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BURN PIT AREA REMOVAL ACTION REPORT

LOCKHEED PROPULSION COMPANY

BEAUMONT TEST FACILITY NO. 1

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EXECUTIVE SUMMARY

This report provides details of the removal action performed from November 1992 through February 1993 at the burn pit area of the former Lockheed Propulsion Company (Lockheed) Beaumont No. 1 facility. The objective of the removal action was to clear the site of any waste remaining from historical activities that would prevent it from being certified for unlimited future land use. Work performed was conducted in accordance with a Consent Order (HSA-88-89-034) with the Department of Health Services, Toxic Substances Control Program (Cal/EPA, Department of Toxic Substances Control [DTSC]) and the regulatory agency-approved *Remedial Action Plan* prepared by Radian Corporation (Radian) in May 1992 (Radian, 1992a).

Site Background

The burn pit area (BPA) is located in a broad valley in the southeastern portion of the Lockheed No. 1 facility which is approximately 70 miles east of Los Angeles, in Beaumont, California. From 1961 to 1974, Lockheed burned waste propellant and other materials used in the production of rocket motors at the BPA in pits averaging 6 feet wide, 4 feet deep, and 50 feet in length (Radian, 1986a). More recently, the BPA has been used for cultivation and grazing. It is now sparsely vegetated grassland that is inhabited by the Stephens' Kangaroo Rat (*dipodomys stephensi*). The Stephens' Kangaroo Rat (SKR) is listed as "threatened" by the California Department of Fish and Game, and "endangered" by the United States Fish and Wildlife Service (Radian, 1991a).

In 1986, Lockheed initiated site investigation activities to determine the nature and extent of waste in the BPA. From early 1986 through 1989, Radian reviewed and compiled historical information; conducted a geophysical investigation; and performed a remedial investigation involving exploratory trenching and sampling. Results of these efforts identified a 16.7-acre area which encompassed approximately 24

suspected burn pit locations, and determined the majority of the burn pit waste, consisting of burn zone residue and miscellaneous debris, to be non-hazardous.

Removal Action

Following site investigation activities, Lockheed began planning a removal action at the BPA. The applicable regulatory agencies were contacted to ensure that the planned removal action would be protective of human health and the surrounding environment, and that all applicable regulations were addressed. The regulatory agencies contacted included: Cal/EPA, DTSC; South Coast Air Quality Management District; California Regional Water Quality Control Board, Santa Ana Region 8 and Los Angeles Region 4; U.S. Fish and Wildlife Service; California Department of Fish and Game; Riverside County; and the City of Beaumont. These agencies also participated in overseeing on-site activities.

In the fall of 1992, after all applicable permits and regulatory concurrences were obtained, the removal action was initiated by Radian, under the direction of Lockheed, using Scrivner Environmental Services as the excavation contractor. Prior to starting excavation activities, the 16.7-acre area affected by the removal action was completely fenced off to protect the SKR and for stormwater pollution control. SKR within the fenced area were trapped and relocated to another part of the Beaumont No. 1 facility so that they would not be harmed by removal action activities.

During the three month removal action, approximately 4,112 tons of non-hazardous material and 18.6 tons of specific waste were removed from 21 burn pits (16 previously identified and 5 newly identified; 4 suspected pits proved not to exist). Non-hazardous material including burn zone residue, metal drums, barrel lids, wood, spent rocket motor casing, scrap metal, glass, and approximately 720 feet of an old irrigation pipe were transported for off-site disposal to BKK Landfill, a Class III facility located in West Covina, California. Specific wastes, including an oily drum, unburned rocket

propellant, and burn rate modifier, were transported for off-site disposal to Laidlaw Environmental Services, a Class I Landfill located in Westmorland, California. Although not technically hazardous, specific wastes were disposed at a Class I facility to avoid costly and time consuming sampling and analysis.

To ensure that no additional burn pits or possible contaminated materials remained, approximately 48,600 cubic yards of surface and subsurface soil in the 16.7-acre BPA were examined for signs of discoloration or disturbance (5 of the 21 pits were found during this activity). Also, to confirm that there were no signs of residual contamination after waste removal, samples were collected from the bottom of four burn pits and analyzed for metals and volatile and semivolatile organic compounds using U.S. EPA Methods 6010, 8240, and 8270, respectively. Analytical results from those samples indicated that total metal concentrations were below the applicable Total Threshold Limit Concentrations and less than 10 times the applicable Soluble Threshold Limit Concentrations as defined by Title 22, California Code of Regulations. No volatile or semivolatile organic compounds were detected above the method detection limit, thereby confirming that no contamination remained. A summary of results for the removal action is provided on Table ES-1.

At the completion of excavation and waste disposal activities, the site was restored to its near original condition. All on-site activities were conducted in accordance with the requirements stipulated by the overseeing regulatory agencies.

Table ES-1

Summary of Results
Burn Pit Area Removal Action Activities

Activity	Quantity[a]
Well Modification/Restoration	33 wells
Top Soil and Overburden Removal/ Replacement	48,600 cubic yards[a]
Removal of Irrigation Pipe	720 feet[a]
Disposal of Non-specific Wastes to BKK Landfill (Class III)	4,112 tons[b]
Disposal of Specific Wastes to Laidlaw Environmental Landfill (Class I)	18.6 tons
Total Number of Burn Pits Found	21
Dust Suppression Water Imported from Off Site	1.17 million gallons
Dust Suppression Water from On-site Well (W-1)	100,000 gallons

[a] Quantities are approximate.
[b] Includes irrigation pipe.

