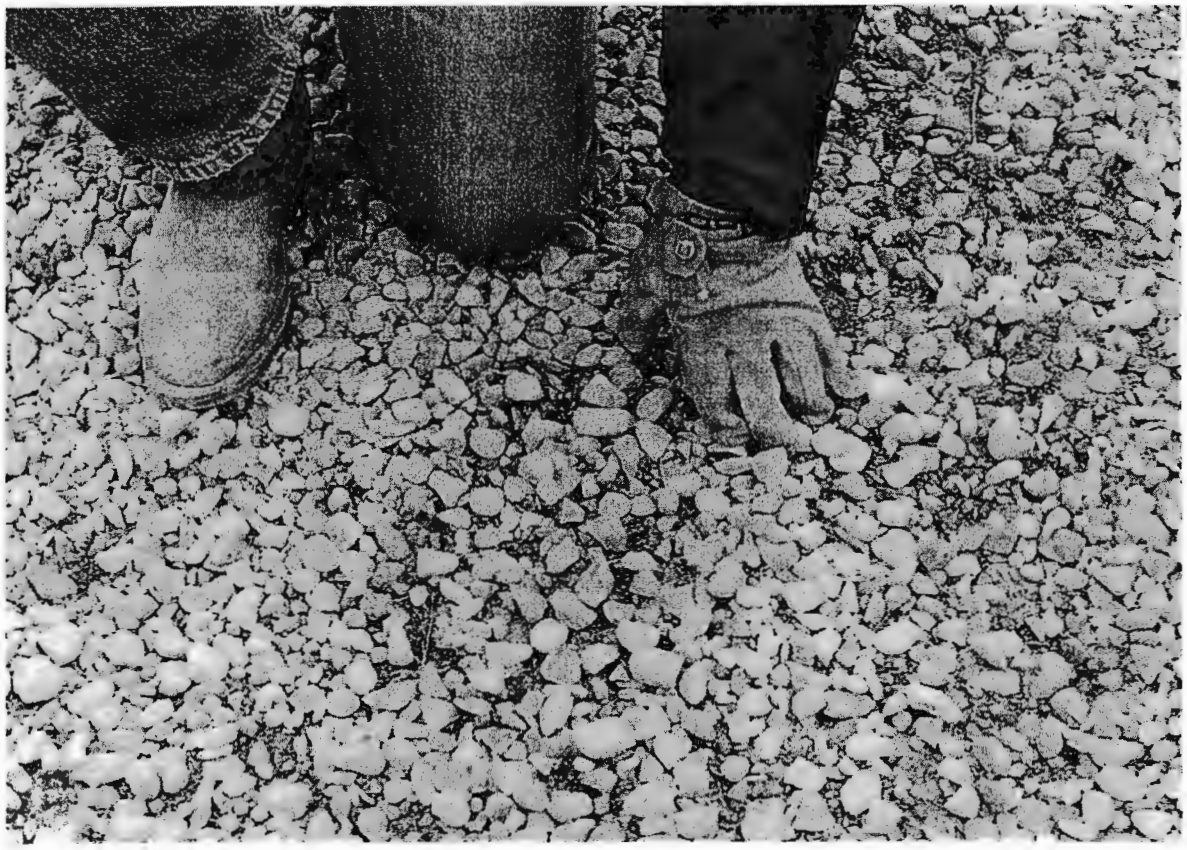

Figure 2-13. Gravel cover

Figure 2-14. Gravel cover on Area 2

The edge of the wire mesh was buried in a 2-ft-deep vertical trench to keep gophers from burrowing under the edge. Individual sheets of wire mesh were approximately 12 x 25 ft in size and were overlapped a minimum of 6 in. About 140 sheets were used to form the barrier. The individual sheets were clipped together with steel hog rings placed about 12 in. apart. The trunk of a pine tree penetrating the barrier was wrapped with wire mesh to a height of about 3 ft, and the openings between the wire mesh and the two 150-ft RFI wellheads were closed with approximately 2-ft by 2-ft surface seals of concrete. The wire mesh biointrusion barrier covered approximately 33,050 ft^2, or 55%, of the 60,260 ft^2 area affected by the stabilization activities. The area covered by the wire mesh biointrusion barrier is shown in Figure 2-1. Photographs of the barrier and its installation are shown in Figures 2-15 and 2-16.

2.11 Site Cleanup and Fencing

After completing the principal stabilization activities, the site was cleaned of all construction debris. Wooden pallets that had previously been stored on the site were removed. A silt fence was constructed around the downgradient edges of the stabilized area, and the MDA AB perimeter road was regraded and regraveled where required. Grade markers that were planned to be placed on the part of the stabilized area not covered by the biointrusion barrier could not be installed because of frozen ground. No markers are needed on the part of the site with biointrusion protection because the wire mesh barrier will serve as a benchmark for visually identifying the depth of erosion. Additional discussion of erosion and the associated inspection and maintenance requirements is presented in Chapter 4.

The site chainlink security fence was relocated around the edge of the stabilized area. Delineator reflectors were placed where the site perimeter road curves around Area 2. The old gate on the eastern side of the site was not replaced because of a concern that it would encourage vehicular traffic across the stabilized area and the biointrusion barrier. However, a new gate was installed on the northwestern side of the site to permit vehicular access to the edge of the stabilized area for borehole drilling and other purposes. Posts for the chainlink fence were placed in 3-ft-deep holes and backfilled with concrete. The soil near the bottoms of two postholes at the northeast corner of the site was nearly saturated with water. These holes were located downgradient from the damp soil encountered when lowering the surface slope in the northeast corner, and the wet conditions are likely associated with the lateral movement of moisture that had accumulated beneath the former asphalt pad. The locations of the stabilized area silt fence, new security fence, wet postholes, and new access gate are shown in Figure 2-1. Photographs of the fences are shown in Figures 2-17 and 2-18.

2.12 Poststabilization Land Survey

The regrading of the site resulted in a crowned final grade that allows runoff to exit the site in all directions (Figure 2-1).

2.13 Final Inspection and Project Acceptance

On February 3, 1999, a final site inspection was conducted by the contractor and the Laboratory's technical representative. The inspection included all aspects of the stabilization measure construction activities and final site cleanup. At the end of the inspection, the Laboratory's technical representative concurred that all project construction activities had been satisfactorily completed.

Figure 2-15. Trenching for the barrier

Figure 2-16. Gopher barrier

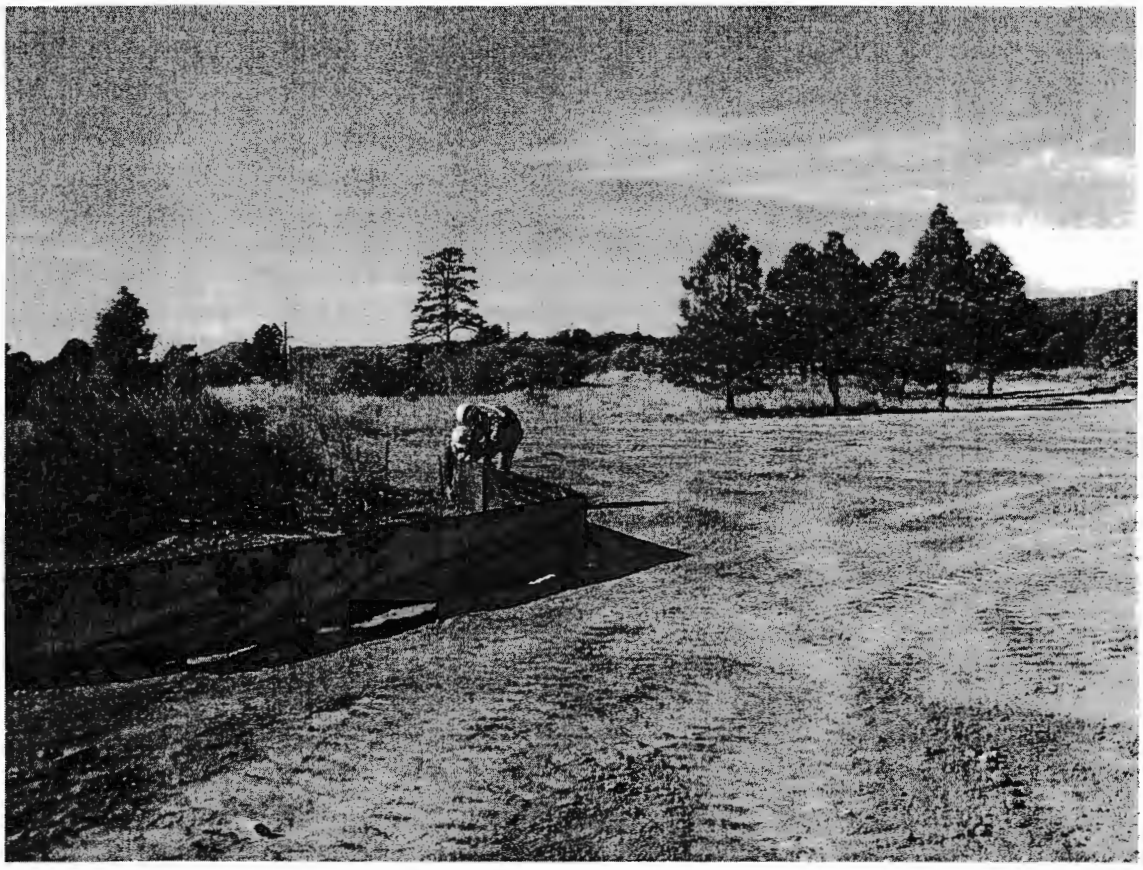

Figure 2-17. Installing the silt fence

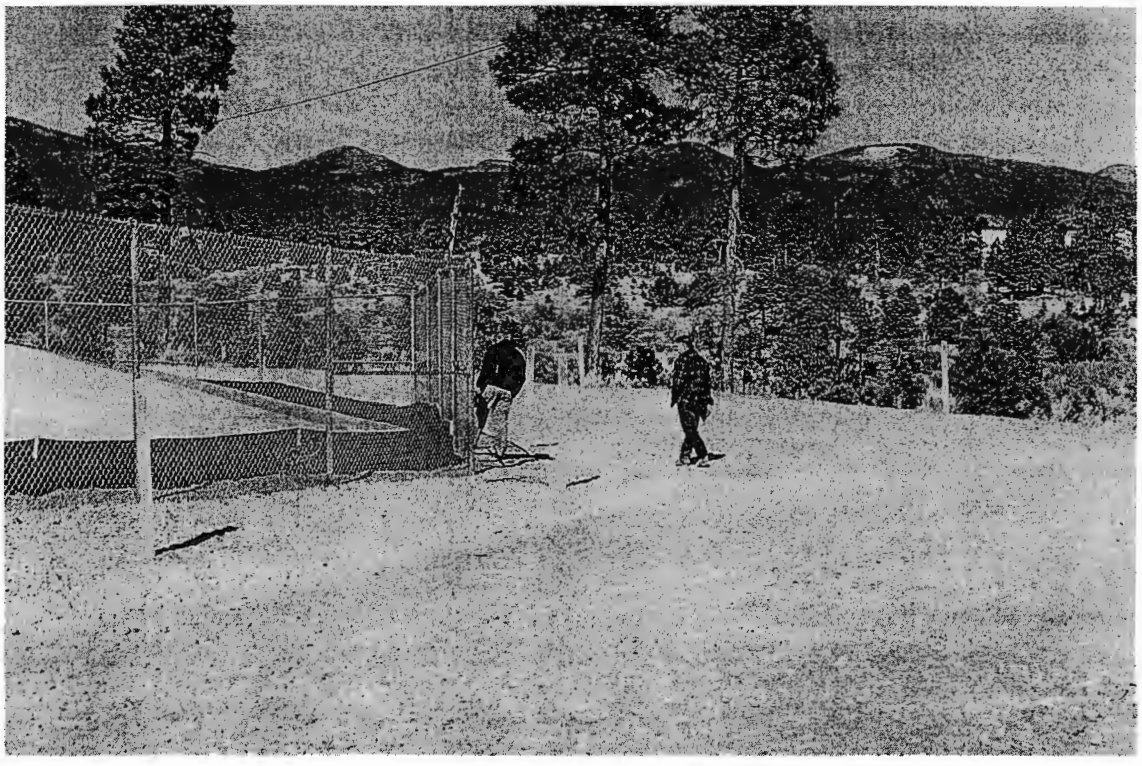

Figure 2-18. New security fence around the area

3.0 MONITORING

Plans for long-term monitoring of the stabilized area and its vicinity have been presented in two documents (LANL 1998, 59641, Chapter 6; Environmental Restoration Project 1998, 62040, Attachment A). The monitoring program will focus on periodic measurement of moisture levels in the subsurface soils and tuff. Monitoring of air, surface water, and sediment quality is also conducted in the vicinity of Area 2 as part of other Laboratory programs. No poststabilization monitoring data to evaluate the effectiveness of the interim measure were available from the site at the time this report was prepared. Extensive monitoring programs to determine effectiveness have been planned and are described below. Because this stabilization effort was not a cleanup activity, no confirmatory sampling was conducted.

3.1 Moisture Monitoring

Because high moisture levels were present at the site, the planned monitoring program will focus principally on moisture monitoring. On a monthly basis, the Laboratory plans to use neutron probes to monitor moisture contents between the ground surface and the soil-tuff interface in the three boreholes in the former pad area (CH-2, 49-2906, and 49-2907) and the two off-site boreholes (TH-1 and TH-3) (Figure 2-1) In addition, on a quarterly basis, the Laboratory plans to monitor all (10) site boreholes to total depth. This program will continue for at least two years, during which time the data will be analyzed for trends. Contingencies that will be taken if a significant trend of increasing moisture content is found are described in an ER Project document (1998, 62040, Attachment A). The results of past moisture monitoring in the existing off-site boreholes are shown in Appendix F. These results show a remarkably consistent pattern below a depth of about 3 ft, indicating relatively stable conditions beneath the zone influenced by seasonal trends and individual storm events.

The results obtained from the August 1998 measurements are the only neutron probe data available from boreholes CH-2, 49-2906, and 49-2907. The results from 4-in.-diameter CH-2 are presented in Appendix F. They were measured before the well was plugged and abandoned and illustrate the elevated moisture levels present beneath the former asphalt pad area. The results from the two 150-ft RFI boreholes (49-2906 and 49-2907) have not been included in this report. They appear to have been significantly attenuated and suggest that the neutron probe may not have been properly calibrated for these larger 8-in.-diameter holes. Additional monitoring planned for Fiscal Year 2000 will include a check on the ability of the instrument to make adequate measurements in these larger holes.

3.2 Stormwater and Sediment Monitoring

Stormwater and sediment monitoring are being conducted at locations AB-2 to the northwest and AB-3 to the northeast of the stabilized area. The locations of these monitoring stations are shown in Figure 2-1. This monitoring is part of ESH-18's site-wide surface water program. ESH has taken sediment samples annually at the two stations since the 1970s, and the above-background radionuclide levels occasionally found focused attention on Area 2. This eventually led to the stabilization effort described in this report. Because of the ephemeral nature of runoff events, there is little data on the quality of stormwater; however, ESH did take water samples at Station AB-2 in 1987 and 1998. The 1987 results were published in the annual environmental surveillance report for that year, and analyses for a limited number of radionuclides, metals, and major ions showed no values exceeding drinking water standards (ESG 1988, 6877, p. 263). The more comprehensive analysis performed on the 1998 sample showed

- no detectable Aroclors,
- gamma spectrometry results that were below detection limits or less than the 2-sigma total propagated uncertainty for all nuclides,
- metals that were either not detected or at the reporting limit (except aluminum at 3.1 mg/l),
- nitroaromatics and nitramines (high explosives) that were below reporting limits, and
- no reportable semivolatile organic compounds (SVOCs).

The results of the 1998 analyses are included in the site storm water pollution prevention (SWPP) plan (MK/PMC Los Alamos Project Team 1998, 62910, Appendix D).

4.0 INSPECTION AND MAINTENANCE

A program of inspections for excessive erosion rates, biointrusion, and general site integrity is described in the stabilization plan (LANL 1998, 59641, Chapter 7). During quarterly monitoring, the site will be inspected for erosion of the regraded surface, deep-rooted plants growing on the site, gopher burrows, evidence of ponding, integrity of the site security fence and signs, and the proper performance of erosion control measures installed as BMPs. Areas with more than 4 in. of erosion will be restored by placing additional topsoil, crushed tuff, and gravel, as needed. The depth of gullying for the 100-yr, 24-hr. storm is estimated to be about 4 in., and the minimum thickness of new cover over the prestabilization ground surface is about 12 in. If the 100-yr storm occurred after the first 4 in. had eroded, the last 4 in. would provide a buffer against erosion to the prestabilization surface. However, it should be noted that site inspection will be performed after major rainfall events to ensure that significant erosion has not occurred.

Breaches in the gopher barrier will be repaired, gophers on the site within the area of the barrier will be removed, and the effects of their burrows will be repaired. Low-lying areas will be filled with soil or crushed tuff. The site security fence will be inspected and repairs will be performed, as needed. Warning and hazard signs installed at the site during the stabilization activities will be inspected and repaired or replaced, as needed. Site inspections and maintenance will be documented on the inspection and maintenance form presented in Appendix G. Completed forms will be maintained by the ER Project's MDA focus area leader. Routine inspections for the proper performance of off-site erosion control measures will be performed and documented as part of the site's SWPP plan (MK/PMC Los Alamos Project Team 1998, 62910).

5.0 WASTE MANAGEMENT

Waste materials generated during the interim measure activities at Area 2 were managed in accordance with the waste characterization strategy form prepared for this project (Environmental Restoration Project 1998, 57587).

5.1 Asphalt

Before the asphalt paving at Area 2 was removed, it was characterized by direct sampling of the asphalt and moisture sampling in the underlying fill material (Figure 5-1). One sample of asphalt taken from above Shaft 2-M in the center of the pad area was analyzed for volatile organic compounds (VOCs), SVOCs, and polychlorinated biphenyls/pesticides. No organic constituents were detected. Five composite asphalt samples taken from the four corners and center of the pad area were analyzed for target analyte list (TAL) metals and radionuclides (isotopic americium, plutonium, and uranium). The metals were detected at levels below RCRA limits for hazardous classification, and the radiochemical analyses indicated background activity ranges. Soil moisture samples taken directly beneath the asphalt at each shaft location and at six supplemental locations were analyzed for tritium. Results for the 28 soil moisture samples ranged from 0 pCi/ml to 4340 pCi/ml and were generally above the background level of about 6 pCi/ml. Detailed results of the asphalt and tritium sampling will be included in the MDA AB data summary report. The above-background tritium levels were found throughout the pad area and probably originated from tritium used in the 1960s nuclear safety tests at the site. A description of those tests is presented in the stabilization plan (LANL 1998, 59641, Chapter 2). Because of the presence and widespread distribution of elevated tritium levels and because of the ability of asphalt to uptake tritium into the structure of its organic compounds, all asphalt was managed as low-level radioactive waste.

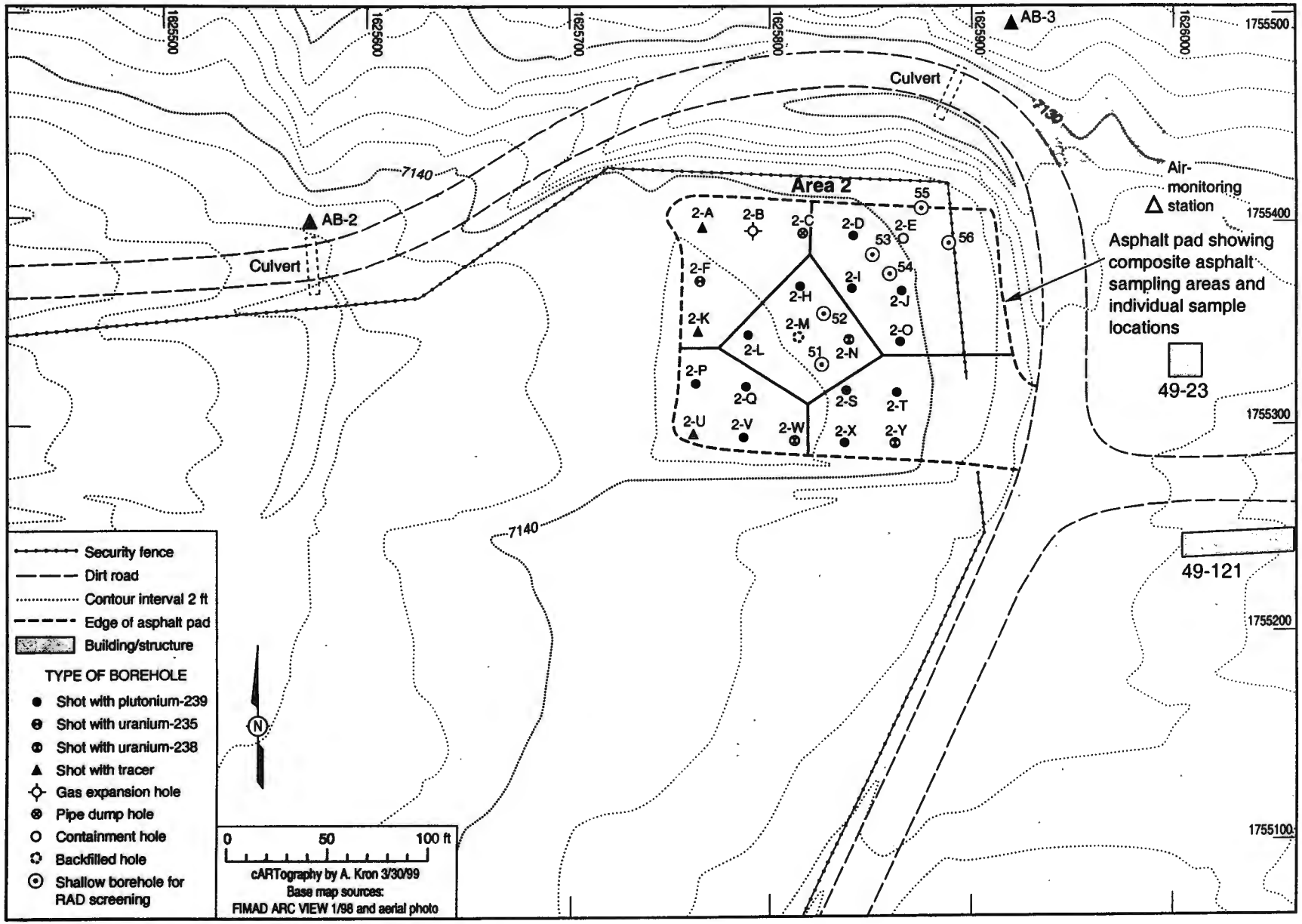

Figure 5-1. Asphalt and tritium sample locations

During transport, the asphalt was covered by tarps. Waste shipments were coordinated with TA-54's operating schedule. The asphalt was placed in disposal pits as directed by TA-54 personnel.

5.2 CH-2 Casing

CH-2 was originally completed with 500 ft of 2-in.-diameter galvanized steel pipe casing that had threaded joints and was installed ungrouted into an approximately 4-in.-diameter borehole. The casing was removed, and the hole was plugged and abandoned in August 1998 as part of the stabilization effort. The casing was disassembled by unscrewing it at the threaded joints as it was removed from the hole. Wet soil and/or bentonite mud coated the casing over its entire length. The thickness of this coating ranged between a thin film and about 1/4 in. and averaged about 1/8 in.

At a depth of about 25 ft, above-background levels of radioactivity were detected on the casing and the attached mud during field screening. All coating scrapings within the depth interval of 21.5 to 103.5 ft were collected to obtain sufficient volume for a sample. The sample was analyzed for TAL metals, VOCs, SVOCs, gross alpha/beta/gamma, tritium, and moisture content. Above-background gross alpha readings were obtained from the sample. Samples were also taken of the soil on top of the concrete surface seal on CH-2 and of the soil/mud coating on the casing within the depth intervals of 223.5 to 243.5 ft and 473.5 ft to total depth The analytical results indicated the presence of total lead at a maximum concentration of 570 ppm. The soil/mud samples were resubmitted for toxicity characteristic leaching procedure metal analysis and were below RCRA limits for hazardous classification. The soil/mud samples were also measured for gross alpha, beta, and gamma radioactivity.

Initially, the casing was to be cleaned so it could be recycled or used as scrap metal; however, this alternative could not be implemented because equipment needed to screen the inside of the casing for radiological constituents was not available. Swipe samples taken of the casing indicated no detectable radioactive contamination. Because the swipe results were negative, the casing could not be accepted for disposal at TA-54. However, the earlier field-screening results and process knowledge of the site indicated that the casing could be radiologically contaminated. The casing was shipped in May 1999 to GTS Duratek, a facility in Oak Ridge, Tennessee, that processes radioactively contaminated metals. The casing was cut into approximately 5-ft lengths and stored on site in a metal B-25-type box before shipment.

5.3 Other On-Site Waste and Salvage Materials

Other waste and salvage materials consisted of wood pallets, vegetation removed from the work area, plastic sheeting, fence materials, personal protective equipment (PPE), and sample residuals. A stack of old wood pallets was found between Areas 2 and 2B. Swipe samples indicated the pallets were free from detectable radioactive contamination, and they were removed from the site by the construction subcontractor for disposal or reuse. Vegetation was cut up and added to the erosion control structures to help minimize erosion. The chainlink security fence at Area 2 was removed during construction. Swipe samples of the fence materials indicated that they were free from detectable radioactive contamination. Damaged sections were removed from the site for disposal; other sections were reused. Based on process knowledge, PPE was drummed for disposal at TA-54 as low-level radioactive waste.

Polyethylene sheeting was used to protect the waste asphalt from rain and to temporarily cover tools and other field equipment. The sheeting was also used to wrap fencing materials, corrugated pipe, hand tools, and other items that were removed from the site and possibly contaminated. Swipe samples were taken of the sheeting; they were free from detectable radioactive contamination, and the sheeting was transported to the Los Alamos County Landfill for disposal. The polyethylene sheeting used to cover the ground when CH-2 was plugged and abandoned was bagged for disposal. Swipe samples were taken of

the sheeting; detectable radioactive contamination was found in 1 of the 12 bags. The bag with detectable radioactive contamination was segregated and drummed for disposal at TA-54; the other bags were disposed of at the Los Alamos County Landfill. Swipe samples were taken of the 20-mil HDPE liner used to cover the fill materials underlying the removed asphalt, they were free from detectable radioactive contamination, and the sheeting was disposed of at the Los Alamos County Landfill.

Most sample residuals were returned to the original sampling locations. One sample from a shallow boring above Shaft 2-N and the associated PPE and sampling equipment were isolated for off-site disposal because the sample contained transuranic (TRU) levels of radiological materials. Because the level of radioactivity was high (129,223 dpm alpha activity, 20,083 dpm beta activity, and 8,207,127 dpm gamma activity) and the sample was located at the original ground surface, it is likely the contamination found above Shaft 2-N originated from the 1960 accidental release from adjacent Shaft 2-M. Additional discussion of this release is presented in the stabilization plan (LANL 1998, 59641, Chapter 2). The lead, which was also used in the nuclear safety tests, is regulated under RCRA and could be collocated with the radionuclides. Therefore, sample residuals and associated PPE and sampling equipment from Shaft 2-N were managed as mixed TRU waste and drummed for storage at TA-54 pending the availability of an appropriate disposal facility. Detailed information on the sampling results will be presented in the MDA AB, Area 2, data summary report.

6.0 SCHEDULE

The Laboratory's ER Project internal peer review of the Area 2 interim measure activities occurred on April 8, 1998, and the readiness review for field implementation occurred on September 8, 1998. Implementation of the interim measure activities began on September 14, 1998, and was completed on January 19, 1999. A detailed schedule of key project activities is presented in Table 6-2.

Table 6-2
Schedule of Interim Measure Activities

Date	Activity
8/17/98	Mobilized equipment for plugging and abandoning CH-2
8/20/98	Began pulling casing on CH-2
8/24/98	Completed pulling casing on CH-2
8/24/98	Began grouting CH-2
8/25/98	Completed grouting CH-2
8/28/98	Completed equipment demobilization
9/14/98	Began site preparation work
9/17/98	Began placement of crushed tuff around pad perimeter
9/18/98	Completed placement of crushed tuff around pad perimeter
9/21/98	Began asphalt removal with excavator
9/22/98	First shipment of asphalt sent to TA-54 for disposal
10/15/98	Completed asphalt removal with excavator
10/19/98	Completed hand raking and removal of smaller asphalt pieces
10/20/98	Last shipment of asphalt sent to TA-54 for disposal
10/28/98	Began site regrading with crushed tuff
11/10/98	Installed 4-ft extensions to the two 150-ft RFI boreholes at Area 2

Table 6-2 (continued)

Date	Activity
11/13/98	Completed site regrading with crushed tuff
11/18/98	Began placing topsoil on regraded area
11/23/98	Recontoured northeast corner (gopher area)
11/23/98	Began installing site silt fence
12/03/98	Completed placing topsoil on regraded area
12/04/98	Seeded topsoil with shallow rooting grasses
12/07/98	Began placing gravel erosion protection
12/15/98	Began installing gopher barrier
12/16/98	Installed drop structure for northeast corner culvert
12/21/98	Completed installing gopher barrier
12/23/98	Completed placing gravel erosion protection
12/24/98	Completed installing site silt fence
1/04/99	Began final cleanup of construction debris
1/06/99	Began installing site security fence
1/07/99	Installed grate for drop structure
1/15/99	Completed installing site security fence
1/19/99	Completed final cleanup of construction debris and demobilization
2/03/99	Performed final site inspection and project acceptance

7.0 REFERENCES

The following list includes all references cited in this document. Parenthetical information following each reference provides the author, publication date, and the ER record identification (ID) number. This information also is included in the citations in the text. ER ID numbers are assigned by the Laboratory's ER Project to track records associated with the Project. These numbers can be used to locate copies of the actual documents at the ER Project's Records Processing Facility and, where applicable, within the ER Project reference library titled "Reference Set for Material Disposal Areas, Technical Area 49."

Copies of the reference library are maintained at the NMED Hazardous and Radioactive Materials Bureau; the Department of Energy Los Alamos Area Office; United States Environmental Protection Agency, Region VI; and the ER Project MDAs Focus Area. This library is a living collection of documents that was developed to ensure that the administrative authority (AA) has all the necessary material to review the decisions and actions proposed in this document. However, documents previously submitted to the AA are not included in the reference library.

Environmental Restoration Project, March 6, 1998. "Waste Characterization Strategy Form, MDA Focus Area, TA-49, RFI Sampling, BMP Activities, and Asphalt Pad Removal, Material Disposal Area AB - Areas 2, 2A, and 2B," Los Alamos National Laboratory, Los Alamos, New Mexico. (Environmental Restoration Project 1998, 57587)

Environmental Restoration Project, July 15, 1998. "LANL ER Project Site-Specific Health and Safety Plan (SSHASP), Core Hole 2 Abandonment at Material Disposal Area (MDA) AB," SSHASP No. 212, Los Alamos National Laboratory, Los Alamos, New Mexico. (Environmental Restoration Project 1998, 63112)

Environmental Restoration Project, August 11, 1998. "LANL ER Project Site-Specific Health and Safety Plan (SSHASP), Best Management Practices/Stabilization (BMP/S) at Material Disposal Area (MDA) AB, Areas 2, 2A, and 2B – PRSs 49-001 (b, c, d, and g)," SSHASP No. 204, Los Alamos National Laboratory, Los Alamos, New Mexico. (Environmental Restoration Project 1998, 63114)

Environmental Restoration Project, September 1998. "Best Management Practices Report for Installation of Stabilization Measures at Potential Release Sites 49-001(b,c,d, and g)," Los Alamos National Laboratory report LA-UR-98-4170, Los Alamos, New Mexico. (Environmental Restoration Project 1998, 63041)

Environmental Restoration Project, September 10, 1998. "RSI for the SP for Implementing Interim Measures and BMPs at TA-49, PRSs 49-001 (b,c,d, and g) (Former OU 1144, FU 5)," Los Alamos National Laboratory report EM/ER:98-336, Los Alamos, New Mexico. (Environmental Restoration Project 1998, 62040)

ESG (Environmental Surveillance Group), May 1988. "Environmental Surveillance at Los Alamos During 1987," Los Alamos National Laboratory report LA-11306-ENV, Los Alamos, New Mexico. (ESG 1988, 6877)

LANL (Los Alamos National Laboratory), July 1998. "Stabilization Plan for Implementing Interim Measures and Best Management Practices at Potential Release Sites 49-001 (b, c, d, and g)," Los Alamos National Laboratory report LA-UR-98-1543, Los Alamos, New Mexico. (LANL 1998, 59641)

MK/PMC Los Alamos Project Team, November 1998. "Storm Water Pollution Prevention Plan, Technical Area 49, Material Disposal Area AB, Areas 2 and 12," Revision 3, Los Alamos, New Mexico. (MK/PMC Los Alamos Project Team 1998, 62910)

NMED (New Mexico Environment Department), August 15, 1992. "Monitor Well Construction and Abandonment Guidelines," Ground Water Bureau, Santa Fe, New Mexico. (NMED 1992, 53805.16)

Nyhan, J. W., T. G. Schofield, and R. H. Starmer, 1996. "A Water Balance Study of Four Landfill Cover Designs Varying in Slope for Semiarid Regions," Los Alamos National Laboratory report LA-UR-4093, Los Alamos, New Mexico. (Nyhan et al. 1996, 63111)

Appendix A

Acronyms and Abbreviations

AA	administrative authority
BMP	best management practice
CH-2	Corehole 2
cpm	counts per minute
DOE	Department of Energy
dpm	disintegrations per minute
ESH	Environment, Safety, and Health (Division)
FIDLER	field instrument for detection of low-energy radiation
GH	gopher hole
HDPE	high-density polyethylene
Laboratory	Los Alamos National Laboratory
MDA	material disposal area
MK/PMC	Morrison Knudsen/Program Management Company
NMED	New Mexico Environment Department
PPE	personal protective equipment
PRS	potential release site
RCRA	Resource Conservation and Recovery Act
RFI	RCRA facility investigation
TA	technical area
TAL	target analyte list
TRU	transuranic
VOC	volatile organic compound

Appendix B

Borehole Plugging and Abandonment Summary

MEMORANDUM

From: C.R. Wilson, MK/PMC Team

To: Project Files

Date: 9 September 1998

Subject: PLUGGING AND ABANDONMENT SUMMARY FOR COREHOLE 2

AT TA-49, MDA AB AREA 2

BACKGROUND

Corehole 2 (CH-2) was drilled in 1959 to provide geologic and hydrologic information on MDA AB Area 2 at TA-49 prior to selecting the site for nuclear safety tests. The hole was plugged and abandoned because of concerns that it could provide a pathway for vertical contaminant migration given the elevated moisture content of the near-surface soils and tuff at the site. This hole was plugged and abandoned in accordance with State of New Mexico Environment Department Ground Water Section *Monitor Well Construction and Abandonment Guidelines* (Ground Water Section, August 15, 1992), LANL Environmental Restoration Project Standard Operating Procedure 5.03, R0, *Monitor Well and RFI Borehole Abandonment* (May 23, 1997), and the Monitoring Well and Borehole Abandonment Plan included as Attachment 3 to LANL's draft *Stabilization Plan for Implementing Interim Measures and Best Management Practices at PRSs 49-001 (b, c,d, and g)* dated July 1998. The work was performed by Stewart Brothers Drilling Company of Grants, New Mexico, under direct contract to the Laboratory. Field direction for drilling operations, waste management, and radiological monitoring were provided by the MDA AB team of LANL and MK/PMC team personnel.

PLUGGING AND ABANDONMENT ACTIVITIES

Monday, 8/17	Morning: Conducted SSHASP and other project-related training. Afternoon: Mobilized grout trailer and tremie pipe to site.
Tuesday, 8/18	Completed pre-operational radiation checks of grout trailer and tremie pipe.
Wednesday, 8/19	Mobilized rig and other support equipment to site, set up contamination control zones, and established decontamination area for casing.
Thursday, 8/20	Inspected equipment and completed pre-operational radiation checks of rig and remaining support equipment. Started casing pull. The casing consisted of approximately 20-ft lengths of 2-in. diameter galvanized pipe with threaded joints. Completed casing pull from collar to 43.5 ft depth, measured from top of collar which extended about 2 ft above the asphalt surface. Found concrete surface-type seal at a depth of about 1 ft extending to a depth of about 3 ft below the asphalt surface. This depth would place the top of the seal at about the original ground surface. The seal dimensions were about 2 x 2 x 1 ft

thick. The concrete was competent and intact, forming a tight seal with the casing. It was separated from the casing with a jackhammer.

One sample was taken of the soil on top of the concrete seal (ID #MD49-98-0140). The sample was analyzed for TAL metals, VOCs, SVOCs, PCBs, gross alpha/beta/gamma, tritium, and moisture content. Analytical results are expected by about mid-September.

Wet soil and/or bentonite mud was found to be coated the casing over its entire length. The thickness of this coating ranged from a thin film to about 1/4 in. and averaged about 1/8 in..

The mud-coated outer surface of the casing was continuously screened for radiation after it was pulled from the ground. Above background levels of radiation were found only at one location, at a depth range of about 24.5 to 25 ft below the collar. Sampling the soil/mud coating at this depth required collecting all coating scrapings within the depth interval of 21.5 to 103.5 ft to obtain sufficient sample volume. One sample was taken (ID #MD49-98-0141) and analyzed for TAL metals, VOCs, SVOCs, gross alpha/beta/gamma, tritium, and moisture content. Analytical results are expected to be available by about mid-September. The casing was unscrewed at the threaded joints as it was removed from the hole.

Friday, 8/21

Pulled casing from 43.5 ft to about 383 ft, then sounded through casing to see if there was a cap on the bottom end. A cap was found, meaning that the tremie pipe could not be extended through the casing until the cap was removed. Wrapped all pulled casing in plastic as protective measure. Casing from 0 to 123 ft was wrapped separately because of potential radioactive contamination.

A sample was taken (ID #MD49-98-0142) of the soil/mud coating within the depth interval of 223.5 to 243.5 ft to obtain sufficient sample volume. The sample was analyzed for TAL metals, VOCs, SVOCs, PCBs, gross alpha/beta/gamma, tritium, and moisture content. Analytical results are expected to be available by about mid September.

Brian Carlson from TA-54 inspected casing and determined that because of the mud coating it had to be cleaned at TA-50 before he could determine its acceptability for recycling or use as scrap metal. Thus Plan A of the CH-2 guidance (copy attached) will be followed.

Monday, 8/24

Pulled last of casing, from 383 ft to total depth at about 500 ft. The bottom approximately 20 ft of casing was rusty and thickly coated with bentonitic type mud. All but one of the slots that had been cut in this length of casing to provide a well screen were completely concealed and appeared to be plugged by the mud and rust. After scraping the pipe, the slots were found to be about 6 to 8 in. long and 6 to 8 in. apart vertically, and cut 90° apart around the casing circumference possibly with a torch. The casing and slots were highly rusted. It is likely that galvanized pipe was not used for this length of casing. Except for the well screen at the bottom, the casing was found to be intact with no breaks, holes, or faulty joints over its entire length.

A sample was taken of the soil/mud coating at the bottom of the hole (ID #MD49-98-0143). Sampling at this depth required collecting all coating

scrapings within the depth interval of 473.5 ft to total depth to obtain sufficient sample volume. The sample was analyzed for TAL metals, VOCs, SVOCs, PCBs, gross alpha/beta/gamma, tritium, and moisture content. Analytical results are expected to be available by about mid September 1998.

The casing was re-inserted into the hole and reassembled to a depth of about 120 ft. This casing was suspended in the hole to protect the tremie pipe from possible contamination in the upper part of the hole. Type I/II Portland cement with 5 % to 7% added bentonite was used for all grouting operations. The tremie pipe was then lowered into the hole to within about 40 ft of the bottom and grout was injected to above the level of the bottom of the tremie. The tremie pipe was then lifted 20 ft and the next 20 ft of hole was grouted. This process was repeated at 20 ft intervals until operations were suspended for the day at an estimated depth to grout of about 170 ft. The process provided a nominal maximum grout drop of about 20 ft. The approximately 500 ft depth of the hole precluded grouting the entire hole in a single, continuous pour.

Tuesday, 8/25

Before recommencing grouting, the hole was sounded with a weighted tape to check the depth to grout placed the previous day. The depth was determined to be 168 ft, which was only 2 ft off the estimate of 170 ft.. This was considered to be an excellent correlation. Grouting was continued at 20 ft intervals as before, and the hole was periodically sounded. The interval from 168 ft to 90 ft was found to require approximately 4 times more grout than was expected based on the dimensions of the hole, possibly indicating a larger diameter hole or grout loss into a permeable zone or zones in the tuff. The hole filled normally after a depth of 55 ft was reached. Grouting was completed to the original ground surface, about 18 in. below the top of the asphalt, and left overnight to settle before placing the surface seal. The rig and tools that were inside the exclusion zone were screened out of the site. The grout trailer was kept outside the zone during the operation.

Wednesday, 8/26

The grout level was checked and found to have settled about 4 ft. The hole was topped off with additional grout and sealed to within about 1 ft below the asphalt surface. The hole was not sealed to the asphalt surface so the seal would not be disturbed when the asphalt is removed and the site is regraded. All equipment used in the exclusion zone was screened out of the site.

Friday, 8/28

Checked grout level in hole and found no settlement. A total of 65 bags of Portland cement was used to seal CH-2.

Appendix C

Selection of a Seed Mix for Revegetating MDA AB Area 2

MEMORANDUM

From: C.R. Wilson, MK/PMC Team

To: Files

Date: 3 December 1998

Subject: SELECTION OF A SEED MIX FOR REVEGETATING MDA AB AREA 2

The revegetation of Area 2 following site regrading with shallow-rooting grasses was included as an element of the stabilization plan to enhance evapotranspiration and help control erosion (LANL, 1998, Section 5.6). A 50/50 mix of blue grama (Bouteloua gracilis) and western wheatgrass (Agropyron smithii) was contemplated for this purpose because of its successful use in tests of alternative landfill cover designs (Nyhan et al., 1990, p. 282). On 2 December 1998, Leslie Hansen of ESH-20 was contacted regarding the appropriateness of this mixture. In response, Ms. Hansen contacted Terry Foxx of ESH-20 and provided the attached seed mix recommendations that had previously been prepared for the Laboratory by Ms. Foxx. Because MDA AB Area 2 is in an ecotone between the ponderosa pine and pinyon-juniper zones, we could select plants from either zone. I was told that both of our grasses were on the list, they were shallow rooted in the intended environment, and they were appropriate for the intended use.

In further discussion on 3 December 1998, Ms. Foxx recommended that we also apply an annual ryegrass seed and that we till the seed under a thin layer of soil. The ryegrass is a cool season grass that sprouts in early spring and would provide earlier stabilization than the other two grasses, which do not sprout until the soil warms up. The ryegrass would also provide shade to help the other grasses germinate. Because the ryegrass is a non-native annual, it would not be expected to reseed itself after the first year. Tilling the seed mixture under a layer of soil would help protect it from being eaten by birds or rodents in the event that the site remains for a period of time after seeding without a protective snow cover. Both recommendations were accepted and a 20/40/40 mixture of ryegrass, blue grama, and western wheatgrass will be applied to the site.

REFERENCES

LANL, 1998. Stabilization Plan for Implementing Interim Measures and Best Management Practices at PRSs 49-001 (b, c, d, and g). LA-UR-98-1534, Los Alamos National Laboratory, Los Alamos, New Mexico, July.

Nyhan, J.W., T.E. Hakonson, and B.J. Drennon, 1990. A Water Balance Study of Two Landfill Cover Designs for Semiarid Regions. Journal of Environmental Quality, Vol. 19, No. 2, April-June, pp. 281-288.

Cc: Dwain Farley, LANL

Leslie Hansen, LANL

John DeJoia, MK/PMC

Project File

Appendix D

Erosion Control Gravel Design and Specifications

MORRISON KNUDSEN CORPORATION

INTER-OFFICE CORRESPONDENCE

DATE: January 15, 1999

TO: John DeJoia
Charlie Wilson

FROM: John Bessaw

LOCATION: LANL

LOCATION: Boise

SUBJECT: Riprap Sizing for TA-49 Temporary Cover

This IOC presents the results of an analysis to size the riprap for the temporary cover for TA-49. The approach was based on the method presented in NUREG/CR-4651, ORNL/TM-10100/v2, "Development of Riprap Design Criteria by Riprap Testing In Flumes: Phase II", Colorado State University, 1998.

The primary assumptions are that the riprap rock is angular and runoff from the cover would be concentrated to 10 ft wide section near the break in the cover slope. The peak design flow was determined using the Corps of Engineers HEC-1 model and was based on a 100-yr, 24-hr storm event for the Los Alamos area.

Based on the analysis it was determined that riprap for the cover slopes should have a $D_{50} \sim 0.8$ inches and a $D_{max} \sim 1.6$ inches. Ready available aggregate has a D_{50} of ~ 0.75 inch and a maximum diameter of ~ 1 inch. While the maximum aggregate size is slightly smaller than the design value, the D_{50} is right on. The coefficient of uniformity for the available material also meets the design requirements.

The design calls for the riprap to be covered with a chain link mesh, with a $\sim .75$ inch opening, to prevent animal intrusion into the cover. The mesh will provide additional anchorage for the riprap and the slight under sizing is not considered a problem. In addition, the cover is a temporary measure (5 to 10 years) and the design method were develop to provide protection for permanent facilities (100^+ year design life).

The proposed 1 inch minus aggregate should be adequate for the side slope protection when combined with the wire mesh cover.

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PHYSICAL PROPERTIES OF AGGREGATES

Date of Report 08/12/98
Job No. 3248JA015
Event / Invoice No. 32480823 — Lab No.
Authorized By L.TRUJILLO — Date 06/01/98
Sampled By GALLEGOS — Date 06/01/98
Submitted By GALLEGOS — Date 06/01/98

Client LOS ALAMOS TRANSIT MIX
POST OFFICE BOX 747
LOS ALAMOS, NEW MEXICO 87544

Location ALBUQUERQUE LABORATORY
Arch. / Engr. N/A
Supplier / Source ESPANOLA TRANSIT MIX PIT
Source / Location Desig. By L. TRUJILLO — Date 06/01/98

Project GENERAL PROJECT SUBMITTAL
Contractor VARIOUS
Type / Use of Aggregate COARSE AGGREGATE
Sample Source / Location ESPANOLA, NEW MEXICO
Reference: ASTMC-33 #56
Special Instructions:

TEST RESULTS

SIEVE ANALYSIS ☒ ASTM C136 ☐ AASHTO T27

SIEVE SIZE	ACCUMULATIVE % PASSING	SPECIFICATION
4 IN.		
3		
1 1/2		
1 1/8		
1	100	90-100
3/4	65	40-85
1/2	20	10-40
3/8	8	0-15
1/4		
NO. 4	1	0-5
8		
10		
16		
30		
40		
50		
100		
FINER THAN NO. 200 ☐ ASTM C117 ☐ AASHTO T11	0.2	0-1

FINENESS MODULUS, ASTM C125 →

LIQUID & PLASTIC PROPERTIES
☒ ASTM D4318 ☐ AASHTO T89 & T90
METHOD ☒ A ☐ B

	RESULT	SPECIFICATION
LIQUID LIMIT		
PLASTIC LIMIT	N/A	
PLASTICITY INDEX	N/A	

SAMPLE AIR DRIED: ☒ YES ☐ NO

CLEANNESS VALUE CA227 →

ORGANIC IMPURITIES ☒ ASTM C40 ☐ AASHTO T21
ORGANIC PLATE NO. → 1

PHYSICAL PROPERTIES			TEST RESULTS	SPECIFICATION
UNIT WEIGHT & VOIDS ☒ ASTM C29 ☐ AASHTO T19 ☒ RODDING ☐ JIGGING ☐ LOOSE	FINE AGGREGATE	UNIT WEIGHT, PCF →		
		VOIDS, % →		
	COARSE AGGREGATE	UNIT WEIGHT, PCF →	100.2	
		VOIDS, % →		
SPECIFIC GRAVITY & ABSORPTION	FINE AGGREGATE ☐ ASTM C128 ☐ AASHTO T84 AGGREGATE DRIED ☐ YES ☐ NO	BULK SPECIFIC GRAVITY →		
		BULK SPECIFIC GRAVITY (SSD) →		
		APPARENT SPECIFIC GRAVITY →		
		ABSORPTION, % →		
	COARSE AGGREGATE ☒ ASTM C127 ☐ AASHTO T85 AGGREGATE DRIED ☒ YES ☐ NO	BULK SPECIFIC GRAVITY →	2.572	
		BULK SPECIFIC GRAVITY (SSD) →	2.601	
		APPARENT SPECIFIC GRAVITY →	2.646	
		ABSORPTION, % →	1.1	
SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176		% →		
RESISTANCE TO DEGRADATION	SMALL COARSE AGGREGATE ☒ ASTM C131 ☐ AASHTO T96 GRADING	100 REV., % LOSS →		
		500 REV., % LOSS →	23.2	50 MAX
	LARGE COARSE AGGREGATE ☐ ASTM C535 GRADING	200 REV., % LOSS →		
		1000 REV., % LOSS →		
LIGHTWEIGHT PIECES ☒ ASTM C123 ☐ AASHTO T113		FINE AGGREGATE, % →		
		COARSE AGGREGATE, % →	2.2	3 MAX
CLAY LUMPS & FRIABLE PARTICLES ☒ ASTM C142 ☐ AASHTO T112		FINE AGGREGATE, % →		
		COARSE AGGREGATE, % →	0.5	2 MAX
FRACTURED FACES COARSE AGGREGATE BY WEIGHT ☐ AZ 212 ☐ FLH T507 ☐ FAA		ONE OR MORE FACES, % →		
		TWO OR MORE FACES, % →		
DURABILITY INDEX ☐ ASTM D3744 ☐ AASHTO T210 PROCEDURE: A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE		D_c →		
		D_f →		
UNCOMPACTED VOID CONTENT ☐ AZ 247 ☐ ASTM C1252 METHOD		% →		

Comments:

Copies To: CLIENT (3)

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REVIEWED BY

426695WT1
031198

Appendix E

Selection of a Temporary Biointrusion Barrier for MDA AB Area 2

MEMORANDUM

From: C.R. Wilson, MK/PMC Team

To: Files

Date: 7 October 1998

Subject: SELECTION OF A TEMPORARY BIOINTRUSION BARRIER FOR MDA AB AREA 2

The highest levels of radioactivity in surface soils at MDA AB Area 2 have historically been associated with gopher diggings in the northeast corner of the site. It is believed that the radioactive materials are being brought to the surface when the gophers extend their burrows through a contaminated soil horizon. An asphalt cap at Area 2 is currently being removed and the site is being regraded with clean soil to improve drainage. It is important that gopher activity at the site be essentially eliminated to avoid contaminating the clean surface that will be established.

Design of a temporary measure to keep gophers out of the site began in August 1998 when members of the TA-49 team contacted ESH-20 personnel to discuss the issue. The first meeting was held on 19 August and attended by Carey Bare, Leslie Hansen, and Gil Gonzales of ESH-20 and by Charlie Wilson representing the TA-49 team. The conditions at the site were reviewed and alternatives discussed. The required lifetime of the gopher barrier was estimated to be 2 to 5 years. The concept of covering the previously asphalted area and adjacent northeast slope at Area 2 with a wire mesh mat appeared to be the most effective deterrent. A maximum mesh opening size of 1/2 in. and minimum perimeter burial depth of 18 in. were offered as initial estimates by Leslie Hansen. It was agreed that ESH-20 personnel would review the issue and get back to us.

The results of ESH-20's review were transmitted in a memo from Leslie Hansen to Carey Bare dated 31 August 1998 (copy attached). In that memo Ms. Hansen confirmed the maximum mesh opening size of 1/2 in., identified several possible suppliers,

Identified possible problems with erosion, woody vegetation, and panel joints, and recommended use of an ultrasonic device to drive gophers away before the mat is installed.

On 22 September a wire mesh product and supplier review was completed by Morrison Knudsen Corporation. Samples of both chainlink and woven wire meshes were included. These samples were shown to Leslie Hansen during a meeting with Dwain Farley, John DeJoia, and Charlie Wilson on 2 October. The various wire mesh products, costs, and installation procedures were reviewed. Ms. Hansen stated that while she was aware of no precedent for the type of wire mesh mat installation we were contemplating, she saw no reason why it would not be effective. In responding to Ms. Hansen's concerns, it was clarified that an underlying gravel layer rather than the wire mat would be relied upon for erosion protection, that woody vegetation would be removed by clipping at the base, and that wire mesh panels would be joined with metal clips spaced at sufficiently close intervals (estimated at about 1 ft) to keep gophers from squeezing between the panels.

Alternatives to the wire mesh mat were discussed with Ms. Hansen in the meeting of 2 October and in subsequent telephone conversations. It was agreed that ultrasonic devices could be used as recommended to drive gophers out before the mat was installed, but would not be appropriate as the sole

gopher deterrent for a multiyear period because of intensive maintenance requirements. The alternative of a vertical wire mesh fence that extended 1 to 2 ft above ground and 3 to 4 ft below ground was also considered. It was agreed that although the fence would be considerably cheaper than the mat, it would not be as effective and would require more intensive maintenance. For the fence to be effective, trees or branches that fell over it would have to be quickly identified and removed, gates and other breaches in fence continuity would have to be designed and maintained with no openings greater than 1/2 in., gates left open could allow gopher access, all gophers would have to be driven from the site before the fence was built, and any gophers found inside the fence would have to be trapped and removed. In view of the intensive inspection and maintenance requirements and reduced effectiveness of the fence alternative, it was agreed that the mat alternative was preferred.

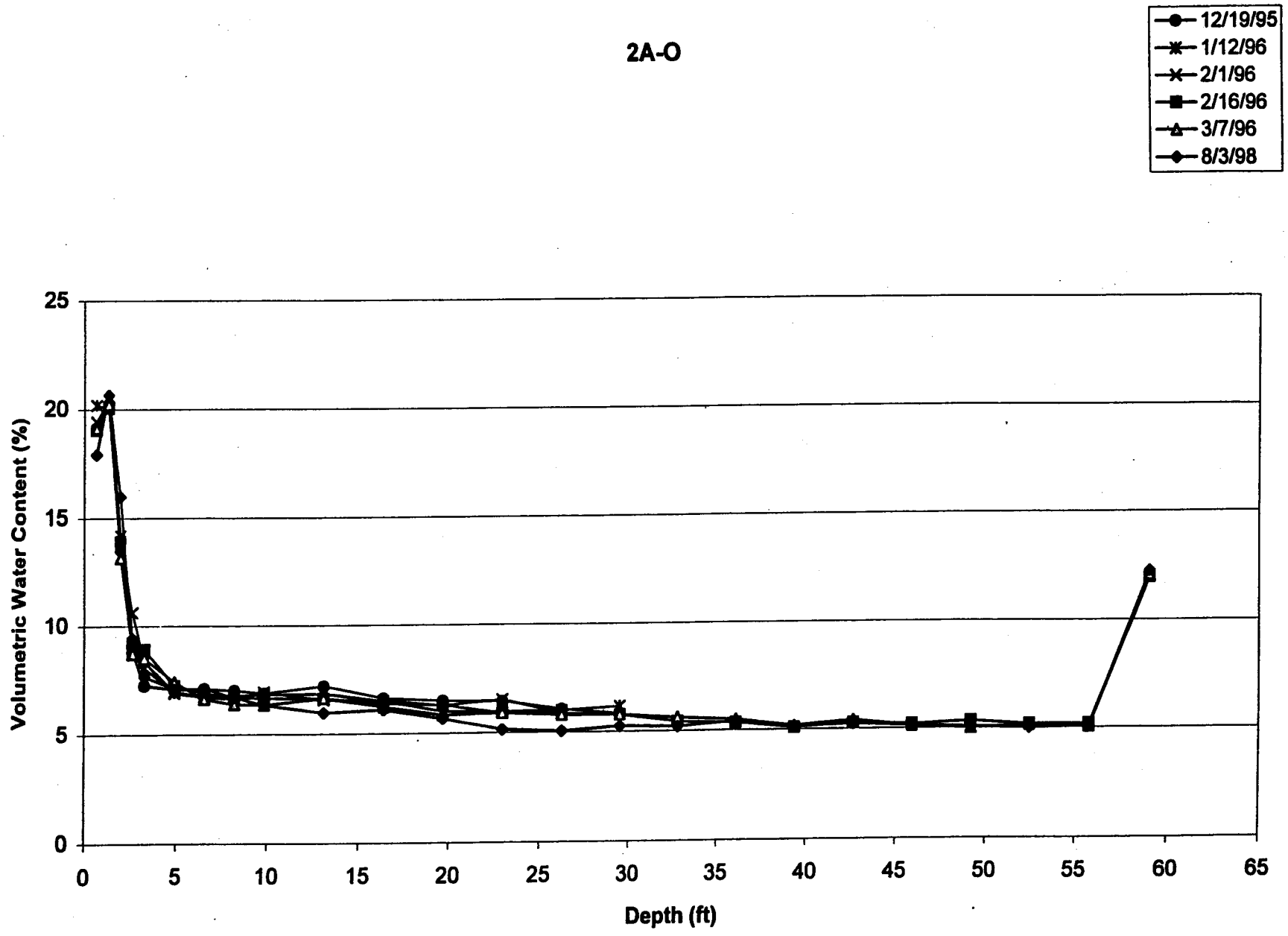
During the meeting of 2 October, Dwain Farley of LANL verbally authorized John DeJoia and Charlie Wilson of the MK/PMC Team to procure and install the wire mesh needed to provide a gopher deterrent mat across MDA AB Area 2. The lead time for this procurement was estimated to be about 1 month. The following principal design elements were agreed upon:

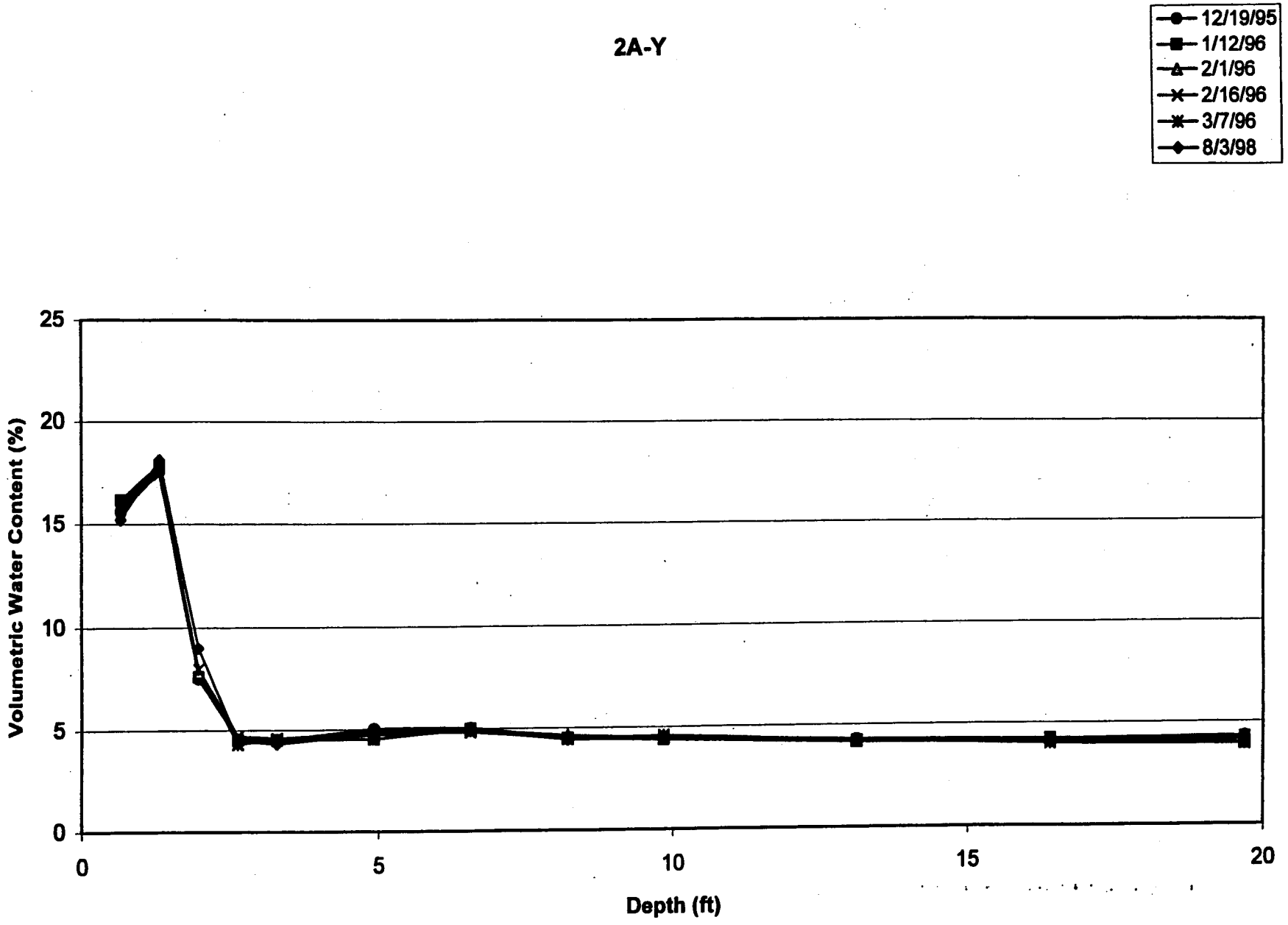
- Use of a chainlink wire mesh of 11 or 12 gauge galvanized iron wire with 1/2 in. openings in approximately 14 ft wide rolls;
- Installation with a nominal 6 in. mesh panel overlap attached at approximately 1 ft intervals with metal clips;
- A nominal 2-ft depth of anchor trench on all sides of the installation;
- The wire mesh mat is to be placed above the soil and gravel layers of the temporary cover;
- Site seeding may have to occur through the mesh depending on climatic conditions at the time of installation;
- A preliminary material cost estimate of $1.00 per square foot of mesh covering a 200 x 200 ft area (40,000 square ft) totaling about $40,000.

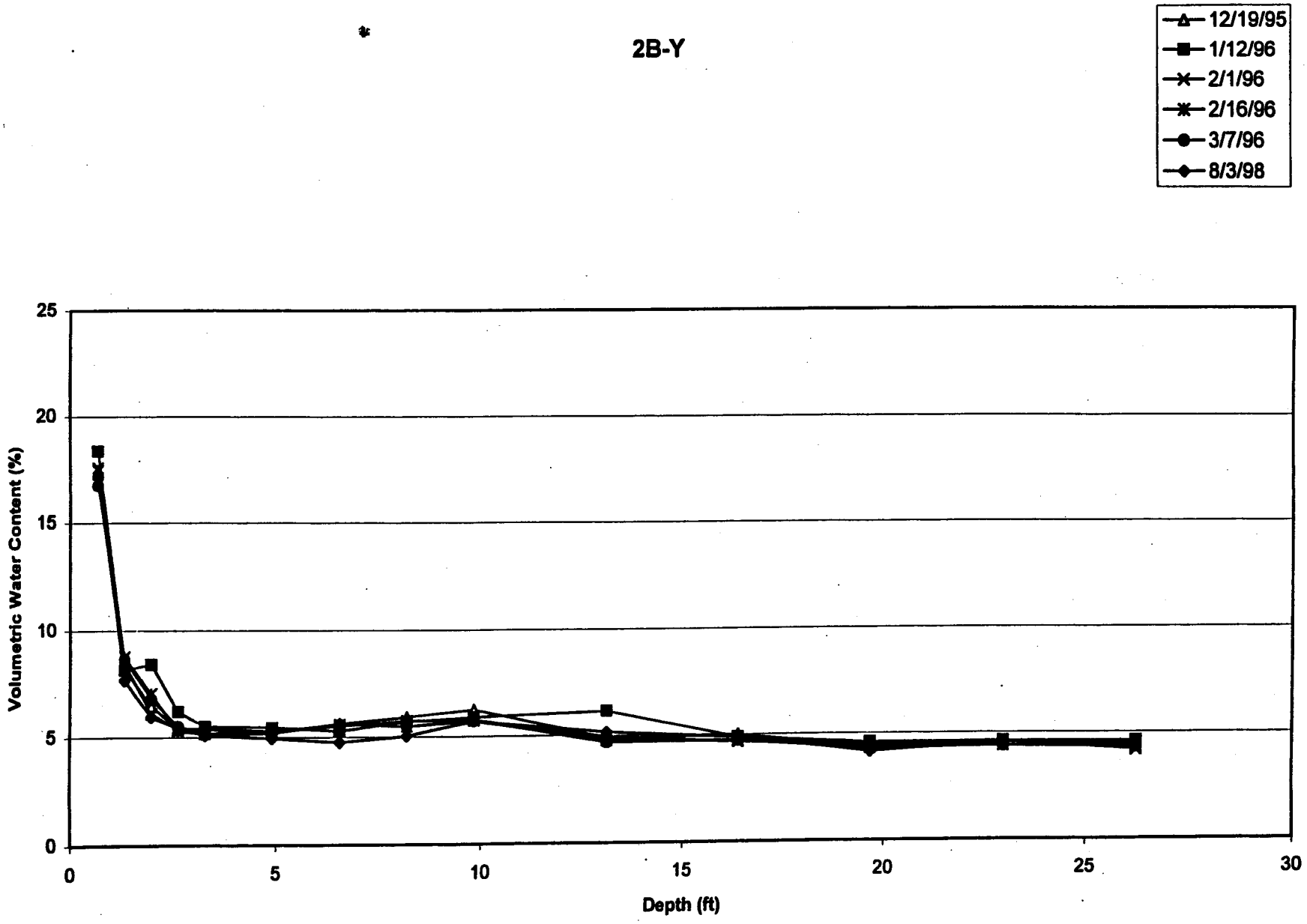
It was agreed with Dwain Farley that the procurement would be stopped if the final cost estimate was significantly greater than $40,000.

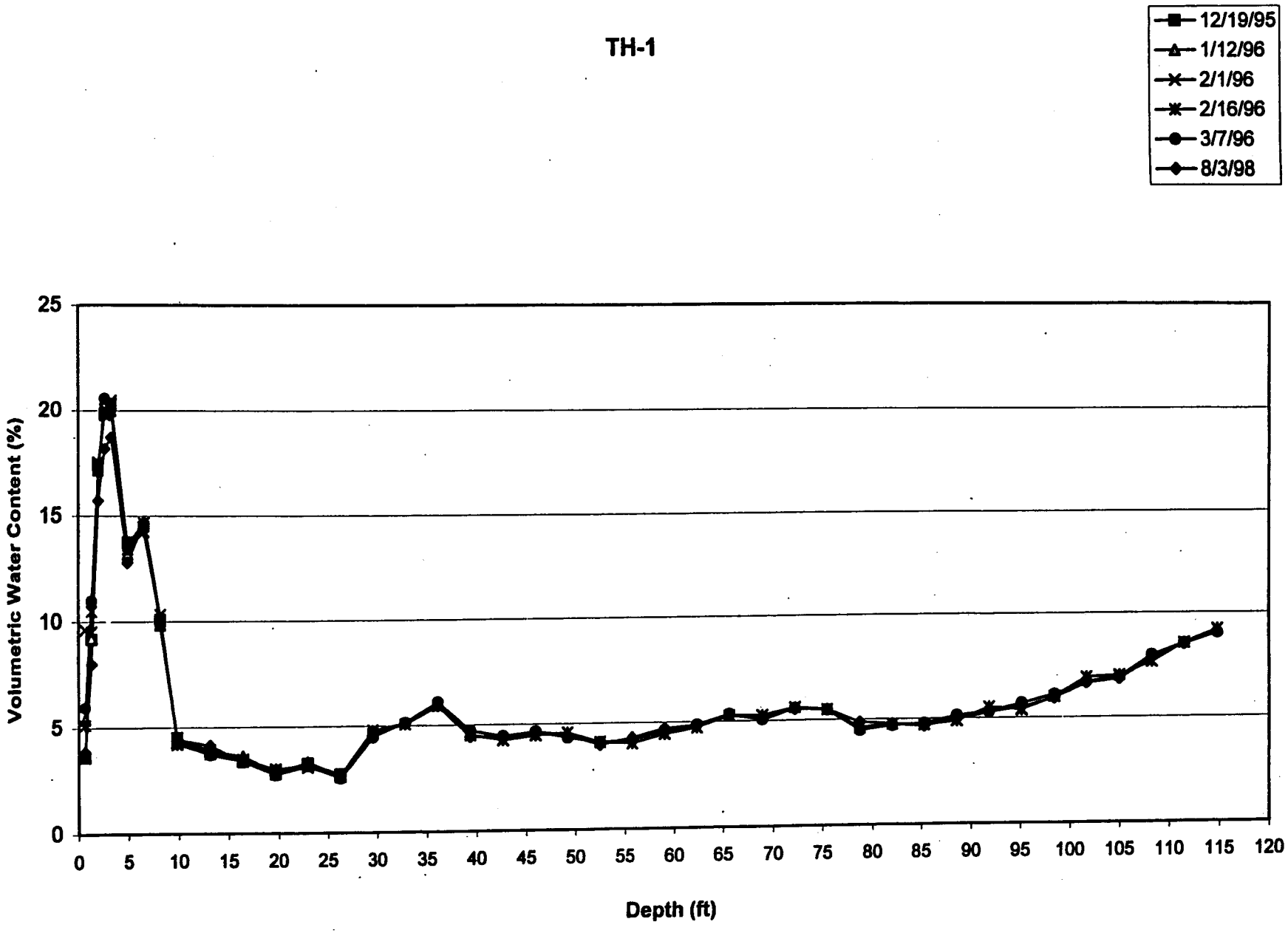
Appendix F

Moisture Content Measurements


2A-O
12/19/95
1/12/96
2/1/96
2/16/96
3/7/96
8/3/98
Volumetric Water Content (%)
0
5
10
15
20
25
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65


2A-Y
12/19/95
1/12/96
2/1/96
2/16/96
3/7/96
8/3/98
Volumetric Water Content (%)
25
20
15
10
5
0
0
5
10
15
20
Depth (ft)


2B-Y
12/19/95
1/12/96
2/1/96
2/16/96
3/7/96
8/3/98
Volumetric Water Content (%)
25
20
15
10
5
0
0
5
10
15
20
25
30
Depth (ft)


TH-1
12/19/95
1/12/96
2/1/96
2/16/96
3/7/96
8/3/98
Volumetric Water Content (%)
0
5
10
15
20
25
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
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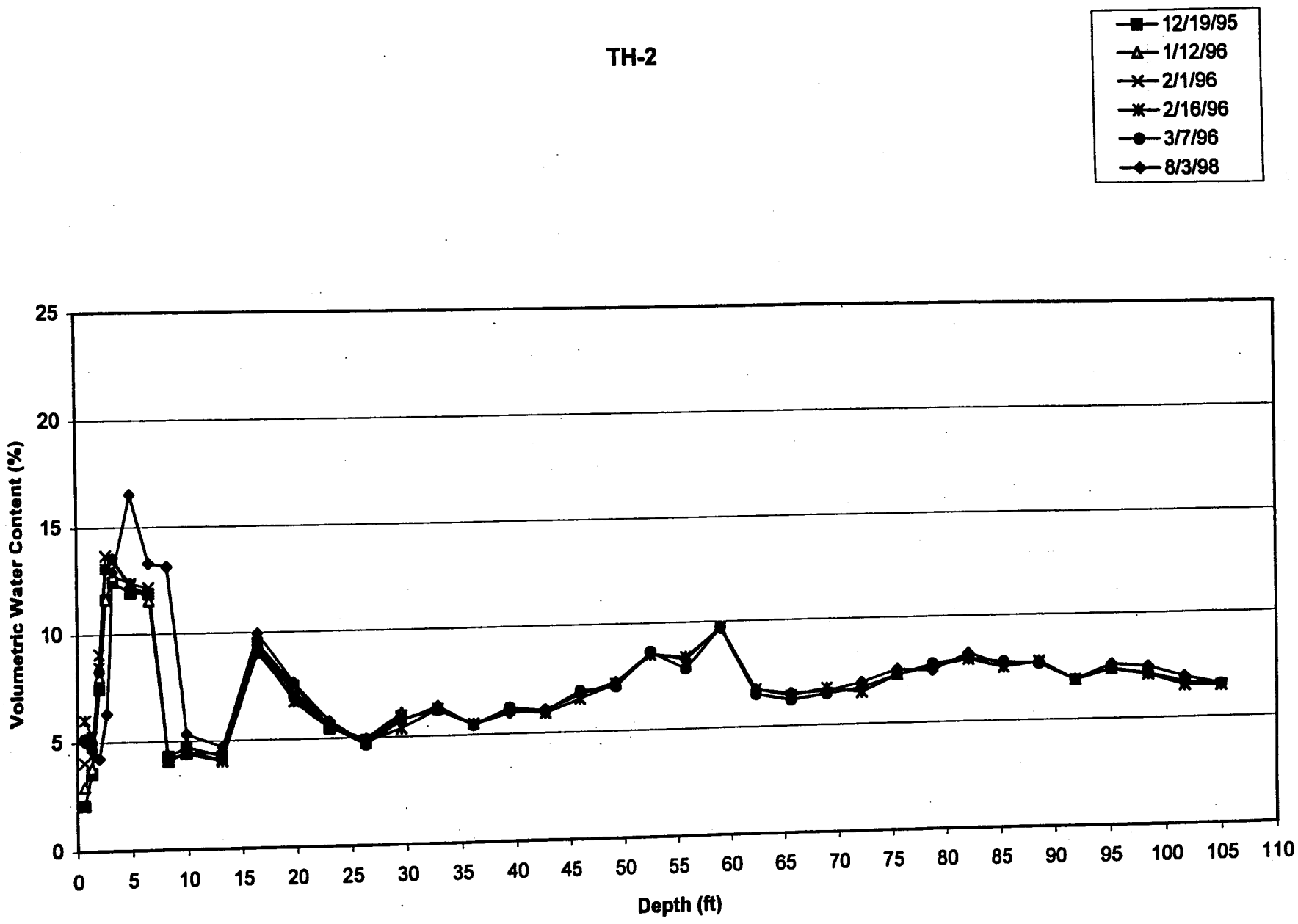
85
90
95
100
105
110
115
120


TH-2
12/19/95
1/12/96
2/1/96
2/16/96
3/7/96
8/3/98
Volumetric Water Content (%)
0
5
10
15
20
25
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
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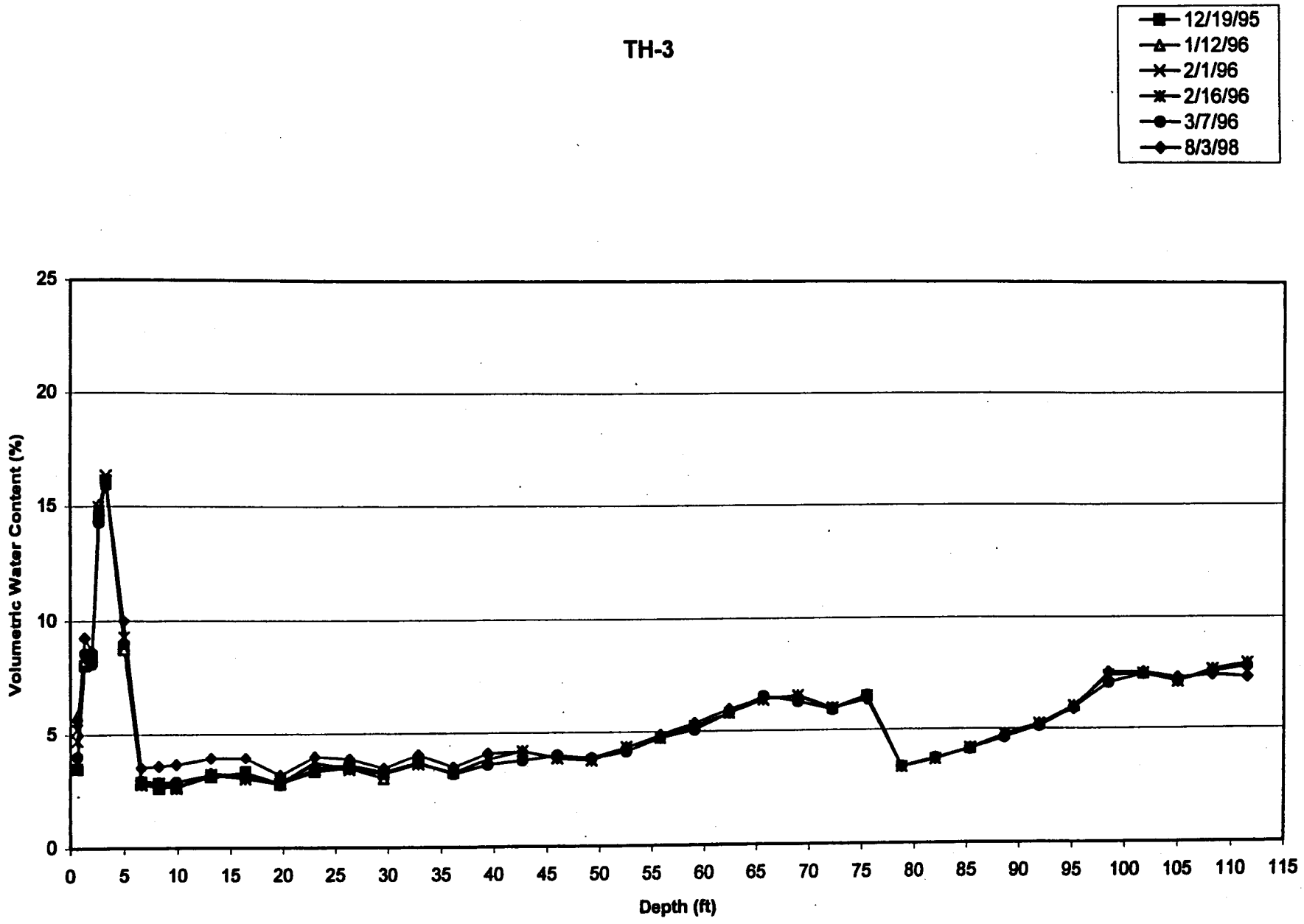
85
90
95
100
105
110


TH-3
12/19/95
1/12/96
2/1/96
2/16/96
3/7/96
8/3/98
Volumetric Water Content (%)
0
5
10
15
20
25
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
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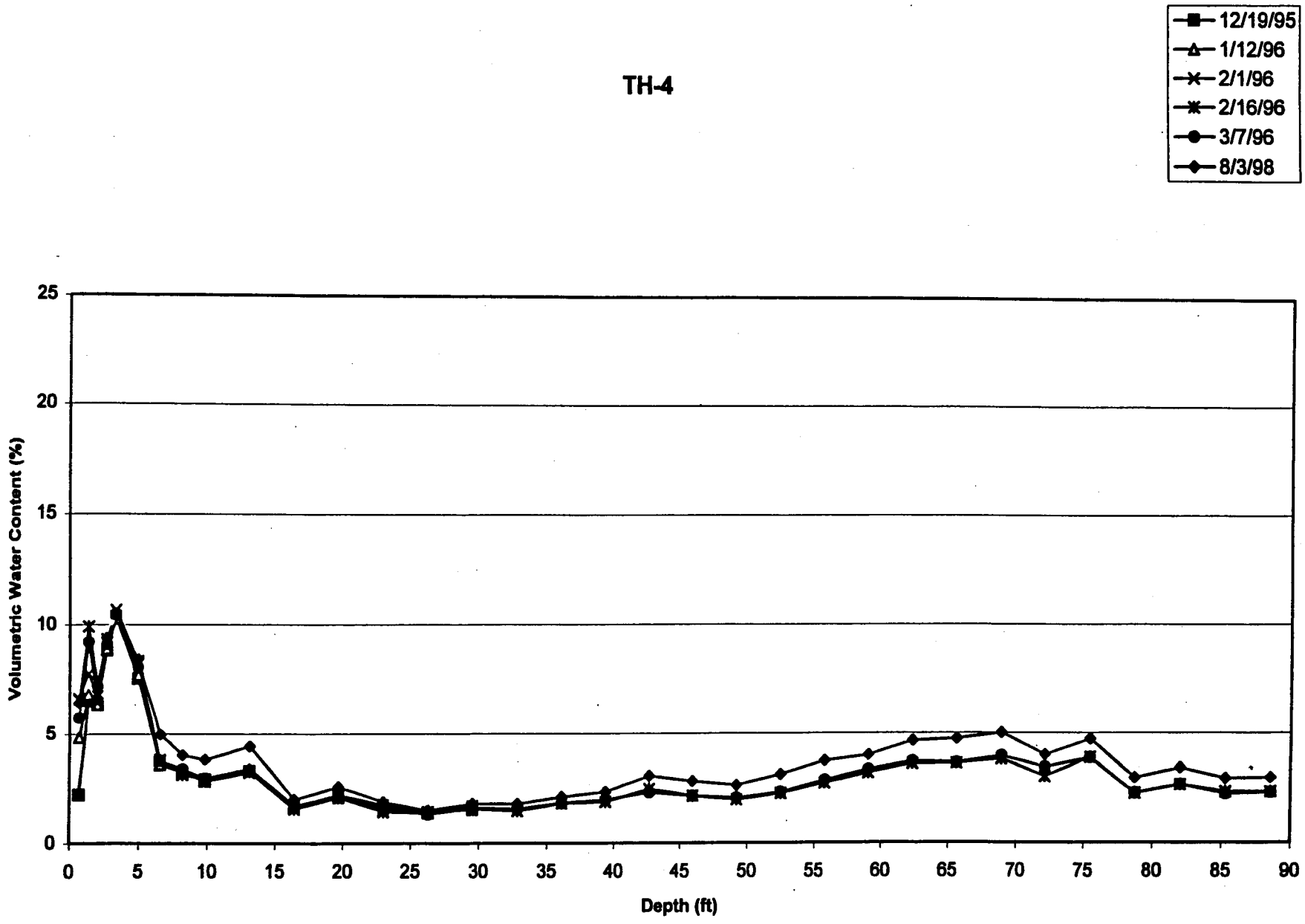
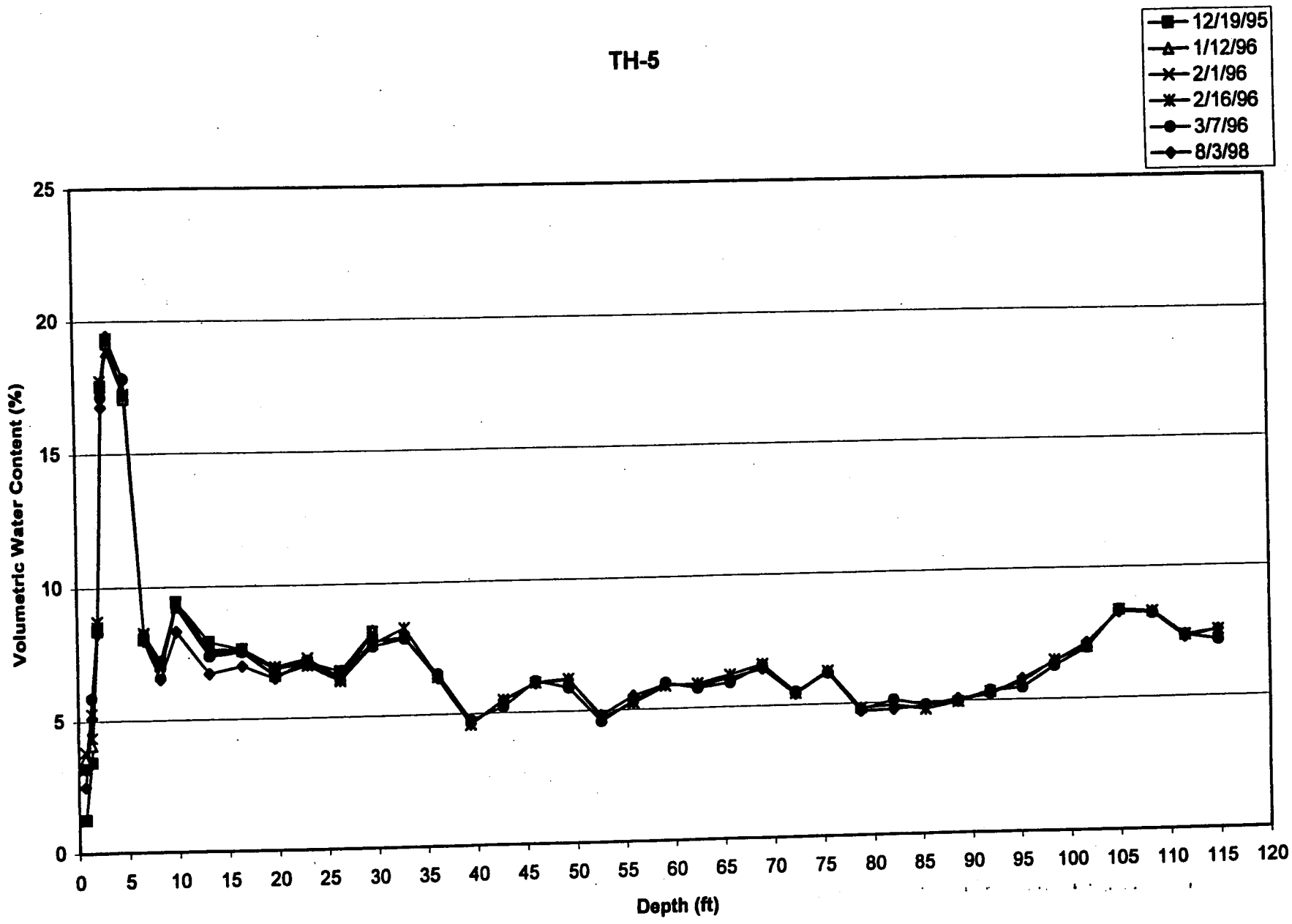
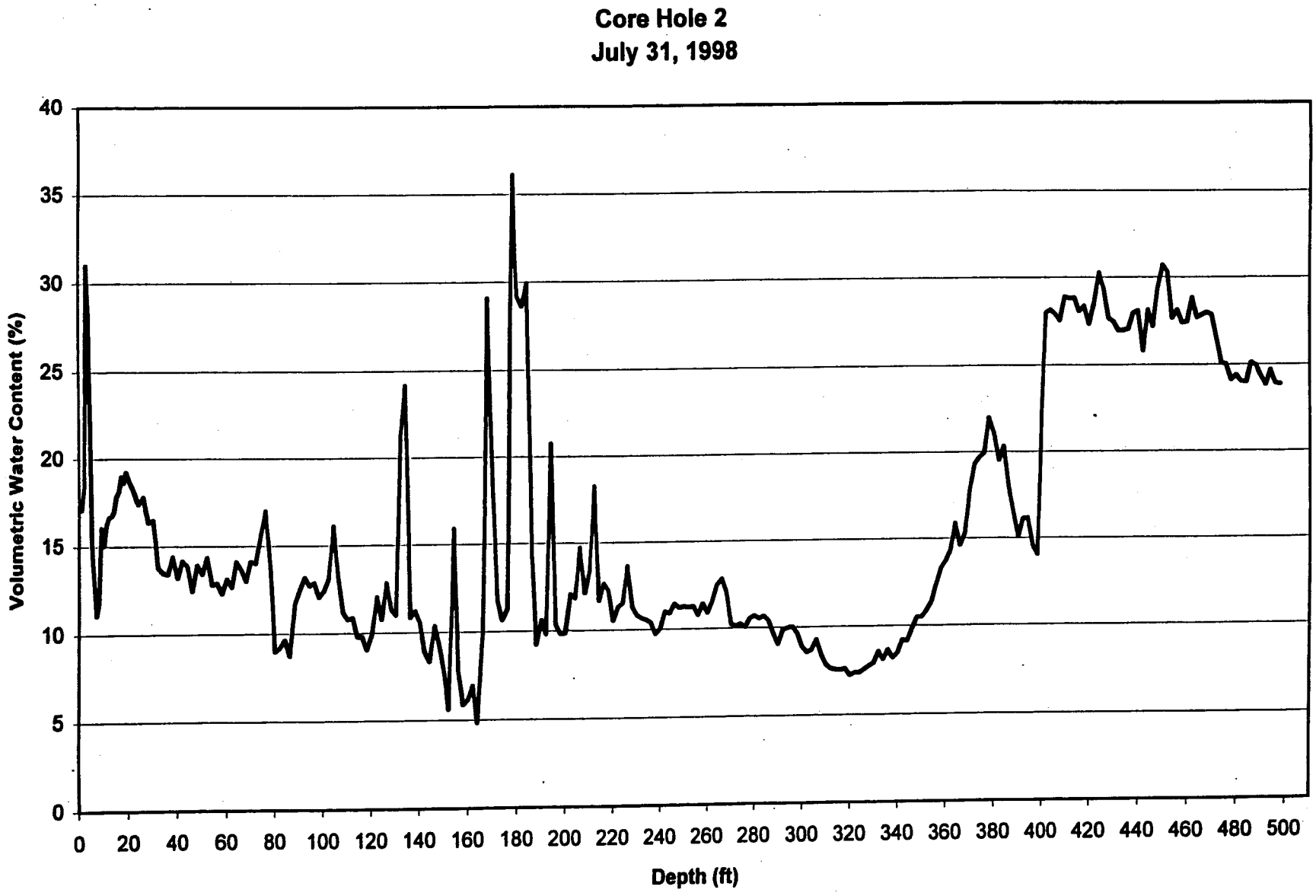
90
95
100
105
110
115


TH-4
12/19/95
1/12/96
2/1/96
2/16/96
3/7/96
8/3/98
Volumetric Water Content (%)
Depth (ft)
0
5
10
15
20
25
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90


TH-5
12/19/95
1/12/96
2/1/96
2/16/96
3/7/96
8/3/98
Volumetric Water Content (%)
0
5
10
15
20
25
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120


Core Hole 2
July 31, 1998
Volumetric Water Content (%)
0
5
10
15
20
25
30
35
40
Depth (ft)
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
480
500

Appendix G

Inspection and Maintenance Form for Stabilization Measures at MDA AB Area 2

Inspector's Name:_____ Date:_____

	Yes	No
1. Is the site security fence adequately posted?		
2. Does the site security fence adequately control site access?		
3. Was the site access gate locked or entry adequately controlled?		
4. Is the site gopher barrier in functional condition?		
5. Was evidence of recent gopher activity observed beneath barrier?		
6. Is the site silt fence in functional condition?		
7. Was evidence of erosion exceeding a depth of 4 in. observed?		
8. Were deep-rooted plants observed growing in the regraded area?		
9. Was evidence of surface water ponding observed?		

Comments:_____

Required Maintenance:_____

Maintenance to be conducted by:_____

Inspector's Signature:_____

2/22/99

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LA-UR-98-4170
Final Report
August 1999

Best Management Practices Report for Installation of Stabilization Measures at Potential Release Sites 49-001 (b,c,d, and g)

Environmental Restoration Project
A Department of Energy Environmental Cleanup Program

Los Alamos
NATIONAL LABORATORY
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Best Management Practices Report for Installation of Stabilization Measures at Potential Release Sites
49-001(b)
49-001(c)
49-001(d)
49-001(g)

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AUG 1999 RECEIVED

Date: August 30, 1999
Refer to: E/ER:99-242

Mr. John Kieling
NMED-HRMB
P.O. Box 26110
Santa Fe, NM 87502

SUBJECT: SUBMITTAL OF PLANS AND REPORTS FOR PRS 49-001 (a, c, d, and g)

Dear Mr. Kieling:

In accordance with our Response to Request for Supplemental Information (RSI) for the Stabilization Plan for Implementing Interim Measures (IMs) and Best Management Practices (BMP) at Potential Release Sites (PRSs) 49-001(b, c, d, and g) (EM/ER:98-339, dated September 11, 1998), the Laboratory's Environmental Restoration Project is submitting the following documents:

- "Stabilization Plan for IMs and BMP at PRSs 49-001(b, c, d, and g);"
- "IM Report for Potential Release Sites 49-001;" and
- "BMP Report for Installation of Stabilization Measures at PRS 49-001 (b, c, d, and g)."

All comments received from the New Mexico Environment Department Hazardous and Radioactive Materials Bureau on the "Stabilization Plan for IMs and BMP at PRSs 49-001(b, c, d, and g)" have been incorporated. The IM Report and BMP Report are being submitted for the first time in accordance with our RSI Response described above. Also included with this deliverable are updates to the "Reference Set for Material Disposal Areas, Technical Area 49." These new references should be added to those previously provided.

If you have any questions, please contact Deba Daymon at (505) 667-9021 or Joe Mose at (505) 667-5808.

Sincerely,

Julie A. Canepa, Program Manager
LANL/ER

Sincerely,

Theodore J. Taylor, Program Manager
DOE/LAAO

JC/TT/PB/ev

Enclosures:
1) Stabilization Plan for IMs and BMP at PRSs 49-001(b, c, d, and g
2) IMs Report for Potential Release Sites 49-001
3) BMP Report for Installation of Stabilization Measures at PRS 49-001(b, c, d, and g)

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1.0 INTRODUCTION

This report provides as-built descriptions of stabilization activities implemented as best management practices (BMPs) to reduce the moisture content of near-surface soils at Potential Release Sites (PRSs) 49-001(b,c,d and g). These PRSs are also known as Material Disposal Area (MDA) AB, Areas 2, 2A, and 2B and as the asphalt pad site. This MDA is in Technical Area (TA) 49 (Figure 1-1) of Los Alamos National Laboratory (the Laboratory). For purposes of this report, Areas 2, 2A, and 2B will be collectively referred to as Area 2. BMPs implemented at the site include constructing a surface water run-on diversion channel upgradient of the site, installing a silt fence downgradient of the site, and placing straw bales in both upgradient and downgradient runoff channels. In addition to stabilization activities, abandoned power poles were also removed from the site. The plan for these stabilization activities is presented in "Stabilization Plan for Implementing Interim Measures and Best Management Practices at Potential Release Sites 49-001 (b,c,d, and g)" (LANL 1998, 59166). The diversion channel, silt fence, downgradient channel stabilization, and power pole removal were completed in June 1998. Following the recommendation of the New Mexico Environment Department's (NMED's) Surface Water Quality Bureau, straw bales were placed in the upgradient runoff channel, and the western bank of the diversion channel was stabilized with erosion control matting in August and September 1998.

2.0 STABILIZATION MEASURES

2.1 Silt Fence

A temporary silt fence was installed downgradient of the site, in accordance with the "Storm Water Pollution Prevention Plan" (Environmental Restoration Project 1998, 62910). This fence was located to capture sediments that could erode from the site during the diversion channel construction and the subsequent asphalt pad removal and site regrading. The silt fence is about 2 feet high and 610 feet long. It is constructed of heavy open-weave fabric backed by a supporting wire mesh and is designed to allow water to flow through while trapping sediments. The as-built location of the silt fence is shown in Figure 2-1, and location coordinates are shown in Table 2-1. The fence crosses the two principal downgradient drainage channels north of the site and extends continuously between them. Continuing the fence around the east side of the site, as originally planned, was not necessary because the off-site drainage does not cross the road in that direction. A photograph of the silt fence is shown in Figure 2-2.

2.2 Downgradient Channel Stabilization

The two principal downgradient channels draining the site were each stabilized in several places with straw bales and by check dams (energy dissipaters) constructed of tree trunks, branches, brush, and rocks. The purpose of these temporary structures was to minimize off-site soil erosion during the installation of the surface water diversion trench and the asphalt removal and regrading projects. These materials provide energy dissipaters to slow storm water flow and retard sediment migration. The approximate locations of these runoff controls are shown in Figure 2-1. A photograph of a portion of one of the stabilized channels is shown in Figure 2-3.

Before stabilizing the downgradient channels, field surveys for low-level gamma radiation were performed for worker health and safety purposes using a FIDLER instrument. Radiation levels were found to be within the background range (<7500 cpm) at every location where channel stabilization activities were conducted.

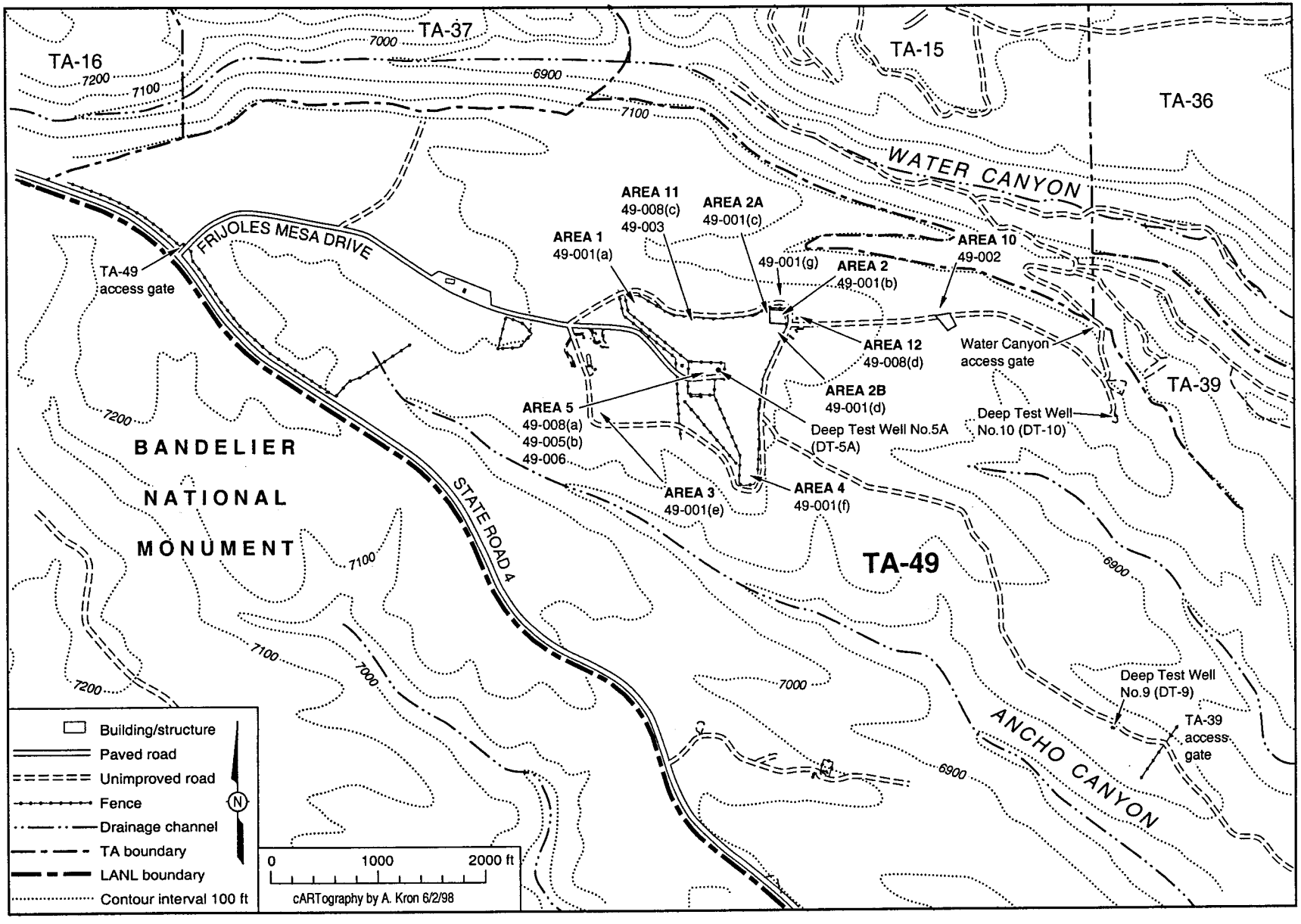

Figure 1-1. Map of TA-49.

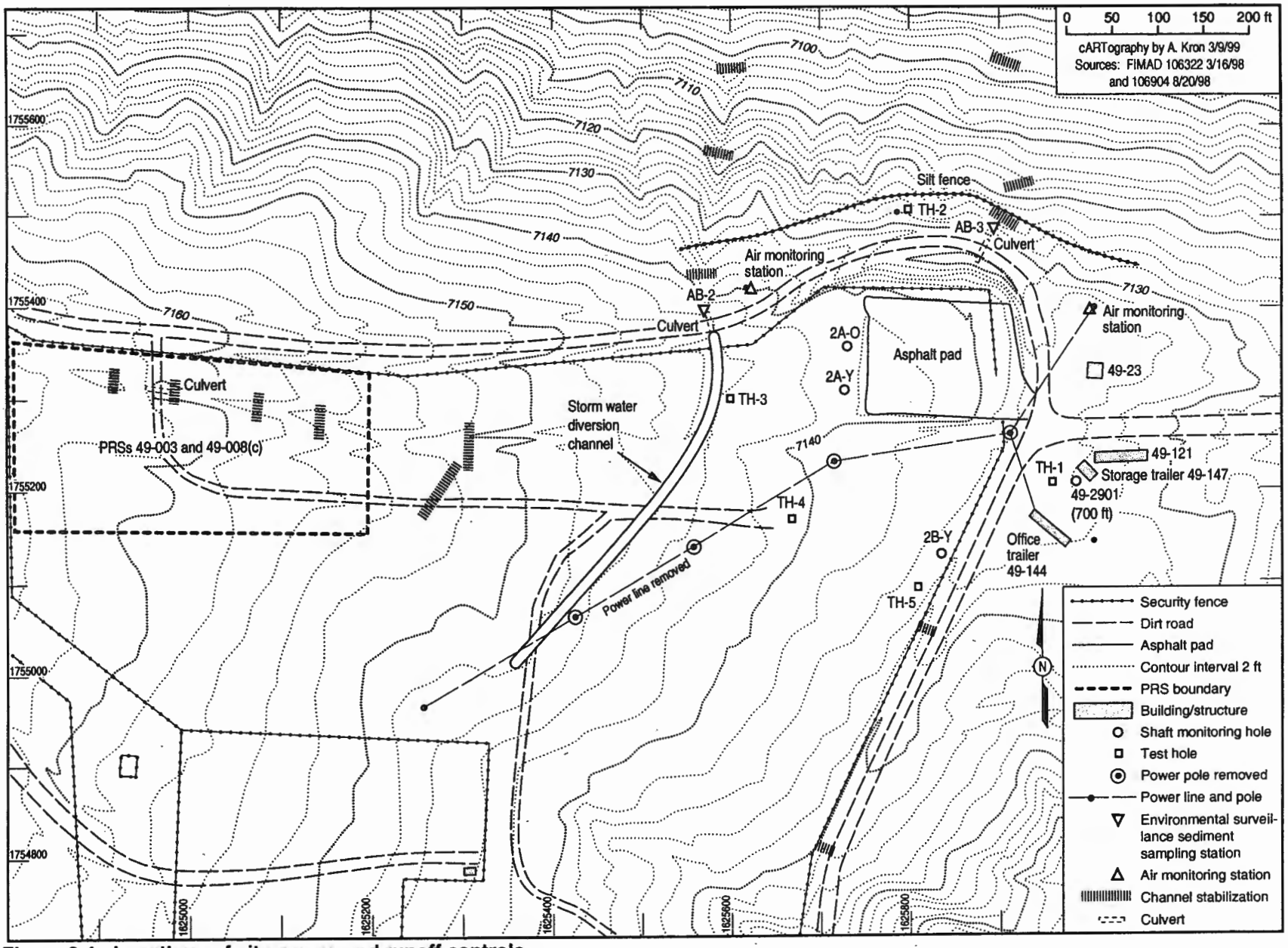

Figure 2-1 Locations of site run-on and runoff controls.