1.0 INTRODUCTION

This report documents the removal action performed from November 1992 through February 1993 at the burn pit area (BPA) of the former Lockheed Propulsion Company (Lockheed) Beaumont No. 1 Facility. The objective of the removal action was to remove any waste that would prevent the site from being certified for unlimited future land use. The work performed was conducted in accordance with a Consent Order (HSA-88-89-034) from the Department of Health Services, Toxic Substances Control Program and the regulatory agency approved *Remedial Action Plan* prepared by Radian Corporation (Radian) in May 1992 (Radian, 1992a). Major components of the removal action included:

- Excavation and off-site disposal of non-hazardous material (burn zone residue and debris) to a Class III landfill;
- Excavation and off-site disposal of specific waste (oily drums, unburned rocket propellant, and burn rate modifier) to a Class I landfill; and
- Scraping and inspection of surface and subsurface soil surrounding the immediate burn pit area (BPA) to ensure no waste or possible contaminated materials remained.

Section 1.0 of this report provides general information on the site and characteristics of the waste removed. Section 2.0 provides details of the activities comprising the complete removal action; and Section 3.0 provides a discussion of applicable regulatory requirements and provides details illustrating compliance with each requirement. All figures and tables are included at the end of each respective section in the order which they were referenced.

1.1 Site Description

The Lockheed Beaumont No. 1 facility is located in a semiarid region approximately 70 miles east of Los Angeles, in the foothills of the San Jacinto Mountains, in Beaumont, California (Figure 1-1). The BPA is located in a broad valley in the southeastern portion of the facility (Figure 1-2). The ground surface in the BPA is relatively flat and mostly covered with native vegetation; the soils are alluvial/floodplain and are generally well drained. Surface features prior to the removal action included shallow pits and trenches and mounds of stockpiled soil from historical activities. Depth to groundwater in the BPA at the time of the removal action was approximately 85 feet below land surface (BLS); flow is generally to the northwest. Bedsprings Creek is located south of the BPA and primarily flows from east to west (Radian, 1986a and 1990). Figures 1-3 and 1-4 are photographs of the BPA taken at the start of removal action activities.

1.2 Historical Use

From 1961 to 1974, the Lockheed Propulsion Company used the facility for manufacturing and testing solid rocket motor propellant and for ballistics testing. Burn pits were used to burn waste propellant and other materials used in the production of rocket motors (such as adhesives, solvents, and resin curatives). At least 20 burn pits are known to have been used during operations at the facility. Each burn pit measured approximately 6 to 8 feet wide, 4 to 6 feet deep, and 50 to 100 feet in length. Materials were placed in the pits, ammonium perchlorate oxidizer or diesel fuel was added to facilitate combustion, and the materials were ignited using an electric match. The resulting fire was occasionally hot enough to melt sand, with temperatures of the burning propellant reaching as high as 2,300° Fahrenheit. The propellant material reportedly burned completely; however, insulation and liner material from inside the rocket casings often would not burn. Any unburned materials were saved for subsequent burns

(Radian, 1986a). Residual burned material was left in place 1565 Kamits were eventually backfilled to conform to the surrounding grade.

1.3 Current Land Use

In recent years, the BPA has been used for sheep grazing and barley dry farming. It is now sparsely vegetated grassland that is inhabited by the Stephens' Kangaroo Rat (SKR), which is listed as "threatened" by the California Department of Fish and Game, and "endangered" by the United States Fish and Wildlife Service (Radian, 1991a). Special precautions were taken to protect the SKR from harm during the removal action. Details of the activities performed to protect the SKR are discussed further in Section 3.3 of this report.

1.4 Nature and Extent of Burn Pit Waste

In early 1986, Radian began gathering historical information regarding the BPA from several sources, including: interviews with former Lockheed employees; review of historical aerial and ground photographs; observations made during site visits; and previous investigations (Radian, 1986a). Results of this historical investigation (specifically the aerial photo analysis) were used to determine the approximate locations of 16 individual burn pits. A subsequent geophysical investigation of the BPA, using terrain conductivity and magnetometry techniques, confirmed the lateral limits of the suspected burn pit locations, and also indicated the approximate location of an old abandoned irrigation pipe (Radian, 1986b). Using this information, Radian delineated a 16.7-acre area which encompassed all suspected burn pit locations (the "central" BPA), the irrigation pipe, and a 200-foot wide buffer surrounding the central BPA. The 200-foot buffer was established to ensure that any additional pits not identified during previous investigations would be found during the removal action.

In 1989, Radian conducted a remedial investigation which included exploratory trenching and sampling, to determine the nature and vertical extent of burn pit waste (Radian, 1990). Trenching activities revealed the location of 14 burn pits and the abandoned irrigation pipe. Of the 14 pits found, 6 were in locations identified using aerial photography and 8 were new pits, not present on the photos. Ten additional pits were identified on the aerial photos, but were not in the area where trenching took place, bringing the total number of suspected pits to 24. The burn pits averaged 10 to 20 feet wide with a 1- to 3-foot thick layer of burned material at a depth of 2 to 3 feet BLS. A variety of material was found in the pits, including rusting drums, wood, spent rocket motor liners, and hard, black burn residue. Ferrocene (a propellant burn rate modifier) and unburned rocket propellant were also present in small amounts (Radian, 1990 and 1991b).

The locations of 24 suspected burn pits and the old irrigation pipe as determined by the historical aerial photography, geophysical, and exploratory trenching are shown on Figures 1-5 and 1-6. The volume of waste to be removed as determined by these investigations was estimated to be approximately 4,500 cubic yards. This volume was calculated by estimating the total surface area of the individual burn pits, assuming an average waste thickness of 3 feet, and including an additional 25% for adjacent soils that would be inseparable from the waste (Radian 1990).

1.5 Waste Classification

During the remedial investigation, several samples were collected from the burn pit waste and underlying soil to determine chemical characteristics and assess the potential disposal options. Results of state certified laboratory analyses were interpreted using federal and state waste classification methods. Results of the analyses indicated that the waste and soil beneath the burn pits contained low levels (parts per billion) of volatile and semivolatile organic compounds, aluminum, iron, and lead. Further analysis of samples containing the highest contaminant concentrations indicated that most of the

burn pit waste was not hazardous. An estimated 50 cubic yards of waste, including unburned rocket propellant and burn rate modifier, contained volatile and semivolatile organic compounds at concentrations just below toxic levels.

The chemical and physical information gained from the remedial investigation was then used to separate the burn pit waste into two categories: "non-hazardous material" and "specific" wastes. The waste was categorized to facilitate planned excavation and segregation during the removal action.

Non-hazardous material included: burn zone residue which had a blackened glassy appearance; soil underlying the burn zone; and general debris such as metal drums, barrel lids, wood, spent rocket motor casing, scrap metal and glass. Because these materials were non-hazardous they were deemed acceptable for Class III landfill disposal.

Specific wastes were the estimated 50 cubic yards of material that contained volatile and semivolatile organic compounds that were just below toxic concentrations. These included: unburned rocket propellant, a gray-green solid with a sponge-like appearance; and ferrocene, an orange-red powdery material. Although not technically hazardous, the limited amount of specific wastes which were expected to be found were designated for Class I landfill disposal to avoid costly and time consuming sampling and analysis (Radian, 1991b).