Table 2-1
Location Coordinates

Installation	State Plane Coordinates	
	Easting (ft)	Northing (ft)
Surface Water Diversion Channel		
South end	1625357	1755012
Middle	1625506	1755177
North end	1625580	1755368
Silt Fence		
West end	1625543	1755463
Middle	1625800	1755523
East end	1626055	1755444

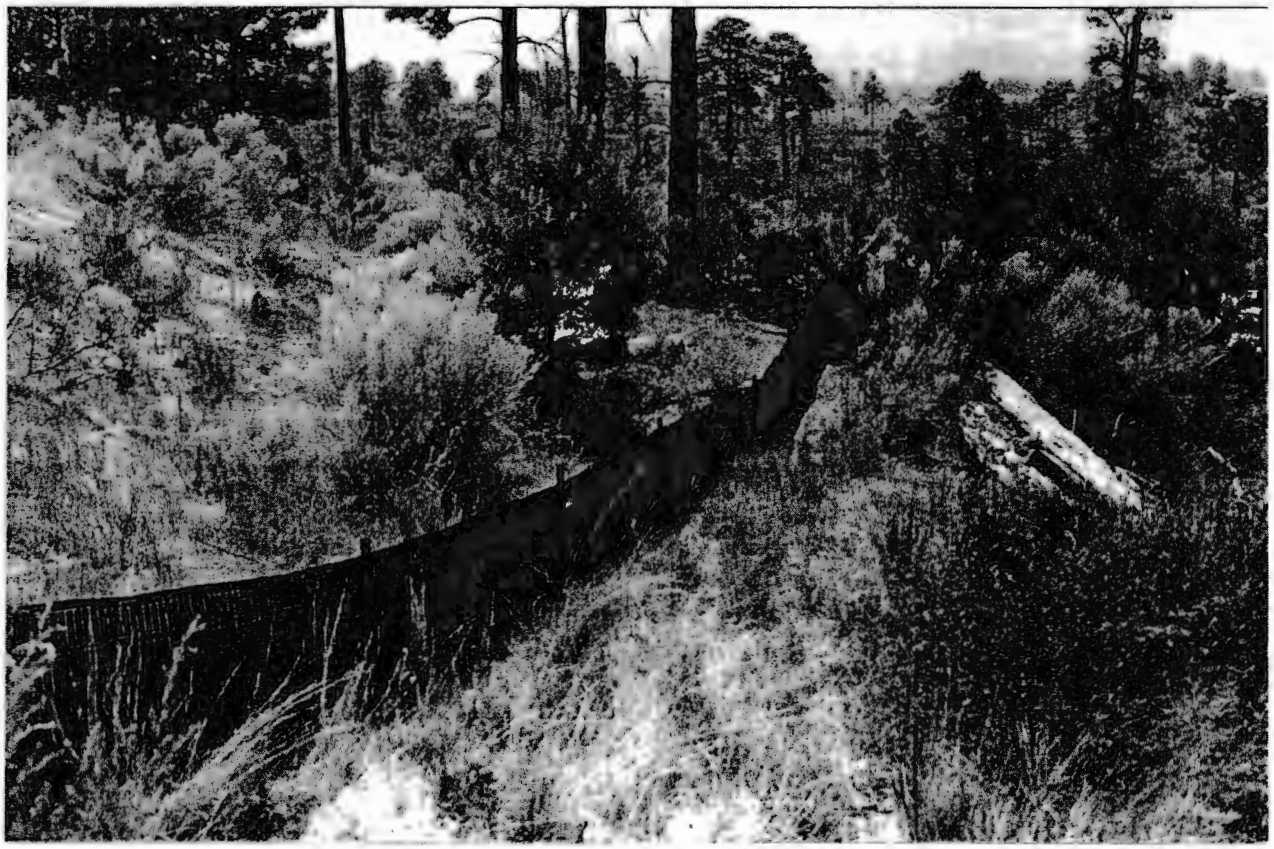

Figure 2-2. **Silt fence (view is from the west).**

Figure 2-3. Channel flow dissipaters downstream of the diversion channel.

2.3 Surface Water Diversion Channel

Before construction of the surface water diversion channel, ESH-1 personnel screened surface soils at the site and found no above-background radiation. Access for construction was gained by temporarily breaching the site fence at the channel outlet. The channel was excavated by backhoe under field direction, and the excavated soil was used to construct a low berm on the downgradient (east) side of the channel. The northern part of the channel followed the trace of an earlier diversion channel, according to NMED's request, to minimize disturbance to the land. The southern part of the channel extended the earlier channel so that all surface water run-on moving toward Area 2 is now intercepted and diverted into a tributary to Water Canyon. The channel was constructed with a nominal bottom width of 4 feet and a depth of 1 foot. The berm was also constructed with a nominal top width of 4 feet and height of 1 foot above the original ground surface. The channel's outlet was located to allow drainage directly into an existing culvert, as shown in Figure 2-1. Except for the length, design and location specifications in the stabilization plan were followed for the surface water diversion channel (LANL 1998, 59166). A land survey conducted before construction indicated that to maintain a continuous grade of about 1%, it was necessary to lengthen the southern part of the channel by about 80 feet and move it farther to the west than originally planned. The as-built channel is 406 feet long, and its location is shown in Figure 2-1. State plane coordinates for locations along the length of the channel are presented in Table 2-1. A photograph of the channel is shown in Figure 2-4. A cross-section of the channel and berm is shown in Figure 2-5.

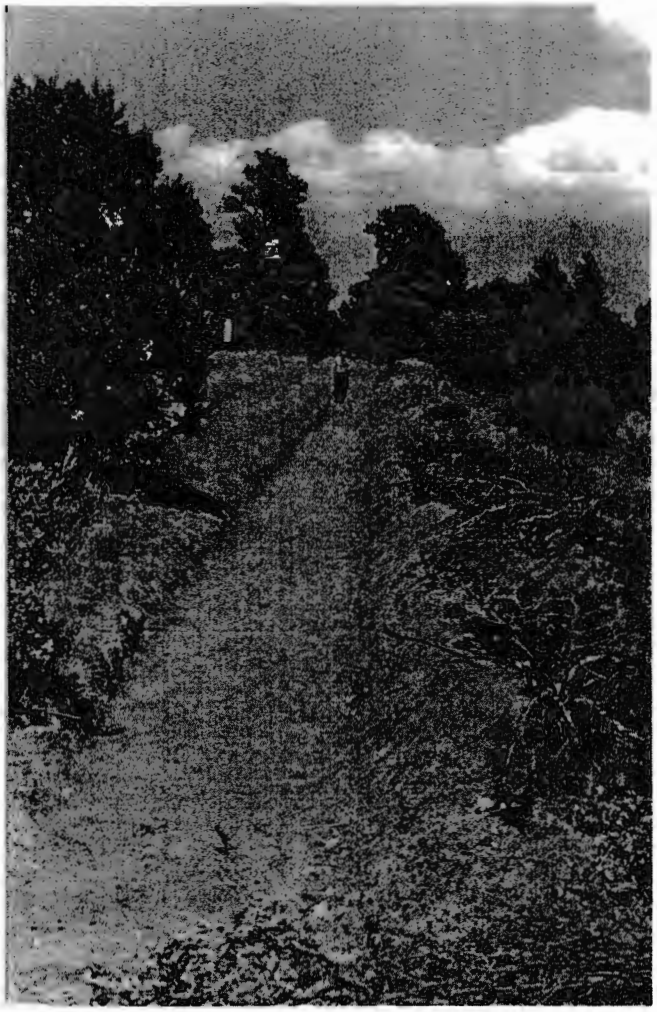

Figure 2-4. **Surface water diversion channel (view is from the north).**

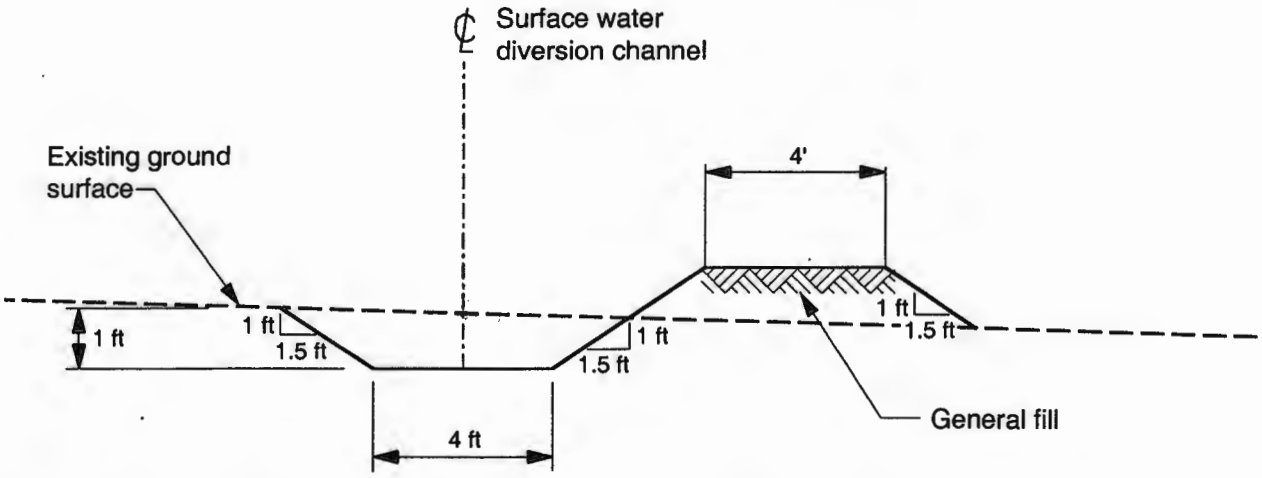

Figure 2-5. **Schematic cross-section of surface water diversion channel.**

After construction, the surfaces of the channel and berm were compacted with a backhoe and vibraplate to improve erosion resistance. An organic mulch was placed on the berm and channel sides to protect against erosion. Brush and limbs removed during construction were placed on top of the berm. Erosion control mats were placed along the entire length of the upgradient (west) bank of the channel and on the downgradient (east) bank across from locations where major drainages enter the channel. These mats are made primarily of biodegradable natural wood fiber. They act to immediately stabilize the soil by slowing surface water flow and aid in germination of vegetation. The mats were installed following the procedure presented in "Storm Water Best Management Practice (BMP) Guidance Document" (Merrick Engineers and Architects 1998, 58696, p. 54). Because of evidence from the storm water diversion channel that natural reseeding occurs quickly at the site, artificial reseeding of the matted area was not conducted. Work was completed by cleaning up the site and restoring the site perimeter fence.

The diversion channel is designed to protect Area 2 from surface water run-on during asphalt pad removal and site regrading work, as required in the "Storm Water Pollution Prevention Plan" (Environmental Restoration Project 1998, 62910). The channel will be left in place following asphalt pad removal and site regrading to provide long-term protection from surface water run-on.

2.4 Upgradient Channel Stabilization

The principal upgradient channel draining onto the site passes through Potential Release Sites 49-003 and 49-008(c). This channel was stabilized in four places (Figure 2-1) to control potential erosion and transport of sediment into Area 2. A smaller tributary channel was stabilized (Figure 2-1), and potential erosion of an adjacent rutted road will be controlled by diverting flow from the ruts into the main channel. Straw bales, which act as energy dissipaters to slow storm water flow and retard sediment migration, were installed to stabilize the channels.

3.0 POWER LINE REMOVAL

A power line that could have posed a safety problem during diversion channel construction was removed in May 1998. This line powered two air-monitoring stations and an office/field laboratory trailer. The power line was rerouted around Areas 2, 2A, and 2B to minimize safety problems during the subsequent asphalt removal and site-regrading phases. Four power poles on the site were decommissioned and cut about 4 feet above the ground when the line was removed. The pole stubs were pulled from the ground during diversion channel construction in June 1998. The original locations of these power poles are shown in Figure 2-1.

4.0 MONITORING AND CONFIRMATORY SAMPLING

Construction equipment was screened for radioactive contamination when entering and leaving the work site, in accordance with the site-specific health and safety plan (Environmental Restoration Project 1998, 57912). Personnel were screened when leaving the site. No contamination was found at any time. In addition, the power poles, pole stubs, wire, and other waste materials generated during the work were screened and found to be free of above-background radiation before being removed from the site. The power lines were rerouted around the construction sites. Electrical power is still available to the site.

5.0 INSPECTION AND MAINTENANCE

The diversion channel and drainage channel energy dissipaters will be inspected and maintained as described in the "Storm Water Pollution Prevention Plan" (Environmental Restoration Project 1998, 62910) and Chapter 7 of the stabilization plan (LANL 1998, 59166).

6.0 WASTE MANAGEMENT

Wastes generated during fieldwork were neither radioactively contaminated nor regulated hazardous wastes. The power poles and wire were turned over to Johnson Controls for reuse or recycling.

7.0 COST AND SCHEDULE

The projected cost of implementation was conservatively estimated to be $39,400.00. The actual cost of implementing the BMP stabilization activities was $28,436.45. Implementation of the BMP activities began on June 1, 1998, and was completed on June 12, 1998. Supplemental upgradient BMP channel stabilization was conducted in August and September 1998, pursuant to a recommendation of NMED's Surface Water Quality Bureau.

8.0 REFERENCES

The following list includes all references cited in this document. Parenthetical information following each reference provides the author, publication date, and the environmental restoration record identification (ER ID) number. This information also is included in the citations in the text. ER ID numbers are assigned by the Laboratory's ER Project to track records associated with the Project. These numbers can be used to locate copies of the actual documents at the ER Project's Records Processing Facility and, where applicable, within the ER Project reference library titled "Reference Set for Material Disposal Areas, Technical Area 49."

Copies of the reference library are maintained at the New Mexico Environment Department Hazardous and Radioactive Materials Bureau; the Department of Energy Los Alamos Area Office; United States Environmental Protection Agency, Region VI; and the ER Project Material Disposal Areas Focus Area. This library is a living collection of documents that was developed to ensure that the administrative authority (AA) has all the necessary material to review the decisions and actions proposed in this document. However, documents previously submitted to the AA are not included in the reference library.

Environmental Restoration Project, November 1998. "Storm Water Pollution Prevention Plan, Technical Area 49, Material Disposal Area AB," prepared for Los Alamos National Laboratory by ERM/Golder Los Alamos Project Team, Los Alamos, New Mexico. (Environmental Restoration Project 1998, 62910)

Environmental Restoration Project, May 26, 1998. "LANL ER Project Site-Specific Health and Safety Plan (SSHASP), Construction of the Surface Water Run-on Diversion Channel and Related Features," SSHASP No. 206, Los Alamos National Laboratory, Los Alamos, New Mexico. (Environmental Restoration Project 1998, 57912)

LANL (Los Alamos National Laboratory), June 1998. "Stabilization Plan for Implementing Interim Measures and Best Management Practices at Potential Release Sites 49-001 (b,c,d, and g)," Los Alamos National Laboratory LA-UR-98-1534, Los Alamos, New Mexico. (LANL 1998, 59166)

Merrick Engineers & Architects, June 1998. "Storm Water Best Management Practice (BMP) Guidance Document," prepared for Los Alamos National Laboratory Water Quality & Hydrology Group ESH-18, Los Alamos, New Mexico. (Merrick Engineers & Architects 1998, 58696)

Appendix A

Acronyms

APPENDIX A ACRONYMS

AA	administrative authority
BMP	best management practice
ER	environmental restoration
ESH	Environment, Safety, and Health (Division)
MDA	material disposal area
NMED	New Mexico Environment Department
TA	technical area

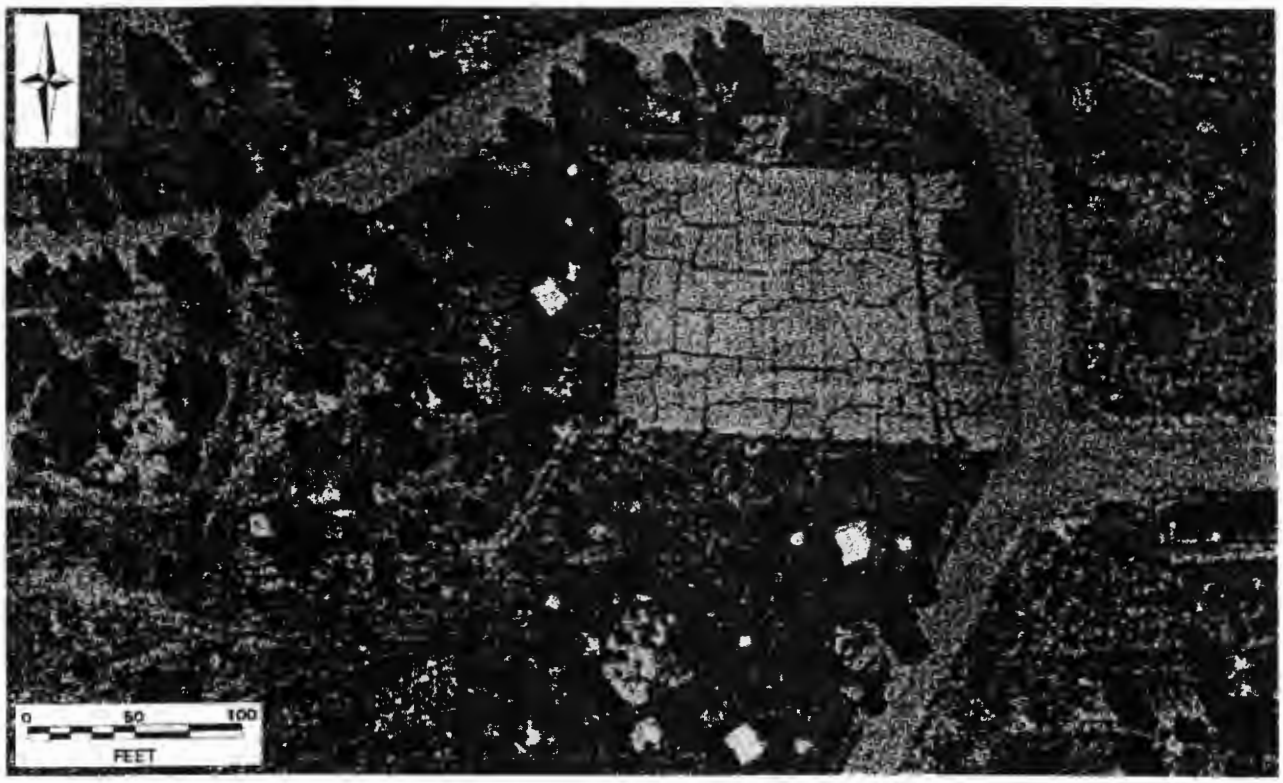

Figure 3-5. Contemporary aerial photograph of vicinity of Areas 2, 2A, and 2B.

In addition, some of the storm water that percolates into the soil has the potential of flowing laterally downslope toward the site as interflow at the soil-tuff interface. This interflow pathway has been shown to be important in a recent field study site at the Laboratory; the site is located on an adjacent mesa on a slope vegetated with ponderosa pine (Wilcox and Breshears 1997, 57578; Wilcox et al. 1997, 57577). As shown in Figure 3-4, the subsurface interflow might directly enter and drain down the sand-filled test shafts, and surface run-on can pond in the low spots, seep into the ground, and enter the shafts along with the interflow.

Low spots where water can pond at the site are present to the northeast of Area 2 (between Area 2 and the site perimeter road), between Areas 2 and 2A, and between Areas 2 and 2B. The locations of these low spots and arrows indicating the directions of surface flow are shown in Figure 3-6. The low spot between Areas 2 and 2A is caused by water backing up against the elevated fill beneath the asphalt pad. The other two low spots are primarily a result of blocking natural drainage patterns by the gravel road that runs around the east and north sides of the site. As previously mentioned, some of the water that collects in these areas comes from upslope storm water run-on, but some also comes from concentrated runoff from the asphalt pad.

Water samples have periodically been taken from CH-2 since standing water was found in that hole in 1975. As previously mentioned, low levels of radionuclides have been found in CH-2 water. Unfiltered samples of water bailed from CH-2 in October 1977 and August 1978 contained 1.7 to 3.1 pCi/L of plutonium-239. Contaminated backfill in Shaft 2-M was considered a possible source of these radionuclides. Subsequent water samples taken in 1979 and 1980 were found to contain from 0.1 to 5.5 pCi/L of plutonium (LANL 1992, 7670, p. 7-30). The results of a more comprehensive analysis from a sample taken in 1991 are shown in Table 3-1.

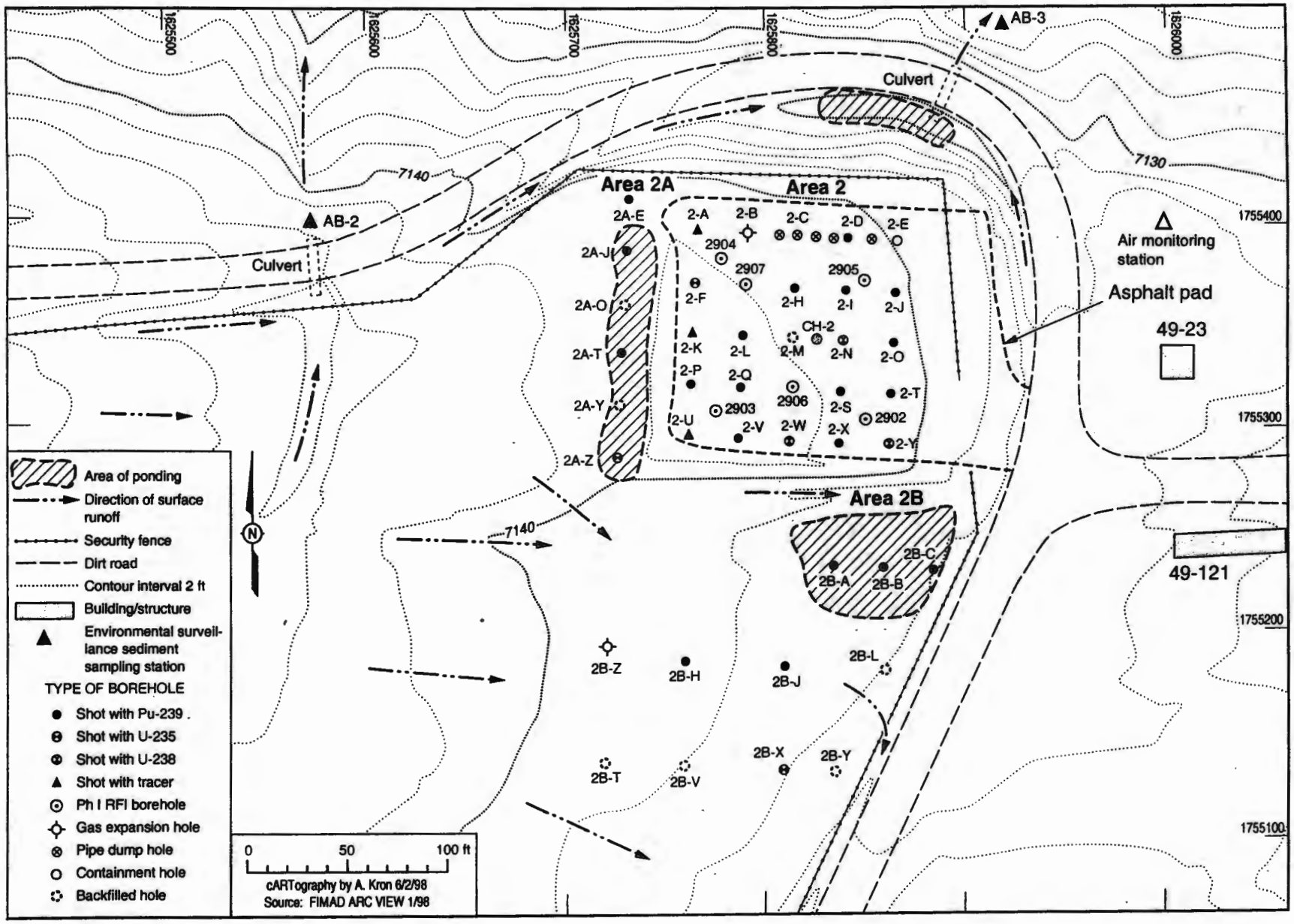

Figure 3-6. Locations of ponding at Areas 2, 2A, and 2B.

Table 3-1
Analytical Results of 1991 Water Sample from CH-2

Analysis	Result	Uncertainty	Units
Barium	28	3	µg/l
Calcium	8.2	0.8	mg/l
Chlorine	1.1	0.1	mg/l
Cyanide	0.01	0.01	mg/l
Potassium	7.2	0.7	mg/l
Magnesium	1.0	0.1	mg/l
Sodium	33	3	mg/l
Nitrate	0.37	0.04	mg/l
Phosphate	0.26	0.05	mg/l
Sulfate	17	2	mg/l
Conductivity	147	7	µmhos/cm
Dissolved solids	22	2	g/l
pH	9.5	0.1	—
Radionuclides			
Uranium	21	2	µg/l
Plutonium-239/240 (unfiltered)	0.19	0.12	pCi/l
Plutonium-239/240 (filtered)	1.1	0.2	pCi/g
Gross beta	6.2	0.7	pCi/l
Tritium	(below 300 pCi/l LSC detection limit)		

Note: This information was taken from the work plan for Operable Unit 1144 (LANL 1992, 7670, p. 7-34). RCRA-regulated metals were not detected above the regulatory levels specified for maximum concentration of constituents for the toxicity characteristic (40 CFR Part 261.24, Table 1). VOCs, SVOCs, and PCBs were not detected.

3.2.4 Surface Water Assessment

There are no perennial surface water courses at TA-49. However, ephemeral flow occurs in drainages in response to snowmelt and rain storms. Surface water assessments (formerly called AP 4.5 assessments) were performed. Total scores are as follows: 34.6 for PRS 49-001(b), 17.5 for PRS 49-001(c), 17.5 for PRS 49-001(d), and 59.2 for PRS 49-001(g).

The only PRSs around Areas 2, 2A, and 2B that scored at or above the level requiring action (a score of 38.0) were PRS 49-001(g), the site-wide surface contamination PRS (with a score of 59.2), and PRS 49-003, an unrelated abandoned septic system and leachfield in Area 11 upgradient from the site (with score of 36.8). These PRSs received higher scores because runoff terminated in a tributary to Water Canyon and (for PRS 49-003 alone) runoff has caused visible erosion. Surface water erosion concerns related to the upgradient PRS are addressed by the surface water run-on diversion channel (Section 5.2). Surface water erosion concerns related to the surface contamination in PRS 49-001(g) downgradient are also addressed by the storm water pollution prevention (SWPP) plan (Environmental Restoration Project 1998, 62910).

3.3 Summary of Constituents

The shafts in Areas 2, 2A, and 2B were used for subsurface nuclear safety and related experiments and contain significant quantities of isotopic plutonium, isotopic uranium, beryllium, and lead, as shown in Table 2-1. In addition, approximately 0.15 kg of americium-241, from the decay of plutonium-241, is expected to be present in the shafts at MDA AB (LANL 1992, 7670, p. 7-4). Tritium was also used in some of the tests and may be locally present in small quantities. The HE used in the tests is thought to have been consumed with high efficiency in the detonations; any residuals remain underground and are negligible in quantity and potential hazard compared with the radionuclide and metal contamination known to be present (LANL 1992, 7670, p. 7-18). There is no basis for expecting HE to be present in the asphalt pad, fill materials, or surface soils that will be disturbed during the stabilization activities. HE is present on or near the ground surface at other Laboratory firing sites because the test devices were detonated on or near the ground surface. At TA-49 the explosive devices were assembled elsewhere and brought to the site as modular units for installation into the downhole test packages, and the test packages were detonated underground at depths sufficient to prevent surface release. Because the current activities will not disturb the subsurface test locations, the near surface filter boxes, or the puddled concrete caps over the shafts and filter boxes, no sampling for HE is required. Samples of surface soils showed no concentrations of VOCs, SVOCs, PCBs, or TCLP metals above maximum concentration of contaminants for toxicity characteristic (40 CFR Part 261.24, Table 1). The surface soils were therefore found to contain no RCRA constituents.

4.0 JUSTIFICATION FOR IMPLEMENTING STABILIZATION ACTIVITIES

The increased moisture conditions at Areas 2, 2A, and 2B are a potential cause for concern, particularly because standing water is periodically observed in CH-2. For contaminants buried underground in competent geologic media, dissolution and transport by moving soil water is the only significant means of mobilization. During the site selection process for the nuclear safety tests, particular attention was paid by the Laboratory and US Geological Survey personnel to the hydrologic conditions at the candidate test sites. According to the OU 1144 RFI work plan (LANL 1992, 7670, p. 3-7), "Frijoles Mesa emerged as a leading candidate site, and the choice was confirmed after an extensive hydrogeologic study demonstrated that the lack of perched aquifers, lack of recharge waters, and great depth to the main aquifer (about 1200 ft at the main experimental area) made the potential for ground water contamination negligible (Weir and Purtymun 1962, 11890)." A deep core hole was drilled at each candidate test area (500-foot-deep CH-2 was the core hole at Area 2) to confirm the low moisture content of the tuff and the lack of perched water.

The subsequent finding of nearly saturated moisture conditions in the soil beneath the asphalt pad at Area 2 and the periodic presence of standing water in CH-2 clearly conflicts with the low moisture conditions sought in the original hydrogeologic siting criteria. The standing water in CH-2 indicates that moisture periodically enters the core hole at a faster rate than it can drain. The high soil-moisture content and adverse site run-on and ponding conditions also indicate the presence of excessive moisture at the site.

Injection well studies at TA-50, described in the OU 1144 RFI work plan (LANL 1992, 7670, p. 4-29), were performed to evaluate the movement of moisture in moderately welded Bandelier Tuff. At 50% to 100% of saturation, gravity is the dominant force driving the movement of moisture. At lower moisture contents, fluid movement is controlled by capillary forces and molecular diffusion and is considerably slower.

The permeability to water in unsaturated materials increases dramatically as moisture content increases, with a concurrent increase in the velocity of water movement. The hydraulic conductivity of saturated

Bandelier Tuff can be from 2 to over 5 orders of magnitude higher than for the unsaturated tuff, indicating that flow velocities can increase by factors of 100 to 100,000 as the tuff becomes wetted (LANL 1992, 7670, p. 4-31). The original concept that a 1200-foot buffer zone between the residual test contaminants and the main ground water aquifer provided adequate isolation is challenged when an essentially continuous source of moisture is located at the ground surface immediately above the test shafts. This conclusion is consistent with the original finding in the siting studies that because the natural moisture content of the tuffs was 5% or less, the main ground water aquifer would be protected from contamination (LANL 1992, 7670, p. 4-17).

Quantitative modeling and risk assessment for conditions at the site will be needed to understand long-term risks and to define actions that may be needed to achieve a final remedy that will successfully isolate subsurface contaminants over the long term. However, current moisture conditions represent an obvious threat to contaminant isolation. Because immediate and obvious actions can be taken to reduce the amount of moisture entering the site, the actions described in Chapters 5 through 9 are being proposed.

Because of the magnitude of the source constituents at Areas 2, 2A, and 2B, this stabilization plan has been prepared to describe near-term activities that will reduce the amount of moisture entering the site and thereby reduce the migration potential of the subsurface contaminants.

5.0 PROPOSED STABILIZATION ACTIVITIES

There are four aspects to the moisture accumulations at Areas 2, 2A, and 2B:

- the presence of the asphalt pad traps moisture in the subsurface by limiting evapotranspiration;
- the asphalt pad concentrates runoff into cracks and areas adjacent to the pads;
- poor drainage around the asphalt pad results in ponding and enhanced infiltration of water; and
- surface run-on and potential interflow from upgradient areas can contribute additional water to these areas.

The BMPs stabilization activities described in this plan directly address excess moisture accumulation and may be summarized as follows:

- remove the asphalt pad to eliminate the moisture buildup that presently occurs beneath it;
- construct a diversion channel upgradient of the site to divert surface run-on from the site;
- regrade the fill materials and soils to eliminate ponding and improve drainage at the site.
- cover the regraded site with a layer of crushed tuff;
- cover the regraded site with topsoil armored with gravel to resist erosion and revegetate the site with shallow-rooted grasses;
- provide a barrier to biointrusion; and
- monitor the site to determine the effectiveness of the BMPs.

Because these activities may change drainage paths, creating new discharge points and potentially increasing runoff flows in some areas, issues of surface soil and sediment contamination dispersal in some existing surface contaminated areas are also addressed. Thus, the following additional component has been added:

- locate and remove, or stabilize, surface contaminants in affected areas downgradient of the site.

An overview of the nature and purpose of each of these activities is presented in the following paragraphs, beginning with a description of the initial site preparation activities necessary for accomplishing all activities. Because of the complexity of moisture movement through the asphalt, beneath the asphalt pad, beneath the ponding areas, and within the shafts, the approach that has been

adopted for stabilizing the site addresses site moisture sources at a more distant perimeter where conditions are simpler to identify and address. At this greater distance, the identified moisture sources are direct precipitation on the site, surface run-on, subsurface interflow, and percolation from areas of ponding. This plan addresses each of these moisture sources except subsurface interflow, for which the relative importance has yet to be determined.

This plan is consistent with *stabilization in place* as the presumptive final remedy and is, therefore, consistent with the basic premise of the EPA-approved OU 1144 RFI work plan (LANL 1992, 7670, Section 7.4.1). However, attention has been given to ensuring that the actions taken under these stabilization activities will not preclude any foreseeable final remedy or investigation that might be necessary to support that remedy. Detailed design information is presented in the attachments to this plan. Additional sampling of the fill materials underlying the asphalt pad will be performed before excavation as part of the RFI Phase I activities. This sampling is summarized below and described more fully in the 1998 document, "RCRA Facility Investigation Stabilization Measures Preparatory Activities Plan" (Environmental Restoration Project, 63383). This plan is intended to achieve the described actions by the end of Fiscal Year (FY) 1998 (September 30, 1998). Thus, the sequence of events and the schedules presented are optimized for that purpose.

5.1 Site Preparation Activities

The site preparation activities include obtaining the necessary permits and approvals and performing the preparatory field activities that initiate all BMP activities.

5.1.1 ESH-ID Review

The ESH-ID review provides a comprehensive checklist for review of field projects by Laboratory organizations outside the ER Project. The process triggers initiation of all key internal and external permitting and approval processes required for a project, including site surveys for cultural and biological resources, National Environmental Policy Act (NEPA) documentation, health and safety issues, National Emission Standards for Hazardous Air Pollutants (NESHAP) air quality monitoring, storm water management, excavation permits, waste management, and regulatory issues. Specifically, the ESH-ID process includes reviews by the following Laboratory organizations outside EM/ER: ESH-3, general safety issues; ESH-19, PCB and RCRA issues; ESH-12, radiological engineering issues; ESH-17, air quality issues; ESH-20, archaeological and historical resources review; ESH-18, water quality issues; ESH-5, ER and decontamination and decommissioning issues; CIC-4, communications facilities issues (telephone lines and network systems); ESH-20, NEPA issues; Facility and Waste Operations (FWO)/Radioactive Liquid Waste (RLW), radioactive liquid waste issues; ESH-6, criticality issues; and ESH-20, biological issues (threatened and endangered species).

The ESH-ID checklist was submitted by the TA-49 Asphalt Pad Team on January 28, 1998, to initiate the ESH-ID process. Feedback from the review process began to be received on February 2, 1998, and the comments received are addressed in this stabilization plan.

Presentations describing the planned activities are being made to the New Mexico Environment Department (NMED). These presentations are intended to help ensure that the regulatory personnel agree that the planned activities are appropriate and consistent with the ultimate goals for stabilizing the residual subsurface test constituents. An overview of the RFI sampling plan was presented to NMED on February 6, 1998; an overview of the site history, moisture issues, and planned stabilization activities was presented on April 7, 1998; an overview of surface and near-surface constituent data collected at the site was presented on May 28, 1998; and a meeting to discuss NMED's comments on the June 1998 version

of this plan was held on June 26, 1998. A revised draft plan was prepared and submitted to NMED on July 14, 1998. Comments and questions on this draft were provided by NMED in a request for supplemental information (RSI) dated August 11, 1998. The Laboratory's responses to this RSI were transmitted to NMED on September 10, 1998, and an attachment, "Contingencies for Reducing Soil Moisture Content at Potential Release Sites 49-001 (b,c,d, and g)" was included. The contingency plan has also been included with this plan (Attachment 2). A notice of deficiency (NOD) was subsequently received from NMED on November 25, 1998, containing comments on the contingency plan submitted in response to NMED's RSI. The Laboratory's responses to these additional comments were transmitted to NMED on December 21, 1998. NMED approved both responses in a letter dated February 12, 1999. Additional meetings are planned with NMED to further discuss the results of the RFI sampling, the stabilization activities, and the results of poststabilization monitoring.

5.1.2. Readiness Review

Following resolution of all ER peer review recommendations and ESH-ID issues and after obtaining Laboratory, ER Project, and DOE approvals for the work, readiness reviews are conducted with the Laboratory EES-13 project manager to ensure that all necessary approvals have been obtained and that field activities are ready to begin. The readiness review for the RFI sampling activities was held on February 19, 1998, and those activities are currently under way. The readiness review for constructing the diversion channel was held on June 2, 1998, and the readiness review for removing the asphalt pad and regrading the site was held on September 8, 1998.

5.1.3 RFI Sampling

Additional Phase I RFI sampling was conducted in PRSs 49-001(b,c,d, and g) to provide information needed to plan the field work and prepare final stabilization designs. Principal objectives and the methods for RFI sampling are summarized in Table 5-1.

Land survey personnel placed markers above the centers of each of the shafts to indicate the locations for the subsequent hand-auger borings. Land survey personnel also determined the locations of subsurface anomalies indicated by geophysical survey techniques. A FIDLER radiation survey was conducted in conjunction with the geophysical survey, and radiation measurements were made on the same grid locations as the geophysical survey. Locations with elevated levels of radiation were specially marked. Maps will be prepared showing the results of the geophysical and radiation surveys. A more detailed discussion of the RFI sampling activities is presented in the preparatory activities plan (Environmental Restoration Project 1998, 63383). The results of the RFI surveys and sampling will be documented in an RFI status report.

5.1.4 Borings to Competent Tuff

A series of approximately 20 borings were drilled around the upgradient perimeter of Areas 2, 2A, and 2B as part of the RFI activities to determine the depth to competent tuff and to identify any significant irregularities in the elevation of the tuff surface. This information will be used in determining the extent to which interflow may be concentrated by buried channels on the tuff surface and will be used to help determine the importance of interflow as a source of moisture in these areas. The presence of excessive moisture in the cuttings was noted in the field log, and a preliminary subsurface contour map of the soil-tuff interface will be produced. The borings were 3 to 4 feet deep and were performed using a hand auger. The approximate locations of the borings are shown on Figure 5-1.

Table 5-1
Principal Objectives and Methods of the RFI Sampling

Objective	Method
Perform a radiological survey over PRSs 49-001(b,c, and d) to identify and document any surface contamination.	Use a FIDLER instrument over a predetermined grid.
Perform a radiological survey over PRS 49-001(g) to identify and document any surface contamination.	Use a FIDLER instrument on a predetermined spacing within the downgradient drainage areas affected by site runoff.
Perform land surveys and geophysical surveys over PRSs 49-001(b,c, and d) to confirm the shaft locations and identify other subsurface hazards that may be present.	Perform the land surveys using standard surveying methods. Perform the geophysical surveys over a predetermined grid using electromagnetic and magnetic techniques.
Confirm the location and elevation of the tops of the shafts in PRSs 49-001(b,c, and d) to support fill excavation.	Install hand-auger borings at each shaft location from the ground surface to the top of the puddled concrete cap.
Characterize the asphalt pad in PRS 49-001(b) for waste disposal.	Sample the asphalt for RCRA metals, plutonium, uranium, americium, PCBs, VOCs, SVOCs, and tritium. Swipe asphalt and sample soil directly beneath asphalt for tritium.
Characterize the fill materials beneath the asphalt pad for worker health and safety during excavation and to clarify disposal or reuse issues.	Field screen all cuttings from the hand borings, send selected samples representative of the range of contamination for radiometric analysis, and collect extra samples in the northeast corner of the asphalt pad where the highest contaminant levels have been found.
Determine the physical characteristics of the fill materials beneath the asphalt pad to facilitate handling during excavation.	Collect and send selected samples representative of the fill composition off site for texture and moisture analyses.

5.1.5 Power Line Relocation

An existing power line that runs between Areas 2 and 2B was relocated outside the area that is likely to be influenced by the stabilization activities. The location of this line is shown in Figure 5-1. The line was relocated by Johnson Controls in coordination with the TA-49 Asphalt Pad Team and the TA-49 facility manager. Subsurface soils excavated during the relocation and the buried parts of the power poles were screened and characterized in accordance with the project's waste characterization strategy form (Environmental Restoration Project 1998, 57587).

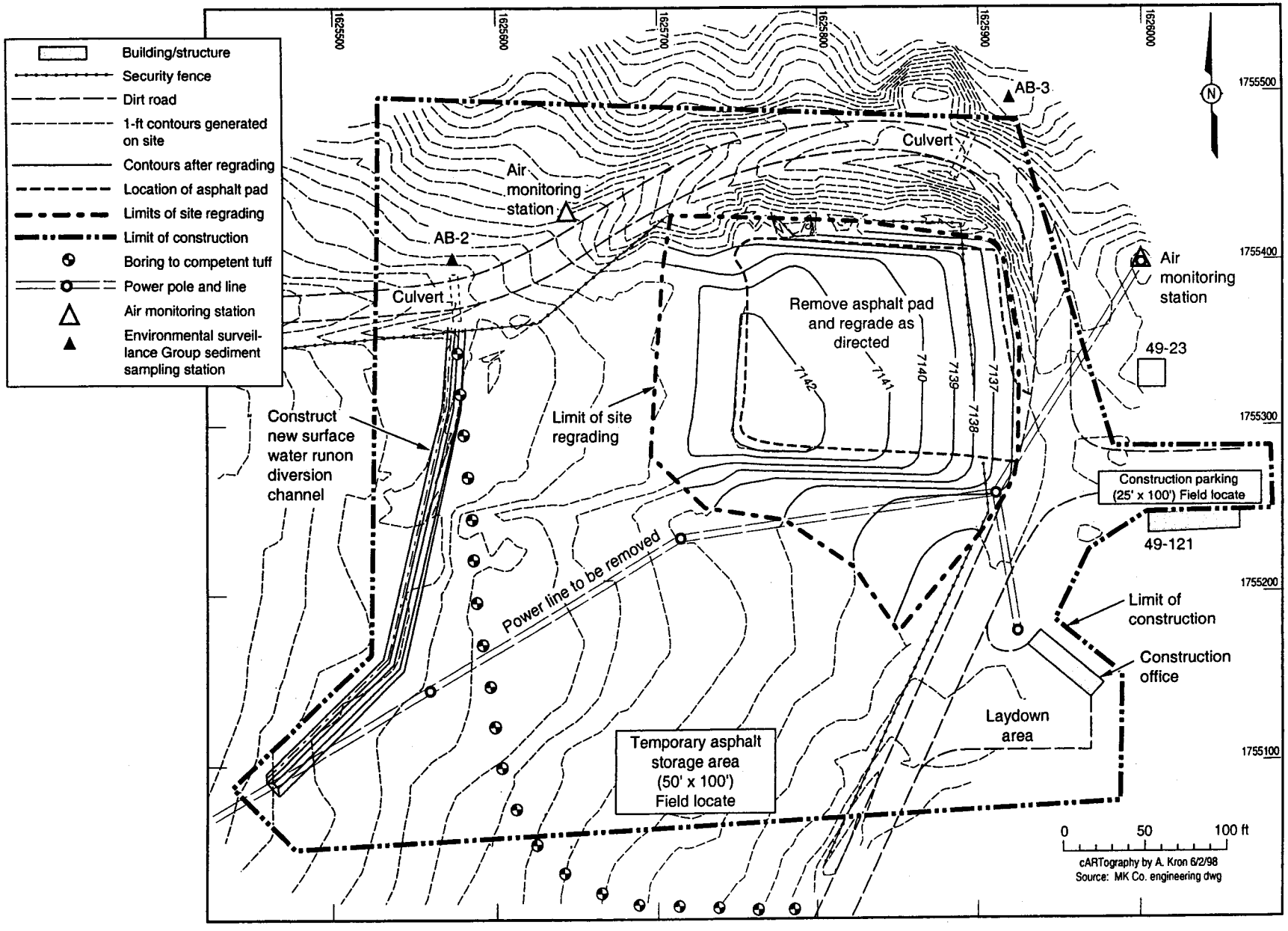

Figure 5-1. Locations of site runon and runoff controls.

5.1.6 Borehole Plugging and Abandonment

CH–2 was plugged and abandoned as part of the stabilization activities because of its inadequate annular seal, the standing water that has been found in the hole, and the possibility that the hole may provide a pathway for contaminant migration. The core hole was plugged and abandoned as described in the monitoring well and borehole abandonment plan presented in Attachment 3. The four 10-foot RFI holes on the asphalt pad (holes 49-2902 through 49-2905) have already been plugged and abandoned. The two 150-foot RFI holes on the asphalt pad (holes 49-2906 and 49-2907) have adequate annular seals, as described in Section 3.2.2. They will be retained during the stabilization activities and will be used as moisture monitoring points to help evaluate the effectiveness of those activities. The remaining moisture monitoring holes previously installed in Areas 2, 2A, and 2B will be retained for future monitoring use. The five TH holes and the 700-foot RFI hole 49-2901 are in low moisture content media outside of contaminated zones and therefore cannot serve as pathways for contaminant migration. The three moisture monitoring holes 2A-O, 2A-Y, and 2B-Y are in unused, sand-filled shafts where vertical permeability is already elevated and settlement of the sand would have closed any annular space that may have existed. The locations of these holes are shown in Figure 3-2.

5.1.7 Site Clearing and Fence Removal

The site will be cleared of surface vegetation before construction activities begin. This clearing will be performed over the minimum required area by trimming the plants at or above the existing soil level to avoid subsurface disturbance. Scrap metal, glass, and other inorganic debris will also be collected and segregated. Concrete and other materials forming caps over the test shafts will be left undisturbed. The existing site fence will be removed, where needed, to facilitate construction. Organic and inorganic waste materials will be disposed of in accordance with the waste characterization strategy (Environmental Restoration Project 1998, 57587).

5.1.8 Laydown, Stockpile, Parking, and Waste Storage Areas

Areas free of cultural and other resource conflicts will be identified for material laydown and stockpiling, vehicle parking, and waste storage areas. The laydown areas will be used for temporary storage of construction supplies and equipment, material processing, and material assembly. The stockpile areas may be used for storing crushed tuff, revegetation topsoil, seed, and other materials to be used in regrading the site. The parking areas may be used for construction equipment, personal and government vehicles, and trailer offices. One <90-day accumulation area will be used primarily for waste, PPE, and decontamination fluids, which will be stored temporarily in drums before disposal. Waste asphalt will be immediately loaded into trucks for shipping or will be temporarily staged on the asphalt pad (within the PRS) pending loading. Asphalt loaded into trucks or staged on the asphalt pad will be covered with tarps as necessary to keep it dry. Additional information on waste storage is presented in the waste characterization strategy (Environmental Restoration Project 1998, 57587). The size of these areas will be minimized to reduce environmental damage. It is anticipated that most of these activities will be conducted in areas already disturbed by past activities along the road leading east from the site toward Area 10 (Figure 2-1).

5.1.9 Baseline Borehole Measurements

The moisture content of the soil and tuff will be measured in the boreholes at the site at the time that construction is initiated. If standing water is present in CH-2, the water level will be measured, and both filtered and unfiltered water samples will be taken. Those samples will be analyzed for isotopic uranium, plutonium, americium, tritium, total RCRA metals, and HE. The results of these measurements will be

compared with those of the postconstruction monitoring described in Chapter 6 to help determine the effectiveness of the stabilization activities.

5.2 Surface Water Run-on Diversion Channel

A surface water run-on diversion channel will be constructed as a BMP to divert surface water that currently flows onto the site. This channel will be used to protect the site from storm water run-on during construction and will be left in place after construction is completed to provide longer-term protection of the site until final corrective measures are implemented. For this reason, the channel will be designed for larger runoff events than a diversion channel designed to be effective only for a short period during construction. Completion of these stabilization activities is scheduled for the fall of 1998, and implementation of a final corrective measure is currently scheduled for FY 2001. Diversion of subsurface interflow was not included in this plan because its significance as a source of moisture for Areas 2, 2A, and 2B is not currently known. An evaluation of the relative significance of interflow is currently under way, and the results will be incorporated into the ongoing RFI/corrective measures study (CMS) studies at MDA AB. Surface run-on and runoff controls during construction are further discussed in the SWPP plan (Environmental Restoration Project 1998, 62910).

The diversion channel will extend across the western, upgradient side of Areas 2, 2A, and 2B, as shown in Figure 5-1. It has been designed to intercept all upgradient surface run-on entering the site. Surface storm water flow running down the mesa south of the end of the channel drains to the southeast and will not enter the site. The channel will drain to the north by gravity flow into an existing culvert.

A cross section of the channel is shown in Figure 5-2. The channel and associated berm will be about 20 feet wide. The channel will be about 2 feet deep, and the berm will be about 2 feet high. The construction zone for this activity is expected to be about 30 feet wide. The berm will be constructed of soil removed from the channel. The facility will be constructed by earth-moving equipment with minimal effort and without formal engineering design. Construction activities will be controlled directly by a field engineer, using land survey information to control grades. The channel and berm will be compacted after excavation to promote stability, but no other materials or lining will be used. Maintenance requirements for this structure are expected to be minimal and are discussed in Chapter 7. The channel and berm are located in uncontaminated areas away from the nuclear safety test sites. Although no monitoring of diverted run-on volumes is currently planned, ESH-18 will periodically sample the water discharged from the channel at the culvert in conformance with the Laboratory's NPDES general permit. Additional discussion of this sampling activity is presented in Section 5.4. Drainage of local runoff water from the site east of the diversion channel is discussed in Section 5.5. Design information for the diversion channel is presented in Attachment 4.

5.3 Asphalt Pad Removal and Fill Excavation

The asphalt pad will be removed as an interim measure. The asphalt will be removed sequentially in squares with dimensions of about 20 feet by 20 feet. Working from the adjacent asphalt surface, asphalt in the first 20- by 20-foot square will be removed in the southwest corner of the site, probably by backhoe. The surface of the underlying fill material will be scarified to a depth of up to 6 inches and reworked to promote drying, but drying of the fill material will be primarily incidental to regrading and will not be a major objective of the construction activity. Because the existing fill material has a thickness of only 2 to 3 feet and the underlying original ground surface may be highly contaminated, the existing fill will not be excavated. The clay content of the old fill material was found in the recent RFIs to be relatively high. It is important to reduce the moisture content of the existing fill to minimize the occurrence of shrinkage fracturing before the fill is covered with crushed tuff and topsoil for regrading, as described in Section 5.5.

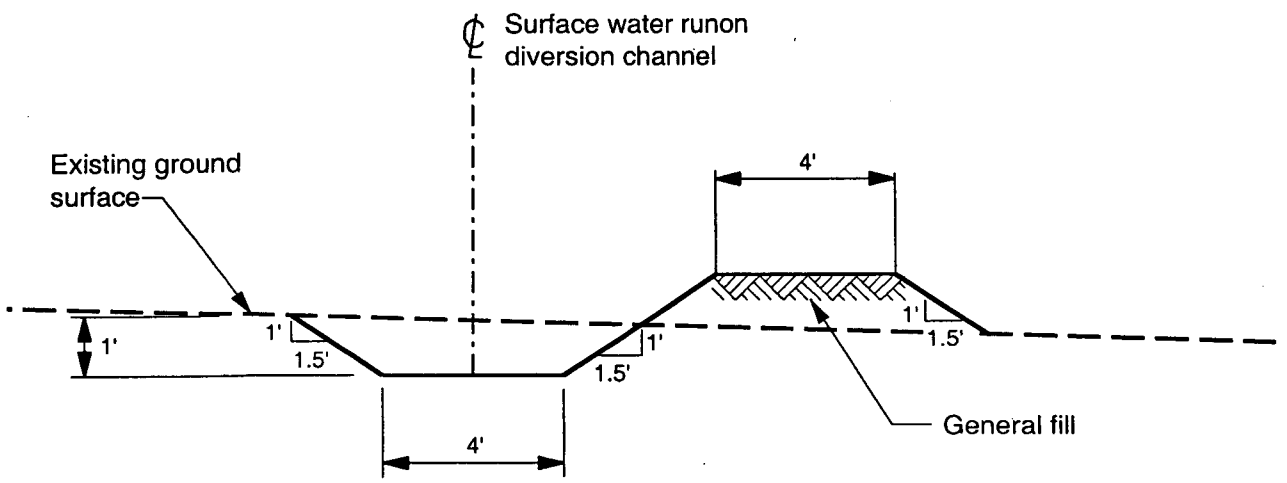

Figure 5-2. Schematic cross-section of surface water run-on diversion channel.

As the asphalt is removed, the underlying surface of fill materials will be field screened with a FIDLER instrument for radioactive contamination before it is scarified. Although the fill materials are not expected to be radioactively contaminated, any materials found to exceed the action levels for worker health and safety described in the SSHASP (Environmental Restoration Project 1998, 63114) will be removed and drummed for shipment to an appropriate disposal facility, in accordance with the waste characterization strategy (Environmental Restoration Project 1998, 57587). Care will be taken during excavation not to damage the casings of boreholes that will be retained on the site (Section 5.1.5). Tarps will be kept at the site to cover the exposed surface of the fill materials in case of rain. Covering the surface during rainstorms will protect the site against erosion and will enhance drying. An illustration of the methodology that will be used to remove the asphalt pad is shown in Figure 5-3.

Excavation by squares has several advantages over uniform site stripping. It permits most of the work to be performed from a clean, hard asphalt surface. This can be highly advantageous if the underlying fill materials are wet. It allows efficient use of personnel because while excavation is proceeding in one square, the radiological survey can be performed in the previously excavated square. Finally, it provides for progressive worker training by starting in the least likely contaminated (southwest) corner of the pad and working toward the most likely contaminated (northeast) corner of the pad.

As the final squares of asphalt are excavated, a comprehensive FIDLER survey of the exposed surface fill will be performed to document radionuclide concentrations for future site investigations. Although hot spots will be removed from that surface as needed for worker safety, the surface does not have to be free of contamination, and the final survey will not be considered confirmatory sampling. Rows of survey grade markers will be placed on the final surface of the old fill materials to allow them to be identified during future site excavation activities. Design information on the asphalt pad removal and fill excavation is presented in Attachment 4.

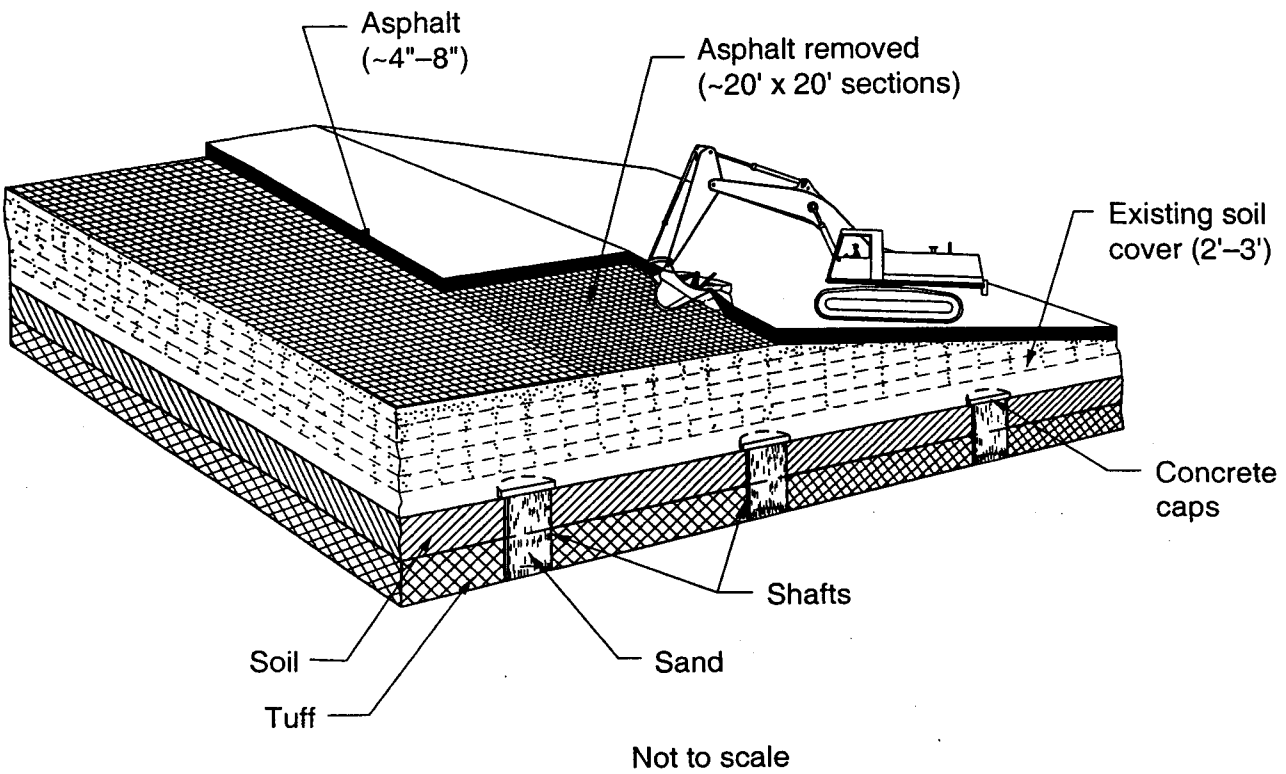

Figure 5-3. Illustration of asphalt pad and fill excavation methodology.

Although analysis of the asphalt samples collected during the RFI (Section 5.1.2) is expected to provide sufficient characterization for disposal, additional screening of the asphalt for radioactive contamination will be conducted during removal, as described above. Asphalt found to be only radioactively contaminated is planned to be sent to TA-54, Area G, for disposal as low-level waste. Although not expected, asphalt found to be contaminated by other than low levels of radioactivity will be disposed of as indicated in the waste characterization strategy for this stabilization plan (Environmental Restoration Project 1998, 57587). Asphalt, wood, vegetation, and other organic matter will not be disposed of at the site because if the final corrective measure at the site involves an engineered cover, the amount of organic matter beneath the cover should be minimized to avoid gas generation.

The hot spots in the fill that would be of concern for worker safety are expected to be few in number, highly isolated, and small in volume. These materials will be isolated in drums or other suitable containers and disposed of off site in accordance with the waste characterization strategy form for this stabilization plan (Environmental Restoration Project 1998, 57587). Other radiologically contaminated inorganic materials from the site, such as metal fencing or concrete on fence posts, will also be disposed of in accordance with the waste characterization strategy form. Previous sampling of the fill materials has indicated that they contain no regulated hazardous wastes (Section 3.2.1).

5.4 Surface Soil Screening and Release of Site Runoff

Surface soils in the vicinity of Areas 2, 2A, and 2B will be screened for radiological contamination in a FIDLER survey as one of the RFI sampling activities described in Section 5.1.2 and in the RCRA Facility Investigation Stabilization Measures Preparatory Activities Plan (Environmental Restoration Project 1998,

63383). The objective of this screening will be for purposes of worker health and safety and not for waste characterization or no further action determination. A final remedy for PRS 49-001(g) will be addressed as part of the CMS process for MDA AB. As previously mentioned, surface soil contamination at MDA AB is included in PRS 49-001(g) and has been found in drainage channels downgradient of Areas 2, 2A, and 2B. The field survey will focus on those parts of PRS 49-001(g) that will be affected by runoff from the site, discharges from the surface water diversion channel, and the project support areas discussed in Section 5.1.8. Soils that are found to be above action levels identified in the SSHASP (Environmental Restoration Project, 1998, 63114) will be removed and drummed for disposal in accordance with the waste characterization strategy for this plan (Environmental Restoration Project 1998, 57587).

Periodic sampling of storm water will be performed by ESH-18 in accordance with the Laboratory's NPDES general permit. Because runoff from upgradient of the site as well as runoff from the site itself originates in identified PRSs, that runoff will be monitored for contaminants. If state water quality standards are found to be routinely exceeded, a site-specific NPDES permit may be required. When implementing the stabilization activities, existing release points will be used rather than creating new ones. Three release points for the site will be used: one at the southeast corner, one at the northeast corner, and one at the northwest corner of the site. Surface water runoff from the site and the upgradient drainage channel will be directed into downgradient areas that are currently receiving runoff from the site. The drainage channels receiving site runoff water will be inspected during construction of the diversion channel, and if remedial stabilization efforts are found to be required, mitigating measures will be taken that could include installation of flow dissipaters, check dams, or sediment traps. Release of runoff water down the same channels that are currently receiving runoff will minimize the potential for mobilizing downgradient contaminants.

5.5 Site Regrading and Drainage Improvements

After the asphalt is removed, additional fill brought in from off site will be needed to raise the center and regrade around the edges of the pad area to promote drainage from the site. The additional fill is expected to predominantly consist of crushed tuff. Although the volume of material needed from off site is not precisely known, crushed tuff is relatively abundant at the Laboratory, and no difficulty in obtaining this material is anticipated. During regrading, the moisture content of the old fill materials is expected to be reduced by natural solar evaporation.

The regrading will be performed by earth-moving equipment; no formal engineering design will be used. Construction activities will be controlled directly by a field engineer, following the general guidance provided by the asphalt pad removal and regrading plan; land survey information will be used to control grades.

During regrading, the fill materials will be compacted to reduce pore volume and subsequent moisture storage capacity. The final surface contour in Areas 2, 2A, and 2B will allow surface water to flow downslope to the edges of the site without ponding. Surface runoff from on site is not expected to go west as far as the diversion channel because of the elevation differences involved. Rather, site surface runoff is expected to go to the south, north, and east toward the perimeter access road. Runoff will be channeled into ditches beside the road and conveyed to culverts at the northeast and southeast corners of the site. These ditches will be graded to keep water from ponding before reaching the culverts. The road circling MDA AB may be temporarily closed if modifications are required to the existing culverts or if new culverts must be installed. Design information for the regrading activities is presented in Attachment 4.

5.6 Cover Revegetation

An approximately 6-inch-thick layer of crushed tuff will be placed over the entire regraded surface when the final contours are approached. The final surface will consist of an approximately 6-inch layer of uncompacted topsoil to provide a rooting medium for vegetation. It is recognized that a 6-inch layer of topsoil is not thick enough to provide an optimal environment for plant growth; however, it is considered sufficient for purposes of temporary site stabilization. Positive deterrents to gopher burrowing at the site will also be emplaced. These may include a wire mesh placed over the topsoil to exclude gophers from areas where burrowing is likely to reach the depths of the original contaminated surface soils. The elements of the deterrent system, such as the required wire gauge, mesh size, and extent of coverage, will be determined in consultation with rodent control specialists. In addition to deterring gopher burrowing, a wire mesh would also have the advantages of helping to control erosion and providing a reference surface for visually inspecting the extent of erosion. The topsoil will be seeded with shallow-rooting grasses, and gravel will be spread over the topsoil for erosion protection. Revegetation of the regraded area with shallow-rooting grasses is expected to increase moisture removal from the site, increase erosion resistance, and provide competition for plants whose roots could penetrate to the depth of contaminated soils and bring radionuclides to the surface. Only those parts of Areas 2, 2A, and 2B where ponding is potentially problematic will be regraded, and only those parts of Areas 2, 2A, and 2B that are regraded or otherwise significantly disturbed by the construction activities will be revegetated. The area expected to be regraded and revegetated is shown in Figure 5-1.

6.0 SITE RESTORATION, CLEANUP, AND MONITORING

The existing site fencing and MDA AB perimeter road will be restored at the conclusion of the stabilization activities. Areas that were disturbed by construction activities will be cleaned of trash and construction materials and revegetated. These include the area of the diversion channel and the site laydown, stockpile, parking, and waste storage areas.

The existing boreholes (Figure 3-2) at the site will be used for monitoring subsurface moisture conditions to help determine the effectiveness of the stabilization activities described in this plan. Neutron probes will be used to determine moisture profiles for each borehole. If standing water is present in a borehole, the depth to water will be measured, and a water sample will be collected for analysis. The water will be analyzed for isotopic uranium, plutonium, americium, and RCRA metals. Monitoring will be performed on a quarterly basis for the first two years following completion of the stabilization activities. At that time, a decision will be made whether to reduce the monitoring frequency to annual or semiannual, depending on the results of the first two years of quarterly sampling.

Supplemental moisture monitoring will be conducted on a monthly basis in the surface soils and across the soil/tuff contact to determine if the moisture content is increasing despite implementation of the stabilization measures described in this plan. Contingencies have been identified for additional site stabilization if significant moisture increases are observed. The supplemental monitoring activities, data analysis, and alternative contingency actions are described in Attachment 2.

7.0 SITE INSPECTION AND MAINTENANCE

Minor periodic maintenance of the stabilization facilities at Areas 2, 2A, and 2B is expected to be required. During each quarterly monitoring round (Chapter 6), the site will be inspected for sedimentation of the diversion channel, erosion of the regraded surface, deep-rooted plants growing on the site, gopher burrows, and evidence of ponding. Stabilization facilities installed in downgradient runoff channels would

also be inspected at that time. The site condition will be documented and used to determine the need for maintenance. Maintenance will be performed on an as-needed basis. Excessive accumulations of sediment will be mechanically removed from the diversion channel and placed on the berm beside the channel. Grade markers or a wire mesh that will protrude from the surface if erosion occurs will be placed on the final regraded topsoil surface of Area 2 to facilitate visual inspection of the extent of erosion. Excessive erosion or gullying of the regraded surface will be corrected by placement of additional topsoil, crushed tuff, and gravel, as needed. Deep-rooted plants found growing on the site will be physically removed, and any soil disruption will be repaired. Gophers found on site will be removed, and the effects of their burrows will be repaired. Low-lying areas that may develop because of settlement of the regraded fill will be filled in with soil or crushed tuff.

8.0 ALTERNATIVES TO THE PROPOSED STABILIZATION ACTIVITIES

Alternatives to the proposed stabilization activities include no action, implementing some but not all of the proposed stabilization, implementing modified versions of the proposed activities, and implementing additional activities. Each of these alternatives is briefly addressed in the following paragraphs.

8.1 No-Action Alternative

The no-action alternative would leave the site in its current condition, without affecting the adverse moisture conditions. Because of the magnitude of the underground source term at the site (Table 2-1), this alternative is not acceptable.

8.2 Implement Some of the Stabilization Activities

The proposed stabilization activities consist of three major activities: constructing a diversion channel and berm to intercept surface run-on; removing the asphalt pad; and regrading the site to improve surface runoff and eliminate ponding. Any one of these three tasks could potentially be implemented independently; however, they are closely interrelated and implementing any one of them would leave other significant problem areas uncorrected. The diversion channel and berm are probably the most easily isolated of the three tasks. Construction of the channel and berm would divert off-site run-on from Areas 2, 2A, and 2B but would not address the significant issues of moisture buildup under the asphalt pad and the on-site ponding of runoff from direct precipitation. Independently removing the asphalt pad and excavating the fill would improve moisture conditions under the pad but would not address off-site run-on and would not improve drainage conditions. Regrading the site without removing the asphalt pad or constructing a surface water diversion would allow moisture to continue to accumulate under the pad and would not provide for the diversion of runoff away from the site. These three major activities are proposed for concurrent implementation in this stabilization plan because

- each of these activities addresses a different and important water management issue at the site,
- each is interrelated with the others,
- concurrent implementation provides cost savings,
- implementation of the three activities can be budgeted in FY 1998,
- disposal of waste asphalt has been arranged in FY 1998, and
- the planned implementation is consistent with the final remedy of in-place stabilization that has been identified for the site.

8.3 Implement Modified Versions of the Stabilization Activities

Variations of the stabilization activities proposed in this plan may consist of alternative design components, alternative activity elements, or alternative activity outcomes. There are many alternatives to the design components of the planned stabilization activities. These include alternative diversion channel capacity, alternative asphalt removal procedures, and alternative revegetation schemes. These and many other variations in the basic design of the major stabilization activities were considered by the TA-49 Asphalt Pad Team, and the proposed designs represent the best judgment of that team.

8.4 Implement Additional Activities

The Asphalt Pad Team considered whether other stabilization activities should be implemented as part of this plan, e.g., whether a more permanent cover should be constructed instead of the simple layer of tuff that is currently planned. The team believes that the current temporary regrading concepts will be adequate if a more permanent cover can be designed and installed within a few years. The team believes that the final cover design should be supported by

- a comprehensive risk assessment of the site;
- an analysis of cumulative releases from Laboratory MDAs planned for in situ stabilization;
- completion of the ER MDA core document, which will provide a process by which final MDA corrective measures are determined;
- an evaluation of the extent to which the cover design should be a demonstration of technology transferable to other MDAs;
- completion of the RFI and CMS processes; and
- approval of the final corrective measures by NMED.

Because many of these supporting elements are not currently available, the team believes that design of a more permanent cover for Areas 2, 2A, and 2B at this time would be premature. To expedite corrective action at Laboratory MDAs, the team recommends that work on a comprehensive risk assessment of the site, an analysis of cumulative releases, and preparation of the MDA core document will proceed concurrently with implementation of this stabilization plan. However, those additional activities are beyond the scope of this plan.

The Asphalt Pad Team also recognizes that alternative stabilization activities may be required if the geological, hydrological, waste property, material property, and other characteristics of the site affecting the proposed stabilization activities are found to be significantly different from what is expected. Uncertain site characteristics that would impact the present design, schedule, and cost estimates include the finding of significantly higher than expected concentrations and volumes of radionuclides in the fill materials beneath the asphalt pad and finding that the asphalt is a different type of waste than expected. In each of these cases, the potential for unexpected problems has been identified, steps have been taken to obtain advance information through early borings and sampling, and alternative approaches have been considered and are available. Unexpectedly high concentrations and volumes of radionuclides in the fill would have the principal effects of slowing work progress and possibly requiring more of the fill materials to be sent to TA-54, Area G, for disposal. Also, as previously mentioned, alternative disposal facilities have been identified if the asphalt is determined to be other than clean or contaminated by low levels of radioactivity. Unexpected, extremely low probability events or conditions can also occur and would be handled on a case-by-case basis.

8.5 Future Site Activities and Final Corrective Measures

The stabilization activities proposed in this plan have been designed to be compatible with a number of alternatives for final in-place site stabilization. These alternatives include construction of an engineered cover (currently considered a possible element of the final remedy), chemical stabilization, grouting, in situ vitrification, in situ physical barriers, and in situ dry barriers. With run-on controlled by the diversion channel and site runoff enhanced by regrading, each candidate final remedy would only need to address the final issues of diverting potential subsurface interflow and controlling infiltration from direct precipitation.

Because of the magnitude of the source term at Areas 2, 2A, and 2B, this site is expected to retain high priority for final stabilization and remain an example for streamlining the CMS/corrective measures implementation (CMI) process for other MDAs at the Laboratory.

9.0 QUALITY ASSURANCE AND SCHEDULE

The sampling and analysis components of this project will be performed in accordance with the QA requirements of the Laboratory Quality Program Plan for Environmental Restoration Activities (LANL 1991, 7651) and the Laboratory generic QA project plan for RCRA facility investigations (LANL 1991, 31294). QA requirements will also be incorporated into the specifications for the construction aspects of this project. The schedule for this project is shown in Attachment 5

REFERENCES

The following list includes all references cited in this document. Parenthetical information following each reference provides the author, publication date, and the environmental restoration record identification (ER ID) number. This information also is included in the citations in the text. ER ID numbers are assigned by the Laboratory's ER Project to track records associated with the Project. These numbers can be used to locate copies of the actual documents at the ER Project's Records Processing Facility and, where applicable, within the ER Project reference library titled "Reference Set for Material Disposal Areas, Technical Area 49."

Copies of the reference library are maintained at the New Mexico Environment Department Hazardous and Radioactive Materials Bureau; the Department of Energy Los Alamos Area Office; United States Environmental Protection Agency, Region VI; and the ER Project Material Disposal Areas Focus Area. This library is a living collection of documents that was developed to ensure that the administrative authority (AA) has all the necessary material to review the decisions and actions proposed in this document. However, documents previously submitted to the AA are not included in the reference library.

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Attachment 1

Evaluation of Potential Surface Water Concerns

Surface water assessments (formerly called AP 4.5 assessments) are performed to evaluate potential release sites (PRSs) for surface water concerns. The process used for the evaluation incorporates site knowledge and surface soil sample results in a constituent assessment (Part A) and information on the potential for erosion of contaminants from the site in a surface water site assessment (Part B). The process results in a determination of the need for mitigating actions at a site and notification of New Mexico Environment Department, as appropriate (Part C).

The attachment contains Part A and B forms for PRSs affecting or affected by planned stabilization activities at Technical Area 49 Material Disposal Area AB, Areas 2, 2A, and 2B.

Los Alamos National Laboratory
Environmental Restoration Program
CONSTITUENT ASSESSMENT

LANL-ER-AP-4.5
Part A

SITE INFORMATION

1. PRS Number: 49-001(b) **2. Date (M/D/Y):** 03/20/98 **Time (am/pm):** 9:45:00 AM

3. ER Point of Contact Dwain Farley **4. FMU/Responsible Party Contact** Ed Hoth

5. HSWA Yes **6. Site Ranking System (SRS) #** 26

7. Description of the historical operations of this PRS:

Per the TA-49 RFI work plan, PRS 49-001(b) is Area 2 of Material Disposal Area AB. Area 2 was one of six experimental areas at TA-49 where underground hydronuclear and related experiments were performed from late 1959 to mid 1961. The experiments were conducted in backfilled shafts that varied from 31 to 142 feet in depth. The experiments involved HE dispersal of significant quantities of U-235 and Pu-239 as well as lead, beryllium, and U-238 at the bottom of the shafts.

8. Description of the current operations of this PRS (if any):

None. Site is covered with asphalt.

PRS STATUS

9. Action/Status to Date (check all that apply)

	Date Completed or Anticipated
☐ **None**	
☐ **Field Investigation** ☒ **Phase I** ☐ **Phase II**	
☐ **Interim Measures** ☐ **IM** ☐ **BMP**	**IM:**
	BMPs:
☐ **VCA** ☐ **VCM**	
☐ **Other** ☐ **Monitoring** ☐ **CMS**	
☐ **Report Status** ☒ **SAP** ☐ **RFI Report** **SAP:**	**RFI RPTs:**
SAP INFO:	
☐ **NFA/DOU** If checked, supply HH NFA criteria number and date:	

SAMPLE INFORMATION

○ Yes ◉ No **10. Have surface/sediment (depth less than 12 inches) samples been collected tha reflect current site conditions?**

If yes: 1) Attach data
2) Include analyte name, value, units, location ID, sample ID, SAL, depth, and media (soil, tuff, etc.)
3) Please attach existing map, showing where samples were taken, if available.

○ Yes ◉ No **11. Have surface water samples been collected that reflect current site conditions?**

If yes: 1) Attach data
2) Include analyte name, value, units, location ID, filtered/non-filtered, & flow data, if available.
3) Please attach existing map, showing where samples were taken, if available.

○ Yes ◉ No **12. Are data pending?**

If yes: 1) List date data are anticipated: _____
2) Provide list of COPCs identified in RFI Work Plan as an attachment.

Dwain Farley

13. Signature of ER Representative

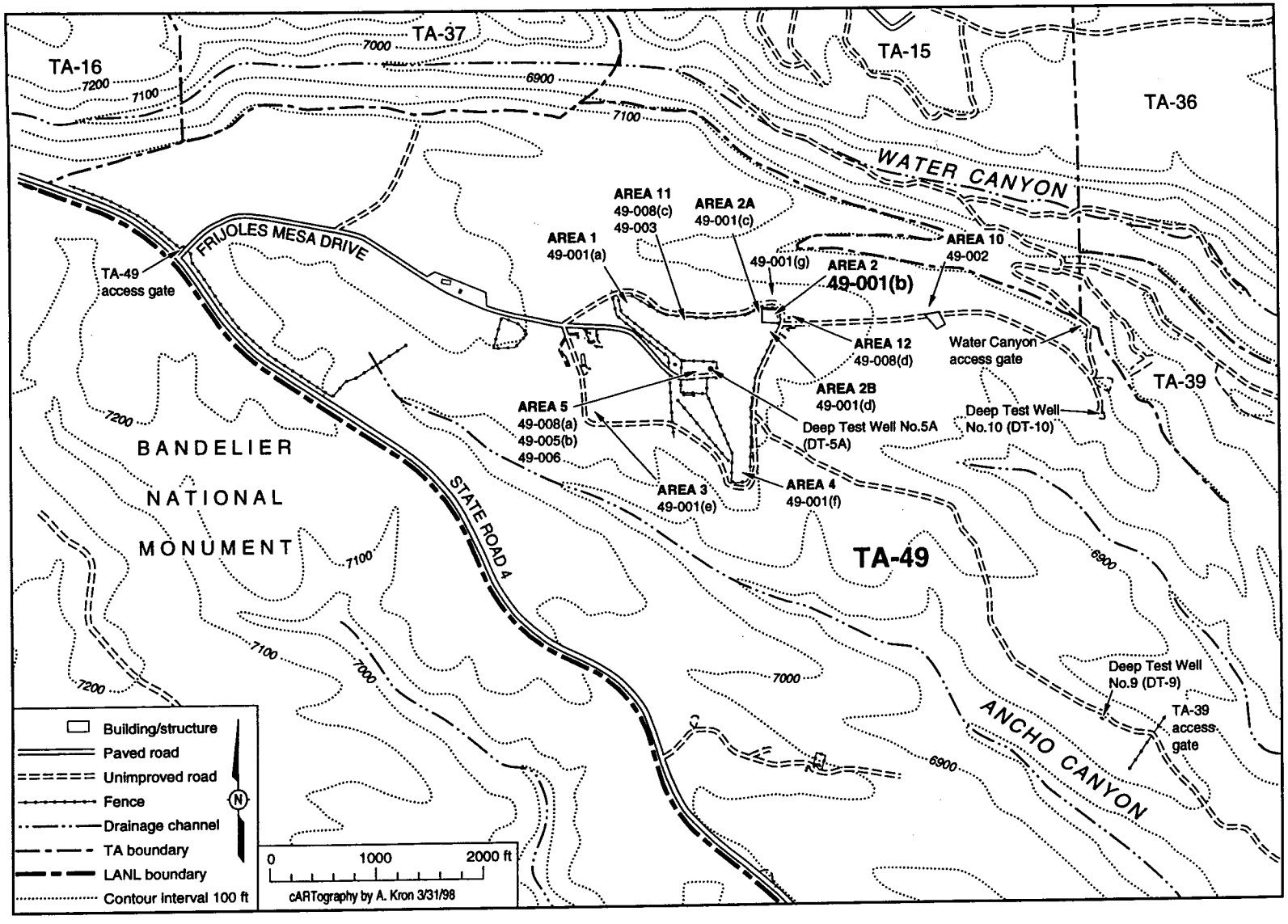

Figure 1. Location of PRS 49-001(b).

Los Alamos National Laboratory

Environment, Safety and Health Division
ESH-18 Water Quality and Hydrology Group

AP 4.5 Surface Water Assessment Erosion Matrix for PRS 49-001(b)

CRITERIA EVALUATED	Value	Erosion/Sediment Transport Potential Low 0.1	Medium 0.5	High 1.0	Calculated Score
Site Setting (43)					
On mesa top	1	Defined based on topographic setting			1.0
Within bench of canyon	4				
Within the canyon floodplain but not watercourse	13				
Within bottom of canyon channel in watercourse	17				
Estimated % ground and canopy cover	13	>75%	25-75%	<25%	1.3
Slope	13	0-10%	10-30%	>30%	1.3
Surface Water Factors-Run-off (46)					
Visible evidence of runoff discharging? (Yes/No)	5	If no, score of 0 for runoff section. If yes, score 5 and proceed with section.			5.0
Where does runoff terminate?	19	Other	Bench Setting	Drainage/Wetland	19.0
Has runoff caused visible erosion? (Yes/No)	22	Sheet	Rill	Gully	0.0
		If no, score as 0. If yes, calculate as appropriate.			
Surface Water Factors-Run-on (11)					
Structures adversely affecting run-on (Yes/No)	7*	If yes, score as 7. If no, score as 0.			0.0
Current operations adversely impacting (Yes/No)	4	If yes, score as 4. If no, score as 0.			0.0
Natural drainages onto site (Yes/No)	7*	If yes, score as 7. If no, score as 0.			7.0
**Select either structures or natural drainages.*					
MAX. POSSIBLE EROSION MATRIX SCORE:	**100**			**Total Score**	34.6**

** Indicates BMPs in place. Erosion potential without BMPs may be greater.

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Los Alamos National Laboratory
SURFACE WATER
SITE ASSESSMENT

SITE INFORMATION

1a) PRS Number: 49-001(b) 1b) Structure Number: 49-23 1c) FMU Number: 81

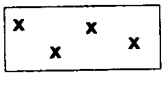
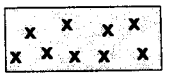
2. Date/Time (M/D/Y H:M am/pm): 2/26/98

SITE SETTING (check all that apply)

3. (●) On mesa top (a). ( ) In the canyon floor, but not in an established channel (c).
   ( ) Within a bench of a canyon (b). ( ) Within established channel in the canyon floor (d).

Explanation: Mesa top area mostly covered with asphalt pad

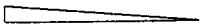
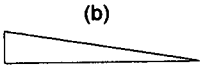
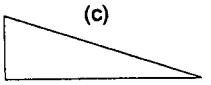
4. Estimated ground and/or canopy cover at site: (deciduous leaves, pine needles, rocks, vegetation, trees, structures, asphalt, etc.)

(illustration) (a)  (b)  (c)

Estimated % of ground/canopy cover: ( ) 0% to 25% ( ) 25% to 75% (●) 75% to 100%

Explanation: Covered with asphalt (surrounding area heavily vegetated).

5. Steepest slope at the area impacted:

(a)  (b)  (c) 

(●) Less than 10% ( ) 10% to 30% ( ) 30% and greater

Explanation: Relatively flat until surface water discharges into culvert below road onto PRS 49-001(g).

RUNOFF FACTORS

Y / N

☑ ☐ **6. Is there visible evidence of runoff discharging from site? If yes, answer a) - c) below:**

☑ ☐ 6a) Is runoff channelized? If yes, describe: (●) Man-made channel. ( ) Natural channel.

Explanation: Run-off to north is conveyed along roadway ditch into culvert. Run-off to east, infiltrates or ponds in southeast corner of site near road intersection and onto access road near gate.

RUNOFF FACTORS, CONT'D

6b) Where does evidence of runoff terminate?

- (●) **Drainage or wetland (name)** Water Canyon
- ( ) **Within bench of canyon setting (name)**
- ( ) **Other (i.e., retention pond, meadow, mesa top)**

Explanation: Culvert discharges into well defined drainage channel which is eventually reaches a tributary of Water Canyon.

Y / N

☐ ☑ 6c) Has runoff caused visible erosion at the site? If yes, explain below: ( ) Sheet ( ) Rill ( ) Gully

Explanation: None observed, drainage swale from run-on, however. Sediment traps have formed in some locations.

RUN-ON FACTORS

Please rate the potential for storm water to run on to this site: (Check EITHER #7 or #9)

☐ ☑ **7.** Are structures (i.e., buildings, roof drains, parking lots, storm drains) creating run-on to the site?

Explanation:

☐ ☑ **8.** Are current operations (i.e., fire hydrants, NPDES outfalls) adversely impacting run-on to the site?

Explanation:

☑ ☐ **9.** Are natural drainage patterns directing stormwater onto site?

Explanation: Sources from west of site are providing sheet flow run-on.

ASSESSMENT FINDING:

☐ ☑ **10. Based on the above criteria and the assessment of this site, does soil erosion potential exist? (REFER TO EROSION POTENTIAL MATRIX.)**

Steve Veenis

11. Signature of Water Quality/Hydrology Representative

SV Initials of independent reviewer.

Check here when information is entered in database: ☑

This page is for ESH-18 notes, recommendations, and photos.

	Y	N	
12. a)	○	◉	Is there visible trash/debris on the site?
b)	○	◉	Is there visible trash/debris in a watercourse?

Description of existing BMPs:

Asphalt cover over PRSs.

◉	○	Are BMPs being properly maintained? If no, describe in "Other Internal Notes."
◉	○	Are BMPs effectively keeping sediment in place and reducing erosion potential?

OTHER INTERNAL NOTES:

Los Alamos National Laboratory
Environmental Restoration Program
CONSTITUENT ASSESSMENT

LANL-ER-AP-4.5
Part A

SITE INFORMATION

1. PRS Number: 49-001(c) **2. Date (M/D/Y):** 03/20/98 **Time (am/pm):** 1:20:00 PM

3. ER Point of Contact Dwain Farley **4. FMU/Responsible Party Contact** Ed Hoth

5. HSWA Yes **6. Site Ranking System (SRS) #** 29

7. Description of the historical operations of this PRS:

Per the TA-49 RFI work plan, PRS 49-001(c) is Area 2A of Material Disposal Area AB. Area 2A was one of six experimental areas at TA-49 where underground hydronuclear and related experiments were performed from late 1959 to mid 1961. The experiments were conducted in backfilled shafts that varied from 31 to 142 feet in depth. The experiments involved HE dispersal of significant quantities of U-235 and Pu-239 as well as lead, beryllium, and U-238 at the bottom of the shafts.

8. Description of the current operations of this PRS (if any):

None.

PRS STATUS

9. Action/Status to Date (check all that apply)

☐ **None** — **Date Completed or Anticipated**

☐ **Field Investigation** ☒ **Phase I** ☐ **Phase II**

☐ **Interim Measures** ☐ **IM** ☐ **BMP** — **IM:** ____ **BMPs:** ____

☐ **VCA** ☐ **VCM**

☐ **Other** ☐ **Monitoring** ☐ **CMS**

☐ **Report Status** ☒ **SAP** ☒ **RFI Report** **SAP:** ____ **RFI RPTs:** ____

SAP INFO: ____

☐ **NFA/DOU** If checked, supply HH NFA criteria number and date: ____

SAMPLE INFORMATION

○ Yes ◉ No **10. Have surface/sediment (depth less than 12 inches) samples been collected tha reflect current site conditions?**

If yes: 1) Attach data
2) Include analyte name, value, units, location ID, sample ID, SAL, depth, and media (soil, tuff, etc.)
3) Please attach existing map, showing where samples were taken, if available.

○ Yes ◉ No **11. Have surface water samples been collected that reflect current site conditions?**

If yes: 1) Attach data
2) Include analyte name, value, units, location ID, filtered/non-filtered, & flow data, if available.
3) Please attach existing map, showing where samples were taken, if available.

○ Yes ◉ No **12. Are data pending?**

If yes: 1) List date data are anticipated: ____
2) Provide list of COPCs identified in RFI Work Plan as an attachment.

Dwain Farley

13. Signature of ER Representative

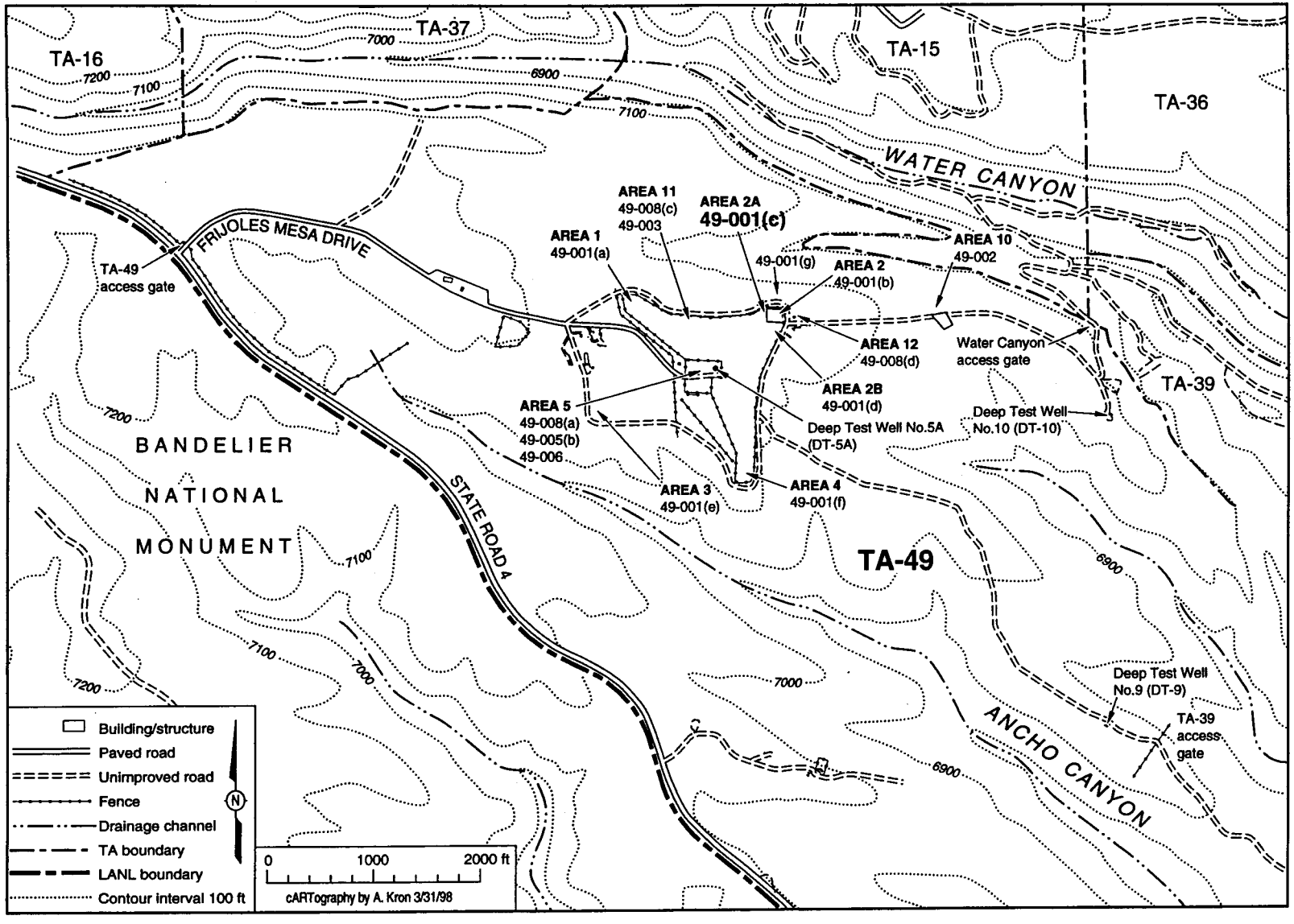


Figure 2. Location of PRS 49-001(c).

Los Alamos National Laboratory

Environment, Safety and Health Division
ESH-18 Water Quality and Hydrology Group

AP 4.5 Surface Water Assessment Erosion Matrix for PRS 49-001(c)

CRITERIA EVALUATED	Value	Erosion/Sediment Transport Potential Low 0.1	Medium 0.5	High 1.0	Calculated Score
Site Setting (43)					
On mesa top	1	Defined based on topographic setting			1.0
Within bench of canyon	4				
Within the canyon floodplain but not watercourse	13				
Within bottom of canyon channel in watercourse	17				
Estimated % ground and canopy cover	13	>75%	25-75%	<25%	1.3
Slope	13	0-10%	10-30%	>30%	1.3
Surface Water Factors-Run-off (46)					
Visible evidence of runoff discharging? (Yes/No)	5	If no, score of 0 for runoff section.			5.0
		If yes, score 5 and proceed with section.			
Where does runoff terminate?	19	Other	Bench Setting	Drainage/Wetland	1.9
Has runoff caused visible erosion? (Yes/No)	22	Sheet	Rill	Gully	0.0
		If no, score as 0. If yes, calculate as appropriate.			
Surface Water Factors-Run-on (11)					
Structures adversely affecting run-on (Yes/No)	7*	If yes, score as 7. If no, score as 0.			0.0
Current operations adversely impacting (Yes/No)	4	If yes, score as 4. If no, score as 0.			0.0
Natural drainages onto site (Yes/No)	7*	If yes, score as 7. If no, score as 0.			7.0
**Select either structures or natural drainages.*					
MAX. POSSIBLE EROSION MATRIX SCORE:	**100**			**Total Score**	17.5

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Los Alamos National Laboratory
SURFACE WATER
SITE ASSESSMENT

SITE INFORMATION

1a) PRS Number 49-001(c) **1b) Structure Number** 49-23 **1c) FMU Number**

2. Date/Time (M/D/Y H:M am/pm) 2/26/98

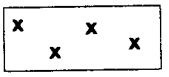
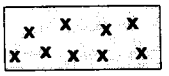
SITE SETTING (check all that apply)

3. ◉ **On mesa top (a).** ○ **In the canyon floor, but not in an established channel (c).**

○ **Within a bench of a canyon (b).** ○ **Within established channel in the canyon floor (d).**

Explanation: Mesa top area west of asphalt pad (Area 2A).

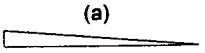
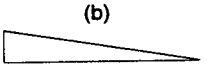
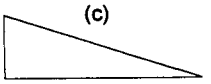
4. Estimated ground and/or canopy cover at site: (deciduous leaves, pine needles, rocks, vegetation, trees, structures, asphalt, etc.)

(illustration) (a)  (b)  (c)

Estimated % of ground/canopy cover: ○ 0% to 25% ○ 25% to 75% ◉ 75% to 100%

Explanation: Area heavily vegetated slighly upslope from the asphalt pad.

5. Steepest slope at the area impacted:

(a)  (b)  (c) 

◉ Less than 10% ○ 10% to 30% ○ 30% and greater

Explanation: Relatively flat area just west of asphalt pad.

RUNOFF FACTORS

Y / N

☑ ☐ **6. Is there visible evidence of runoff discharging from site? If yes, answer a) - c) below:**

☐ ☑ 6a) Is runoff channelized? If yes, describe: ◉ Man-made channel. ○ Natural channel.

Explanation: Run-off to north is conveyed along roadway ditch into culvert. Run-off to east, infiltrates or ponds in southeast corner of site near road intersection (49-001(d)).

RUNOFF FACTORS, CONT'D

6b) Where does evidence of runoff terminate?

- ○ **Drainage or wetland (name)** Water Canyon
- ○ **Within bench of canyon setting (name)**
- ◉ **Other (i.e., retention pond, meadow, mesa top)** swale

Explanation: If runoff reaches culvert, it discharges into well defined drainage channel which is designated as 49-001(g).

Y / N

☐ ☑ 6c) Has runoff caused visible erosion at the site? If yes, explain below: ○ Sheet ○ Rill ○ Gully

Explanation: None observed.

RUN-ON FACTORS

Please rate the potential for storm water to run on to this site: (Check EITHER #7 or #9)

☐ ☑ **7.** Are structures (i.e., buildings, roof drains, parking lots, storm drains) creating run-on to the site?

Explanation:

☐ ☑ **8.** Are current operations (i.e., fire hydrants, NPDES outfalls) adversely impacting run-on to the site?

Explanation:

☑ ☐ **9.** Are natural drainage patterns directing stormwater onto site?

Explanation: Sources from west of site are providing sheet flow run-on.

ASSESSMENT FINDING:

☐ ☑ **10. Based on the above criteria and the assessment of this site, does soil erosion potential exist? (REFER TO EROSION POTENTIAL MATRIX.)**

Steve Veenis

11. Signature of Water Quality/Hydrology Representative

SV Initials of independent reviewer.

Check here when information is entered in database: ☑

This page is for ESH-18 notes, recommendations, and photos.

	Y	N	
12. a)	○	◉	Is there visible trash/debris on the site?
b)	○	◉	Is there visible trash/debris in a watercourse?

Description of existing BMPs:

○	○	Are BMPs being properly maintained? If no, describe in "Other Internal Notes."
○	○	Are BMPs effectively keeping sediment in place and reducing erosion potential?

OTHER INTERNAL NOTES:

Los Alamos National Laboratory
Environmental Restoration Program
CONSTITUENT ASSESSMENT

LANL-ER-AP-4.5
Part A

SITE INFORMATION

1. PRS Number: 49-001(d)
2. Date (M/D/Y): 03/20/98 Time (am/pm): 1:40:00 PM
3. ER Point of Contact: Dwain Farley
4. FMU/Responsible Party Contact: Ed Hoth
5. HSWA: Yes
6. Site Ranking System (SRS) #: 29
7. Description of the historical operations of this PRS:

Per the TA-49 RFI work plan, PRS 49-001(d) is Area 2B of Material Disposal Area AB. Area 2B was one of six experimental areas at TA-49 where underground hydronuclear and related experiments were performed from late 1959 to mid 1961. The experiments were conducted in backfilled shafts that varied from 31 to 142 feet in depth. The experiments involved HE dispersal of significant quantities of U-235 and Pu-239 as well as lead, beryllium, and U-238 at the bottom of the shafts.

8. Description of the current operations of this PRS (if any):

None.

PRS STATUS

9. Action/Status to Date (check all that apply)

Date Completed or Anticipated

- ☐ None
- ☐ Field Investigation ☒ Phase I ☐ Phase II
- ☐ Interim Measures ☐ IM ☐ BMP — IM: ; BMPs:
- ☐ VCA ☐ VCM
- ☐ Other ☐ Monitoring ☐ CMS
- ☐ Report Status ☒ SAP ☒ RFI Report — SAP: ; RFI RPTs:

SAP INFO:

☐ NFA/DOU If checked, supply HH NFA criteria number and date:

SAMPLE INFORMATION

○ Yes ◉ No **10. Have surface/sediment (depth less than 12 inches) samples been collected tha reflect current site conditions?**

If yes: 1) Attach data
2) Include analyte name, value, units, location ID, sample ID, SAL, depth, and media (soil, tuff, etc.)
3) Please attach existing map, showing where samples were taken, if available.

○ Yes ◉ No **11. Have surface water samples been collected that reflect current site conditions?**

If yes: 1) Attach data
2) Include analyte name, value, units, location ID, filtered/non-filtered, & flow data, if available.
3) Please attach existing map, showing where samples were taken, if available.

○ Yes ◉ No **12. Are data pending?**

If yes: 1) List date data are anticipated: _____
2) Provide list of COPCs identified in RFI Work Plan as an attachment.