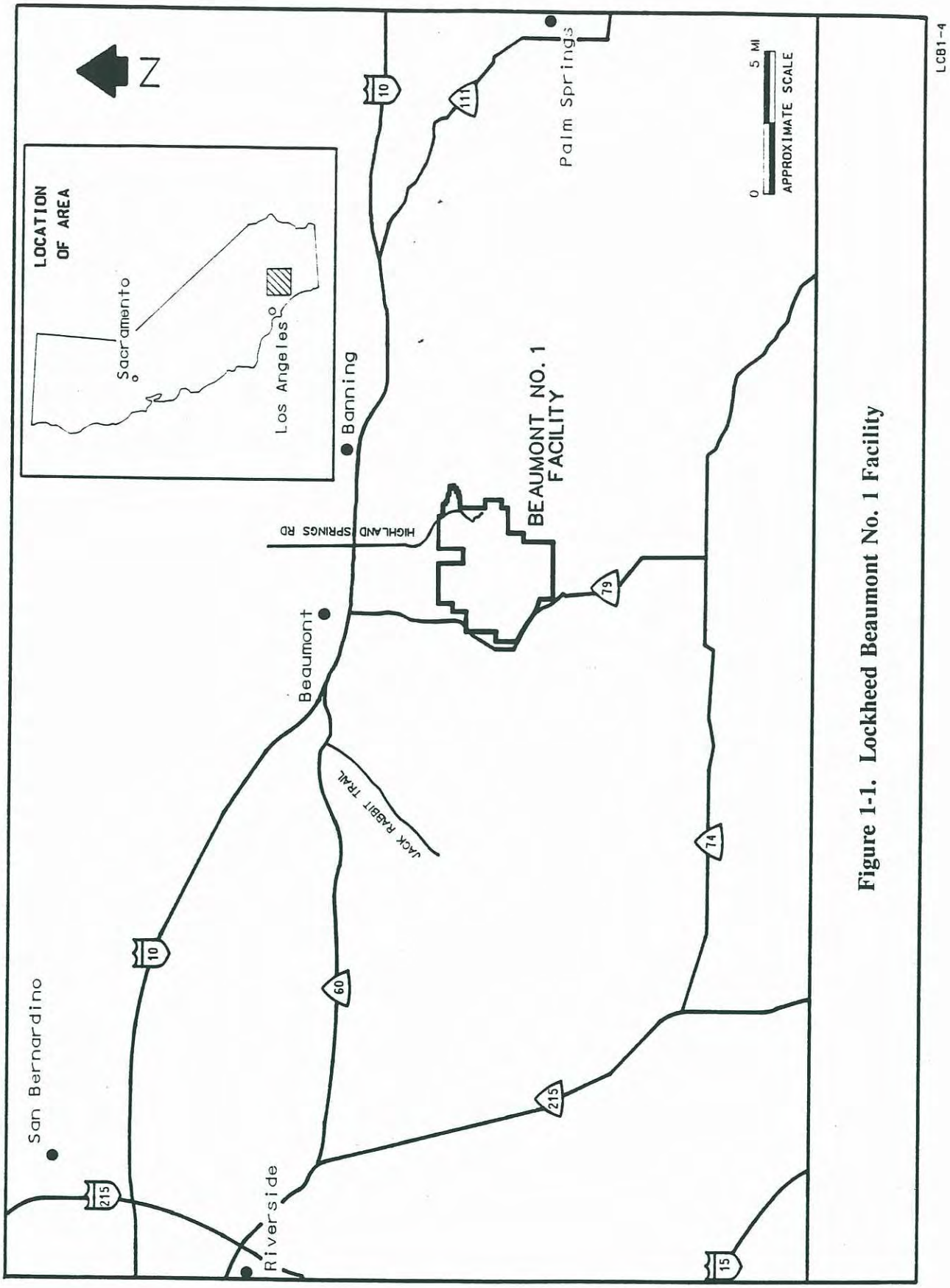

Figure 1-1. Lockheed Beaumont No. 1 Facility

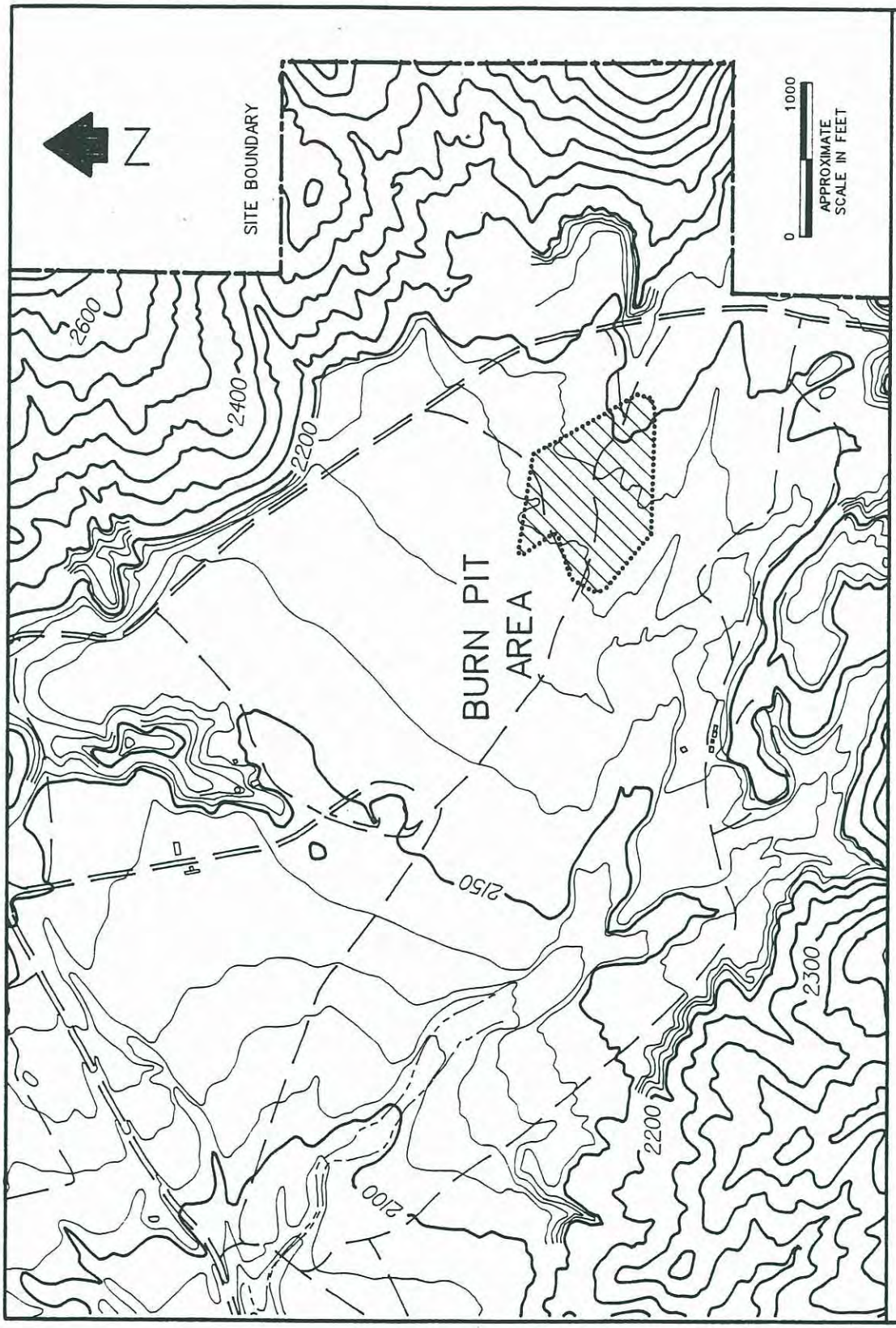

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Figure 1-2. Burn Pit Area

Figure 1-3. Overlooking the Burn Pit Area

Figure 1-4. Burn Pit Area at the Start of Removal Action Activities

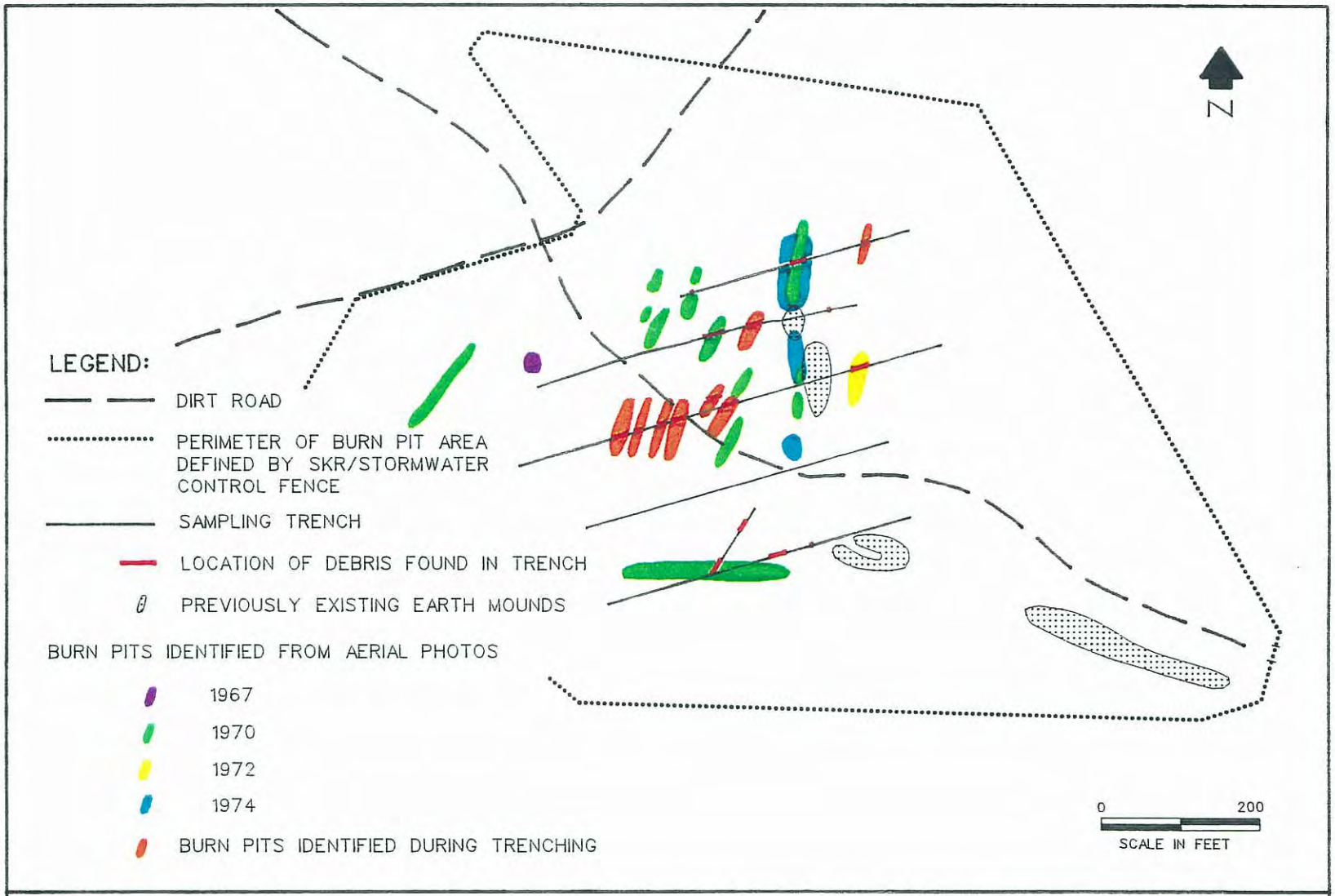

Figure 1-5. Suspected/Confirmed Burn Pit Locations Identified During Site Investigations