Dwain Farley

13. Signature of ER Representative

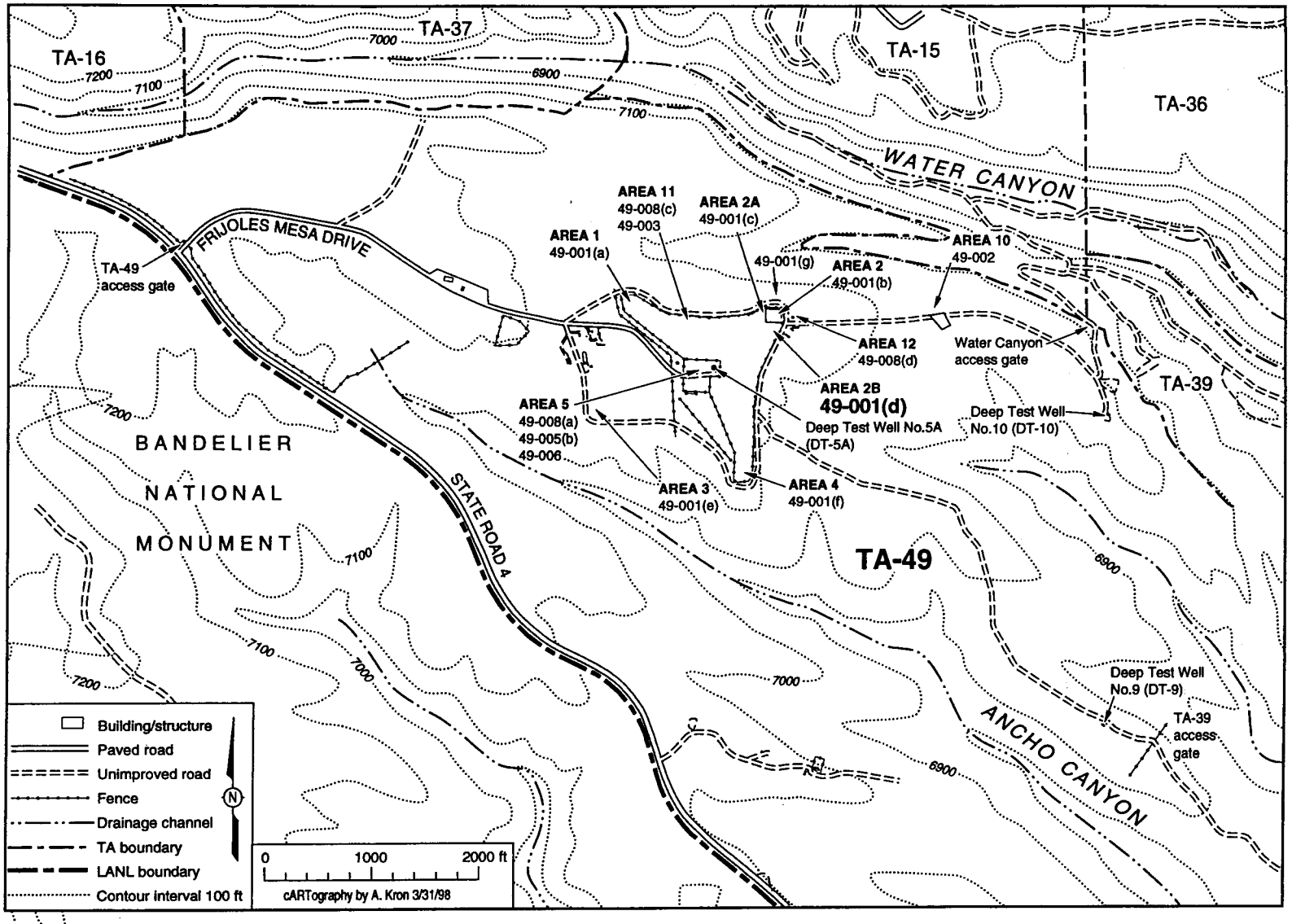


Figure 3. Location of PRS 49-001(d).

Los Alamos National Laboratory

Environment, Safety and Health Division
ESH-18 Water Quality and Hydrology Group

AP 4.5 Surface Water Assessment Erosion Matrix for PRS 49-001(d)

CRITERIA EVALUATED	Value	Erosion/Sediment Transport Potential: Low 0.1	Medium 0.5	High 1.0	Calculated Score
Site Setting (43)					
On mesa top	1	Defined based on topographic setting			1.0
Within bench of canyon	4				
Within the canyon floodplain but not watercourse	13				
Within bottom of canyon channel in watercourse	17				
Estimated % ground and canopy cover	13	>75%	25-75%	<25%	1.3
Slope	13	0-10%	10-30%	>30%	1.3
Surface Water Factors-Run-off (46)					
Visible evidence of runoff discharging? (Yes/No)	5	If no, score of 0 for runoff section. If yes, score 5 and proceed with section.			5.0
Where does runoff terminate?	19	Other	Bench Setting	Drainage/Wetland	1.9
Has runoff caused visible erosion? (Yes/No)	22	Sheet	Rill	Gully	0.0
		If no, score as 0. If yes, calculate as appropriate.			
Surface Water Factors-Run-on (11)					
Structures adversely affecting run-on (Yes/No)	7*	If yes, score as 7. If no, score as 0.			0.0
Current operations adversely impacting (Yes/No)	4	If yes, score as 4. If no, score as 0.			0.0
Natural drainages onto site (Yes/No)	7*	If yes, score as 7. If no, score as 0.			7.0
**Select either structures or natural drainages.*					
MAX. POSSIBLE EROSION MATRIX SCORE:	**100**			**Total Score**	17.5

Report Printed 6/2/98 4:03:08 PM.

Los Alamos National Laboratory
SURFACE WATER
SITE ASSESSMENT

SITE INFORMATION

1a) PRS Number 49-001(d) **1b) Structure Number** 49-23 **1c) FMU Number** 81

2. Date/Time (M/D/Y H:M am/pm) 2/26/98

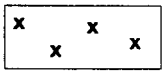
SITE SETTING (check all that apply)

3. ◉ **On mesa top (a).** ○ **In the canyon floor, but not in an established channel (c).**

○ **Within a bench of a canyon (b).** ○ **Within established channel in the canyon floor (d).**

Explanation: Mesa top source, south of asphalt covered pad (Area 2B).

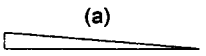
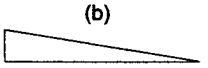
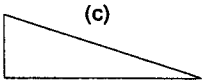
4. Estimated ground and/or canopy cover at site: (deciduous leaves, pine needles, rocks, vegetation, trees, structures, asphalt, etc.)

(illustration) (a)  (b) (c)

Estimated % of ground/canopy cover: ○ 0% to 25% ○ 25% to 75% ◉ 75% to 100%

Explanation: Heavy vegetation, ground saturated from upslope sheet flow run-on.

5. Steepest slope at the area impacted:

(a)  (b)  (c) 

◉ Less than 10% ○ 10% to 30% ○ 30% and greater

Explanation: Gentle slope from west to east.

RUNOFF FACTORS

Y / N

☑ ☐ **6. Is there visible evidence of runoff discharging from site? If yes, answer a) - c) below:**

☐ ☑ 6a) Is runoff channelized? If yes, describe: ○ Man-made channel. ○ Natural channel.

Explanation: Sheet flow to east to access road.

RUNOFF FACTORS, CONT'D

6b) Where does evidence of runoff terminate?

- ○ **Drainage or wetland (name)**
- ○ **Within bench of canyon setting (name)**
- ◉ **Other (i.e., retention pond, meadow, mesa top)** Roadway ditch

Explanation: Sheet flow stops at roadway.

Y / N

☐ ☑ 6c) Has runoff caused visible erosion at the site? If yes, explain below: ○ Sheet ○ Rill ○ Gully

Explanation: Heavy vegetation throughout site.

RUN-ON FACTORS

Please rate the potential for storm water to run on to this site: (Check EITHER #7 or #9)

☐ ☑ **7.** Are structures (i.e., buildings, roof drains, parking lots, storm drains) creating run-on to the site?

Explanation:

☐ ☑ **8.** Are current operations (i.e., fire hydrants, NPDES outfalls) adversely impacting run-on to the site?

Explanation:

☑ ☐ **9.** Are natural drainage patterns directing stormwater onto site?

Explanation: From the west. Sheet flow run-on.

ASSESSMENT FINDING:

☐ ☑ **10. Based on the above criteria and the assessment of this site, does soil erosion potential exist? (REFER TO EROSION POTENTIAL MATRIX.)**

Steve Veenis

11. Signature of Water Quality/Hydrology Representative

SV Initials of independent reviewer.

Check here when information is entered in database: ☑

This page is for ESH-18 notes, recommendations, and photos.

	Y	N	
12. a)	○	◉	Is there visible trash/debris on the site?
b)	○	◉	Is there visible trash/debris in a watercourse?

Description of existing BMPs:

○	○	Are BMPs being properly maintained? If no, describe in "Other Internal Notes."
○	○	Are BMPs effectively keeping sediment in place and reducing erosion potential?

OTHER INTERNAL NOTES:

Los Alamos National Laboratory
Environmental Restoration Program
CONSTITUENT ASSESSMENT

LANL-ER-AP-4.5
Part A

SITE INFORMATION

1. PRS Number: 49-001(g)
2. Date (M/D/Y): 03/20/98 Time (am/pm): 1:45:00 PM
3. ER Point of Contact: Dwain Farley
4. FMU/Responsible Party Contact: Ed Hoth
5. HSWA: Yes
6. Site Ranking System (SRS) #: 39
7. Description of the historical operations of this PRS:

Per the TA-49 RFI work plan, PRS 49-001(g) is contaminated surface soil at Material Disposal Area AB. MDA AB has six experimental areas at TA-49 where underground hydronuclear and related experiments were performed from late 1959 to mid 1961. The experiments were conducted in backfilled shafts that varied from 31 to 142 feet in depth. The experiments involved HE dispersal of significant quantities of U-235 and Pu-239 as well as lead, beryllium, and U-238 at the bottom of the shafts. Some surface releases of contamination resulted in designation of PRS 49-001(g)

8. Description of the current operations of this PRS (if any):

None.

PRS STATUS

9. Action/Status to Date (check all that apply)

Date Completed or Anticipated

- ☐ None
- ☐ Field Investigation ☒ Phase I ☐ Phase II
- ☐ Interim Measures ☐ IM ☐ BMP
- ☐ VCA ☐ VCM
- ☐ Other ☐ Monitoring ☐ CMS
- ☐ Report Status ☒ SAP ☒ RFI Report

IM:
BMPs:
SAP:
RFI RPTs:
SAP INFO:

☐ NFA/DOU If checked, supply HH NFA criteria number and date:

SAMPLE INFORMATION

○ Yes ◉ No **10. Have surface/sediment (depth less than 12 inches) samples been collected tha reflect current site conditions?**

If yes: 1) Attach data
2) Include analyte name, value, units, location ID, sample ID, SAL, depth, and media (soil, tuff, etc.)
3) Please attach existing map, showing where samples were taken, if available.

○ Yes ◉ No **11. Have surface water samples been collected that reflect current site conditions?**

If yes: 1) Attach data
2) Include analyte name, value, units, location ID, filtered/non-filtered, & flow data, if available.
3) Please attach existing map, showing where samples were taken, if available.

○ Yes ◉ No **12. Are data pending?**

If yes: 1) List date data are anticipated: _____
2) Provide list of COPCs identified in RFI Work Plan as an attachment.

Dwain Farley

13. Signature of ER Representative

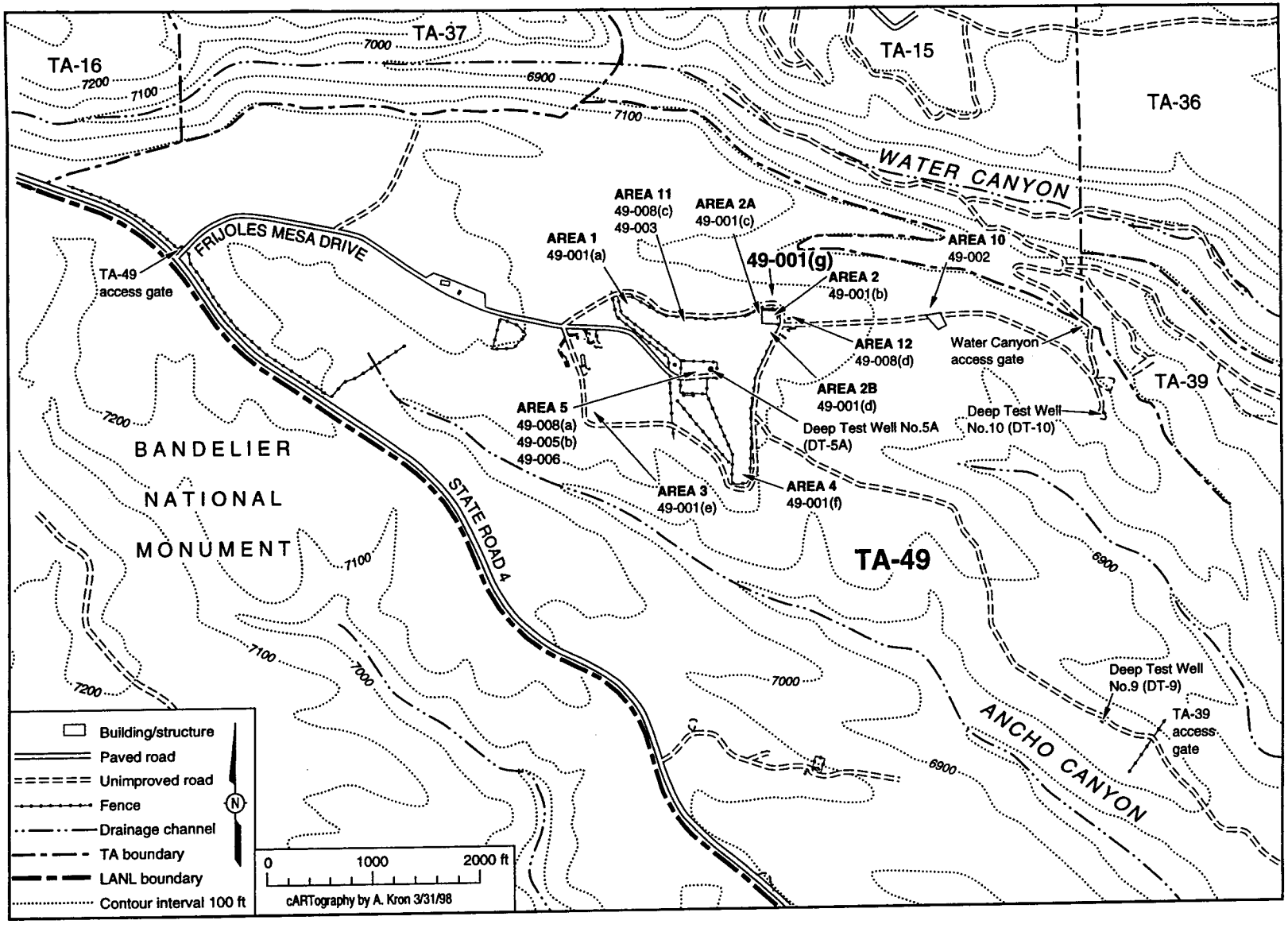


Figure 4. Location of PRS 49-001(g).

Los Alamos National Laboratory

Environment, Safety and Health Division
ESH-18 Water Quality and Hydrology Group

AP 4.5 Surface Water Assessment Erosion Matrix for PRS 49-001(g)

CRITERIA EVALUATED	Value	Erosion/Sediment Transport Potential Low 0.1	Medium 0.5	High 1.0	Calculated Score
Site Setting (43)					
On mesa top	1	Defined based on topographic setting			
Within bench of canyon	4				
Within the canyon floodplain but not watercourse	13				13.0
Within bottom of canyon channel in watercourse	17				
Estimated % ground and canopy cover	13	>75%	25-75%	<25%	6.5
Slope	13	0-10%	10-30%	>30%	6.5
Surface Water Factors-Run-off (46)					
Visible evidence of runoff discharging? (Yes/No)	5	If no, score of 0 for runoff section. If yes, score 5 and proceed with section.			5.0
Where does runoff terminate?	19	Other	Bench Setting	Drainage/Wetland	19.0
Has runoff caused visible erosion? (Yes/No)	22	Sheet	Rill	Gully	2.2
		If no, score as 0. If yes, calculate as appropriate.			
Surface Water Factors-Run-on (11)					
Structures adversely affecting run-on (Yes/No)	7*	If yes, score as 7. If no, score as 0.			7.0
Current operations adversely impacting (Yes/No)	4	If yes, score as 4. If no, score as 0.			0.0
Natural drainages onto site (Yes/No)	7*	If yes, score as 7. If no, score as 0.			0.0
**Select either structures or natural drainages.*					
MAX. POSSIBLE EROSION MATRIX SCORE:	**100**			**Total Score**	59.2

Report Printed 6/2/98 4:07:50 PM.

Los Alamos National Laboratory
SURFACE WATER
SITE ASSESSMENT

SITE INFORMATION

1a) PRS Number 49-001(g) **1b) Structure Number** 49-23 **1c) FMU Number** 81

2. Date/Time (M/D/Y H:M am/pm) 2/26/98

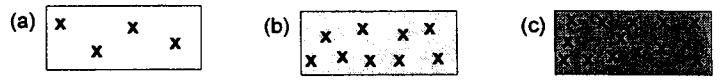
SITE SETTING (check all that apply)

3.
- ○ **On mesa top (a).**
- ◉ **In the canyon floor, but not in an established channel (c).**
- ◉ **Within a bench of a canyon (b).**
- ○ **Within established channel in the canyon floor (d).**

Explanation: Drainage swale and adjacent banks discharge directly towards tributary of Water Canyon.

4. Estimated ground and/or canopy cover at site: (deciduous leaves, pine needles, rocks, vegetation, trees, structures, asphalt, etc.)

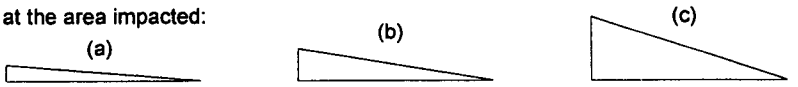
(illustration)



Estimated % of ground/canopy cover: ○ 0% to 25% ◉ 25% to 75% ○ 75% to 100%

Explanation: Mixed vegetation and exposed tuff within channel.

5. Steepest slope at the area impacted:



○ Less than 10% ◉ 10% to 30% ○ 30% and greater

Explanation: Moderate to steep slope from south to north.

RUNOFF FACTORS

Y / N

☑ ☐ **6. Is there visible evidence of runoff discharging from site? If yes, answer a) - c) below:**

☑ ☐ 6a) Is runoff channelized? If yes, describe: ○ Man-made channel. ◉ Natural channel.

Explanation: Swale dissipates +/- 100 feet above canyon rim.

RUNOFF FACTORS, CONT'D

6b) Where does evidence of runoff terminate?

- (●) **Drainage or wetland (name)** Water Canyon
- ( ) **Within bench of canyon setting (name)** Swale dissipates flow
- ( ) **Other (i.e., retention pond, meadow, mesa top)**

Explanation: No evidence that flows reach canyon but slope indicates that heavy rains probably would sheet flow into canyon.

Y / N

☑ ☐ 6c) Has runoff caused visible erosion at the site? If yes, explain below: (●) Sheet ( ) Rill ( ) Gully

Explanation: Minor evidence of sediment transport (I.e., sediment traps) within drainage swale. No rill or gully erosion observed.

RUN-ON FACTORS

Please rate the potential for storm water to run on to this site: (Check EITHER #7 or #9)

☑ ☐ **7.** Are structures (i.e., buildings, roof drains, parking lots, storm drains) creating run-on to the site?

Explanation: Run-on from roadway plus PRS 49-001 (b & c).

☐ ☑ **8.** Are current operations (i.e., fire hydrants, NPDES outfalls) adversely impacting run-on to the site?

Explanation:

☐ ☑ **9.** Are natural drainage patterns directing stormwater onto site?

Explanation:

ASSESSMENT FINDING:

☑ ☐ **10. Based on the above criteria and the assessment of this site, does soil erosion potential exist? (REFER TO EROSION POTENTIAL MATRIX.)**

Steve Veenis

11. Signature of Water Quality/Hydrology Representative

SV Initials of independent reviewer.

Check here when information is entered in database: ☑

This page is for ESH-18 notes, recommendations, and photos.

	Y	N	
12. a)	○	◉	Is there visible trash/debris on the site?
b)	○	◉	Is there visible trash/debris in a watercourse?

Description of existing BMPs:

○	○	Are BMPs being properly maintained? If no, describe in "Other Internal Notes."
○	○	Are BMPs effectively keeping sediment in place and reducing erosion potential?

OTHER INTERNAL NOTES:

Flow dissipation and/or sediment/erosion controls needed.

Los Alamos National Laboratory
Environmental Restoration Program
CONSTITUENT ASSESSMENT

LANL-ER-AP-4.5
Part A

SITE INFORMATION

1. PRS Number: 49-003 **2. Date (M/D/Y):** 03/20/98 **Time (am/pm):** 1:50:00 PM

3. ER Point of Contact Dwain Farley **4. FMU/Responsible Party Contact** Ed Hoth

5. HSWA Yes **6. Site Ranking System (SRS) #** 38

7. Description of the historical operations of this PRS:

Per the TA-49 RFI work plan, PRS 49-003 is a leachfield located in Area 11 within the Radiochemistry and Small-Scale Shot Area. Significant laboratory used of Area 11 was limited to activities related to the hydronuclear program at TA-49 from 1959 to 1961. Area 11 activities consisted of limited radiochemistry operations and small-scale containment experiments involving HE detonations in shallow (12 feet deep) shafts. PRS 49-003 includes a subsurface leachfield and associated piping connected to building TA-49-15, which contained hoods and sinks for performing radiochemical operations.

8. Description of the current operations of this PRS (if any):

TA-49-15 was decontaminated and demolished in 1971, although the leachfield and piping were left in place. No activities are currently conducted at PRS 49-003.

PRS STATUS

9. Action/Status to Date (check all that apply)

		Date Completed or Anticipated
☐ None		
☐ Field Investigation ☒ Phase I ☐ Phase II		
☐ Interim Measures ☐ IM ☐ BMP	IM:	
	BMPs:	
☐ VCA ☐ VCM		
☐ Other ☐ Monitoring ☐ CMS		
☐ Report Status ☒ SAP ☒ RFI Report	SAP: / RFI RPTs:	08/25/97
SAP INFO:		
☐ NFA/DOU If checked, supply HH NFA criteria number and date:	5	08/25/97

SAMPLE INFORMATION

○ Yes ◉ No **10. Have surface/sediment (depth less than 12 inches) samples been collected tha reflect current site conditions?**

If yes: 1) Attach data
2) Include analyte name, value, units, location ID, sample ID, SAL, depth, and media (soil, tuff, etc.)
3) Please attach existing map, showing where samples were taken, if available.

○ Yes ◉ No **11. Have surface water samples been collected that reflect current site conditions?**

If yes: 1) Attach data
2) Include analyte name, value, units, location ID, filtered/non-filtered, & flow data, if available.
3) Please attach existing map, showing where samples were taken, if available.

○ Yes ◉ No **12. Are data pending?**

If yes: 1) List date data are anticipated: _____
2) Provide list of COPCs identified in RFI Work Plan as an attachment.

Dwain Farley

13. Signature of ER Representative

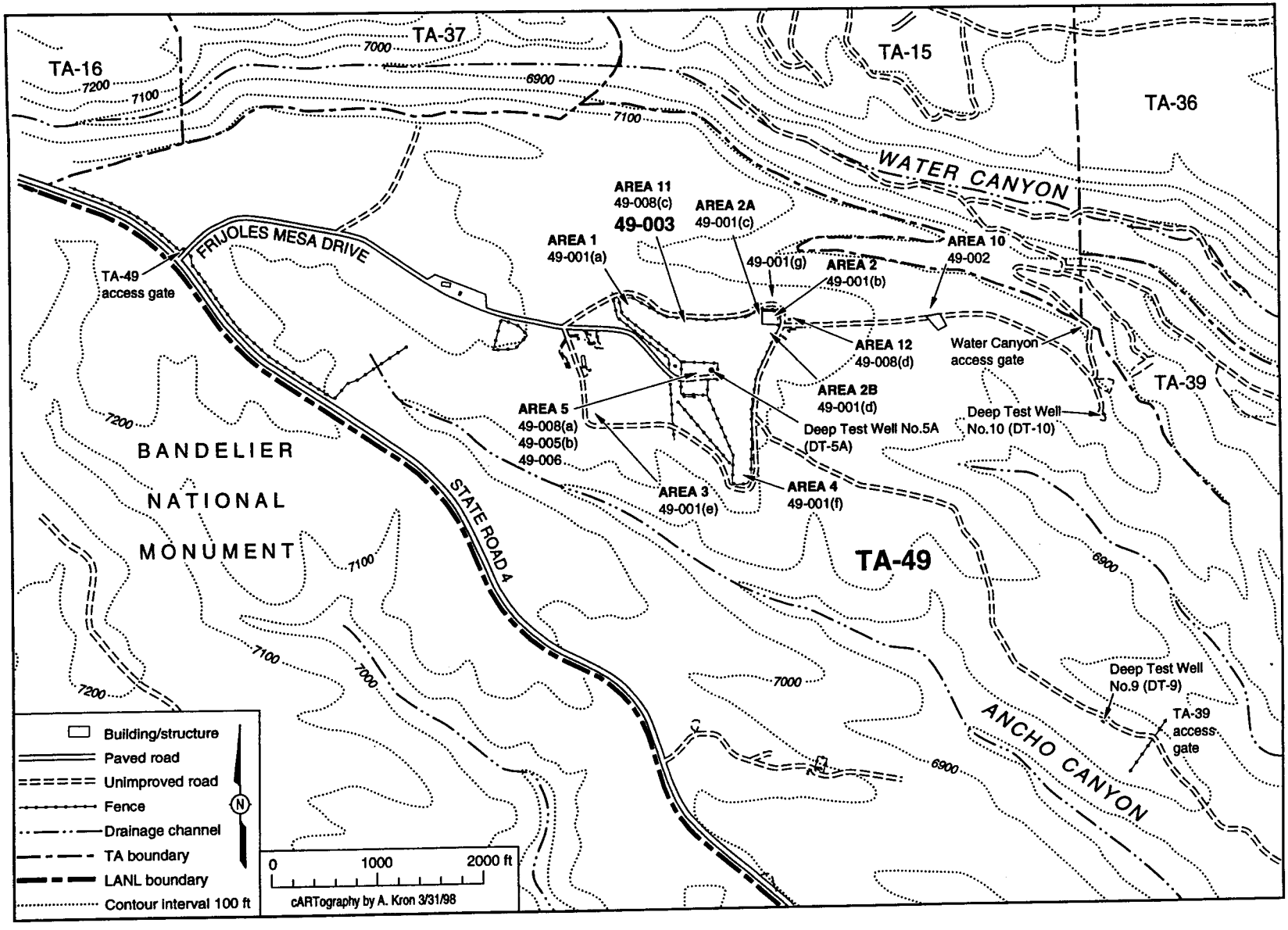


Figure 5. Location of PRS 49-003.

Los Alamos National Laboratory

Environment, Safety & Health Division
ESH-18 Water Quality & Hydrology Group

Surface Water Assessment Erosion Matrix for PRS 49-003

CRITERIA EVALUATED	Value	Erosion/Sediment Transport Potential Low 0.1	Medium 0.5	High 1.0	Calculated Score
Site Setting (43)					
On mesa top	1	Defined based on topographic setting			1.0
Within bench of canyon	4				
Within the canyon floodplain but not watercourse	13				
Within bottom of canyon channel in watercourse	17				
Estimated % ground and canopy cover	13	>75%	25-75%	<25%	1.3
Slope	13	0-10%	10-30%	>30%	1.3
Surface Water Factors-Run-off (46)					
Visible evidence of runoff discharging? (Yes/No)	5	If no, score of 0 for runoff section. If yes, score 5 and proceed with section.			5.0
Where does runoff terminate?	19	Other	Bench Setting	Drainage/Wetland	19.0
Has runoff caused visible erosion? (Yes/No)	22	Sheet	Rill	Gully	2.2
		If no, score as 0. If yes, calculate as appropriate.			
Surface Water Factors-Run-on (11)					
Structures adversely affecting run-on (Yes/No)	7*	If yes, score as 7. If no, score as 0.			0.0
Current operations adversely impacting (Yes/No)	4	If yes, score as 4. If no, score as 0.			0.0
Natural drainages onto site (Yes/No)	7*	If yes, score as 7. If no, score as 0.			7.0
**Select either structures or natural drainages.*					
MAX. POSSIBLE EROSION MATRIX SCORE:	**100**			**Total Score**	36.8

REVISED PART B

Report Printed 5/11/99 12:17:28 PM.

Los Alamos National Laboratory
SURFACE WATER
SITE ASSESSMENT

Revised Part B. Please discard previous.

SITE INFORMATION

1a) PRS Number 49-003 **1b) Structure Number** **1c) FMU Number** 81

2. Date/Time (M/D/Y H:M am/pm) 8/3/98

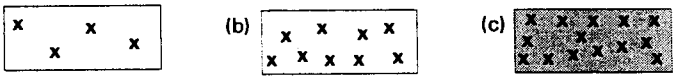
SITE SETTING (check all that apply)

3.
- (●) **On mesa top (a).**
- ( ) **Within a bench of a canyon (b).**
- ( ) **In the canyon floor, but not in an established channel (c).**
- ( ) **Within established channel in the canyon floor (d).**

Explanation: Inactive septic leach field, located on mesa top within a grassy meadow.

4. Estimated ground and/or canopy cover at site: (deciduous leaves, pine needles, rocks, vegetation, trees, structures, asphalt, etc.)

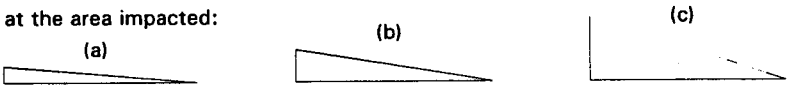
(illustration)



Estimated % of ground/canopy cover:
- ( ) 0% to 25%
- ( ) 25% to 75
- (●) 75% to 100

Explanation: Grasses and weeds with sparse pinon pine trees.

5. Steepest slope at the area impacted:



- (●) Less than 10%
- ( ) 10% to 30%
- ( ) 30% and greater

Explanation: Generally flat, gently sloping to the north.

RUNOFF FACTORS

Y / N

☑ ☐ **6. Is there visible evidence of runoff discharging from site? If yes, answer a) - c) below:**

☐ ☑ 6a) Is runoff channelized? If yes, describe ( ) Man-made channel. (●) Natural channel.

Explanation: Sheet flow evidence, primarily on access road which is nearby. The leach field itself has minimal evidence of runoff.

RUNOFF FACTORS, CONT'D

6b) Where does evidence of runoff terminate?

- (●) **Drainage or wetland (name)** Water Canyon
- ( ) **Within bench of canyon setting (name)** Channel drainage
- ( ) **Other (i.e., retention pond, meadow, mesa top)**

Explanation: Sheet runoff from the vicinity enters into the run-on diversion channel installed 300-400 yards north of the site for PRS 49-001. The actual impact from 49-003 is suspect.

Y / N

☑ ☐ 6c) Has runoff caused visible erosion at the site? If yes, explain below (●) Sheet ( ) Rill ( ) Gully

Explanation: Minimal sediment transport evidence found. Mostly near access road that is near site. The actual PRS boundary has little or no visible erosion.

RUN-ON FACTORS

Please rate the potential for storm water to run on to this site: (Check EITHER #7 or #9)

☐ ☑ **7.** Are structures (i.e., buildings, roof drains, parking lots, storm drains) creating run-on to the site?

Explanation: No structures are near site.

☐ ☑ **8.** Are current operations (i.e., fire hydrants, NPDES outfalls) adversely impacting run-on to the site?

Explanation:

☑ ☐ **9.** Are natural drainage patterns directing stormwater onto site?

Explanation: Upslope vegetated meadow.

ASSESSMENT FINDING:

☐ ☑ **10. Based on the above criteria and the assessment of this site, does soil erosion potential exist? (REFER TO EROSION POTENTIAL MATRIX.)**

S. Veenis

11. Signature of Water Quality/Hydrology Representative

SW Initials of independent reviewer.

Check here when information is entered in database: ☑

This page is for ESH-18 notes, recommendations, and photos.

	Y	N	
12. a)	○	●	Is there visible trash/debris on the site?
b)	○	●	Is there visible trash/debris in a watercourse?

Description of existing BMPs:

○	○	Are BMPs being properly maintained? If no, describe in "Other Internal Notes."
○	○	Are BMPs effectively keeping sediment in place and reducing erosion potential?

OTHER INTERNAL NOTES:

Original assessment performed on 2/26/98 was performed outside the fenced area without knowledge of the actual PRS boundary. Upon further review, the PRS boundary was determined to be a small 30'x40' septic leach field located in the center of a heaviliy vegetated meadow. This updated score reflects the new information obtained from a field visit performed on 8/3/98.

Attachment 2

Contingencies for Reducing Soil Moisture Content

1.0 INTRODUCTION

The contingencies described in this document are supplemental measures that can be taken if needed to control soil moisture content at Los Alamos National Laboratory's (Laboratory's) Potential Release Sites (PRSs) 49-001(b, c, d, and g). These measures can be implemented if future moisture contents are found to progressively increase despite the interim measures that are currently being implemented to reduce moisture levels. PRSs 49-001(b, c, d, and g) are located in the Laboratory's Technical Area (TA) 49 and include Areas 2, 2A, and 2B of Material Disposal Area (MDA) AB. These areas are collectively known as the asphalt pad site, and their locations are shown in Figure 1-1.

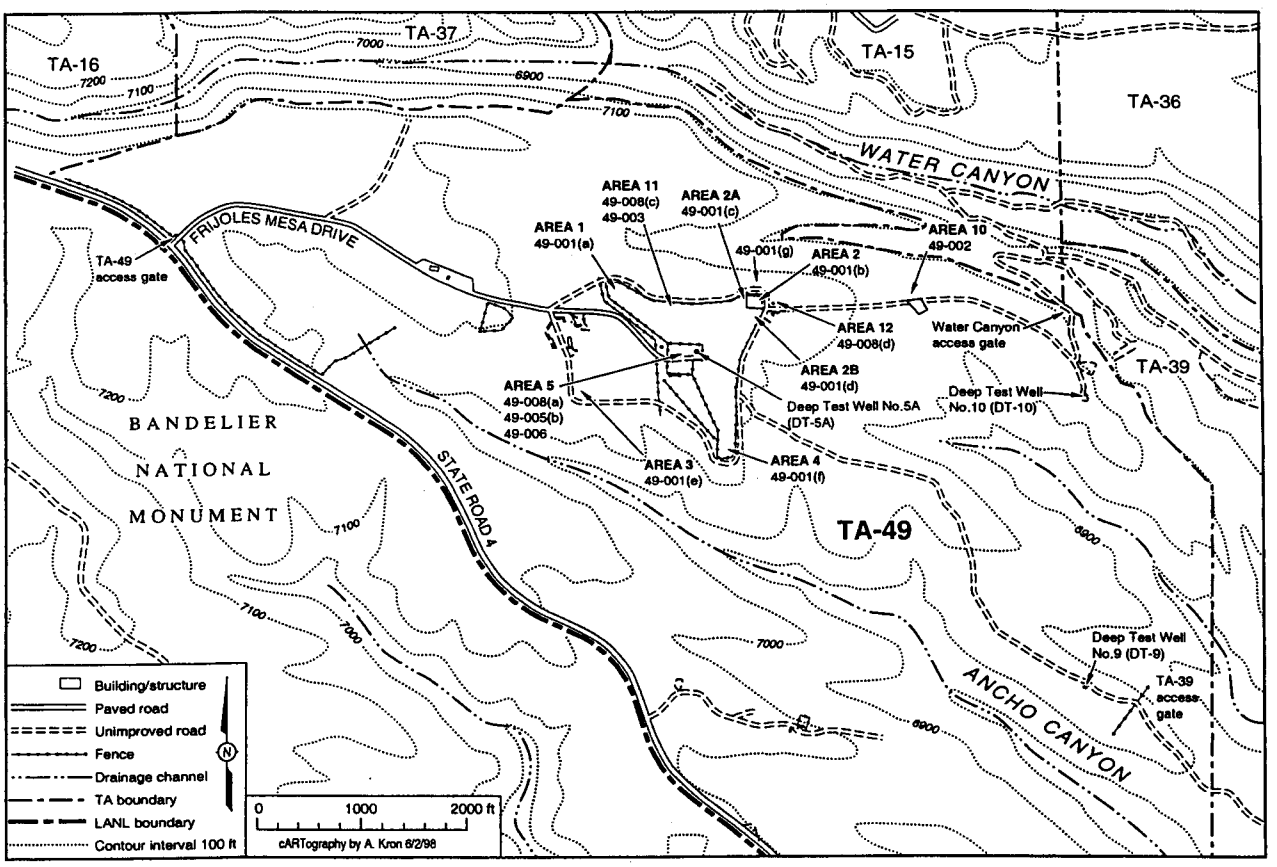


Figure 1-1. Map of TA-49.

Stabilization measures intended to induce a long-term reduction in moisture content at the site are currently being implemented and are described in this document. The stabilization measures include diverting surface water run-on before it reaches the site, removing the asphalt pad to enhance soil moisture evaporation, regrading the site to improve drainage by eliminating surface ponding, and revegetating the site with shallow-rooting grasses to enhance evapotranspiration. The stabilization measures will restore the site to more natural conditions, and over a period of years, the moisture content of the near-surface soil and fill materials is expected to drop. However, in the unlikely event that climatic conditions result in a series of years with high recharge and low evaporation, temporary increases in soil moisture may possibly be observed. The following paragraphs describe the soil moisture monitoring program that will be used to determine the effectiveness of the best management practices, introduce the

decision methodology, and provide preliminary action alternatives in the event that a significant, progressive increase in soil moisture content occurs.

This document has been prepared in response to a request by the Hazardous and Radioactive Materials Bureau of the New Mexico Environment Department (NMED).

2.0 SOIL MOISTURE MONITORING PROGRAM

The moisture monitoring program described in Section 6.0 of this document will be supplemented as described below to obtain the information necessary to determine the need for implementing contingency actions. The current plan calls for quarterly monitoring to total depth of two existing boreholes penetrating the asphalt pad (49-2906 and 49-2907) and eight additional existing holes located off the pad (TH-1 through TH-5 and 2A-O, 2A-Y, and 2B-Y). The supplemental program calls for monthly monitoring to a depth of 3 feet beneath the soil/tuff contact in the two existing boreholes penetrating the asphalt pad (49-2906 and 49-2907), in the two existing off-pad test holes TH-1 and TH-3, and in one additional new hole on the pad. Monthly monitoring will be conducted to nominal depths of about 10 feet beneath the present ground surface for the three boreholes on the pad and to about 7 feet for the two boreholes off the pad. The locations and total depths of these holes are shown in Figure 2-1.

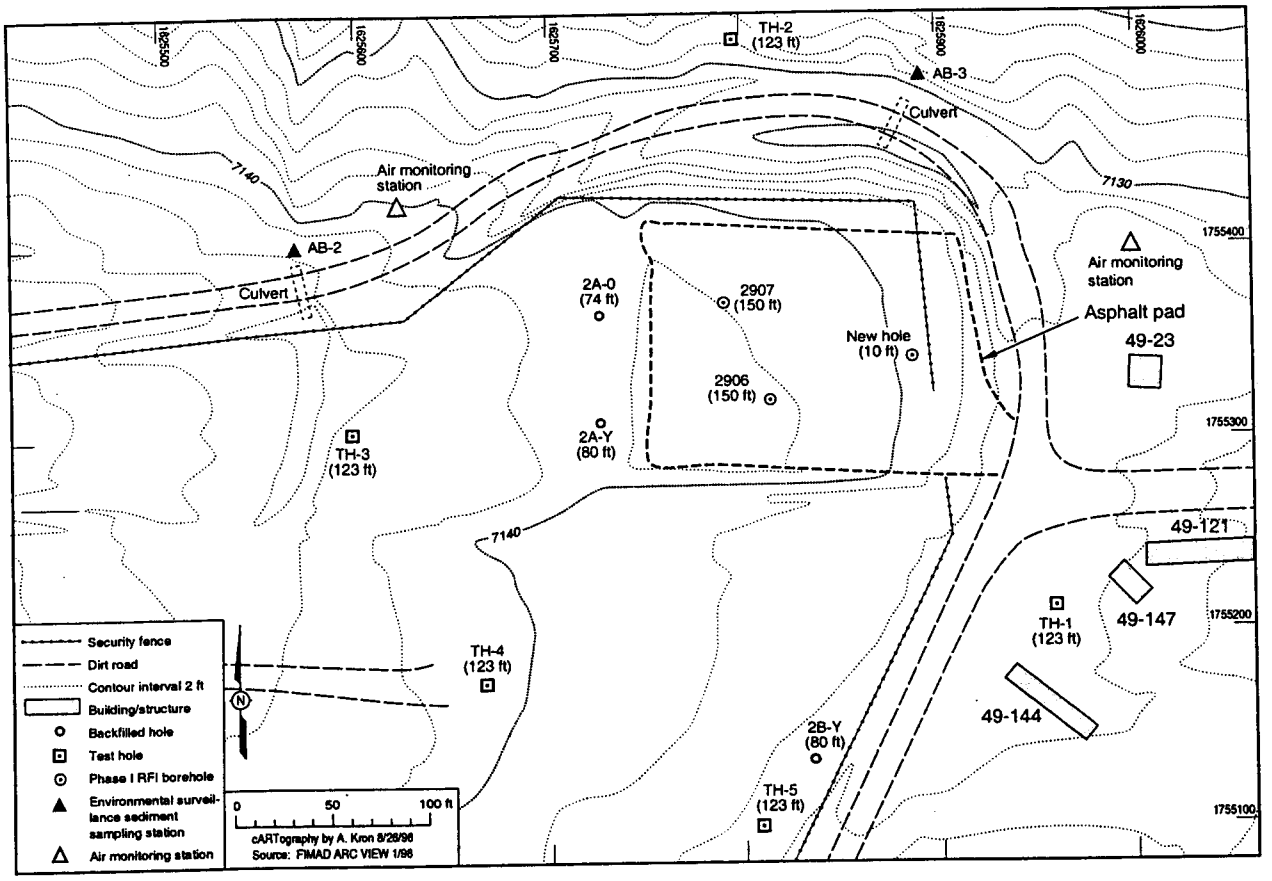


Figure 2-1. Monitoring hole locations at Area 2.

The new hole (designation to be determined) will be located approximately 20 feet east of Shaft 2-O and 10 feet inside the current site fence. It will be installed to a depth of about 4 feet beneath the soil/tuff contact, which is estimated to be about 10 feet beneath the present ground surface. The new hole will be installed at the time the site stabilization measures are implemented. Installation will proceed cautiously and although not expected, if elevated radiation levels are encountered the hole may be moved to another location. The hole will be completed with a sealed PVC casing in tight contact with the borehole wall. This design will provide a durable installation with no annular space for vertical water movement.

Of the three monitoring holes on the pad, hole 49-2907 is located in the northwestern, upgradient part of the pad, hole 49-2906 is located in the south-central part of the pad, and the new hole is located in the east-central, downgradient part of the pad. Holes 49-2906 and 49-2907 are located approximately 25 feet from the nearest shafts where no concrete caps are believed to be present and may therefore be in areas of better vertical drainage where the moisture content of the fill materials beneath the asphalt is lower. The new hole is located downgradient of shaft 2-O where standing water was found above a concrete cap at a depth of 24 inches during RFI sampling in April 1998. The concrete cap may impede vertical drainage, and the new hole may be in an area where the moisture content of the fill materials is higher. These three holes are appropriate for conservatively determining representative average conditions because less than a third of the pad is believed to be underlain by concrete caps. The moisture content of the native soil underlying the fill materials and concrete caps is expected to be elevated throughout the pad.

Because of their geographic spread, their locations relative to known concrete shaft caps, and their upgradient, central, and downgradient sites on the pad, the three monitoring holes on the pad are expected to provide adequate information on the range of moisture conditions in the fill materials, native soils, and soil/tuff contact zone beneath the pad. Monitoring is not planned for holes into test shafts beneath the pad because of the potential for encountering contamination and because moisture measurements in the shaft sand backfill would not provide information typical of the surrounding soils. Monitoring through direct measurement of standing water levels in shallow wells in the fill material above concrete caps is also not planned because the open wells may provide a pathway for enhanced vertical moisture migration, the appropriate well depth in a perched water zone of varying thickness over time would be difficult to determine, and the masking effects of slow flow transients in the clayey fill would be difficult to assess.

The two TH holes that will be monitored are located off the pad in areas where more natural mesa-top moisture conditions prevail. Information from these holes will provide a basis for comparing changes in moisture conditions at the pad with changes in natural soil moisture to help evaluate the effects of the pad fill materials on soil moisture conditions. Hole TH-3 is located upgradient and hole TH-1 is located downgradient of the pad.

The moisture monitoring will be conducted using a calibrated neutron probe. Neutron probes have been extensively studied by the Laboratory and have been found to be effective tools for measuring soil moisture content at Los Alamos (Nyhan et al. 1994, 44015). Radioactive constituents in the fill, soil, and tuff around the existing monitoring holes are within the background range and will not interfere with the probe measurements. Measurements will be taken according to the following specifications.

- Volumetric field moisture measurements of the fill, soil, and tuff material around each borehole will be taken every foot to a depth of three feet beneath the soil/tuff contact.
- Measurements will be made in a manner that allows quantitative comparison to volumetric moisture content data previously obtained from holes at the site.
- Field logs will be maintained documenting each monitoring round.
- An annual monitoring report will be prepared describing the results of each monitoring round, interpreting the results, and documenting any identified trends.

Monitoring to support contingency decisions will be conducted on a monthly basis for at least the first two years following completion of the stabilization measures to provide a comprehensive database that can be analyzed for seasonal trends. A two-year base period has been selected for supporting contingency decisions to defray the potential of reacting to false positives. Limited historical data collected by the Laboratory on percolation of surface runoff into the soil indicates that although climatic conditions may favor substantial percolation in a given year (Wilcox et al. 1997, 57577), the likelihood that such conditions will persist for two years in a row is small. Additionally, the significant 1200-foot depth to groundwater at the site would substantially attenuate short-term pulses in near-surface moisture supply, and minimal incremental risk would be associated with one or two years of high moisture conditions in the fill and underlying soil. Seasonal variations in moisture level are anticipated, such that two full years of data are expected to be necessary to identify differences between seasonal variability and actual long-term changes in moisture content. Although the supplemental monitoring program will be continued until a final corrective measure is completed at the site, after the first two years, the program will be reviewed and modified as appropriate.

In addition to the monthly measurements, additional measurements may be taken to investigate the effects of selected storm events and rainfall patterns to obtain a better understanding of those climatic events that affect storm water percolation and consequent changes in soil moisture content. To facilitate efficient implementation of the monitoring program as well as the rapid response of monitoring personnel to specific storm events, a dedicated neutron probe is planned to be acquired and maintained at TA-49. This would eliminate delays related to transporting the neutron source over public highways.

Moisture measurements have historically been taken in the asphalt pad monitoring holes on an occasional basis and baseline measurements were made in all holes in July 1998 before removing the asphalt. Routine monthly monitoring will start upon completion of the stabilization measures and is expected to begin in 1999.

3.0 CRITERIA FOR IMPLEMENTING CONTINGENCY ACTIONS

Contingency actions will be implemented if a progressive, significant increase in moisture content is observed in the fill materials and underlying soil at the pad. A *significant increase* will be determined on the basis of projected risk. Significant moisture content is defined as the amount that would result in a projected human health risk by way of the groundwater pathway above 1 x 10-6 within 1000 years. This determination is nominally expected to be made after two years of monitoring data are collected and is expected to be based on average moisture trends in the three monitored wells on the pad. However, if significant increases in moisture content are observed after the first year of monitoring that are not related to short-term causes such as unusual climatic conditions, the determination to implement contingency actions may be made earlier.

Linking contingency action implementation to health risk provides a rational, quantitative basis for evaluating the significance of any moisture increases that are observed. It would not be appropriate to expend resources on additional site stabilization if an increase in moisture content had only negligible consequences. Because the determination to implement contingency actions involves an analysis of the consequences of increased moisture content, it will necessarily be based on model predictions of contaminant mobilization and transport. The model will be based on site-specific data and will be available for use in the fall of 1999. This schedule will provide timely model availability and the associated implementation trigger values for the consequence analysis when the first year of monitoring data will have been collected.

Because the site information and monitoring database available at the time the consequence analysis would be conducted will be more comprehensive than what is available today, it would be premature to define in detail the methods and approach that would be used in the consequence analysis. In addition,

the Laboratory's MDA core document, currently under development, will provide a comprehensive approach to addressing corrective measures at MDAs. It is expected that information on the extent, rate, and significance of contaminant migration in the vadose zone beneath the site will be available from

- monitoring in Phase II RFI slant boreholes planned to be drilled beneath the asphalt pad site in fiscal year 1999 (LANL 1992, 7670, Section 7.6.6),
- modeling studies of the rates of contaminant migration, and
- an assessment of the associated risk.

If the increase in moisture content is found to be significant in terms of the human health risk criterion described above, the next step would be to determine the appropriate contingency actions. If the increase in moisture content is not found to potentially cause this criterion to be exceeded, no contingency action would be required.

4.0 ALTERNATIVE CONTINGENCY ACTIONS

Three alternative classes of contingency actions are described in the following subsections. They consist of

- implementing in whole or in part the final corrective measures to be developed for the site through the corrective measures study (CMS) process,
- implementing temporary measures designed to address infiltration from direct precipitation on the site, or
- implementing temporary measures designed to address surface run-on and subsurface interflow entering the site.

The appropriate contingency actions would be implemented if the foregoing consequence analysis indicates that the observed increase in moisture content may significantly reduce the ability of the site to isolate the waste. The actual contingency actions that would be implemented will be selected at the time that the need for such actions is determined. Because knowledge of site conditions and available remedial techniques is expected to increase over the two or more year period before the need for contingency actions is determined, measures designed today would not be expected to be as effective as those designed at a later date.

Selection of the appropriate contingency action will depend on the source of the excess moisture identified at the site. If contingency action is required, analysis of moisture levels will focus on the horizons where moisture peaks have typically been observed beneath the asphalt. As shown in Figure 4-1, these are in the fill materials directly beneath the asphalt and in the native soils underlying those fill materials. The three potential findings are significant increases in moisture levels in the upper horizon, in the lower horizon, or in both horizons.

Because the upper horizon of fill materials is higher than the local ground surface, a finding of significant increases in moisture levels in that horizon could only result from increases in the net infiltration of direct precipitation on the site. One alternative contingency action must therefore address control of direct precipitation. Increases in moisture levels in the lower horizon could result from three principal sources:

- increases in downward migration of moisture from the overlying fill materials,
- increases in surface water run-on originating in the upgradient area between the existing surface water diversion channel and the pad, and
- increases in potential subsurface interflow onto the site beneath the existing surface water diversion channel.

These sources are illustrated in Figures 4-1 and 4-2. Additional alternative contingency actions must therefore address control of potential interflow and supplemental surface run-on.

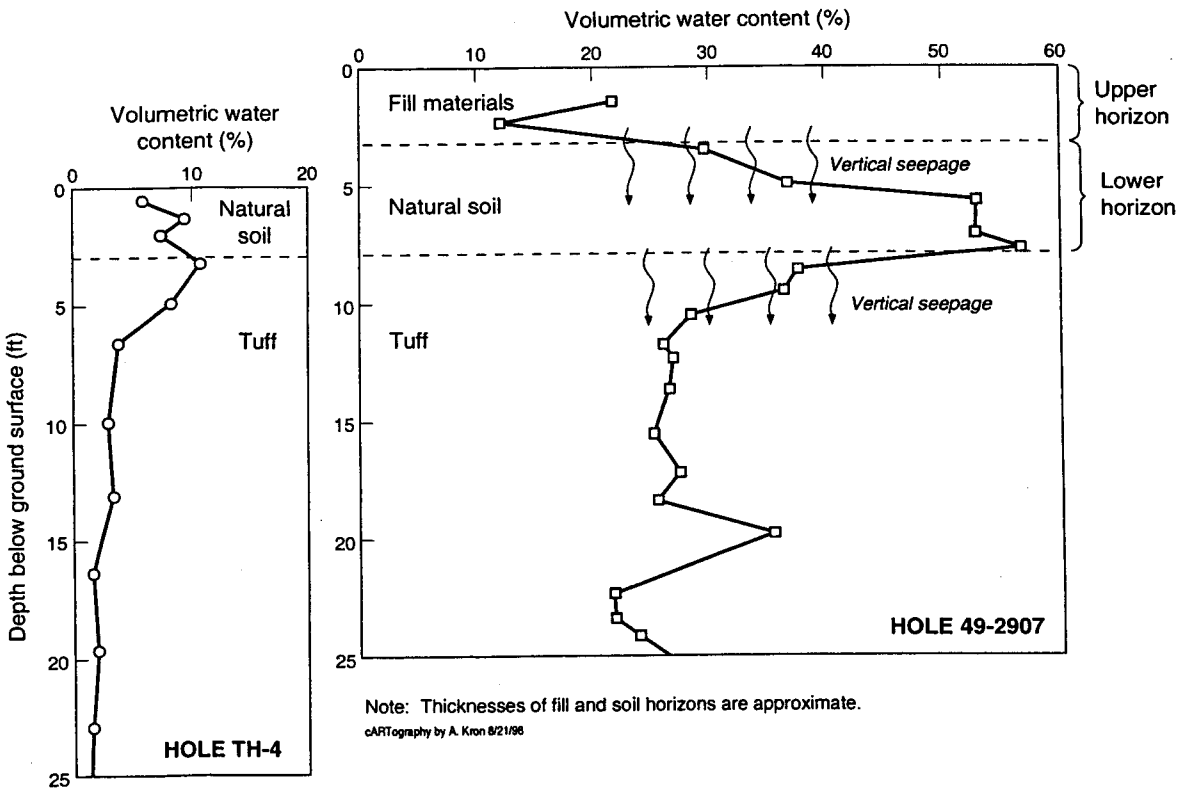


Figure 4-1. **Upper and lower horizons for soil moisture monitoring.**

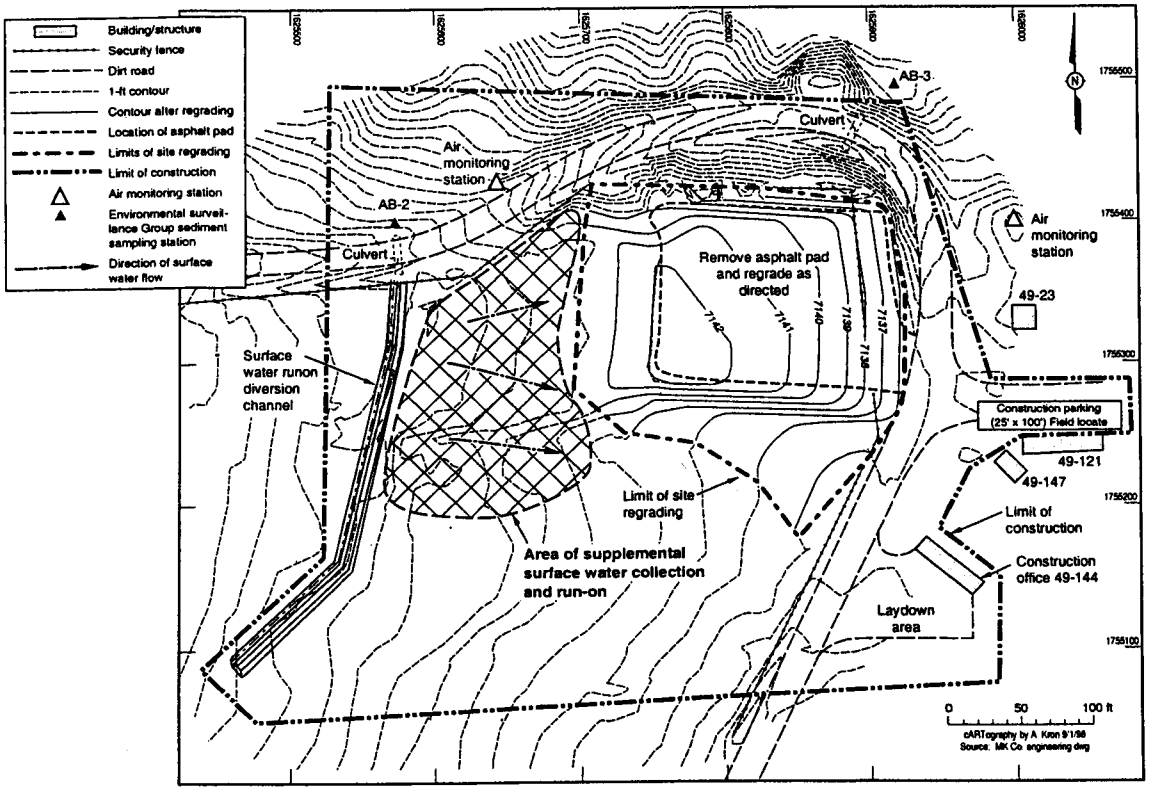


Figure 4-2. **Approximate area of supplemental surface water collection and run-on.**

The following alternative contingency actions are intended to provide examples of effective steps that might be taken but are not necessarily descriptive of the actual contingency actions that would be implemented.

4.1 Implement Full Final Corrective Measure

The first alternative contingency action is to implement the full final corrective measure for stabilizing Areas 2, 2A, and 2B. Selection of this alternative would address all additional sources of moisture at the site. It would have the advantage of avoiding additional expenditure of funds on interim stabilization measures but has the disadvantage of likely being more costly and requiring additional design time. Because of the magnitude of the source term and the importance of the site, the final corrective measure would be designed to meet performance criteria developed to help ensure adequate isolation of the source term for the necessary duration of time. It is anticipated that these criteria will be developed by the Laboratory in conjunction with NMED.

A decision to implement the final corrective measure as the contingency action will depend on the timing of the planned corrective measure implementation (CMI), when the need for contingency action is determined, the urgency of the contingency action, and the availability of funding. If implementation of the final corrective measure has been planned for a later date, consideration could be given to expediting completion of the CMS/CMI process. If expediting implementation of the full final corrective measure is not feasible, then staged implementation of the final measure or implementation of a temporary corrective action could be considered.

4.2 Implement Control of Direct Precipitation

Controlling direct precipitation on the site would address moisture increases in the upper horizon as well as increases in vertical seepage from the upper to the lower horizon (Figure 4-1). One method for temporarily controlling direct precipitation on the site would be to construct a structure over the site that would shed all direct precipitation until the final corrective measure is implemented. Alternatively, if the final corrective measure involves an engineered cover, direct precipitation on the site could be controlled by construction of that cover. Either approach could be used and illustrate that effective corrective actions to control direct precipitation, if needed, are feasible and readily available.

4.3 Implement Control of Supplemental Run-on

Although most surface water run-on is currently diverted by an upgradient channel, a small but possibly important volume of supplemental storm water run-on could occur from precipitation falling on the upgradient area between the site and the diversion channel. This area is shown in Figure 4-2. Because of differences in elevation, supplemental run-on could only contribute to increases in moisture content in the lower horizon shown in Figure 4-1. Although most of this supplemental run-on will flow around the site as a result of the regrading that will be performed as an interim measure, some will percolate into the ground and could add to any subsurface interflow that originates upgradient of the diversion channel. One method for temporarily diverting the supplemental surface water run-on would be to construct a second, smaller diversion channel near the limit of the regraded area. If needed, seepage from the bottom of both diversion channels and potential accretions to subsurface interflow could be reduced by the addition of low permeability layers in the bottoms of the channels. Although excavation of a second diversion channel may not be the actual remedy selected to control supplemental run-on, it illustrates that effective corrective actions to control supplemental run-on, if needed, are feasible and readily available.

4.4 Implement Control of Interflow

Subsurface interflow is the last potentially significant contributor to moisture buildup beneath the site. As with supplemental run-on, because of differences in elevation, interflow could only contribute to increases in moisture content in the lower horizon shown in Figure 4-1. Contributions to interflow could occur from percolation of surface storm water at locations upgradient of either the existing storm water diversion channel or the smaller channel described in Section 4.3. One method for controlling potential interflow would be to construct a trench extending to the soil-tuff interface at an upgradient location that would intercept and divert interflow from the site. The closer this trench is to the site, the more interflow it would potentially intercept. If a temporary trench is needed, it could be colocated with the small diversion channel. Alternatively, potential interflow could be controlled by a low-permeability curtain installed from ground surface to competent tuff around the upgradient perimeter of the site. If an interflow interceptor trench is needed as part of the final corrective measure for the site, interflow could be controlled by constructing that trench. Although the foregoing examples may not include the actual remedy that may be selected to control interflow, these options illustrate that effective corrective actions to control interflow, if needed, are feasible and readily available.

5.0 ENHANCED POSTCONTINGENCY MONITORING AND MAINTENANCE

If contingency action is found to be required to address significant increases in moisture contents at the site, the adequacy of the presently planned supplemental monitoring program will be reviewed in light of the observed increases, and the need for modifications will be evaluated. Similarly, the adequacy of the presently planned maintenance program, described in Section 7.0 of this document, will also be evaluated and modified as needed. An increase in soil moisture content at the site that could potentially result in an unacceptable health risk would be viewed by the Laboratory as a serious issue that would require rapid correction and may also require enhanced site monitoring and maintenance.

6.0 REFERENCES

LANL (Los Alamos National Laboratory), May 1992. "RFI Work Plan for Operable Unit 1144," Los Alamos National Laboratory report LA-UR-92-900, Los Alamos, New Mexico. (LANL 1992, 7670)

Nyhan, J. W., J. L. Martinez, and G. J. Langhorst, October 1994. "Calibration of Neutron Moisture Gauges and their Ability to Spatially Determine Soil Water Content in Environmental Studies.," Los Alamos National Laboratory report LA-12831-MS, Los Alamos, New Mexico. (Nyhan et al. 1994, 44015)

Wilcox, B. P., B. D. Newman, D. Brandes, D. W. Davenport, and K. Reid, October 1997. "Runoff from a Semiarid Ponderosa Pine Hillslope in New Mexico," *Water Resources Research* 33 (10), pp. 2301–2314. (Wilcox et al. 1997, 57577)

Attachment 3

Monitoring Well and Borehole Abandonment Plan

Selected monitoring wells at Material Disposal Area AB located at Los Alamos National Laboratory Technical Area 49 may require abandonment and plugging during implementation of stabilization activities designed to improve subsurface moisture conditions in Areas 2, 2A, and 2B. At the time this plan was prepared, only Core Hole 2 were scheduled for abandonment. However, any wells that are abandoned will be abandoned and plugged in accordance with State of New Mexico Environment Department Ground Water Section Monitor Well Construction and Abandonment Guidelines (Ground Water Section, August 15, 1992) and Standard Operating Procedure 5.03, R0, Monitor Well and RFI Borehole Abandonment.

Construction details of each monitoring well will be reviewed before abandonment by reviewing the Core Sample Log, Monitor Well Construction Field Data Log, and/or other applicable records. Each borehole and well will be sounded immediately before abandonment to ensure no obstructions exist in the well bore that could interfere with filling and sealing. All materials within each original borehole and well including, but not limited to, foreign obstructions, the well casing filter pack, and annular seal, should be removed, if possible. If the casing, filter pack, and annular seal materials cannot be removed from any monitoring well, they may be left in place. Casing left in place will be perforated or punctured to allow proper placement of the sealing materials.

Each borehole and well bore will then be filled with a sealing material by pumping the material under pressure through a tremie pipe from the bottom of the well to the top. Cement grout used as a sealing material will have a mixture of 2 to 5 percent bentonite added. The cement/bentonite grout will be thoroughly mixed mechanically in a grout mixer/pump before pumping into the boring or well bore.

Sealing material will be placed in one continuous operation (or *pour*) from the bottom to the top of the well. Whenever work is interrupted by such events as overnight shutdown, poor weather, or other delays, the well opening will be covered at the surface to prevent the entry of foreign material, water, and pollutants. The cover will be held in place or weighted down in such a manner that it cannot be easily removed, except by equipment or tools.

All field work and comments will be recorded in a field logbook and a memorandum to file describing the results of the abandonment. At a minimum, the depth from the surface to the bottom of the borehole, type of cement, amount of bentonite added, amount of cement/bentonite grout used, and ground surface construction details will be recorded.

Attachment 4

Diversion Channel Construction, Asphalt Pad Removal, and Site Regrading Plan and Design

Overview and Site Description

This plan details the construction process and the steps required to remove and dispose of the asphalt pad, to remove and relocate part of the moist to wet fill that underlies the pad, and to construct a surface water diversion channel at Technical Area (TA) 49, Material Disposal Area (MDA) AB, Areas 2, 2A, and 2B, Potential Release Sites (PRS) 49-001 (b, c, d, and g). The work will be done in a manner that protects the health and safety of all involved personnel and protects the environment.

A stabilization plan has been prepared to describe the activities required to stabilize this site. The plan describes the rationale and design for the removal of the asphalt pad and addresses the construction activities associated with the removal of the pad and the regrading of the site. This work plan accompanies and augments the stabilization plan.

Based on the available records, the potential contaminants that might reasonably be expected to be in contact with the asphalt or be present in the underlying moist fill include uranium-235, uranium-238, plutonium, beryllium, and lead. The approach to activities for removing the asphalt with the possible presence of uranium, plutonium, beryllium, and lead is presented below.

The purpose of this plan is to

- supplement the site-specific health and safety plans (SSHASPs) (Environmental Restoration Project 1998, 63114; Environmental Restoration Project 1998, 57912) by providing construction details and standards specifically designed to address the hazards associated with the possible contaminants,
- ensure that each employee is trained and made aware of the safety provisions that are addressed in this work plan, and
- provide details that will aid the workers in implementing these activities.

This plan is designed to enable all involved personnel to recognize the potential hazards on this project and to establish the controls necessary to provide a safe and healthy workplace while protecting the environment and property. Work activities in this plan described using the word *shall* are required to be performed by the subcontractor; work activities described using the word *will* are required to be performed by the contracting party. The work will be accomplished in compliance with this plan, the overall stabilization plan for the asphalt pad site, the attached specifications and drawings, and quantity estimates (Table 1).

Responsibilities

It is the responsibility of the field team leader (FTL)/field project manager, with the assistance of the site safety officer (SSO), to implement this plan. Work activities described in this plan will be modified by the FTL or his designee, as required to accommodate existing field conditions. An ESH-1-approved radiological control technician (RCT) is responsible for providing technical expertise relevant to radioactive contamination identification and the handling of materials with potential radioactive constituents. It is the responsibility of each employee to bring to the attention of the FTL, the SSO, the RCT, or any other employee, any unsafe or hazardous conditions or acts of negligence that may cause injury to themselves or others, damage to property, or harm the environment.

Table 1
TA-49 Stabilization Plan for Installing BMPs
Quantity Estimates

Item Description	Unit	Quantity
Asphalt pad	BCY[a]	390
Base tuff	FCY[b]	320
Cover tuff	FCY	470
Cover topsoil	FCY	470
Gravel armor	FCY	40
Diversion channel and berm	LF[c]	320
Asphalt storage area HDPE liner	SY[d]	560
Asphalt storage area general fill	FCY	30
Laydown/parking areas gravel surfacing	FCY	190
Seeding	AC[e]	3.3

[a] BCY = bank cubic yards.

[b] FCY = fill cubic yards.

[c] LF = linear feet.

[d] SY = square yards.

[e] AC = acres.

Scope of Work

The scope of work covered by this plan includes the activities required to remove the asphalt pad and to regrade the site. Sedimentation control structures and a surface water run-on diversion channel will be installed before the work begins on the asphalt pad. Site preparation activities, including parking, office, laydown, and storage areas and fence removal shall also occur before asphalt pad activities begin.

Approximately 400 cubic yards of asphalt shall be removed, temporarily stored, crushed, loaded, and transported from the pad. The existing access road may be slightly disturbed to accommodate this stabilization action. If the low areas around the pad are muddy, a layer of tuff material shall be placed in those areas to provide a stable working surface. The fill under the asphalt will be field screened for contaminants and shall be partially recontoured to promote drainage and drying. The fill and tuff shall then be covered with clean, crushed tuff, and the site shall be recontoured and covered by a temporary, stabilizing cover. This cover shall be revegetated with short-rooted (native) grasses. *Hot spots* downgradient of the pad shall be removed and disposed of off site. A schedule for the planned work is included in the stabilization plan.

This plan addresses the activities associated directly with the removal of the asphalt pad and the underlying soil. These activities have been reviewed relative to storm water pollution prevention (SWPP) plan requirements. These requirements include installation of the surface water run-on diversion channel and sedimentation control features (silt fences). The maintenance of the SWPP plan features is included in this scope of work.

SSHASPs (Environmental Restoration Project 1998, 63114); Environmental Restoration Project 1998, 57912] cover this SWPP plan, asphalt pad, and regrading work scope. The appropriate reviewers and signatories will be identified and included in the SSHASPs. The SSHASPs will be coordinated closely with

and will include recommendations by TA-49 Field Management Unit 81 (FMU 81) and ESH-1 personnel. Morrison Knudsen (MK) Corporation and its subcontractors shall adopt and abide by the SSHASPs.

Construction Operations, Work Controls, and Descriptions

There are several preparatory activities that must occur before the actual removal of the asphalt and fill. An Environmental, Safety, and Health Project Summary (ESH ID 98-0014) will be completed. A *facility agreement* for conducting the planned activities will be developed with the facility coordinator. A work/project schedule will be given to the facility coordinator. All site access shall be coordinated with TA-49 personnel. An excavation/soil disturbance permit will be obtained, and the utilities will be located in the field before any surface penetrations are made. The project's National Environmental Protection Act requirements will be identified. A Waste Characterization Strategy (WCS) form has been completed. Various surveys will be completed that will provide data to enable the field implementation of the asphalt removal. These surveys are described in the BMP plan, and the results of these surveys will be available on site.

MK will use only appropriately trained and experienced personnel to accomplish the work described in this plan. Specific personnel training requirements will be defined in the SSHASPs, and MK will coordinate closely with TA-49 and other appropriate Los Alamos National Laboratory (Laboratory) personnel to identify training requirements for work in the area. Before starting any field work, all personnel shall be trained commensurate with the hazards of the involved work. All workers entering the exclusion zone and/or the radiological controlled area (RCA) shall have HAZWOPER training and radiological worker II training. All site personnel shall attend TA-49 site-specific training and any other Laboratory-sponsored training specific to the MDA AB asphalt pad removal. All site personnel shall have the appropriate security clearances and shall abide by TA-49 security and safety requirements. All site workers shall attend and participate in daily tailgate safety meetings before the start of construction activities.

After all required project documents are completed and all involved personnel are trained, a readiness review will be conducted. Once this readiness review has been passed, equipment and personnel shall be mobilized to the area. All equipment shall be inspected before the start of work and regularly thereafter.

Nearby archeological sites will be delineated by a barrier installed by ESH-20 personnel. All project personnel will be instructed not to intrude into these archeological sites. Construction activities shall be limited to daylight hours and no off-road driving shall be permitted. No field disturbances shall occur without a site visit and approval of the area by a representative of ESH-20 for archeological/historical features.

The following general work constraints and assumptions shall be used in the performance of the scope of work included in this plan.

1. Construction activities may be periodically suspended because of TA-49 operations. TA-49 personnel will provide 24 hour notice for scheduled operations requiring the suspension of BMP plan construction activities.
2. All equipment shall be inspected for environment, health, and safety (ES&H) concerns before working on site. All equipment scheduled to be idle for more than six hours shift shall be parked on plastic. All fueling operations shall have spill safeguards in place.
3. All construction activities shall proceed with the constraints required for the potential type of contamination that could reasonably be expected for the concerned area.

4. Personal protective equipment will be used as defined in the SSHASP.
5. When working on or at the base of steep slopes, the condition of the uphill slope and the debris on that slope shall be evaluated before working. Debris that could dislodge and roll into the construction area shall be stabilized or removed.
6. All work within areas defined by an exclusion zone shall be considered a HAZWOPER activity and shall be conducted in compliance with OSHA 29 CFR 1910.120. Exclusion zones, contamination reduction zones, and support zones shall be installed and posted, as required. All personnel and equipment leaving the exclusion zones/contamination reduction zones shall be monitored for contamination and decontaminated as appropriate. All decontamination will be done as described in the SSHASPs.
7. A radiological work permit will be obtained. RCAs will also be established for areas where a reasonable potential exists for surface contamination in excess of the levels required for such designation. No materials originating in an RCA shall leave the site without RCT release.
8. If any unanticipated materials that could potentially affect worker health and safety are discovered during any activity associated with this project, all related operations shall cease. Work in the involved area shall not resume until a resolution is made and operations are authorized to recommence.
9. Before starting daily construction activities where contamination is suspect, the RCT or the SSO shall inspect the area. The results of this daily inspection will be conveyed to all workers at the daily tailgate safety meeting. All ES&H concerns and controls required for that day's activities will be discussed.
10. Hot spots for the purposes of this scope of work shall be defined as those areas or items with radioactivity levels that exceed approximately 100 pCi/g. All radiological controls and monitoring shall be performed by the RCT or the RCT's delegate.
11. Although moist or even wet conditions are expected, if dust becomes a problem, a light water mist shall be used for dust suppression.
12. All work shall be performed in compliance with the SSHASPs and all applicable rules, regulations, drawings, specifications, and project documents.

The requirements of the SWPP plan (Attachment 2 of BMP plan) will be implemented before asphalt removal activities begin. SWPP plan structures will be maintained during the period of field activity.

The existing power line has been relocated to serve the existing facilities and to furnish power to an air-sampling station that is located northwest of Area 2A. This power line relocation was done by Johnson Controls Northern New Mexico and was coordinated with FMU 81 personnel.

Before the construction of the surface water run-on diversion channel, asphalt pad removal, and site regrading begins, the existing access road shall be modified, as needed, to allow for safe ingress and egress of the area by construction equipment and personnel. Modifications to the existing road are expected to be limited to regrading and some widening. Road modifications will be selected that result in the least amount of tree removal and grading. Appropriate traffic controls shall be implemented. All road work shall be closely coordinated with TA-49 personnel and ESH-20 personnel.

Parking, laydown, storage, and support areas shall be established and constructed. A temporary field office shall be set up in the existing trailer east of Area 2B. Parking and storage areas shall be set up along the existing roads whenever possible. In no case shall parking or storage areas impede the use of the existing roads unless an alternative route is established and TA-49 personnel are notified. An area

shall be set aside for an asphalt crushing operation. A portable decontamination area/facility shall be established to support the work in contaminated areas. The design drawings accompanying this attachment should be consulted for proposed facility locations. Portable sanitary facilities shall be set up to comply with the needs of the site work force.

The construction of the surface water run-on diversion channel, the removal of the asphalt pad, the regrading of the site, vegetative cover placement, and all associated activities will be accomplished using MK personnel and subcontractor personnel and equipment. The areas where these activities will occur have the potential to be contaminated, as detailed in the stabilization plan. The area of the surface water run-on diversion channel and the fill underlying the asphalt are assumed to be uncontaminated. The asphalt will be treated as a low-level radioactive material. However, anomalously high areas of radioactive contamination could be present in any of these media. The most elevated radionuclide levels in surface soils/fill at Areas 2, 2A, and 2B are concentrated in the northeast corner of Area 2 and appear to be associated with the exhumation of contaminated soil beneath the asphalt pad by gophers. No field work will be done in potentially contaminated areas without the direct involvement and approval of the RCT or SSO.

FIDLER (radiological) surveys were performed during the Resource Conservation and Recovery Act facility investigation (RFI) sampling activities in the spring of 1998 for Areas 2, 2A, and 2B and adjacent land in downslope drainages toward Water Canyon. Various other surveys of the involved areas were also performed in the spring of 1998. These surveys are described in the RFI sampling and analysis plan (Environmental Restoration Project 1999, 63383). These surveys shall be reviewed before starting removal activities in these areas.

Before work begins inside the existing chain link fence, a pre-job briefing will be conducted for all personnel. Areas where contamination could be present and the levels expected will be discussed at this meeting. After this meeting the exclusion zone(s), RCA(s), contamination reduction zone(s), support zone(s) and construction zone(s) will be established for the involved work areas. After the appropriate zones are established, work may begin. A visual inspection of work areas will be performed by the RCT, the FTL, and the SSO. Any areas identified as hot spots will be delineated at this time. If it is determined that no additional controls are needed, then work shall proceed.

The initial activity shall be the removal of the existing chain link fence and the fence posts. The fence and the fence area will be screened by the RCT or the RCT's delegate before the removal begins. The post anchors will be screened by the RCT or the RCT's delegate after removal. If the concrete and/or steel are determined to be contaminated, they shall be placed in drums or other suitable containers, stored, and subsequently disposed of as stated in the WCS form. Uncontaminated fence components shall be removed, stored nearby, and reinstalled at the end of the project.

All features that are to be preserved will be identified, marked, and protected by tape or barricades/fencing, as required. All surface debris shall be removed from the work area and screened, segregated, and disposed of, as appropriate according to the WCS. Concrete and other materials forming caps over the test shafts shall be left undisturbed. Vegetation shall be cleared from the site after the debris has been removed. Plants shall be trimmed at or above the existing soil level to avoid surface disturbance. The vegetation in the areas of work shall be removed and screened by the RCT or the RCT's delegate. Any vegetation determined to be contaminated will be containerized and stored/disposed of, as defined in the WCS form. All areas adjacent to the asphalt pad should be considered to be wet areas where equipment will get mired. Caution shall be exercised when navigating equipment in these areas.

After the vegetation is removed, an area shall be established to store asphalt and to set up an asphalt crusher. An asphalt crusher will be mobilized as needed to support asphalt disposal activities. All personnel operating the crusher shall receive training specific to that crusher. Barriers shall be installed to restrict access to the crushing area.

Survey markers will be placed to allow for horizontal and vertical control of the site. These markers will allow for (noninstrument) locating of old shaft locations and elevations. Offset grid lines will be established. The buried locations of the shafts under the asphalt pad will be marked on the asphalt. Areas of underlying fill where contamination could exist, based on the 1998 RFI sampling, will be delineated on the asphalt before asphalt removal starts and as required during the removal process.

A surface water run-on diversion channel shall be constructed upgradient, west and southwest of Areas 2, 2A, and 2B. This diversion channel is designed to intercept surface water run-on from upgradient areas and to divert this run-on to the north with a discharge point at the south end of the existing culvert. The existing culvert shall be relocated vertically, as required, to maintain diversion channel grade. If the culvert is damaged or otherwise unusable, a new culvert shall be installed. The area of the diversion channel will be surveyed to mark the channel location and the required excavation limits and grades. The accompanying design drawings should be consulted for details of the surface water run-on diversion channel.

Equipment planned for use in constructing the diversion channel includes a backhoe or a track hoe (excavator), a motor grader, and a compactor. The diversion channel is planned to be approximately two feet in depth and a minimal width. The width will be a function of the construction equipment capabilities and is expected to be approximately 4 to 6 feet. Excavation of the diversion channel shall start at the north end and progress to the south end to avoid the possibility of water accumulation in the channel during construction. The materials excavated from the diversion channel shall be placed on the downslope side of the channel and shall be compacted to lessen stabilization problems. The grade of the diversion channel will be checked during construction and at the end of construction. If the survey results indicate elevation (drainage) problems, the channel shall be regraded to ensure positive drainage (flow) to the north.

Once the final grade has been attained, the bottom of the surface water run-on diversion channel shall be compacted to minimize erosion. Then the culvert shall be permanently set, and the road shall be restored to its original condition. Efforts shall be made to limit the aerial extent of disturbance resulting from the construction of the diversion channel.

Following completion of the surface water run-on diversion channel, dry tuff shall be placed in low-lying areas adjacent to the asphalt pad, as needed to provide a stable working surface. The *footprint* (boundary) of the area where dry tuff fill is to be placed will be surveyed and delineated by the surveyors. This base material shall be compacted and graded smooth. At this time, the existing culvert to the northeast of the asphalt pad shall be cleaned, and drainage shall be established to ensure that no water accumulates during the ensuing removal and regrading operations.

After this base (tuff) pad is completed, asphalt removal can proceed. The asphalt is assumed to be approximately 4 to 8 inches thick. The asphalt removal activities will be performed as shown on Figure 1.

The asphalt pad shall be removed sequentially in approximately 20-ft by 20-ft squares or in sections sized to coincide with possible contamination levels of the underlying fill. A track hoe is expected to be used to remove the asphalt. The equipment used to excavate the asphalt shall be supported by transfer equipment to take the asphalt either to a storage area or to a disposal facility. As the asphalt is being removed, the underlying fill material shall be raked with the track hoe teeth to a maximum depth of 6

inches to promote drying. To minimize the possibility of cross contamination, an additional piece of equipment may be used to rake the underlying fill. The fill material is expected to range from moist to saturated conditions.

Working from the adjacent asphalt surface, the first 20-ft by 20-ft square of asphalt shall be removed in the southwest corner of the site. The asphalt shall be temporarily stored adjacent to the section removed while awaiting field screening. Fill material adhering to the asphalt shall be removed by the track hoe or by manual means. The undersides of the removed pieces of asphalt will be screened for radionuclides. While the asphalt and soil fill surface are being screened for contamination, the asphalt in the adjacent square to the north shall be removed. This process shall be repeated until all the asphalt in a 20-foot-wide strip along the west side of the pad is removed. When the asphalt removal operation reaches the end of the row, a delay may be experienced while awaiting the screening for radionuclides. This process shall be repeated across the asphalt pad.

Asphalt shall be transported to a nearby storage area, if required, while awaiting final disposition. The asphalt shall be temporarily stored on an HDPE liner incorporating a berm and precipitation cover. Asphalt shall be segregated and stored by expected similarity of possible contaminant constituents. The asphalt storage area shall be inspected for liner and cover integrity on a regular interval. The integrity of this asphalt storage area shall be maintained until the asphalt has been transported off site.

A 100% FIDLER survey of the exposed fill material surface will be conducted following asphalt removal to identify possible areas of local contamination (hot spots) exceeding the action level for worker safety defined in the SSHASP (Environmental Restoration Project 1998, 63114). Hot spots in the fill that would be of concern for worker safety and health are expected to be few in number, highly isolated, and small in volume. Any fill identified as hot spots, shall be excavated and drummed to isolate them from normal soil-handling practices. Hot spot removal may be done manually in lieu of using heavy equipment to minimize cross contamination. Hot spot materials shall be stored and then transported to TA-54, Area G, for disposal.

Following hot spot removal, the underlying fill material shall be raked as described above to facilitate drying. Care shall be taken to not damage the casings of the boreholes penetrating the pad. The thickness of the fill is expected to average approximately 3 feet. If exceedingly wet fill is encountered, operations may have to be suspended to allow drying. No regrading or recontouring of this fill material other than the raking described above shall be conducted.

After the fill materials have been allowed to dry for a sufficient length of time, areas adjacent to the fill shall be regraded to improve surface water drainage and eliminate ponding. New fill materials brought in from off site shall be used in regrading. Drying of the site fill will occur as a part of the regrading process. The regraded materials shall be compacted to form a firm base for possible future activities at the site and to minimize future subsidence and the subsequent formation of potential ponding areas.

The final surface of the *pile* formed as a result of regrading shall be formed to allow surface water to flow downslope to the edges without ponding. The regraded site contours are presented in the design drawings. This surface will be land surveyed and an evenly spaced grid of survey grade markers (hubchasers/whiskers) will be installed to mark the surface. At this time, a gross dry decontamination of the equipment used in fill-grading operations shall take place. This decontamination effort shall be done on this potentially contaminated fill surface. Liquids shall not be used in the decontamination process at this time.

After the site has been recontoured, a comprehensive FIDLER survey of the recontoured surface will be performed to document the condition of that surface. Although hot spots may have been removed from

that surface as needed for worker safety, this surface may not be free of contamination, and this survey will not be considered confirmatory sampling. Design information on the asphalt pad removal and fill excavation is presented in the design drawings.

Before proceeding with temporary cover construction, removal activities downgradient of the road shall be undertaken. Surface soil contamination at MDA AB is included in PRS 49-001(g) and has been found in a drainage channel downgradient and north of Areas 2, 2A, and 2B. A FIDLER survey will focus on those parts of PRS 49-001(g) that will be affected by runoff from the site project support areas. The objectives of this focus are to protect worker health and safety by providing areas for project construction and support activities that pose no risk to worker health and safety.

Contamination in PRS 49-001(g) downgradient of Areas 2, 2A, and 2B is expected to be minor and large volumes of contaminated soil are not anticipated. Those soils found to exceed the action level defined in the SSHASP (Environmental Restoration Project 1998, 63114) shall be removed and disposed of accordingly. Before removal, the locations where contaminated soils are found will be reviewed for possible cultural and biological resources. Contaminated soils approved for removal shall be containerized (probably in drums) before disposal as low-level waste. Equipment shall be decontaminated, as appropriate, before moving to the downgradient location. Soils that would pose an unacceptable health and safety risk shall be sent to TA-54, Area G, for disposal. A FIDLER survey of the downgradient areas of activity will be performed to document the site conditions after soil removal is completed.

Following the downgradient removal activities, work shall resume at the former asphalt pad area. Before starting cover placement activities, the equipment used for the downgradient activities will undergo dry decontamination on the recontoured fill surface. After this decontamination process, temporary cover construction activities shall commence.

A temporary cover consisting of approximately six inches of clean crushed tuff overlain by approximately six inches of imported topsoil shall be placed across the surface of the fill and tuff (emplaced to prevent ponding) to isolate the potentially contaminated fill materials. All equipment engaged in the installation of this clean cover shall be uncontaminated before starting and decontaminated as required during the activity. Placement of the clean crushed tuff cover material shall begin at one edge and proceed in a fashion that eliminates the need to work on potentially contaminated fill. The clean tuff cover shall be compacted for structural integrity.

After the clean crushed tuff cover material has been completed, the approximately six-inch layer of topsoil will be placed. Because the topsoil will be compacted slightly as a function of placement, the topsoil shall be tilled, as necessary, to prepare a seedbed. If at the completion of topsoil placement, the season is appropriate for seeding, then the topsoil area will be seeded with a mix of short-rooted grasses. The anticipated seed mix is approximately 50% Blue Gramma and approximately 50% Western Wheatgrass. If this phase of the operation is completed at a time when seeding is inappropriate, then seeding will be delayed until the time is optimal for seeding. A gopher barrier consisting of a sturdy wire mesh or other devices shall be placed over the surface of the topsoil and fastened in a manner that will preclude gophers from burrowing into the site. The surface of the topsoil shall be armored with gravel to minimize erosion. This gravel armor will be applied manually to approximately 70% visual surface coverage. A land survey of the final surface will be performed and documented. Survey markers will again be installed to allow for visual assessment of possible erosion and cover loss.

The asphalt may be crushed, if required, before disposal, and disposal may occur at any time after removal. However, because of operational logistics, asphalt crushing, transport, and disposal activities are best scheduled to occur after the temporary cover is completed.

Although analysis of the asphalt samples collected during the RFI is expected to provide sufficient characterization for disposal, additional screening of the asphalt for radioactive contamination will be conducted during removal. The removed asphalt shall be segregated based on RFI analyses and operational field radiological screening. After excavation, the handling of the asphalt will be determined by sampling and screening, All clean asphalt meeting release criteria shall be crushed before any potentially contaminated asphalt is processed to minimize cross contamination.

Asphalt may be stored awaiting additional sampling and crushing. This asphalt shall be stored as dictated by the quantity. This asphalt may be stored in rolls, drums, or on plastic and covered. After crushing, if needed, asphalt found to be radioactively contaminated shall be sent to TA-54, Area G, for disposal as low-level waste. Although not expected, asphalt found to be contaminated by other than low levels of radioactivity shall be disposed of as indicated in the WCS form in the plan. Asphalt, wood, and other organic matter will not be disposed of at the site because if the final corrective measure at the site involves an engineered cover, the amount of organic matter beneath the cover should be minimized to avoid gas generation. The assigned waste management coordinator (WMC) will be consulted throughout the removal, sampling, processing, storage, and shipment process. All contaminated materials shall be stored and monitored as directed by the WMC.

After the temporary cover is completed and the asphalt has been transported off site for disposal, site completion activities shall begin. All equipment and materials exposed to possible contamination shall be cleaned or decontaminated, as required. This final decontamination effort may require the installation and use of a decontamination facility that will support a thorough (wet) decontamination procedure. This facility shall be installed in a fashion that will not contaminate the site. This facility shall be removed when decontamination activities are completed. Decontamination products will be properly packaged, labeled, characterized, and disposed of as detailed in the WCS. All personnel, materials, and equipment will leave the site only with release approval by the RCT.

The site fencing, removed earlier, will be reinstalled and augmented as necessary. Appropriate signage will be installed on the fence. The MDA AB perimeter road shall be restored at the conclusion of the stabilization activities. Site laydown, stockpile, parking, and waste storage areas will be cleaned of trash and construction materials. All areas disturbed during project activities shall be graded and seeded with an approved seed mix if the season is appropriate. If the season is not appropriate for seeding, the seeding of the site will be delayed until optimal conditions exist.

After all project work is completed, the area shall be inspected, and all trash shall be collected and disposed of. An inspection walk-through will be performed and a punch list of items requiring attention will be developed. Concurrence of satisfactory site condition will be obtained from the facility coordinator. The items on the punch list shall be completed, and project-related construction will be released by the program administrator.

REFERENCES

Environmental Restoration Project, June 24, 1998. "RCRA Facility Investigation Stabilization Measures Preparatory Activities Plan, Areas 2, 2A, 2B, Material Disposal Area AB, Technical Area 49," Los Alamos National Laboratory, Los Alamos, New Mexico. (Environmental Restoration Project 1998, 63383)

Environmental Restoration Project, August 11, 1998. "LANL ER Project Site-Specific Health and Safety Plan (SSHASP), Best Management Practices/Stabilization (BMP/S) at Material Disposal Area (MDA) AB, Areas 2, 2A and 2B - PRSs 49-001(b, c, d and g)," SSHASP No. 204, Los Alamos National Laboratory, Los Alamos, New Mexico. (Environmental Restoration Project 1998, 63114)

Environmental Restoration Project, May 26, 1998. "LANL ER Project Site-Specific Health and Safety Plan (SSHASP), Construction of the Surface Water Rub-on Diversion Channel and Related Features," SSHASP No. 206, Los Alamos National Laboratory, Los Alamos, New Mexico. (Environmental Restoration Project 1998, 57912)

TA-49 STABILIZATION PLAN FOR INSTALLING BMPs

SPECIFICATIONS

MORRISON KNUDSEN CORPORATION

SPECIFICATION TITLE SHEET

This sheet is a record of each issue or revision to the subject specification.

The exact sheets changed and the nature of the change should be noted under "Remarks." These remarks are not a part of the specification. The revised sheets become part of the original document and shall be complied with in their entirety.

Issue Date	Author/ Reviser	Checked By	APPROVAL			REMARKS
			Department Manager	Project Engineer	Safety Review	
4/10/98	KLO	[illegible]	CAW	[illegible]	[illegible]	Issue "A" "ISSUED FOR REVIEW"

Client, Project, Location	Work Order	Specification Title/Description
TA-49 STABILIZATION PLAN FOR INSTALLING BMPs PROJECT LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NEW MEXICO	4869 Specification 01010	SUMMARY OF WORK

SECTION 01010

SUMMARY OF WORK

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SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.1 INTRODUCTION

This project implements the stabilization activities that have been selected for implementation at Technical Area (TA) 49 asphalt pad at Area 2 (Potential Release Site 49-001(b)) at the Los Alamos National Laboratory.

1.2 WORK BY SUBCONTRACTOR

A. The subcontract work consists of

1. site preparation,
2. construction of support areas,
3. clearing of vegetation and removal of surface debris from work areas,
4. removal of the existing asphalt pad,
5. hauling and stockpiling the asphalt,
6. partial drying of the underlying wet fill,
7. placement of a layer of clean crushed tuff soil over the exposed wet fill and in isolated low areas,
8. placement of topsoil and gravel armor layers,
9. construction of an upstream surface water run-on diversion channel, and
10. site restoration and seeding of disturbed areas.

B. Based on the available records, the potential contaminants that might reasonably be expected to be in contact with the asphalt or be present in the underlying wet fill include uranium-235, uranium- 238, plutonium, beryllium, and lead. The approach to activities for removing the asphalt and regrading the underlying fill with the possible presence of uranium, plutonium, beryllium, and lead is presented herein.

C. The most elevated radionuclide levels in surface soils/fill at Areas 2, 2A, and 2B are concentrated in the northeast corner of Area 2 and appear to be associated with the exhumation of contaminated fill beneath the asphalt pad by gophers. No field work will be done in potentially contaminated areas without the direct involvement and approval of the radiological control technician (RCT) or site safety officer.

1.3 WORK BY OTHERS

Before work starts, existing power poles will be relocated to serve the existing facilities and to furnish power to a proposed air-sampling station located to the north of Area 2. The existing power line will be relocated by others.

1.4 WORK SEQUENCE

The work will be conducted in the following general sequence:

1. Clear vegetation from the construction support area. Trim plants at or above the existing soil level to avoid surface disturbance.
2. Construct parking, laydown, and storage areas.
3. All features that are to be preserved shall be identified, marked, and protected by tape or barricades/fencing, as required.
4. Set up a portable decontamination area/facility.
5. Set up portable sanitary facilities to meet the needs of the site work force.
6. Construct a surface water run-on diversion channel to the west of the work areas as shown on the drawings.
7. Relocate existing culvert at the north end of the diversion channel, as needed to maintain grade.
8. Clean out and inspect the existing culvert near the northeast corner of the asphalt pad. Modify or replace as required.
9. Remove portions of the existing chainlink fence that cross the asphalt pad. The fence and the fence area will be screened by the RCT or the RCT's delegate before the removal begins. The post anchors will be screened by the RCT or the RCT's delegate after removal. If the concrete and/or steel is determined to be contaminated, it shall be placed in drums or other suitable containers and stored and subsequently disposed of as stated on the Waste Characterization Strategy (WCS) form. Uncontaminated fence components shall be removed, stored nearby, and reinstalled at the end of the project. Establish exclusion, contamination reduction, and support zones, as required.
10. All surface debris shall be removed from the work area and screened, segregated, and disposed of, as appropriate according to the WCS.
11. Clear the potentially contaminated work areas. Trim vegetation at or near the existing ground surface without disturbing the subsurface. The vegetation in the areas of work will be removed and screened by the RCT or the RCT's delegate. Any vegetation determined to be contaminated shall be containerized and stored or disposed of as defined on the WCS form.
12. Establish and set up the asphalt stockpile area.
13. Install survey markers for horizontal and vertical control of the site. Areas of underlying fill where contamination is known to exist, based on the 1998 RFI sampling, shall be delineated on the asphalt before asphalt removal starts and as required during the excavation process.
14. Place, spread, and compact fill in isolated low areas as shown on the drawings to provide a stable working surface.

15. Begin asphalt pad removal. The asphalt is approximately 4 inches to 8 inches thick and will be treated as a low-level radioactive material. Working from the adjacent asphalt surface, the asphalt shall be removed in approximate 20-foot by 20-foot square sections, starting in the southwest (potentially least contaminated) corner of the site. Asphalt shall be temporarily stored adjacent to the section removed while awaiting field screening. Fill material adhering to the asphalt shall be removed by mechanical or manual methods. The undersides of the removed pieces of asphalt shall be screened for radionuclides. While the asphalt and the exposed soil fill surface is being screened for contamination, the asphalt in the adjacent square to the north shall be removed. This process shall be repeated until all the asphalt in a 20-foot-wide strip along the west side of the pad is removed. When the asphalt removal operation reaches the end of the row, a delay may be experienced while awaiting the screening for radionuclides.

16. The removed asphalt shall be segregated, based on RFI analyses and operational field radiological screening. After excavation, the handling of the asphalt shall be determined by sampling and screening.

17. All clean asphalt meeting release criteria shall be hauled and stockpiled in the location shown on the drawings.

18. Asphalt suspected to be contaminated, based on RFI and/or field screening, shall be stored awaiting additional sampling. This asphalt shall be stored as dictated by the quantity and as directed by the contractor. This asphalt may be stored in roll-off containers, drums, or on plastic and covered. Asphalt found to be radioactively contaminated shall be sent to TA-54, Area G, for disposal. Although not expected, asphalt found to be contaminated by other than low levels of radioactivity shall be disposed of as indicated in the WCS form in the BMP plan. All contaminated materials shall be stored and monitored as directed by the WMC.

19. A 100% FIDLER survey of the exposed fill material surface shall be conducted following regrading to identify areas of local contamination (hot spots) exceeding the action level defined in the SSHASP for worker safety. Contaminated fill identified as hot spots shall be excavated and drummed to isolate them from normal soil handling practices. Hot spot removal may be done manually in lieu of using heavy equipment to minimize cross contamination. Scarify the underlying fill material with track hoe teeth to promote drying. If exceedingly wet fill is encountered, operations may have to be suspended to allow drying.

20. Place, spread, and compact a 6-inch-thick layer of crushed tuff over the fill material. Begin at one edge and proceed such that contact with potentially contaminated fill is avoided. Finish to contours and grades shown in the drawings.

21. Place and spread topsoil over the placed crushed tuff.

22. Place wire mesh and spread the gravel armor layer over the topsoil.

23. Reinstall site fencing removed earlier. Augment as necessary. Install signage on the fence.

24. Decontaminate all equipment and materials exposed to possible contamination. All personnel, materials, and equipment shall leave the site only with release approval by the RCT.

25. Clean the site laydown, stockpile, parking, and waste storage areas of trash and construction materials.

26. Restore disturbed areas. Grade and seed all disturbed areas and topsoil/gravel armor areas.

1.5 SUBCONTRACTOR USE OF PREMISES

A. The subcontractor's use of the premises is limited only by the contractor's right to perform work or to retain other subcontractors on portions of the project.

B. Limit use of the site to work in areas indicated above. Do not disturb portions of the site beyond the areas in which the work is indicated. Keep driveways and entrances serving the premises clear and available to the contractor, the contractor's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.

C. Nearby archeological sites will be delineated by barriers installed by ESH-20 personnel. All subcontractor personnel shall be instructed not to intrude into these archeological sites. Construction activities shall be limited to daylight hours and no off-road driving shall be permitted outside of the work area. No field disturbances shall occur without a site visit and approval of the area by a representative of ESH-20 for archeological/historical features.

1.6 OCCUPANCY REQUIREMENTS

The contractor will occupy the site and construction support area during the entire construction period. Cooperate with the contractor during construction operations to minimize conflicts and facilitate contractor usage. Perform the work so as not to interfere with the contractor's operations.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Not used

END OF SECTION 01010

MORRISON KNUDSEN CORPORATION

SPECIFICATION TITLE SHEET

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The exact sheets changed and the nature of the change should be noted under "Remarks." These remarks are not a part of the specification. The revised sheets become part of the original document and shall be complied with in their entirety.

Issue Date	Author/ Reviser	Checked By	APPROVAL			REMARKS
			Department Manager	Project Engineer	Safety Review	
4/10/98	KLO	[illegible]	CAW	[illegible]	[illegible]	Issue "A" "ISSUED FOR REVIEW"

Client, Project, Location	Work Order	Specification Title/Description
TA-49 STABILIZATION PLAN FOR INSTALLING BMPs PROJECT LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NEW MEXICO	4869 Specification 01300	SUBMITTALS

SECTION 01300

SUBMITTALS

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SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. submittal procedures.

B. construction progress schedules.

C. construction photographs.

1.2 RELATED SECTIONS

A. Section 01400, Quality Assurance

B. Section 02200, Earthwork

1.3 SUBMITTAL PROCEDURES

A. Transmit each submittal to contractor with a contractor-approved form.

B. Sequentially number the transmittal forms. Revise submittals with original number and a sequential alphabetic suffix.

C. Identify on form the project, contractor, subcontractor, pertinent drawing and detail number, and specification section number, as appropriate.

D. Apply to form the subcontractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and subcontract documents.

E. Schedule submittals to expedite the project, and deliver to contractor. Coordinate submission of related items.

F. For each submittal for review, allow 15 days excluding delivery time to and from the contractor.

G. Identify variations from subcontract documents and product or system limitations that may be detrimental to successful performance of the completed work.

H. Provide space for contractor review stamps.

I. When a submittal is revised for resubmission, identify all changes made since previous submission.

J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

K. Submittals not requested by the contractor will not be recognized or processed.

1.4 CONSTRUCTION PROGRESS SCHEDULES

A. Submit to contractor initial schedule in duplicate within 15 days after date of notice to proceed.

B. Revise and resubmit schedule as required.

C. Submit revised schedules with each application for payment, identifying changes since previous version.

D. Submit a computer-generated horizontal bar chart with separate line for each major portion of work or operation, identifying first work day of each week.

E. Show complete sequence of construction by activity, identifying work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.

F. Indicate estimated percentage of completion for each item of work at each submission.

1.5 CONSTRUCTION PHOTOGRAPHS

A. Submit photographs to document work progress and milestones.

B. Photographs: Two prints; color, glossy 4- by 6-inch size; mounted on 8 1/2- by 11-inch soft card stock, with left edge binding margin for three-hole punch. Also provide digital copy of all photographs.

C. Take site photographs from differing directions indicating the relative progress of the work, 5 days maximum before submitting.

D. Identify photographs with date, time, orientation, and project identification.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION 01300

MORRISON KNUDSEN CORPORATION

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4/10/98	KLO	[illegible]	CAW	[illegible]	[illegible]	Issue "A" "ISSUED FOR REVIEW"

Client, Project, Location	Work Order	Specification Title/Description
TA-49 STABILIZATION PLAN FOR INSTALLING BMPs PROJECT LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NEW MEXICO	4869 Specification 01400	QUALITY ASSURANCE

SECTION 01400

QUALITY ASSURANCE

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QUALITY ASSURANCE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. quality assurance, control of installation.

B. inspecting services.

1.2 QUALITY ASSURANCE, CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. If manufacturers' instructions conflict with subcontract documents, request clarification from contractor before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform work by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

1.3 INSPECTION SERVICES

A. Contractor will perform inspection or will appoint, employ, and pay for specified services of an independent firm to perform inspection.

B. The contractor or the independent firm will perform inspections and other services specified in individual specification sections and as required by the contractor.

C. Inspecting may occur on or off the project site, as required by the contractor.

D. Reports will be submitted by the independent firm to the contractor, indicating inspection observations and indicating compliance or noncompliance with subcontract documents.

E. Cooperate with inspectors. Furnish safe access and assistance by incidental labor as requested.

F. Notify contractor and independent firm 24 hours before expected time for operations requiring inspection services.

G. Inspecting does not relieve subcontractor to perform work to subcontract requirements.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that existing site conditions and subgrade surfaces are acceptable for subsequent work. Beginning new work means acceptance of existing conditions.

B. Examine and verify specific conditions described in individual specification sections.

END OF SECTION 01400

MORRISON KNUDSEN CORPORATION

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Client, Project, Location	Work Order	Specification Title/Description
TA-49 STABILIZATION PLAN FOR INSTALLING BMPs PROJECT LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NEW MEXICO	4869 Specification 01500	CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

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SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary Utilities: electricity, telephone service, water, and sanitary facilities.

B. Temporary Controls: barriers, enclosures and fencing, protection of the work, and water control.

C. Construction Facilities: access roads, parking, project signage, and temporary buildings.

1.2 TEMPORARY ELECTRICITY

Subcontractor shall provide and pay for power service required.