LOCK13 BPSFIGC SAC

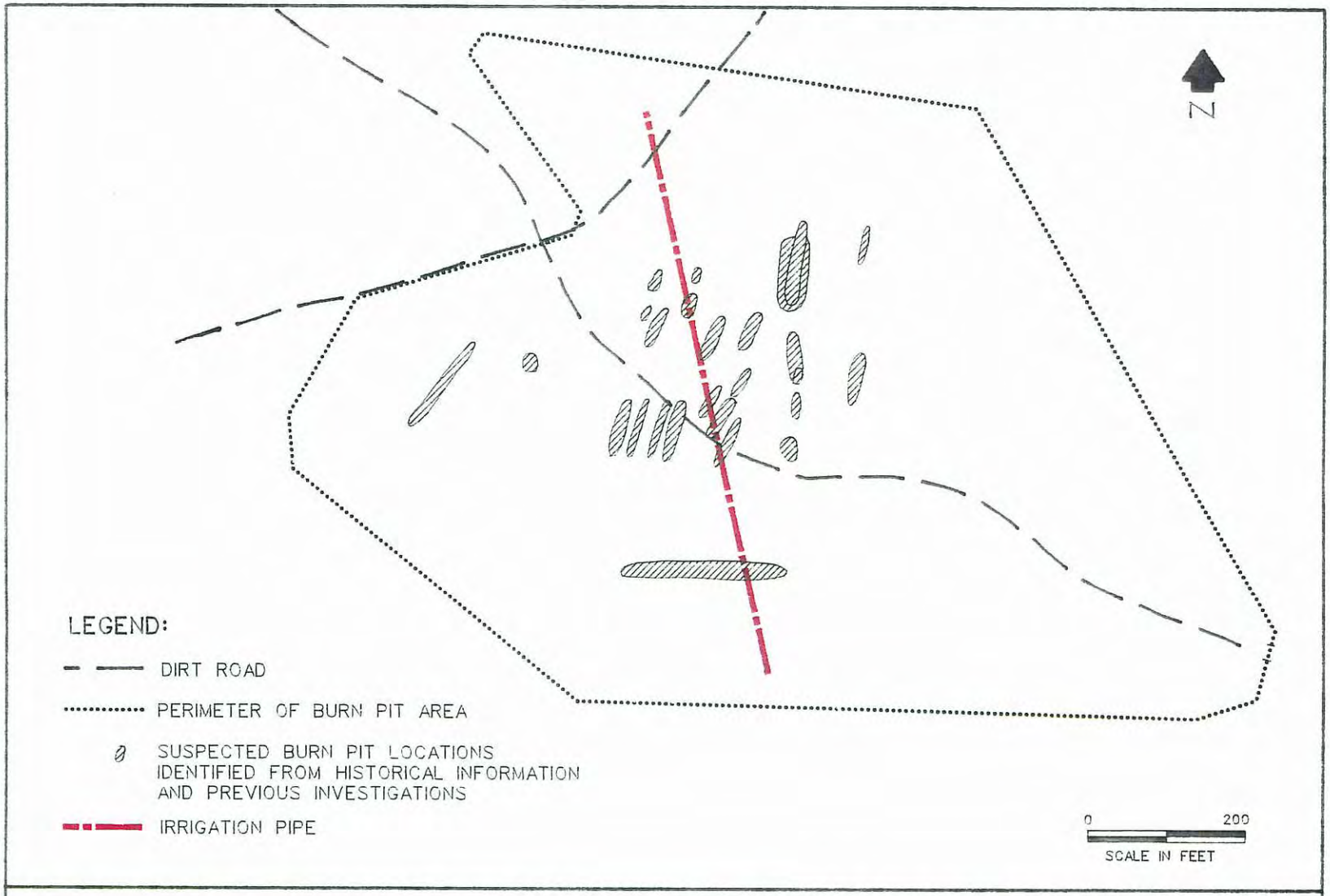

Figure 1-6. Location of Irrigation Pipe Identified During Site Investigations

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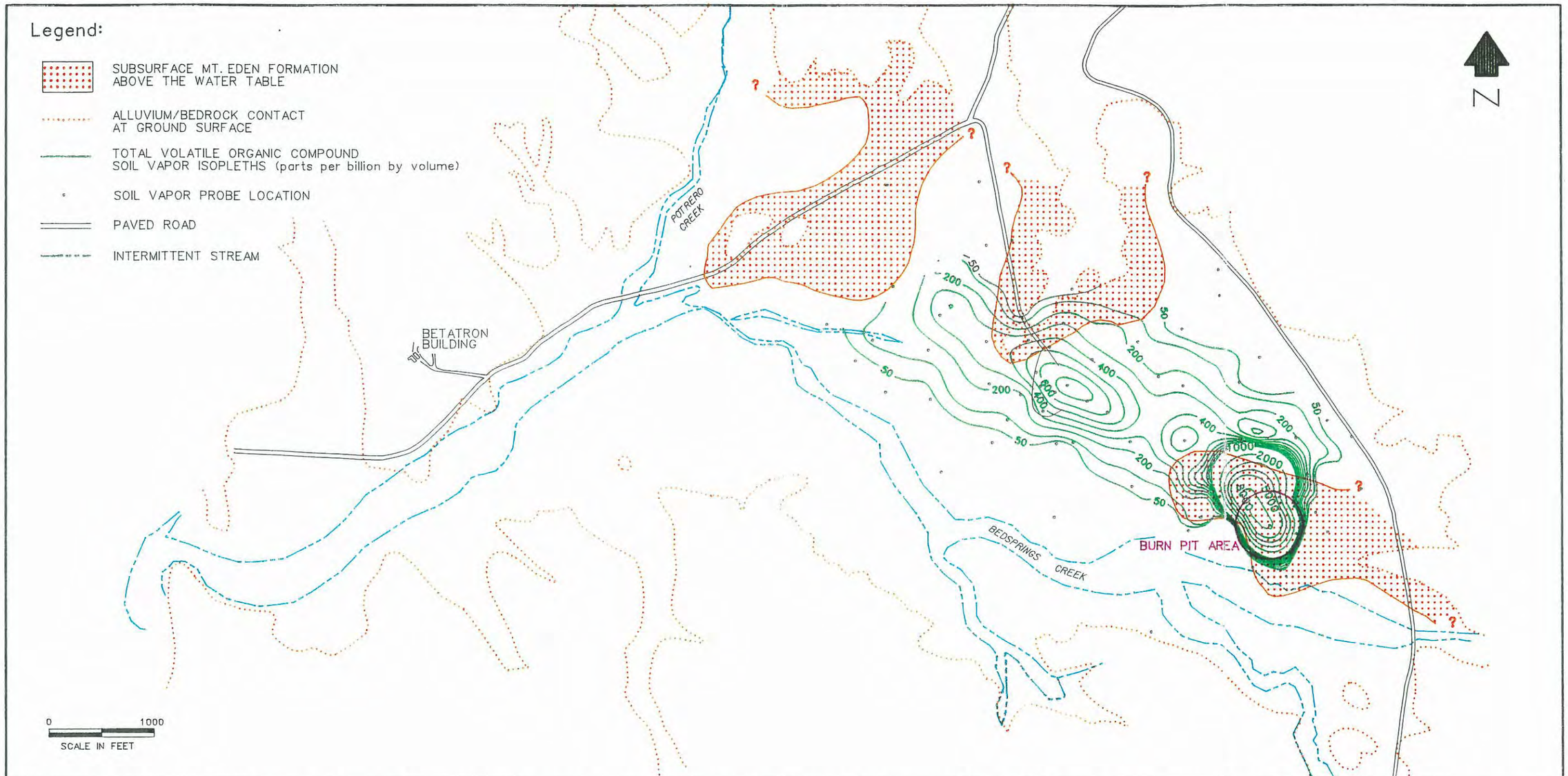