1.3 TELEPHONE SERVICE

Provide, maintain, and pay for telephone service to subcontractor's field office at time of project mobilization.

1.4 FACSIMILE SERVICE

Provide, maintain and pay for facsimile service and a dedicated telephone line to subcontractor's field office at time of project mobilization.

1.5 TEMPORARY WATER SERVICE

Provide, maintain, and pay for suitable quality water service required for construction operations at time of project mobilization.

1.6 TEMPORARY SANITARY FACILITIES

Provide and maintain required facilities and enclosures for site work force. Existing facility use is not permitted. Provide at time of project mobilization.

1.7 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.

B. Provide protection for features designated to remain.

C. Protect nonowned vehicular traffic, stored materials, site, and structures from damage.

1.8 FENCING

A. Remove existing fencing as shown on the drawings and store for later reuse. All fencing shall be scanned before beginning work and upon removal. Dispose of contaminated fencing as directed by the contractor.

B. Fencing shall be 6-foot-high commercial-grade chain link fence.

C. Reinstall stored fencing at completion of the work. Furnish and install additional fencing as required to complete new fence alignment.

1.9 WATER CONTROL

Grade site to drain. Protect site from ponding or running water. Provide barriers as required to protect site from soil erosion and gophers.

1.10 PROTECTION OF WORK

Protect completed work and provide special protection where specified in individual specification sections.

1.11 SECURITY

Coordinate with Los Alamos National Laboratory site security.

1.12 PARKING

A. Construct temporary gravel-surface parking areas to accommodate construction personnel.

B. Do not allow vehicle parking on existing access roads.

1.13 PROJECT IDENTIFICATION

A. Provide contractor-approved project sign of exterior grade plywood and wood frame construction, painted, with lettering by professional sign painter and corporate logo.

B. List title of project, names of owner, contractor, and major subcontractors.

C. Erect sign on site at location approved by contractor.

D. No other signs are allowed without contractor permission, except those required by law.

1.14 FIELD OFFICES AND SHEDS

Offices and sheds locations shall be approved by contractor.

1.15 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, and materials before final application for payment.

B. Grade site as indicated.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Not used

END OF SECTION 01500

MORRISON KNUDSEN CORPORATION

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Client, Project, Location	Work Order	Specification Title/Description
TA-49 STABILIZATION PLAN FOR INSTALLING BMPs PROJECT LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NEW MEXICO	4869 Specification 02200	EARTHWORK

SECTION 02200

EARTHWORK

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SECTION 02200

EARTHWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. clearing

B. drying of existing fill

C. placement of a layer of clean crushed tuff

D. placement of a layer of topsoil

E. placement of a gravel armor layer

F. construction of a surface water run-on diversion channel

G. installation of culverts

1.2 RELATED SECTIONS

Section 02220, Asphalt Removal and Stockpiling

1.3 REFERENCES

A. American Society of Testing and Materials (ASTM)

ASTM D 422, Standard Test Method for Particle-Size Analysis of Soils

B. New Mexico State Highway Department Standard Specifications for Road and Bridge Construction

Section 206, Excavation and Backfill for Culverts and Minor Structures

1.4 SUBMITTALS

A. Submit one gradation test result for the gravel armor material for each material source.

B. Submit equipment specifications for tracked equipment and compactor for contractor approval.

C. Submit names of proposed topsoil, crushed tuff, and general fill borrow sources for contractor approval.

PART 2 PRODUCTS

2.1 MATERIALS

A. Topsoil shall be obtained from a contractor-approved source.

B. Crushed tuff shall be comprised of crushed, uncontaminated tuff obtained from a contractor-approved area. Crushed tuff shall not be placed when frozen.

C. Gravel armor shall be comprised of hard, durable aggregate. The gravel armor shall be free of debris, trash, frozen materials, and organics. The gravel armor gradation, as determined in accordance with ASTM D 422, shall be within the following limits:

US Std. Sieve Size	Percent Passing
1 inch	100
3/8 inch	0–10

D. General fill shall be comprised of contractor-approved uncontaminated soils obtained from project excavations and contractor-approved borrow areas.

2.2 EQUIPMENT

A. Tracked equipment to be used for compacting crushed tuff shall have a minimum ground contact pressure of 6 psi.

B. Compaction equipment to be used for proofrolling subgrade and for compacting general fill shall be a self-propelled vibratory compactor with a minimum operating weight of 13,000 lbs.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify site conditions.

B. Verify that survey bench marks and intended elevations for the work are as indicated.

C. Identify required lines, levels, contours, and datum.

D. Locate, identify, and protect from damage utilities, monitoring wells, and features that are to remain.

E. Utilities requiring relocation will be relocated by others. Coordinate with contractor.

F. Protect vegetation outside of the immediate work zone.

G. Protect bench marks, survey control points, existing structures, and fences from equipment and vehicular traffic.

3.2 CLEARING

A. Clear vegetation from only from those areas approved by the contractor to accommodate site features and construction operations. Trim vegetation at or near the ground surface. Do not grub.

A. Remove surface debris, trash, excess, and unsuitable materials and dispose of as directed by contractor.

3.3 DRYING AREA 2 FILL

A. Equipment shall not be allowed to traffic directly upon the fill exposed by removal of the asphalt pad.

B. Working from the perimeter of the removed asphalt pad footprint, scarify the fill with track hoe teeth to promote drying.

3.4 CLEAN CRUSHED TUFF PLACEMENT

A. Place, spread, and compact a layer of crushed tuff on the regraded fill surface to the lines and grades shown on the drawings. The crushed tuff shall be placed in a single lift with a nominal compacted thickness of 6 inches.

B. Begin placement at one end and proceed such that contact with potentially contaminated surfaces is avoided.

C. Place additional crushed tuff lift(s) in isolated areas of potential ponding as shown on the drawings. Place crushed tuff in loose lifts not exceeding 12 inches in thickness.

D. Each crushed tuff lift shall be compacted by tracking with a minimum of three passes by tracked equipment. Moisture conditioning of crushed tuff before compaction is not required.

E. Following compaction, grade to produce a smooth, draining surface before placement of the topsoil and gravel armor layers.

3.5 TOPSOIL PLACEMENT

A. Place and spread a single lift of topsoil over graded crushed tuff and other disturbed areas.

B. The topsoil lift shall have a nominal thickness of 6 inches.

C. Topsoil shall not be compacted.

3.6 GOPHER BARRIER AND GRAVEL ARMOR LAYER PLACEMENT

A. Hand-place the wire mesh gopher barrier over the topsoil and stake using a contractor-approved method.

B. Hand-spread the gravel armor layer over the topsoil in a single lift using a contractor-approved method.

C. Gravel layer shall have areal coverage of approximately 70 percent.

D. Compaction of the gravel protection layer is not required.

3.7 SURFACE WATER RUN-ON DIVERSION CHANNEL

A. Proof-roll berm subgrade to identify soft spots. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill and compact with a minimum of three passes of contractor-approved compactor. Moisture-condition backfill as needed before compacting to obtain a dense compacted material. Contractor will inspect and may direct subcontractor to alter the moisture content as the contractor deems appropriate.

B. Overexcavation for the convenience of the subcontractor shall be backfilled as directed by the contractor and at no expense to the contractor.

C. Excavate diversion channel to the lines and grades shown in the drawings. Overexcavation for the convenience of the subcontractor shall be backfilled as directed by the contractor and at no expense to the contractor.

D. Use soils excavated from channel to construct adjacent berm. Obtain additional general fill from contractor-approved borrow source as needed.

E. Place general fill to construct berm in loose lifts not exceeding 8 inches in thickness. Moisture condition fill before compaction as needed to obtain a dense compacted material. Contractor will inspect and may direct subcontractor to alter the moisture content as the contractor deems appropriate.

F. Compact general fill with at least three passes of contractor-approved compactor.

3.8 CULVERT INSTALLATION

A. Install culverts in accordance with New Mexico State Highway Department Standard Specification Section 206.

A. Minimum cover over culvert shall be 18 inches.

3.9 TOLERANCES

A. All final graded surfaces shall be within plus or minus 0.1 foot of required elevations.

A. The diversion channel final invert slope shall be within 0.3 percent of required slope and shall have positive drainage to outlet.

A. Gravel armor layer coverage may vary depending upon the placement method used.

3.10 FIELD QUALITY CONTROL

A. Perform the quality control inspections as detailed in Table 1.

A. Rework or remove and replace work not meeting quality requirements as directed by the contractor.

TABLE 1
FIELD QUALITY CONTROL INSPECTIONS

Material	Inspection Item	Method	Frequency
Subgrade	Soft spots	Visual observation	Continuous
Crushed Tuff	Compaction passes	Visual observation	Continuous
	Loose lift thickness	Visual observation	Continuous
General Fill	Compaction passes	Visual observation	Continuous
	Field compaction moisture	Visual observation	Continuous
	Loose lift thickness	Visual observation	Continuous
Gravel Armor	Areal coverage	Visual observation	Continuous

END OF SECTION 02200

MORRISON KNUDSEN CORPORATION

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Client, Project, Location	Work Order	Specification Title/Description
TA-49 STABILIZATION PLAN FOR INSTALLING BMPs PROJECT LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NEW MEXICO	4869 Specification 02220	ASPHALT REMOVAL AND STOCKPILING

SECTION 02220

ASPHALT REMOVAL AND STOCKPILING

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SECTION 02220

ASPHALT REMOVAL AND STOCKPILING

PART 1 GENERAL

1.1 SECTION INCLUDES

This section includes the requirements for removal and disposal of the existing asphalt pad at Technical Area (TA) 49, Area 2.

1.2 RELATED SECTIONS

Section 02200, Earthwork

1.3 EQUIPMENT

All equipment and tools used in the performance of the work covered by this section shall be subject to approval by the engineer before the work is started and shall be maintained in satisfactory working condition at all times. The equipment shall be adequate and shall have the capability of meeting the grade controls, thickness controls, and smoothness requirements set forth herein.

PART 2 PRODUCTS

2.1 MATERIALS

Asphalt forms a pad at Area 2 with 4-inch to 8-inch thickness.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Clear the asphalt pad of all vegetation by trimming close to the asphalt surface.

B. Prepare the asphalt stockpile area as shown in the project drawings.

C. Install survey markers to establish vertical and horizontal control of the site.

D. The contractor will delineate areas of known contamination on the asphalt pad surface before pad removal.

3.2 EXCAVATION

A. Remove asphalt in sequential sections of approximately 20-foot squares, starting in the southwest corner and proceeding in a planned sequence across the pad.

B. Reduce size of asphalt rubble during removal, as needed, to accommodate handling by equipment. Avoid intrusion by equipment into the underlying fill.

C. Perform gross removal of fill adhering to the asphalt by mechanical methods or hand shovel.

D. Minimize mixing of asphalt rubble into the underlying fill.

E. Equipment shall not traffic on or unnecessarily disturb the exposed underlying fill during asphalt removal.

F. Temporarily store excavated asphalt on an adjacent section of the asphalt pad for field scanning for contamination.

3.3 HAULING, STOCKPILING, AND STORAGE

A. Asphalt rubble that is not contaminated, as determined by field screening, shall be hauled and placed in the designated asphalt stockpile area.

B. Asphalt rubble that has suspected contamination, as determined by field screening, shall be stored as directed by the contractor while awaiting confirmation sampling and testing.

C. Asphalt rubble that has confirmed contamination shall be hauled to TA-54, Area G, for disposal.

3.4 EQUIPMENT DECONTAMINATION

After asphalt removal is completed, perform dry decontamination of equipment over areas that will be covered by clean crushed tuff before moving equipment to the decontamination pad.

END OF SECTION 02220

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Final Report
August 1999

Stabilization Plan for Implementing Interim Measures and Best Management Practices at Potential Release Sites

49-001(b)
49-001(c)
49-001(d)
49-001(g)

Environmental Restoration Project
A Department of Energy Environmental Cleanup Program

Los Alamos
NATIONAL LABORATORY
Los Alamos, NM 87545

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Produced by the Material Disposal Areas Focus Area

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AUG 1999 RECEIVED

Date: August 30, 1999
Refer to: E/ER:99-242

Mr. John Kieling
NMED-HRMB
P.O. Box 26110
Santa Fe, NM 87502

SUBJECT: SUBMITTAL OF PLANS AND REPORTS FOR PRS 49-001 (a, c, d, and g)

Dear Mr. Kieling:

In accordance with our Response to Request for Supplemental Information (RSI) for the Stabilization Plan for Implementing Interim Measures (IMs) and Best Management Practices (BMP) at Potential Release Sites (PRSs) 49-001(b, c, d, and g) (EM/ER:98-339, dated September 11, 1998), the Laboratory's Environmental Restoration Project is submitting the following documents:

- "Stabilization Plan for IMs and BMP at PRSs 49-001(b, c, d, and g);"
- "IM Report for Potential Release Sites 49-001;" and
- "BMP Report for Installation of Stabilization Measures at PRS 49-001 (b, c, d, and g)."

All comments received from the New Mexico Environment Department Hazardous and Radioactive Materials Bureau on the "Stabilization Plan for IMs and BMP at PRSs 49-001(b, c, d, and g)" have been incorporated. The IM Report and BMP Report are being submitted for the first time in accordance with our RSI Response described above. Also included with this deliverable are updates to the "Reference Set for Material Disposal Areas, Technical Area 49." These new references should be added to those previously provided.

If you have any questions, please contact Deba Daymon at (505) 667-9021 or Joe Mose at (505) 667-5808.

Sincerely,

Julie A. Canepa, Program Manager
LANL/ER

Sincerely,

Theodore J. Taylor, Program Manager
DOE/LAAO

JC/TT/PB/ev

Enclosures:
1) Stabilization Plan for IMs and BMP at PRSs 49-001(b, c, d, and g
2) IMs Report for Potential Release Sites 49-001
3) BMP Report for Installation of Stabilization Measures at PRS 49-001(b, c, d, and g)

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D. Daymon, EES-13, MS M992
J. Mose, LAAO, MS A316
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E/ER File, MS M992
Tracker, RM 604, MS M992

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1.0 RATIONALE AND OBJECTIVE

This stabilization plan proposes implementing best management practices (BMPs) and interim measures to stabilize a portion of Material Disposal Area (MDA) AB located in Technical Area (TA) 49. MDA AB consists of Areas 1, 2, 2A, 2B, 3, and 4 (Figure 1-1). The specific area of concern for this plan includes contiguous Areas 2, 2A, and 2B, which have been identified by Los Alamos National Laboratory (the Laboratory) as Potential Release Sites (PRSs) 49-001(b,c, and d), respectively. Historically, the site is the location of underground nuclear safety and related tests performed during 1960 and 1961. In 1961, the entire surface of Area 2 [PRS 49-001(b)] was covered with fill and an asphalt pad after it was determined in late 1960 that plutonium contamination resulting from an accidental release was present in the surface soils. It was subsequently determined that moisture was accumulating between the asphalt and the tuff surface, that there was a potential for surface water to pond at the site, and that standing water was periodically present in a monitoring well that extended through the site to far below the area of experimentation. These moisture issues have raised concern as to the potential for deep subsurface migration of contaminants.

The objective of this stabilization plan is to reduce the potential for subsurface contaminant migration along water pathways by

- constructing a run-on diversion channel upgradient of the site,
- removing the asphalt pad, and
- regrading the site to eliminate surface water ponding.

The run-on diversion channel will be constructed as a BMP. It will be a relatively simple structure that will not involve high cost; it will be located outside the Area 2 PRSs; and it will not restrict future remedial activities. The remaining activities, such as removing the asphalt pad and regrading the site, will be performed as interim measures. These activities will be performed inside the Area 2 PRSs and are more costly and complex than constructing the diversion channel. This plan describes the site and its history, the proposed BMP and interim measures, and the schedule and cost to complete these activities.

Following this introduction, an overview of the site history is presented in Chapter 2. Chapter 3 summarizes the available Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) site characterization data, moisture conditions, and other site information; identifies the principal constituents present at the site; and provides the rationale for the proposed action. Chapter 4 presents the justification for implementing the stabilization plan. Chapter 5 provides an overview of the proposed stabilization plan. Chapter 6 presents information on site restoration, cleanup, and monitoring, and Chapter 7 presents information on long-term maintenance. Chapter 8 presents a discussion of alternatives to the proposed BMPs. Chapter 9 presents project schedule and quality assurance (QA) information. References and attachments are at the back of the document; the attachments include detailed design information and plans that will support the activity.

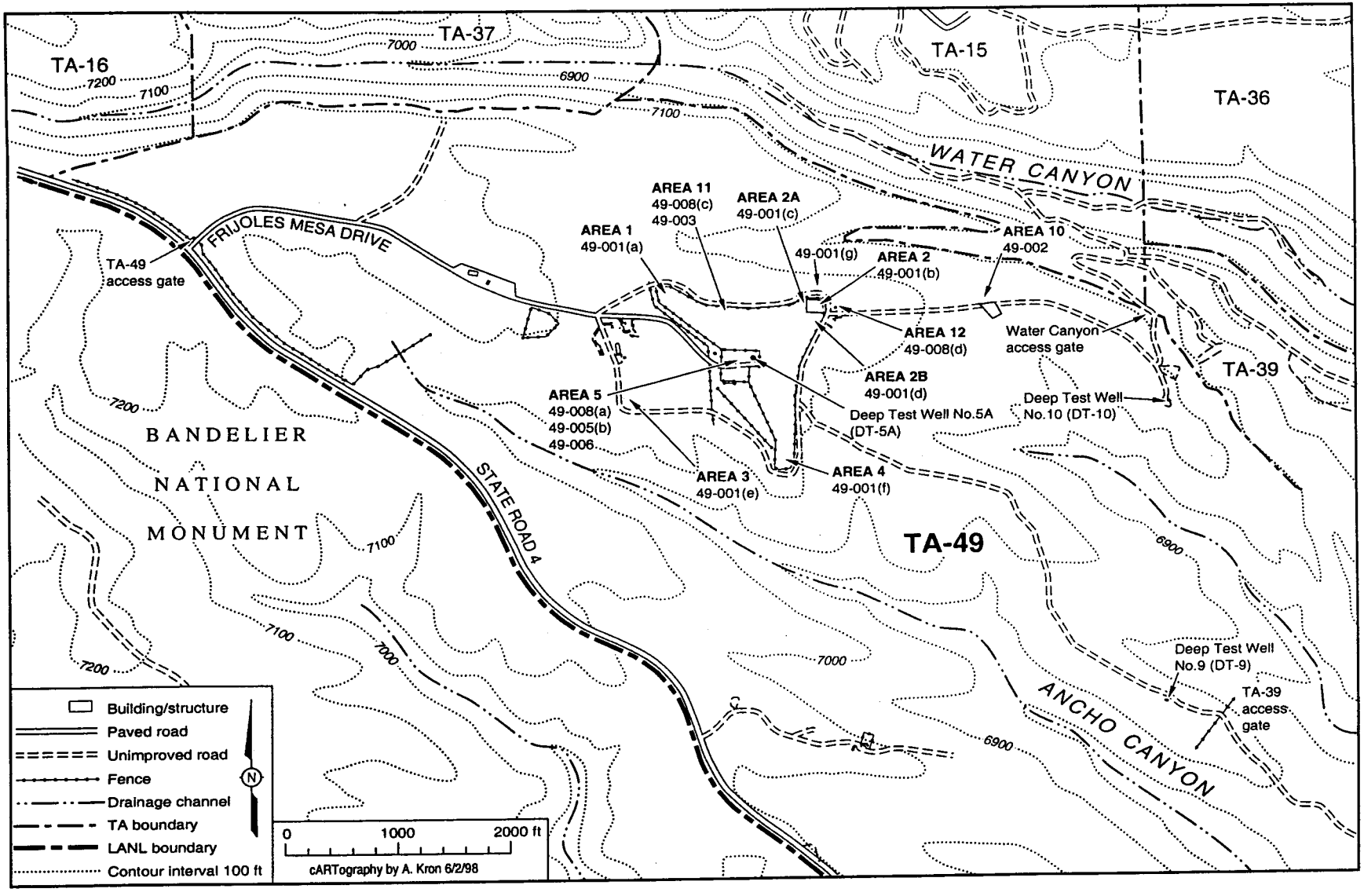


Figure 1-1. Map of TA-49.

2.0 SITE DESCRIPTION DATA

2.1 General Site Description

TA-49, the Frijoles Mesa Site, occupies approximately 1280 acres along the southwestern boundary of the Laboratory. It is bounded by Bandelier National Monument to the south and west (State Road 4), TA-15 to the north (the edge of Water Canyon), TA-39 to the east, and TA-16 and TA-37 to the north and west. The PRSs addressed in this plan are located on the mesa top at an elevation of approximately 7140 feet. These sites are approximately 1650 feet from an ephemeral stream at the bottom of Water Canyon. The distance to the nearest mesa edge, above a tributary to Water Canyon, is approximately 700 feet. The layout of MDA AB in TA-49 is shown in Figure 1-1. Much of the information presented in this section was taken from the Operable Unit (OU) 1144 RFI work plan (LANL 1992, 7670).

TA-49 has been used since the mid-1940s as a buffer zone for firing sites in adjacent TA-15 and TA-39. A period of intense experimental activity took place at TA-49 from late 1959 through mid-1961, during which significant amounts of plutonium, uranium, lead, and beryllium were used in nuclear safety and related experiments in underground shafts. These activities were responsible for almost all of the radioactive and hazardous materials currently present at TA-49.

Between January 1960 and August 1961, 41 underground nuclear safety tests involving high explosives (HE) and special nuclear materials (SNM) were conducted in Areas 1, 2, 3, and 4 at TA-49. The purpose of the tests was to determine if an accidental detonation of the HE in a nuclear weapon would be capable of triggering a nuclear explosion. Of these tests, 37 involved either plutonium or plutonium and uranium-235, and 4 involved only uranium-235. Mockup experiments used in test design incorporated small amounts of depleted uranium (uranium-238) as a radioactive tracer; larger amounts of depleted uranium were also used in the actual safety tests. The area selected for these tests had previously been studied extensively by the Laboratory and the US Geological Survey to determine its suitability. The location was selected because it exhibited geologic characteristics that ensured containment of the experiments and hydrologic characteristics that were thought to preclude the contamination of ground water. The four test areas lie approximately 1200 feet above the main aquifer, and deep core holes drilled at each of the test areas demonstrated that the underlying tuff had very low moisture content and no perched ground water.

The nuclear safety tests were conducted in 3- or 6-foot-diameter shafts at depths ranging from 31 to 108 feet. The general configuration (before detonation) of the test shafts, filter boxes, and equipment used in Areas 2, 2A, and 2B is shown in Figure 2-1. In a typical nuclear safety test, the test apparatus was placed at the bottom of the shaft, instrument cables leading to the surface were installed, and the shaft was backfilled with sand or crushed tuff to contain the explosion. The downhole test assembly was encased in a steel container with substantial amounts of lead shielding. After detonation, completion of measurements, and radiochemical sample collection, the cables were severed, and the shaft was topped off with clean sand or crushed tuff to compensate for the settlement that had occurred during the shot. Most holes containing SNM were capped with concrete. In most cases, the steel filter boxes (when used) also were filled with concrete and left in place. To minimize radiation exposure from a portable neutron source used in some tests, large, portable concrete radiation shields were used. Short-lived activation products, which by now have decayed to undetectable levels, resulted from the operation of the neutron source. Occasional monitoring with field instrumentation has confirmed that the concrete shields remaining at TA-49 have no detectable surface contamination. Approximately ten of the shields still remain at TA-49, of which three are visible in the vicinity of Area 2. The shields were generally placed over the shafts to supplement the concrete caps. Because they cover potentially contaminated soil, there are no plans to disturb either the shields or the associated concrete caps. They do not interfere with the planned stabilization activities and are not expected to interfere with final corrective measures for the site.

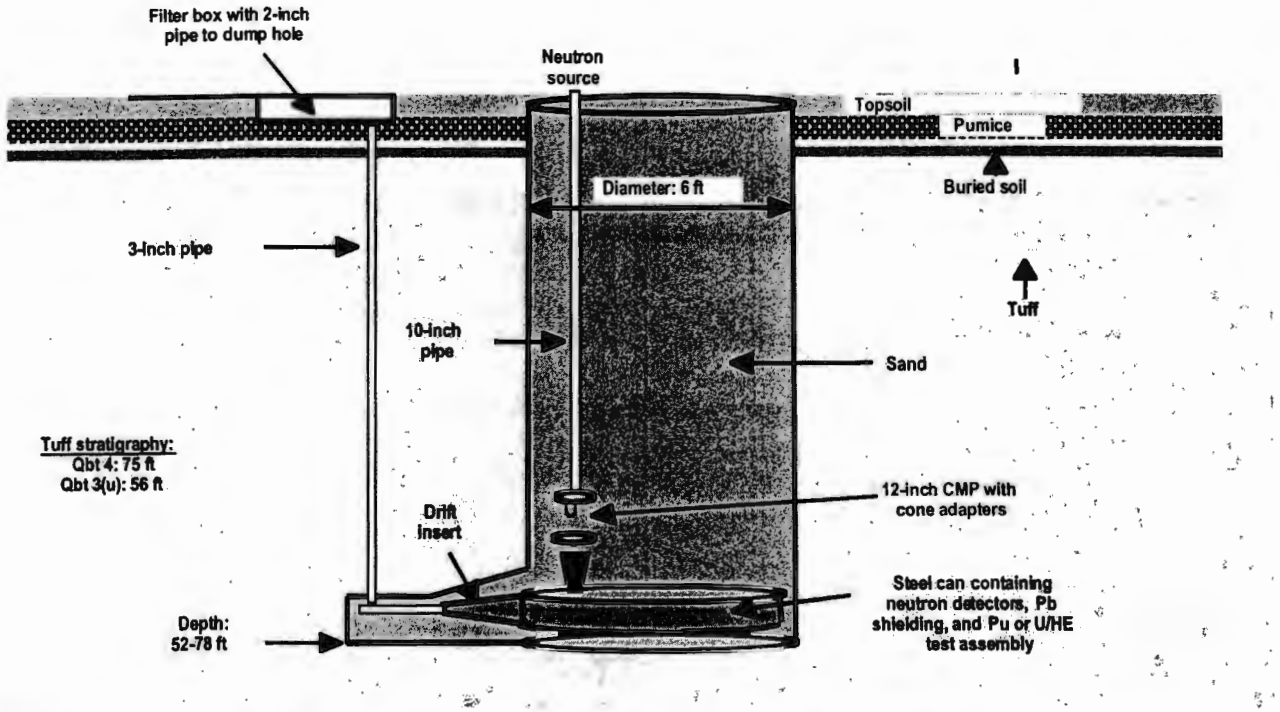


Figure 2-1. **General configuration of test shaft and equipment at Areas 2, 2A, and 2B before detonation.**

During the test, the experimental apparatus was placed at the bottom of the shaft and oriented to drive gases and particulates generated by detonation of the HE into a collector tube in a short horizontal side drift. The collector tube connected with a 3-inch-diameter pipe in a separately drilled vertical borehole that led to a filter box at the ground surface where samples of radioactive particulates were collected. Excess gas and particulates were directed through piping on the ground surface into vertical shafts called gas expansion holes.

The configuration (after detonation) of the test shafts and equipment used in Areas 2, 2A, and 2B is shown in Figure 2-2. Contaminated surface piping was disposed of in specially drilled *pipe dump* holes. No effort was made to recover any of the downhole test equipment and residual materials dispersed by detonation of the HE remain at the bottom of the shafts and in the surrounding tuff. It must be assumed that radioactive contamination also remains in the filter boxes, gas expansion holes, and pipe dump holes. It is stated in the OU 1144 RFI work plan (LANL 1992, 7670, p. 7-19) that available information may not account for all of the auxiliary holes. Minor contamination from the oxidation of lead bricks temporarily placed around the experimental shafts may also be present on the original ground surface. A summary of the principal constituents remaining underground at MDA AB is presented in Table 2-1.

2.2 Tests at Areas 2, 2A, and 2B

The activities described in this stabilization plan address conditions at Areas 2, 2A, and 2B. The locations of the test shafts and information on the use of each shaft in these areas are shown on Figure 2-3. Detailed descriptions of the shafts and experiments can be found in the OU 1144 RFI work plan (LANL 1992, 7670, Chapter 7).

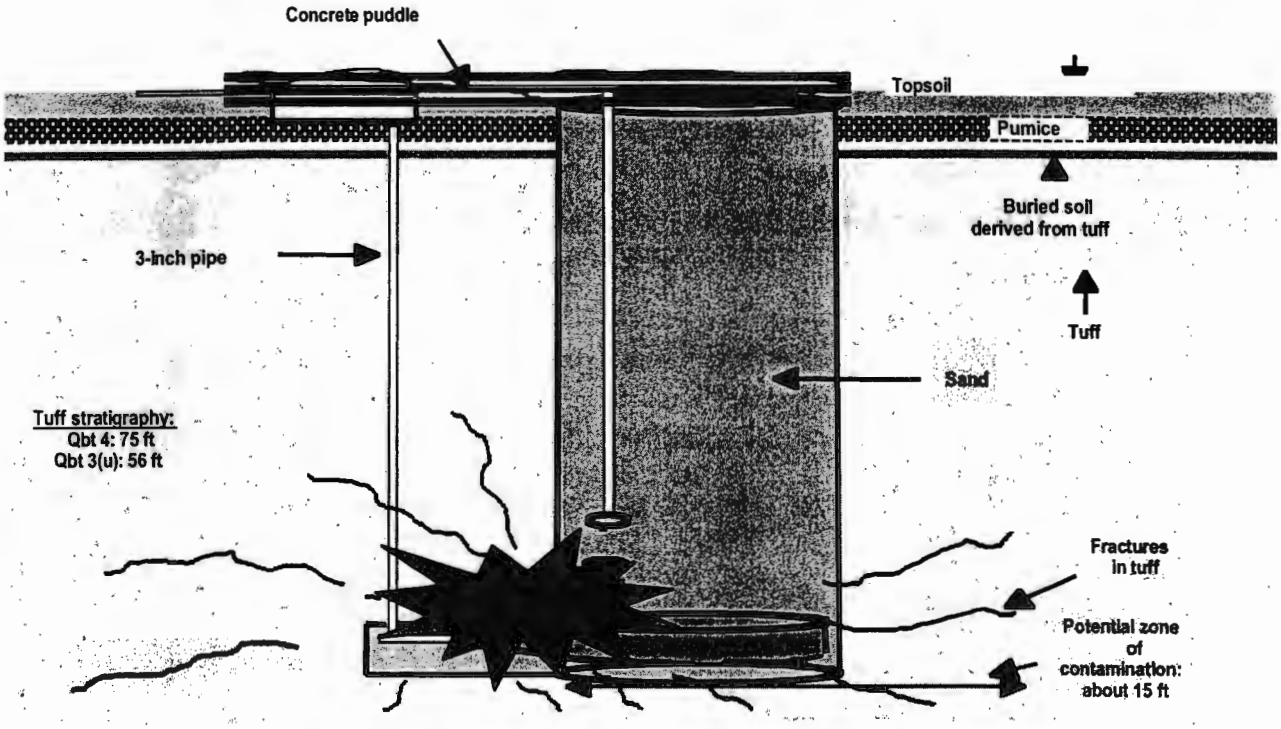


Figure 2-2. **General configuration of test shaft and equipment at Areas 2, 2A, and 2B after detonation.**

Table 2-1
Inventories of Major Constituents Remaining Underground at MDA AB

PRS Number	MDA Area	Plutonium	Uranium-235	Uranium-238	Beryllium	Lead
49-001(a)	1	1	0	62	—*	—
49-001(b,c,d)	2, 2A, 2B	22	64	78	—	—
49-001(e)	3	0	<1	<1	—	—
49-001(f)	4	17	29	29	—	—
	Totals	**40**	**93**	**169**	**11**	**90,000**

Note: Concentrations are in kg.

* A dash means quantities not known by individual PRS, total quantities only.

The subsurface tests at Areas 2, 2A, and 2B were conducted within the depth range of 52 to 78 feet. The confinement provided by the tuff and sand backfill appears to have successfully contained the explosions and confined most of the test assembly materials to within a predicted maximum radius of 10 to 15 feet from the point of detonation at the bottoms of the shafts. Exceptions included the planned release of test materials into the ground-surface filter boxes described in Section 2.1. To avoid drilling into tuff contaminated by previous shots, the shafts were located on 25-foot centers. This spacing was found to be adequate and provided a verification of the original design concept.

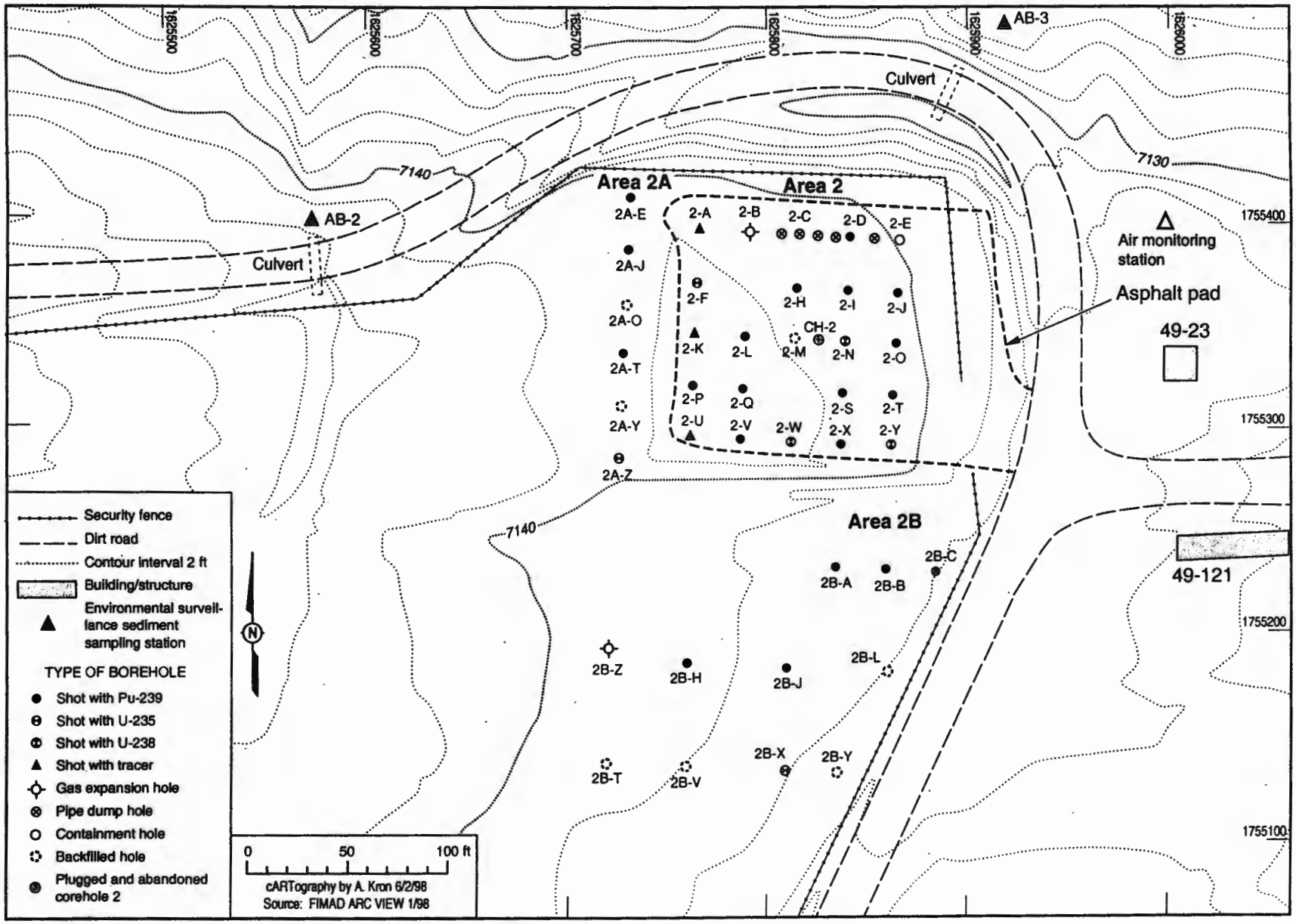


Figure 2-3. Test shafts at Areas 2, 2A, and 2B.

Three accidental releases in Area 2 and one in Area 2B resulted in contamination of the ground surface. Three of these releases were small and affected only the local area around the shaft and filter box. The remaining release caused more widespread contamination and resulted in the closing and capping of Area 2. The test program continued at adjacent locations to the west and south; the locations were designated Areas 2A and 2B. The smaller releases were generally associated with problems that occurred because of unexpected back pressure when opening the filter box to retrieve the filter for analysis. The first release occurred at Shaft 2-H in January 1960 and was corrected by covering the surface soils around the shaft with 300 cubic feet of concrete. The second release occurred at Shaft 2-S in March 1960 and was again corrected by covering the surface soils with concrete. The third and most extensive release occurred in Shaft 2-M in November 1960 and was detected in December 1960, as described in more detail below. The contamination was addressed by backfilling Shaft 2-M with contaminated surface soil and equipment, covering Area 2 with 2 to 3 feet of fill material, and capping the fill with 4 to 6 inches of asphalt. The fourth and final release was small. It occurred at Shaft 2B-H in March 1961 and was corrected by covering a 30- by 40-foot area with concrete. The locations of these constituent releases are shown in Figure 2-4.

The third and most significant contamination incident occurred in Shaft 2-M in November 1960. An illustration of the conditions that led to this incident is shown in Figure 2-5. Tests were completed in neighboring Shaft 2-L in April 1960, and the succeeding test shaft (2-M) was bored 25 feet to the east of Shaft 2-L in October. In November, a drift toward the southwest was constructed in Shaft 2-M. This drift was mistakenly oriented toward the southeast-trending drift from Hole 2-L, making the ends of the two drifts only about 6 to 7 feet apart. This separation was apparently small enough that the drift from Shaft 2-M encountered radioactive contamination in the tuff resulting from the test detonation in Shaft 2-L. The contamination remained undetected for about one month. In late December, alpha contamination in excess of 100,000 cpm was noted in the as yet empty Shaft 2-M. Monitoring indicated that surface contamination was as high as 800,000 cpm (LANL 1992, 7670, p. 7-27). Surface soil and equipment contaminated by this incident were placed in the unused Shaft 2-M, and the rest of the shaft was backfilled with sand. All remaining open shafts at Area 2 were also filled with sand. In January 1961, Area 2 was covered with a fill material, and in September 1961, it was capped with asphalt pavement and closed. The fill cap and asphalt pad extended approximately 12.5 feet beyond the outermost shafts to form a 125-foot by 125-foot surface. It is almost certain that the accidental release at Shaft 2-M is the source of most or all of the above-background levels of radionuclides now observed in surface soils around the Area 2 pad and at short distances down the natural drainage toward Water Canyon.

In March 1975, it was found that the subsurface had subsided, causing the asphalt pad over the backfilled Shaft 2-M to collapse. It is suspected that the hole in the asphalt formed in the fall of 1974. The opening was about 6 feet long by 3 feet wide and 3 to 4 feet deep in the asphalt and underlying fill. In September 1976, the collapsed opening over Shaft 2-M was filled with crushed rock and clay, and the entire pad was repaved with another 2 inches of asphalt (Purtymun and Ahlquist 1986, 14722).

2.3 Moisture Conditions at Area 2

During the initial site characterization in 1959, a deep core hole was drilled at each of the four areas (1, 2, 3, and 4) at MDA AB and cased with 2-inch galvanized pipe. The purpose of these holes was to determine whether the tuff was dry and to confirm the lack of perched water beneath the candidate test locations. No perched water was found at any of the test areas. The core hole at Area 2 (CH-2) is located approximately 10 feet from where the cave-in around Shaft 2-M occurred (Figure 2-4) and is still available for monitoring. Many of the following details on the drilling of CH-2 were obtained during an April 1998 conversation between Jack Nyhan representing the Laboratory Asphalt Pad Team and Bill Purtymun, one of the original technical investigators at the site (Nyhan 1998, 57911).

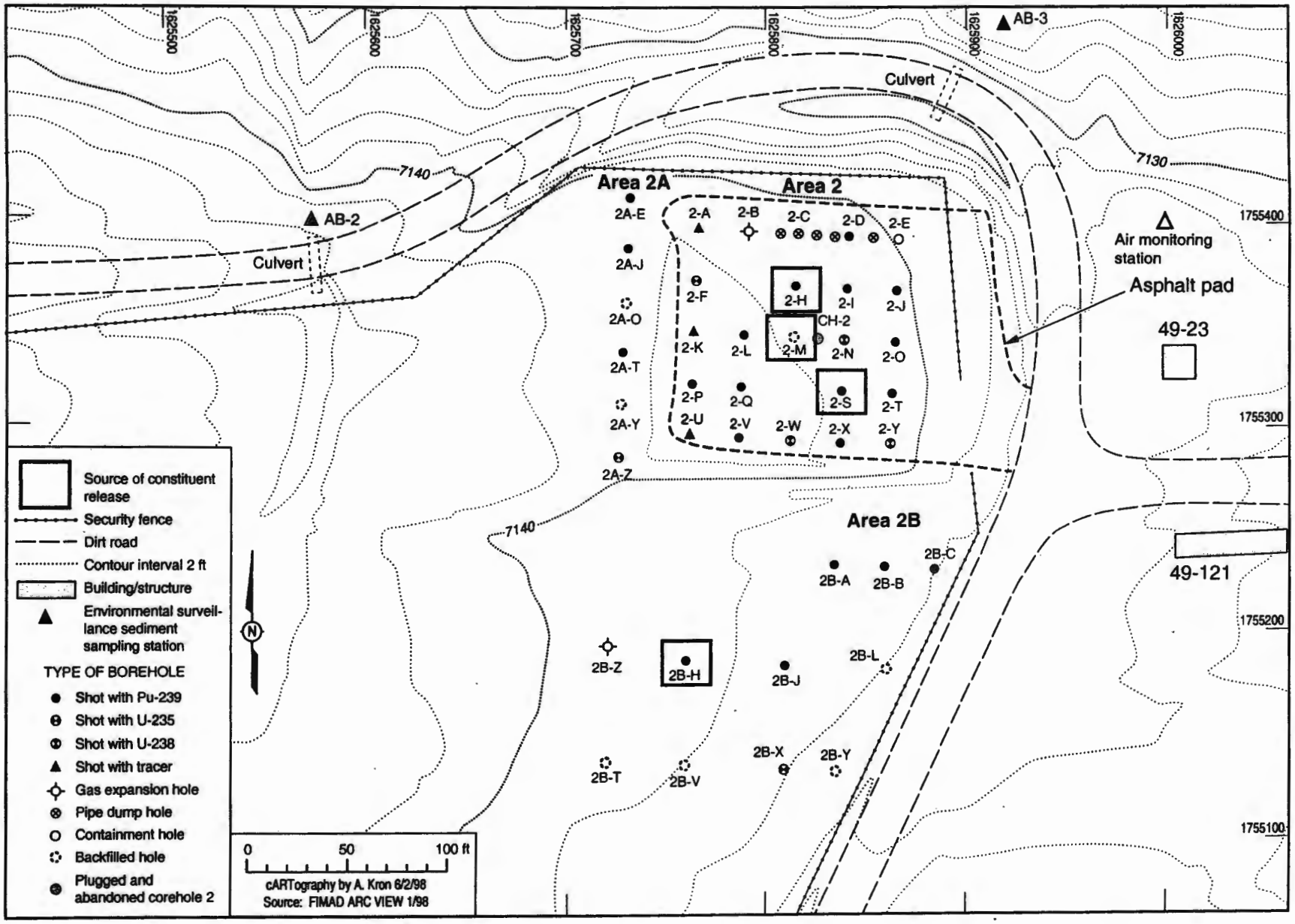


Figure 2-4. Locations of constituent releases at Areas 2, 2A, and 2B.

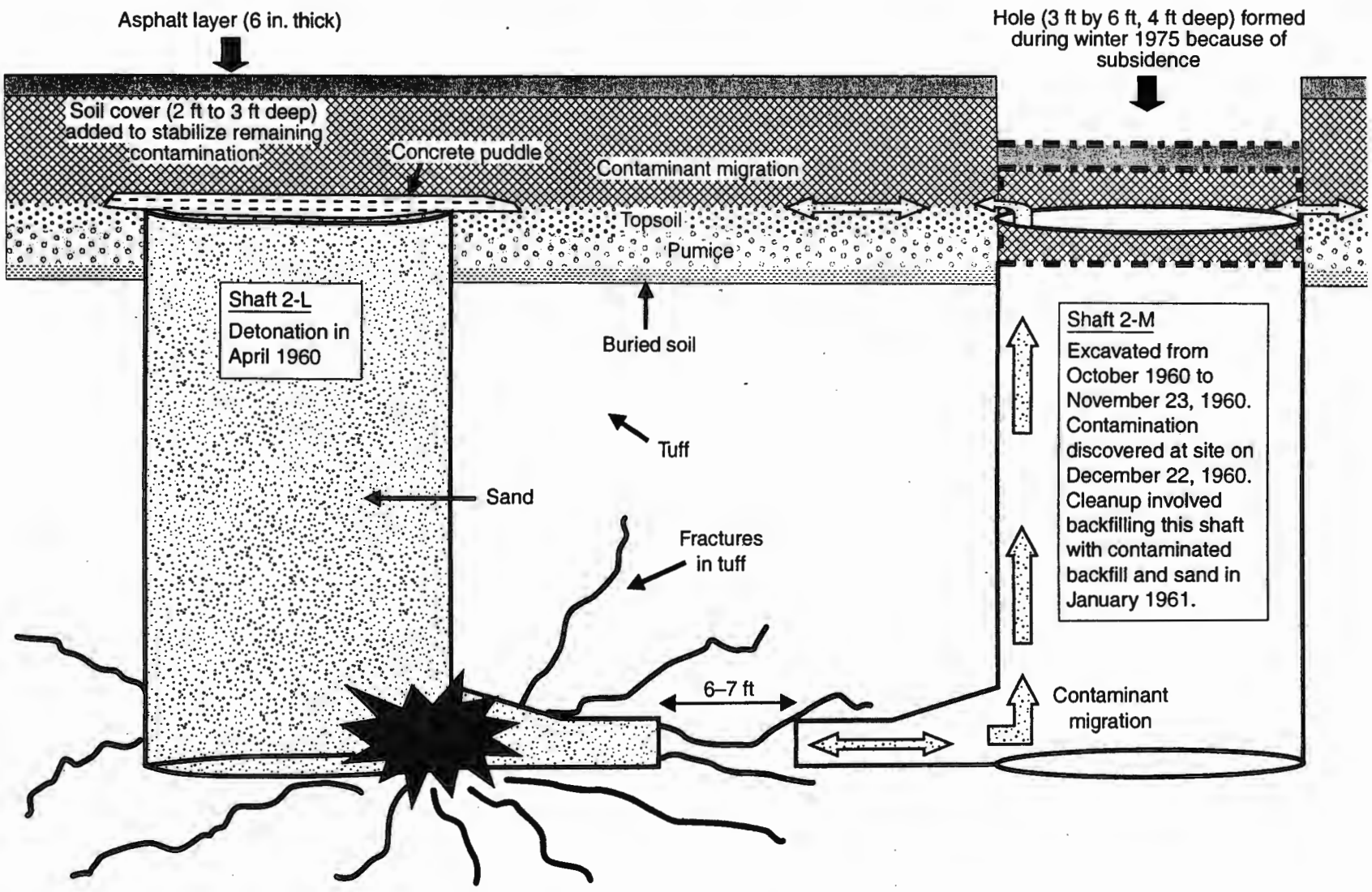


Figure 2-5. Surface contamination incident involving Shafts 2-L and 2-M at Area 2 in MDA AB

CH-2 was originally drilled with air to a depth of 501 feet below ground surface (bgs). An attempt was made to fill the core hole with water to facilitate geophysical logging, but it could not be filled past the 150-foot-depth level, probably because of a high permeability zone near the bottom of the hole. Because of this, only the lower 350 feet of the hole could be logged. United States Geological Survey personnel directed the drilling contractor to attempt to seal the hole to reduce the drainage rate, so the rest of the hole could be logged. The contractor put into the hole drilling mud (sodium saturated bentonite), peanut shells, cotton seed hulls, and a small amount of geologic material that came out of the bottom of the hole, but the effort was unsuccessful in sealing the hole. The driller completed the hole with 2-inch galvanized steel pipe, with a 20-foot length of slotted pipe in the bottom. The casing was not grouted in place, and the condition of the surface seal is not known. When the fill material and asphalt pad were added to Area 2, an extension pipe was welded to the top of the casing of CH-2 to maintain access. Currently, only about 10 feet of slotted section is available as a result of backfilling with sediment.

An unknown volume of water drained from CH-2 during the initial logging attempts. Following logging, the water level in CH-2 gradually declined from 146 feet bgs in December 1959 to no standing water in June 1960 (LANL 1992, 7670, p. 7-28). After the asphalt pad was installed, the casing for CH-2 was extended through the fill to the top of the pad. Inspection of CH-2 after the 1974 cave-in revealed that there was about 50 feet of standing water in the core hole (about 10 gallons of water). Snowmelt that collected throughout the winter may have drained into CH-2 from Shaft 2-M and moved down the annular space between the tuff and the casing to the bottom of the hole. Unfiltered samples of the water bailed from CH-2 in October 1977 and August 1978 contained 1.7 to 3.1 pCi/l of plutonium-239. These concentrations are above background but far below the Department of Energy (DOE) guidance of 100,000 pCi/l for controlled areas (Purtymun and Stoker 1987, 6688). Contaminated backfill in Shaft 2-M was considered a possible source of these radionuclides.

Approximately annual checks of CH-2 between 1980 and 1987 showed no standing water. However, in May 1991, cracks were noted in the Area 2 asphalt pad and vegetation several feet tall was observed to be growing through the cracks. An inspection of CH-2 indicated the presence of about 100 feet of standing water. This finding triggered an investigation of moisture conditions under the asphalt pad; the investigation was conducted as part of the RFI site characterization for OU 1144. Subsequent measurements indicated that CH-2 was dry by the fall of 1993, that about 25 feet of standing water was present in the spring of 1997, and that the hole was again dry in the spring of 1998. The source of the standing water in CH-2 is not well understood but likely originates from percolation of direct rainfall through cracks in the asphalt and from subsurface interflow entering the site around the edges of the pad. The high moisture content of the soil and tuff beneath the pad reduce the ability of those media to retain additional water, and excess moisture that is occasionally available at the site can migrate to greater depths than at drier locations. A summary of the occurrence of standing water in CH-2 and a discussion of the possible sources of that water are presented in the OU 1144 RFI work plan (LANL 1992, 7670, p. 7-30). The results of the RFI activities are summarized in Chapter 3.

3.0 SITE CHARACTERIZATION DATA

3.1 Approach to RFI Site Characterization at MDA AB

For purposes of RCRA site characterization, the four test areas at MDA AB have been divided into the following seven PRSs:

- PRS 49-001(a), shaft area under Area 1;
- PRS 49-001(b), shaft area under Area 2;
- PRS 49-001(c), shaft area under Area 2A;
- PRS 49-001(d), shaft area under Area 2B;
- PRS 49-001(e), shaft area under Area 3;
- PRS 49-001(f), shaft area under Area 4; and
- PRS 49-001(g), surface soil contamination associated with Areas 1, 2, 2A, 2B, 3, and 4.

These PRSs are listed as solid waste management units (SWMUs) in the Hazardous and Solid Waste Amendments Module of the Laboratory's Hazardous Waste Facility Permit. The locations of these SWMUs are defined in the SWMU Report (LANL 1990, 07513), as clarified by the Environmental Protection Agency (EPA) approved OU 1144 RFI work plan (LANL 1992, 7670). The descriptions of those SWMUs are taken from page 7-2 of that work plan.

The PRSs of concern in this stabilization plan are 49-001(b,c,d, and g) (Figure 3-1). PRSs 49-001(b,c, and d) include the contaminants left beneath the original ground surface at the time of the nuclear safety tests. Because of their similar history and close proximity (they are contiguous), these three PRSs will be treated as a single unit when implementing this stabilization plan. PRS 49-001(g) includes the soil contamination on or above the original ground surface within and adjacent to Areas 2, 2A, and 2B. PRS 49-001(g) thus includes any residual contamination on the original ground surface at the time the nuclear safety tests were performed, any contamination in the soil fill placed over Area 2, any contamination in the asphalt pad placed over Area 2, and any contamination that may have migrated from Areas 2, 2A, and 2B into adjacent land. For example, contaminant migration may have occurred from Areas 2, 2A, and 2B into downslope drainages toward Water Canyon (LANL 1992, 7670, p. 7-27).

The RFI site characterization at MDA AB adopted a streamlined approach wherein a final remedy involving stabilizing the subsurface constituents in place was envisioned. For the subsurface PRSs, only those data were to be collected that defined the consequences of leaving the residual test materials in place and provided information needed to effect an appropriate in situ stabilization (LANL 1992, 7670, p. 2-1). The types, locations, and quantities of constituents for these PRSs (Table 2-1) were considered by the work plan authors to have been adequately identified from process knowledge because extreme care was given to the disposition of the SNM used in the tests. For the surface contamination in PRS 49-001(g), in situ stabilization was not envisioned at all locations, and extensive sampling was planned to determine both the nature and extent of contamination to evaluate appropriate actions.

3.2 Site Characterization at Areas 2, 2A, and 2B

Field efforts to better characterize surface and subsurface contamination at Areas 2, 2A, and 2B were initiated after standing water was found in CH-2 during 1975. Special studies not associated with the RFI work plan were performed before 1993. Site characterization under the work plan began in the spring of 1993.

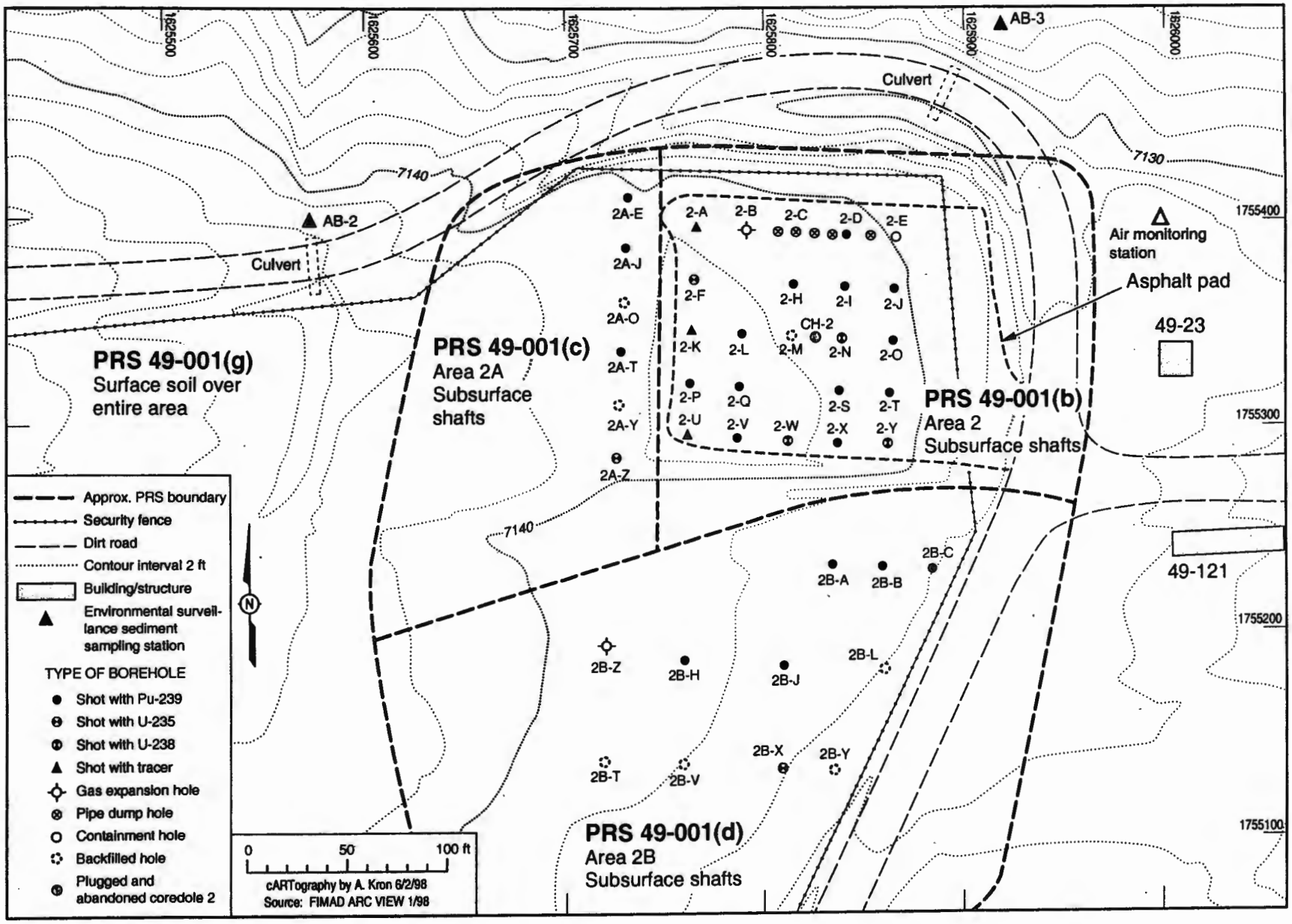


Figure 3-1. PRS at Areas 2, 2A, and 2B.

3.2.1 Surface Soils and Vegetation

In 1975, an annual sediment sampling program was initiated at TA-49 as part of the Laboratory's routine environmental surveillance program. Two of these stations (Stations A-2 and A-3) are located near Area 2, as shown on Figure 3-2. These stations were later designated as AB-2 and AB-3, respectively, and are identified under their current designations on the figure. Analytical results from this sampling program are available in Laboratory memoranda from 1975 to 1986, in annual Environmental Surveillance Group reports since 1987, and in the work plan. Data from 1983 and 1984 (LANL 1992, 7670, p. 4-48) are considered representative and indicated that Station A-2 was typical of other stations at TA-49. By comparison, Station A-3 had the highest concentrations of plutonium of any of the 11 stations at TA-49 (0.012 to 0.086 pCi/g of plutonium-238 and 0.535 to 3.10 pCi/g of plutonium-239/240). However, the results vary considerably from year to year, and the 1990 sampling data at Station A-3 are similar to those of the other stations (LANL 1992, 7670, Tables D-2 through D-4). Station A-2 is located in a channel that collects surface runoff from upgradient of Areas 2, 2A, and 2B, and Station A-3 is located in a channel that collects surface runoff from Areas 2 and 2A.

Several studies of the surface soils and vegetation were conducted in 1987. During the A411 survey (Soholt 1990, 7510), about 40 soil and 45 vegetation samples were collected around Areas 2, 2A, and 2B. Analytical results and sample locations are summarized in the OU 1144 RFI work plan (LANL 1992, 7670, p. 7-37). The study indicated that concentrations of constituents in Area 2B and in the portion of Area 2A farthest from the asphalt pad were at or slightly above regional background levels. However, at several sampling locations immediately adjacent to the asphalt pad, plutonium and americium levels well above background were observed. Elevated radionuclide levels were particularly notable at the northeast corner of the pad, where the level of americium-241 in one soil sample was 53 pCi/g (LANL 1992, 7670, p. 7-39).

In a second 1987 study, about 20 soil samples and 20 vegetation samples were collected around Area 2 (Fresquez 1991, 14822). Of the soil samples analyzed, one sample from the northeast corner of Area 2 showed elevated levels of gross alpha activity (80 pCi/g), and a nearby sample showed elevated plutonium-239 activity (1660 pCi/g). Replicate analyses for the first sample gave values of 41 pCi/g and 1.7 pCi/g of gross alpha activity, indicating a highly discontinuous distribution of surface contaminants. A PHOSWICH survey over the same area showed readings about twice the background level. Positive readings were also measured along the drainage channel leading to a culvert under the road on the northeast side of Area 2 (Figure 3-1). The highest concentration of beryllium (44 ppm) was found in a sample collected in the same drainage about 50 feet from the pad and was well above the regional background level of about 1.7 ppm. A sample from the same location exhibited the highest concentration of plutonium-239/240 found in vegetation (24 pCi/g). These samples indicated that contaminants may have migrated downgradient of the site. Elevated levels of other potential contaminants from Area 2 were also detected in the soil and vegetation samples; however, mean concentrations were typically much lower than the peak values, again indicating the highly localized nature of the constituent distributions.

During another special study in March 1991, 10 samples of pocket gopher soil diggings along the perimeter of the Area 2 pad were collected and analyzed (Fresquez 1991, 14822). The location of the gopher diggings is shown in Figure 3-2. As observed in the 1987 study, elevated radioactivity was detected in soil samples from the northeast corner of the asphalt pad. Gopher digging samples contained 135 pCi/g of gross alpha, 38 pCi/g of americium-241, 24 pCi/g of plutonium-238, and 43 pCi/g of plutonium-239/240. Gopher diggings at the same location were resampled in April 1991, and elevated gross alpha activity (1200 pCi/g) was again found. Additional analyses indicated no volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), or toxicity characteristic leaching procedure (TCLP) metal levels above maximum concentration of contaminants for the toxicity characteristic (40 CFR Part 261.24, Table 1).

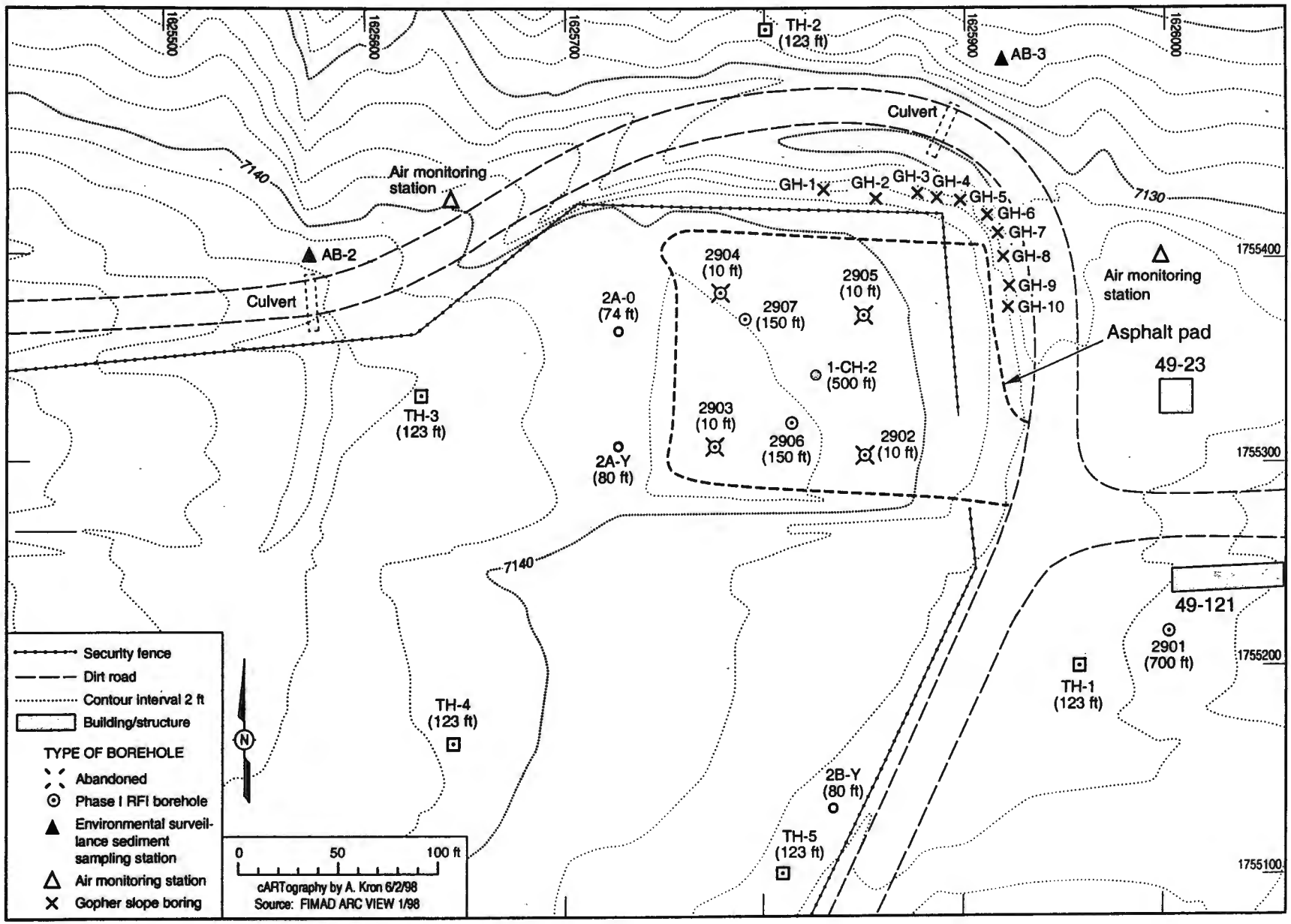


Figure 3-2. Existing sampling hole locations at Area 2.

In summary, the most elevated radionuclide levels in surface soils at Areas 2, 2A, and 2B are in the northeast corner of Area 2 and appear to be associated with the excavation of contaminated soil from beneath the asphalt pad by gophers. Because of the extensive previous sampling of surface soils and vegetation, the RFI sampling activities focused on subsurface sampling beneath the asphalt pad.

3.2.2 Subsurface Sampling

The only pre-RFI sampling of the soils beneath the asphalt pad was conducted in September 1987 when a power pole was installed 2 feet northeast of Shaft 2-T in the southeast part of the site (Romero 1987, 57904). Four soil samples were collected to a depth of 5 feet and were analyzed for gross alpha and gross beta radioactivity. An average of 44 pCi/g alpha was found, and gross beta was below detection limit. Similar samples were taken away from the asphalt pad at the location of a second power pole 27 feet north of Shaft 2B-Z, where both gross alpha and gross beta were found to be below the detection limits of 25 pCi/g.

In 1994, subsurface sampling of fill materials, soils, and tuff was performed beneath the asphalt pad in Area 2 as part of the Phase I RFI. Four 10-ft core holes (49-2902 through 49-2905) were drilled through the asphalt pad and sampled for gross radiation levels, isotopic plutonium, total uranium, metals, and moisture content. Two 150-ft core holes (49-2906 and 49-2907) were also drilled through the asphalt and sampled. The locations of these core holes are shown in Figure 3-2. The 10-foot holes were drilled with hollow stem augers, and the two 150-foot core holes were Odex (air rotary) drilled with tight-fitting steel casings that leave no annular space and therefore do not provide a pathway for contaminant migration. The 150-foot holes also have a 10- to 20-foot-long grouted surface casings that extend from the asphalt surface into the tuff. Detailed results of this investigation are discussed in the TA-49 subsurface RFI status report now being prepared. The shallow core holes penetrated the fill and underlying native soil but did not reach the depth of the test shots. The deep core holes penetrated beyond the depths of the test shots but were specifically located between test shafts to avoid encountering the elevated levels of contamination known to be present in the fractured tuff around the shots.

The only elevated radioactivity found in initial analysis of samples from the RFI core holes occurred in the northeast corner of the pad in shallow core hole 49-2905. In the 3- to 3.5-foot sampling interval of that hole, 291 pCi/g of plutonium-239, 5.1 pCi/g of plutonium-238, and 59 pCi/g of americium-241 were detected. The single elevated sample was taken from the soil beneath the fill materials. Accurate analytical results for total uranium were not obtained in any of the Phase I core hole samples because of poor recovery in the analytical laboratory, and the archived core has been resampled and analyzed for isotopic uranium to replace the original data. All samples were found to have uranium concentrations of less than 1 pCi/g.

In addition to the aforementioned core holes, a 700-ft-deep core hole (49-2901) was drilled approximately 100 feet east of Area 2B in late 1993 as part of the Phase I RFI (Figure 3-2). This hole was Odex (air rotary) drilled in the same manner as the two 150-foot holes. The casing originally installed in the 700-foot hole has since been pulled, and the hole is currently being used for moisture monitoring; however, a 20-foot-deep grouted surface casing remains in place. This hole was located east of the nuclear safety test areas to obtain uncontaminated samples for additional measurements and tests. No perched water and no elevated contaminant levels were found in this core hole. The lack of contamination in either the 150-foot or the 700-foot RFI core holes indicates that any lateral migration of the subsurface contaminants is minor. Vertical migration of the subsurface contaminants has not yet been checked and is the objective of slant drilling beneath the shafts planned for the Phase II RFI site characterization (LANL 1992, 7670, p. 7-68).

3.2.3 Moisture Conditions and Water Sampling

The moisture content of the fill, soil, and tuff beneath the Area 2 asphalt pad was measured in the RFI core holes and found to be clearly elevated above moisture levels in adjacent holes away from the pad (Figure 3-2). Moisture data from cores taken from 150-ft core hole 49-2907 are presented in Figure 3-3. The depth profiles in that figure show moisture content increasing to near saturation (50% to 60% by volume) immediately above the competent tuff. This trend is representative of conditions in the other deep RFI core hole at the site (49-2906). For comparison, a moisture profile for TH-4 is shown on the same figure. TH-4 is one of five test holes drilled around the site for monitoring moisture conditions in the soil and tuff. Each hole is 123 feet deep and is completed with an ungrouted, sealed PVC casing. In addition to the TH holes, three similarly completed moisture monitoring holes have been installed in unused shafts 2A-0, 2A-Y, and 2B-Y. TH-4 is located west of Area 2B (Figure 3-2).

The TH-4 data were collected by the Laboratory's Environmental Science Group in March 1996 using neutron probe techniques. The moisture profile in TH-4 is typical for mesa-top test holes at the Laboratory and is similar to the moisture profiles measured in test holes in well-drained areas at TA-49 before the nuclear safety tests began (LANL 1992, 7670, p. 4-16). In TH-4, the moisture content builds to a maximum of about 10% near the ground surface, and then decreases to a relatively stable 2% to 4% in the underlying tuff. By comparison, the moisture beneath the asphalt pad drops to about 29% at the soil-tuff interface and does not approach natural conditions until a depth of about 70 feet is reached. It is interesting to note the small spike in the data where the moisture beneath the pad increases from about 5% to over 10% in the depth interval of 50 to 65 feet. No stratigraphic changes have been identified in this interval that account for this anomaly. This depth interval roughly corresponds to the depths of the adjacent test shafts and may reflect the influence of excess water seeping from the bottom of the shafts.

The dramatic difference in moisture content between the soils and tuff beneath the asphalt pad and those that are not beneath the pad is thought to be caused primarily by reduced evapotranspiration caused by the asphalt pad. In addition, runoff from direct precipitation on the asphalt is concentrated at the edges of the pad and in cracks in the asphalt and enters the underlying soils through gravity flow and capillary forces. The lack of plant growth on the pad and the minimal effects of evaporation along the cracks and edges of the pad contribute significantly to a buildup of water in the underlying soil. Virtually all of the moisture that percolates into the fill beneath the asphalt remains there until it seeps down toward the underlying contaminants. The periodic appearance of standing water in CH-2 (Section 2.3) results in part from the high moisture content of the fill and tuff, which has little remaining storage capacity to absorb excess moisture that periodically enters the site through direct precipitation, surface run-on, and subsurface interflow. An illustration of the conceptual hydrology of Areas 2 and 2A is shown in Figure 3-4.

Moisture conditions at the site are made worse by excess surface water run-on and by low spots at the site where storm water can pond and infiltrate to areas of contamination. The site is located downslope from the former test control area (Area 5, Figure 2-1), downslope from an abandoned septic system and leachfield in Area 11, and also downslope from the former MDA AB access road, which passed through the control area. The concentration of traffic between the site and Area 5 at the time the tests were conducted created rutted dirt roads that can still be seen today; these roads channel surface runoff directly toward Areas 2, 2A, and 2B (Figure 3-5).

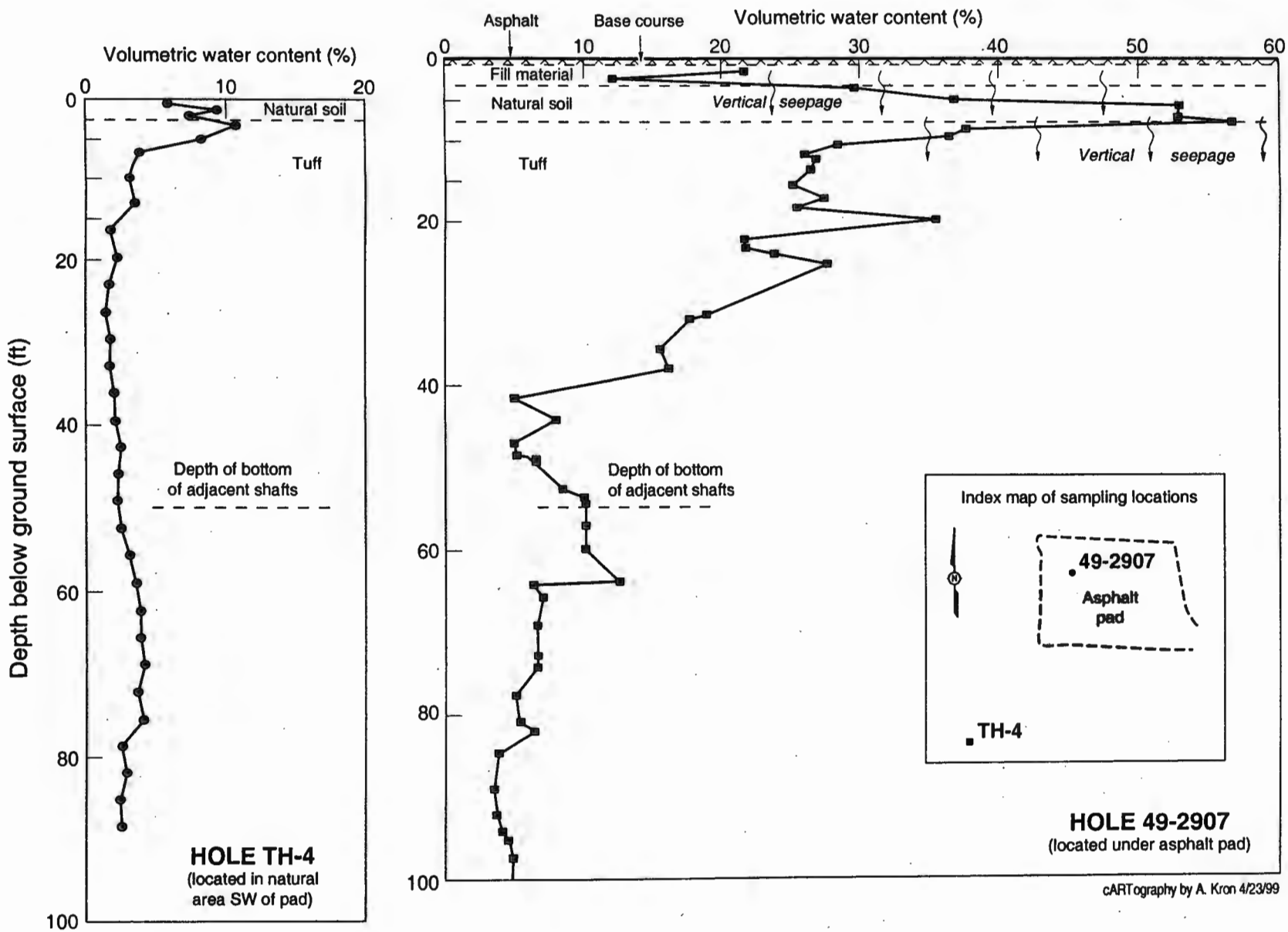


Figure 3-3. Subsurface moisture profiles at Area 2

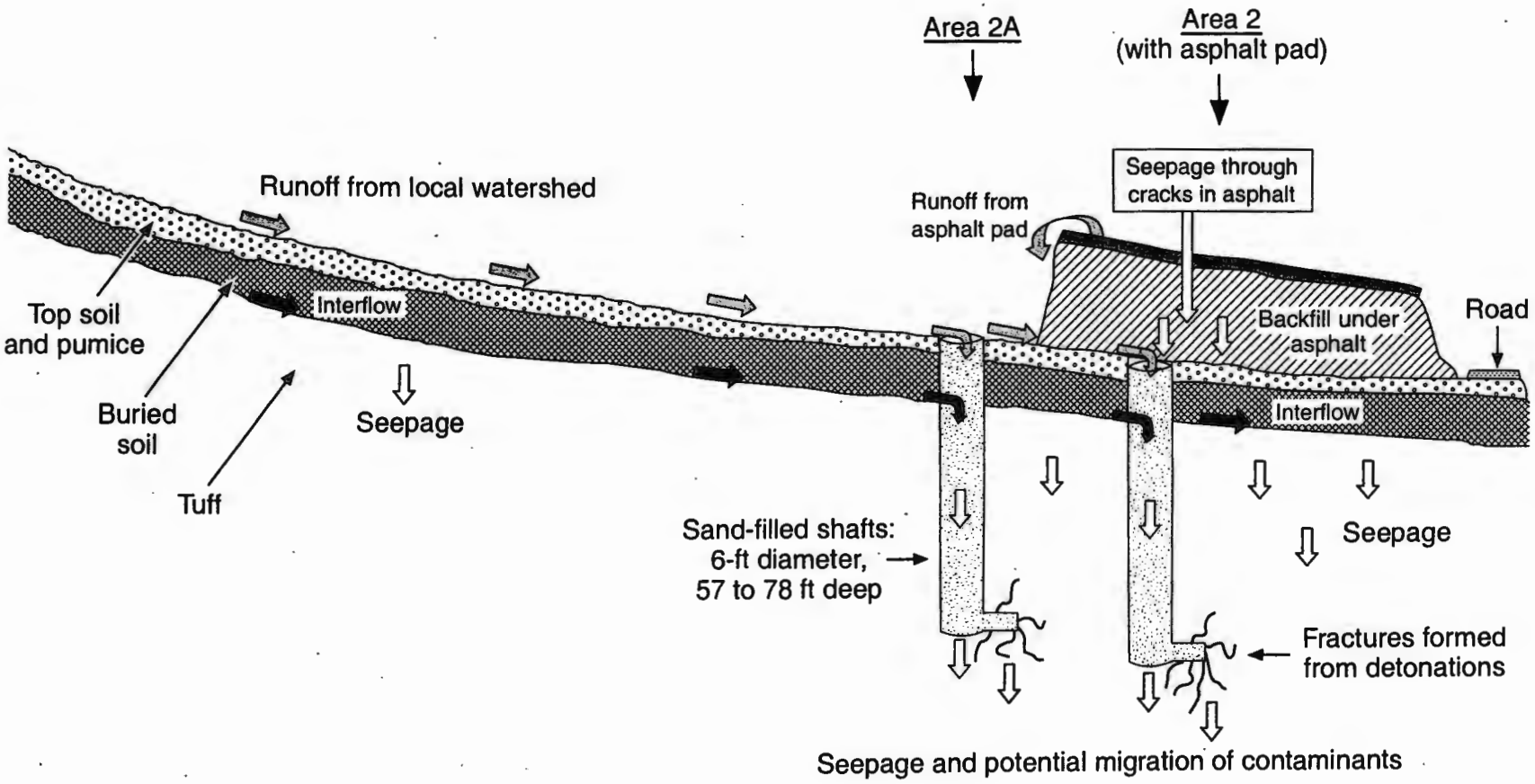
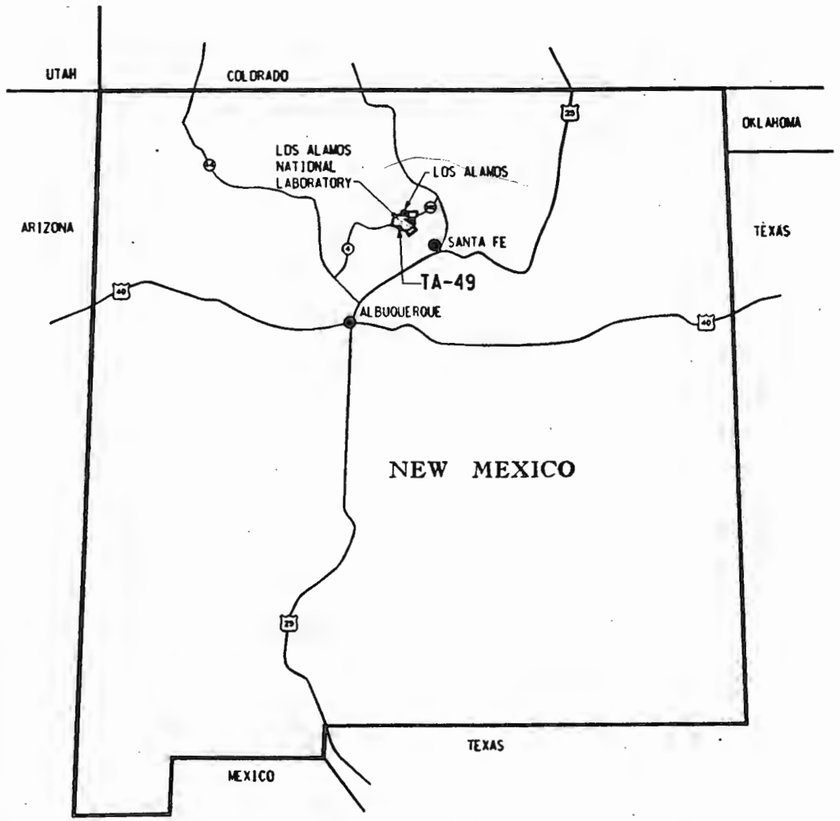


Figure 3-4. Conceptual hydrology of Areas 2 and 2A

ENVIRONMENTAL RESTORATION PROJECT

TA-49 STABILIZATION PLAN FOR INSTALLING BMPs
LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NEW MEXICO
UNIVERSITY OF CALIFORNIA



VICINITY MAP

NTS

DRAWING SCHEDULE

DRAWING No.	DRAWING TITLE
4869-74-0-010	COVER SHEET
4869-74-0-012	EXISTING SITE PLAN
4869-74-0-013	GRADING PLAN

REV	DATE	DESCRIPTION	BY	CK ENGR	DEPT MGR	PE
A	04/10/96	ISSUED FOR 90% REVIEW	BRM	JB		
B	06/05/96	ISSUED FOR 90% REVIEW	BRM	JB		

NOTES

REFERENCE DRAWINGS

DRAWING NO.	DRAWING TITLE

ENVIRONMENTAL RESTORATION PROJECT
LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NEW MEXICO
UNIVERSITY OF CALIFORNIA

TA-49 STABILIZATION PLAN
FOR INSTALLING BMPs
COVER SHEET

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL /GOVERNMENT GROUP

DRAWN BY	APPROVED BY	WORK ORDER NUMBER	
BRM	JB	W04869	
CHECKED BY	SCALE	DRAWING NUMBER	REV
KO	AS NOTED	4869-74-0-010	B

DEPT	ARCH	STRUCTURAL /SUP	MECH	ELECT	PROC	PIPING	SYS CTR	SAF DES	P.E.
INIT									
DATE									

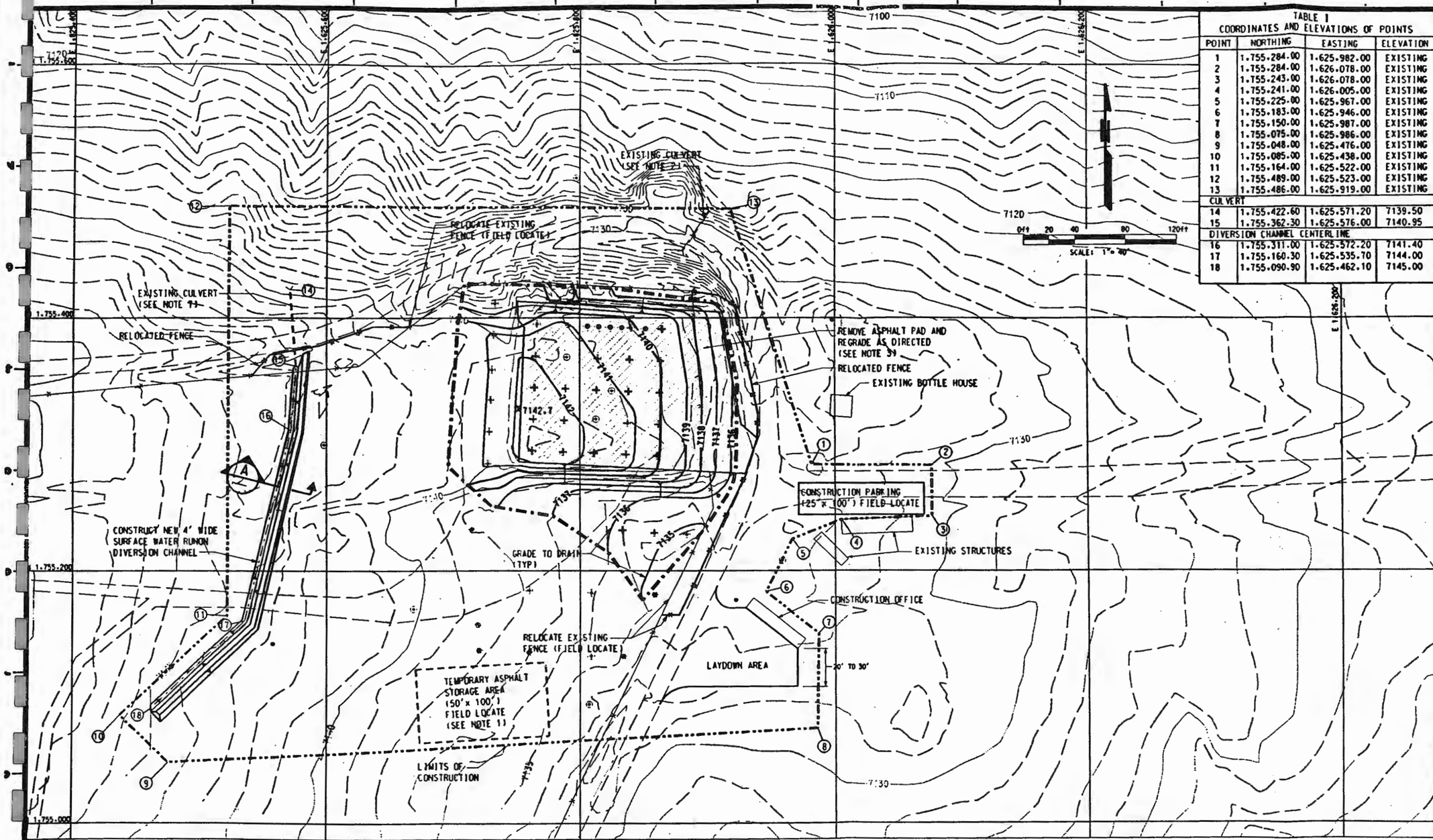


TABLE 1
COORDINATES AND ELEVATIONS OF POINTS

POINT	NORTHING	EASTING	ELEVATION
1	1.755.284.00	1.625.982.00	EXISTING
2	1.755.284.00	1.626.078.00	EXISTING
3	1.755.243.00	1.626.078.00	EXISTING
4	1.755.241.00	1.626.005.00	EXISTING
5	1.755.225.00	1.625.967.00	EXISTING
6	1.755.183.00	1.625.946.00	EXISTING
7	1.755.150.00	1.625.987.00	EXISTING
8	1.755.075.00	1.625.986.00	EXISTING
9	1.755.048.00	1.625.476.00	EXISTING
10	1.755.085.00	1.625.438.00	EXISTING
11	1.755.164.00	1.625.522.00	EXISTING
12	1.755.489.00	1.625.523.00	EXISTING
13	1.755.486.00	1.625.919.00	EXISTING
CULVERT			
14	1.755.422.60	1.625.571.20	7139.50
15	1.755.362.30	1.625.576.00	7140.95
DIVERSION CHANNEL CENTERLINE			
16	1.755.311.00	1.625.572.20	7141.40
17	1.755.160.30	1.625.535.70	7144.00
18	1.755.090.90	1.625.462.10	7145.00

REV	DATE	DESCRIPTION	BY	CH ENGR	DEPT MGR	PE
A	04/30/98	ISSUED FOR 95% REVIEW	GR	JB		
B	05/05/98	ISSUED FOR 98% REVIEW	BRM	JB		

NOTES

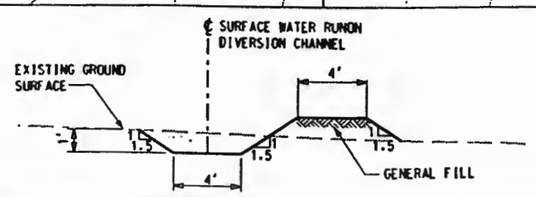
1. INSTALL BALLAST AS NEEDED TO SECURE AND PREVENT UPLIFT.
2. CLEAN OUT AND INSPECT CULVERT. REPLACE AS NEEDED.
3. SUBCONTRACTOR TO REGRADE EXISTING FILL AS DIRECTED BY CONTRACTOR. REGRADED SLOPES SHALL BE 4:1 (H:V) OR FLATTER.
4. CMP SHALL MEET HELICALLY CORRUGATED PIPE REQUIREMENTS OF NEW MEXICO STATE HIGHWAY DEPARTMENT (NMSHD) STD. SPEC. SEC. 501.
5. SEED ALL DISTURBED AREAS WITH CONTRACTOR APPROVED SEED MIX AS DIRECTED BY CONTRACTOR.
6. FURNISH AND INSTALL ADDITIONAL 6 FT. CHAIN LINK FENCE AS NEEDED AND MEETING THE REQUIREMENTS OF NMSHD STD. SPEC. SEC. 607.
7. RESET AND EXTEND CULVERT AS DIRECTED BY CONTRACTOR.

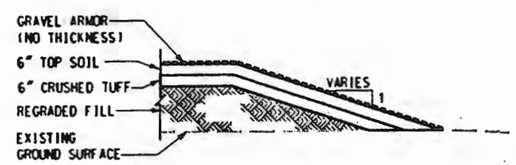
LEGEND

- CONSTRUCTION LIMITS / LIMITS OF CLEARING
- REGRADING LIMITS
- 7140 FINAL GRADING CONTOURS
- CENTERLINE AND FLOW DIRECTION
- NEW FENCE LOCATION
- ASPHALT PAD REMOVAL LIMITS
- SHOT LOCATIONS (RETAIN AND PROTECT CONCRETE CAPS WITH 12" OF SOIL FILL)
- (1) COORDINATE POINT NUMBER
- POWER POLE
- GAS EXPANSION
- WELL CH-2
- PIPE DUMP HOLE

REFERENCE DRAWINGS

DRAWING NO.	DRAWING TITLE
4869-74-0-012	EXISTING SITE PLAN





TYPICAL SECTION-TEMPORARY COVER
NTS

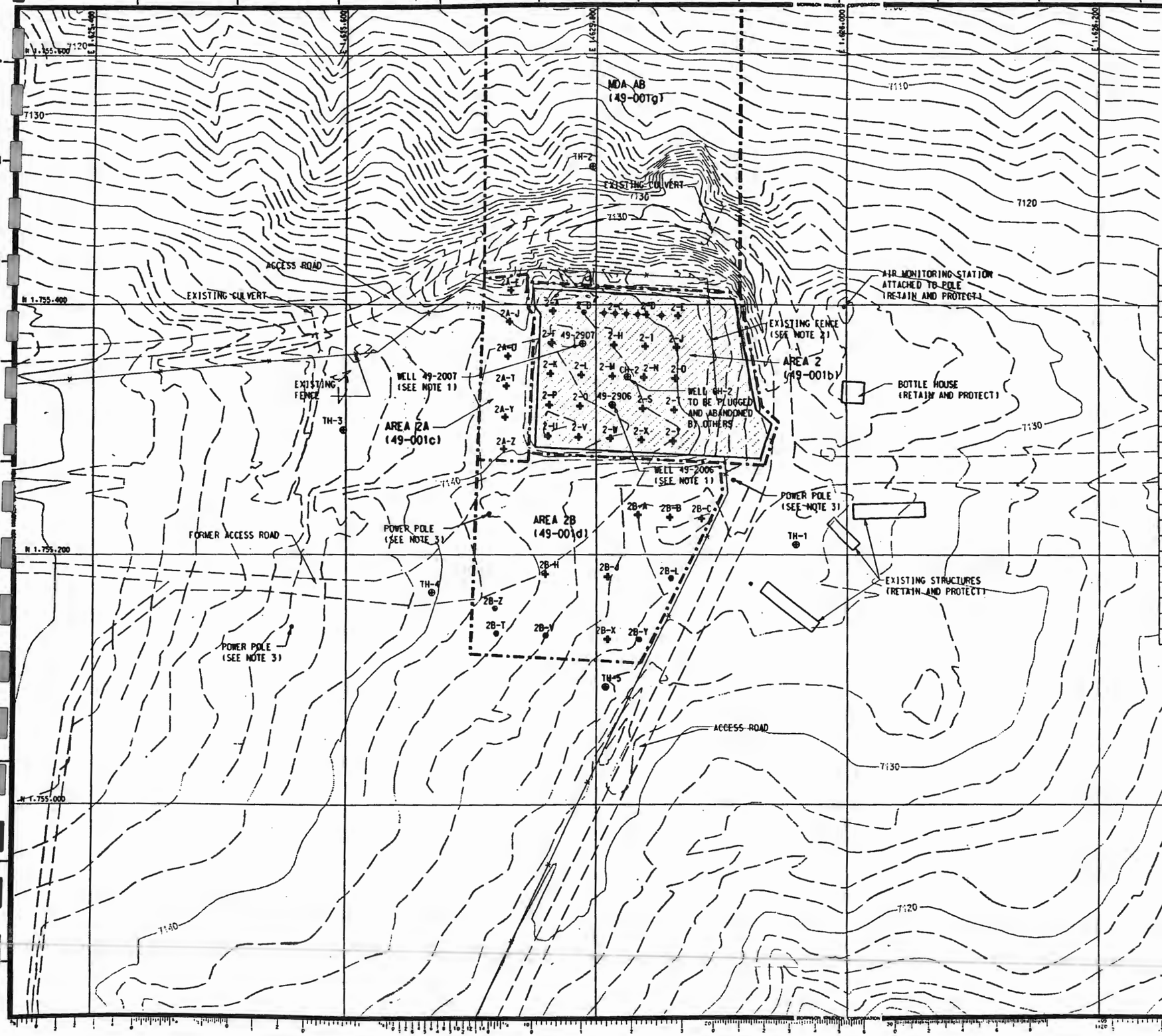
ENVIRONMENTAL RESTORATION PROJECT
LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NEW MEXICO
UNIVERSITY OF CALIFORNIA

TA-49 STABILIZATION PLAN FOR INSTALLING BMPs GRADING PLAN

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL / GOVERNMENT GROUP

DRAWN BY	APPROVED BY	WORK ORDER NUMBER
GR	JB	W04869
CHECKED BY	SCALE	DRAWING NUMBER / REV
MO	AS SHOWN	4869-74-0-013 / B

DEPT	ARCH	STRUCT/GEO	MECH	ELECT	PROC	PIPING	SYS CTR	SAF OES	P.E.
INIT									
DATE									



REV	DATE	DESCRIPTION	BY	CHK BY	EQUIP CHK	PE
A	04/10/96	ISSUED FOR 90% REVIEW	BRM	JB		
B	06/05/96	ISSUED FOR 100% REVIEW	BRM	JB		

0 10 20 40 80 120 ft
SCALE: 1" = 40'

IDENTIFIER	NORTHING	EASTING	ELEVATION OF CONCRETE CAP/PLUG
2-A	1755395.14	1625765.59	NO CAP
2-B	1755394.05	1625790.57	NO CAP
2-C	1755392.96	1625815.54	7138.15
2-D	1755391.87	1625840.52	7137.64
2-E	1755390.79	1625865.49	NO CAP
2-F	1755370.17	1625764.50	7139.23
2-H	1755367.99	1625814.45	7138.62
2-I	1755366.90	1625839.43	7138.07
2-J	1755365.81	1625864.40	7137.51
2-K	1755345.19	1625763.41	7139.93
2-L	1755344.10	1625788.39	7139.53
2-M	1755343.01	1625813.36	7134.47
2-N	1755341.92	1625838.34	NO PLUG
2-O	1755340.83	1625863.32	7137.77
2-P	1755320.21	1625762.32	7139.19
2-Q	1755319.12	1625787.30	7139.31
2-S	1755316.95	1625837.25	7137.71
2-T	1755315.86	1625862.23	7137.49
2-U	1755295.24	1625761.23	NO CAP
2-V	1755294.15	1625786.21	7138.43
2-W	1755293.06	1625811.18	NO CAP.
2-X	1755291.97	1625836.16	7136.99
2-Y	1755290.88	1625861.14	NO CAP

NOTES

1. SUBCONTRACTER SHALL RETAIN AND PROTECT ALL EXISTING MONITORING WELLS.
2. FENCE TO BE REMOVED ACROSS ASPHALT PAD AND ADJACENT AREAS AS NEEDED.
3. POWER POLE TO BE CUT OFF 3 FEET ABOVE GROUND BY OTHERS. CONTRACTOR TO REMOVE REMAINING PORTION OF POLE.

LEGEND

- ASPHALT PAD
- APPROXIMATE PRS BOUNDARY
- EXISTING FENCE
- SHOT LOCATION
- GAS EXPANSION HOLE
- BACKFILLED HOLE (NOT SHOT)
- PIPE DUMP HOLE
- MONITORING WELL
- POWER POLE

REFERENCE DRAWINGS

DRAWING NO.	DRAWING TITLE

ENVIRONMENTAL RESTORATION PROJECT
LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NEW MEXICO
UNIVERSITY OF CALIFORNIA

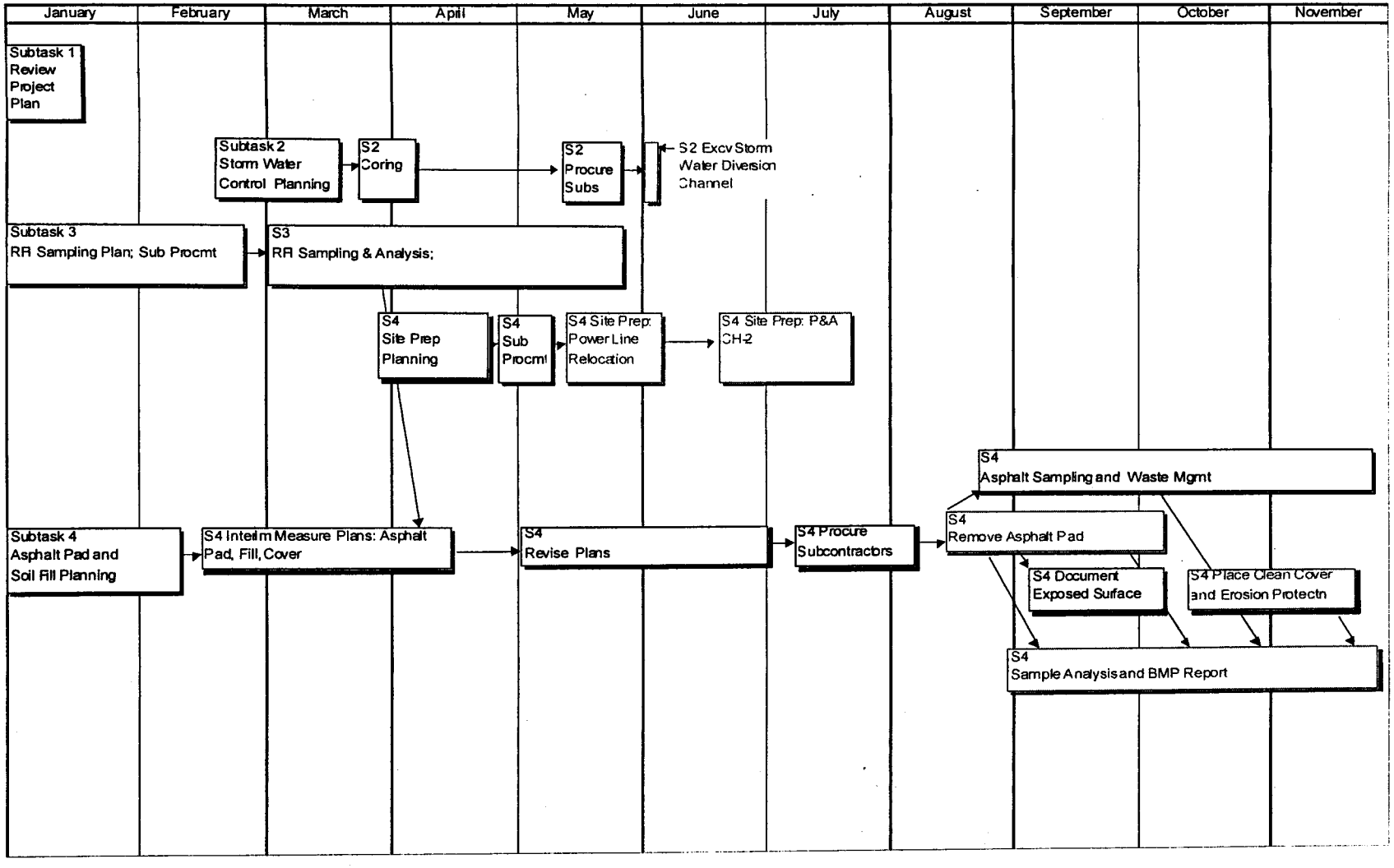
TA-49 STABILIZATION PLAN FOR INSTALLING BMPs EXISTING SITE PLAN

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL/GOVERNMENT GROUP

DRAWN BY	APPROVED BY	WORK ORDER NUMBER
BRM	JB	W04869
CHECKED BY	SCALE	DRAWING NUMBER / REV
WO	AS SHOWN	4860-74-0-012 / B

DEPT	APPD	QUALITY ASS	MECH	ELECT	PROC	PIPING	SYS CTR	SAF	DES	P.E.
INIT										
DATE										

Attachment 5

Schedule

Schedule to Achieve TA-49 Asphalt Pad Performance Measure