Figure 1-3. Lockheed Beaumont No. 1 Total Chlorinated Volitale Organic Compound Soil Vapor Isopleths (from 1990 Study)

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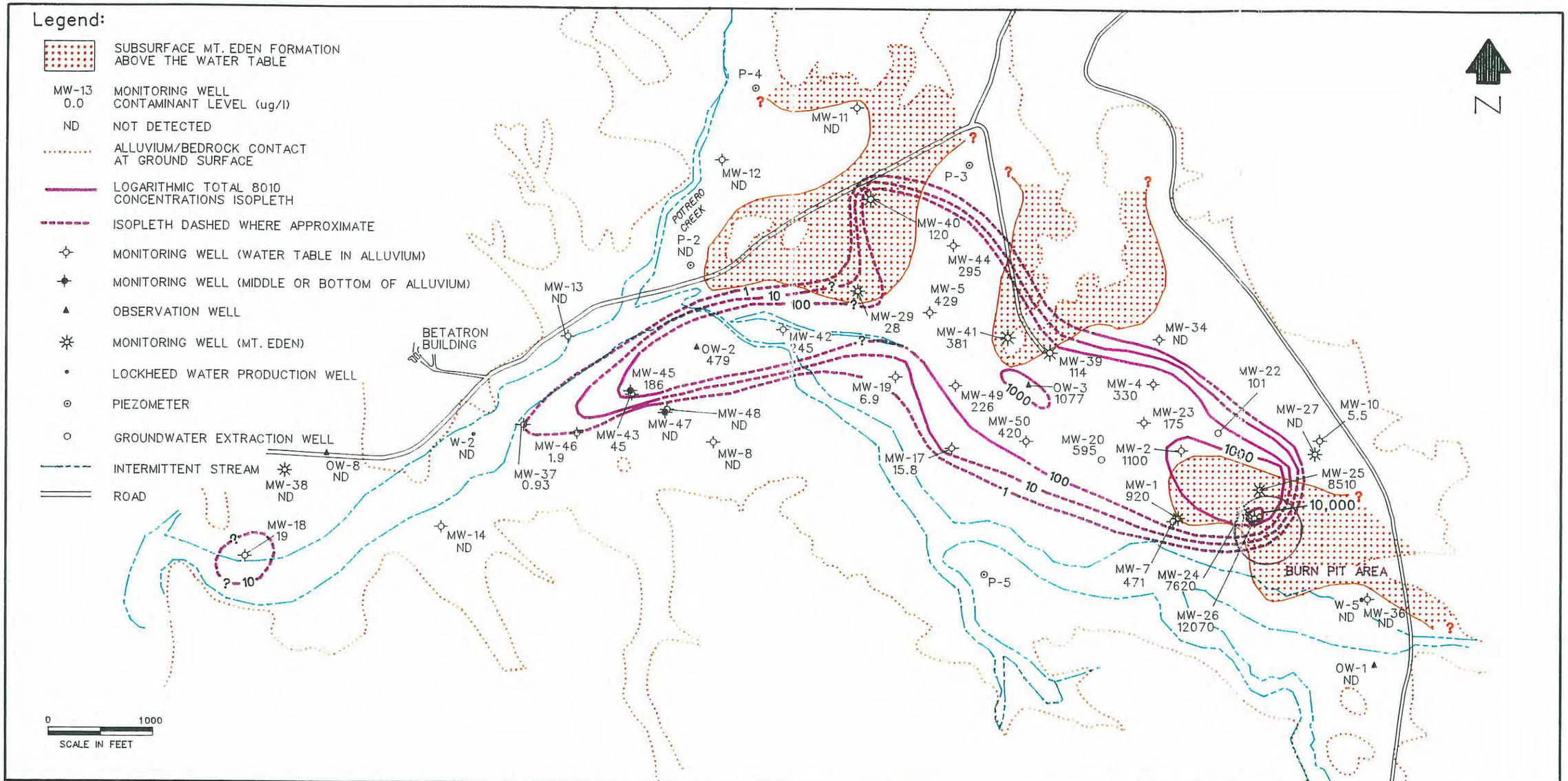

Figure 1-4. Lockheed Beaumont No. 1 Total Chlorinated VOC Concentrations in Shallow Groundwater (Fall 1991)

2.0 REMOVAL ACTION

Following site investigation activities, Lockheed and Radian began planning the removal action necessary to achieve an unrestricted land use certification at the Beaumont No. 1 facility. To ensure that the removal action was protective of human health and the surrounding environment, and that all applicable regulations were addressed, the following regulatory agencies were contacted:

- Cal/EPA, Department of Toxic Substances Control (DTSC) (which acted as the lead agency);
- South Coast Air Quality Management District (SCAQMD);
- California Regional Water Quality Control Board (CRWQCB), Santa Ana Region 8 and Los Angeles Region 4;
- U.S. Fish and Wildlife Service (FWS);
- California Department of Fish and Game (CDFG);
- Riverside County; and
- The City of Beaumont.

The coordinated efforts resulted in the following documents and permits:

- *Excavation Management Plan* (Radian, 1991a);
- *Burn Pit Area Removal Action Plan* (Radian, 1991b);
- *Remedial Action Plan* (Radian, 1992a);
- *Stormwater Pollution Prevention Plan* (Radian, 1992c)
- Rule 1150 Landfill Excavation Permit;
- Waste Discharge Permit;

- FWS Approval Letter; and
- Grading Plan and Permit.

Further discussion of the applicable regulations and steps taken to protect human health and the surrounding environment is provided in Section 3.0.

In the fall of 1992, after all applicable permits and regulatory concurrences were obtained, the removal action was initiated by Radian at Lockheed's request, using Scrivner Environmental Services (Scrivner) as the excavation contractor. Removal action activities were performed in the burn pit area (BPA) from November 1992 through February 1993. They included:

- Exposing and capping existing wells below grade;
- Removing and replacing topsoil and overburden in the BPA buffer zone;
- Excavating, segregating, and stockpiling burn pit wastes;
- Excavating the old irrigation pipe;
- Collecting confirmation samples from the bottom of the burn pit excavations;
- Disposing of non-hazardous material at BKK, a Class III landfill in West Covina, California;
- Disposing of specific wastes at Laidlaw Environmental Services, a Class I landfill in Westmorland, California;
- Backfilling and compacting soil in burn pit excavations;
- Restoring existing wells to grade; and
- Final grading and restoration of the site.

These activities were performed by Scrivner under the direction of Radian. The dates and duration for each event are illustrated in Figure 2-1.

Prior to the removal action, the 16.7-acre BPA was completely fenced off to protect the Stephens' Kangaroo Rat (SKR) and for stormwater pollution control (as discussed further in Section 3.0). After the fence was erected, more than three hundred Kangaroo rats, approximately two hundred of which were SKR, were trapped and removed from the enclosed area and relocated to another part of the Beaumont No. 1 facility so that they would not be harmed by removal action activities. The fenced area enclosed the 24 suspected burn pit locations (the "central" BPA), the 200-foot buffer surrounding the burn pits (the BPA "buffer zone"), the old irrigation pipe, and a small area in the northwestern portion of the BPA. The central BPA, buffer zone, and area in the northwestern portions of the BPA are shown in Figure 2-2. The area in the northwestern portion of the BPA was identified as having been free from any burn pit activity, but was included within the fenced BPA to aid in future remediation efforts for groundwater and soil vapor beneath the BPA. (Installation of groundwater and soil vapor extraction wells was hampered by the dense SKR habitat, and could not be completed in the northwestern portion of the BPA until the SKR were removed.) The fenced area also included approximately 35 groundwater and vapor wells installed during past investigations and studies. The following paragraphs provide an overview of the removal action activities, and the steps taken to restore the site to its near original condition. All earthmoving activities were conducted in accordance with the requirements of the appropriate regulatory agencies (see Section 3.0).

2.1 Well Preservation

Prior to initiating soil and waste excavation activities, 33 of the 35 existing wells in the BPA were temporarily modified to facilitate earthmoving operations. These modifications included: exposing the well casing to approximately 6.5 feet below land surface (BLS); sealing the well casing to prevent dirt and debris from falling into the

well; cutting the well casing approximately 6 feet BLS; capping each modified well with a tight-fitting PVC cap; and backfilling the well excavation to the pre-existing land surface to restore traffic pathways and prevent potential accidents. The 33 wells modified included 18 vapor monitoring wells, 3 vapor recovery wells, 4 groundwater monitoring wells, 4 vapor extractions wells, and 4 groundwater extraction wells. Table 2-1 lists the BPA wells and dates of modification. The location of each well is shown in Figure 2-3. Figures 2-4 and 2-5 are photographs showing soil being removed from around the PVC well casing using a backhoe. Well modification activities were conducted in accordance with Riverside County guidelines as discussed in Section 3.4 of this report. Modified wells were restored to their original condition at the completion of waste removal activities as discussed in Section 2.9.

2.2 Dust Suppression

Dust suppression measures were implemented at all times during the removal action, in accordance with stipulations set forth in the SCAQMD Rule 1150 permit to minimize airborne dust. Suppression measures included spraying water and/or modifying earthwork operations which prevented visible dust conditions during the majority of removal action activities. Approximately 100,000 gallons of water was taken from an on-site well (W-1) and used for dust suppression. However, because of the well's slow recharge rate, another source of water was required to meet dust suppression needs. The majority of the water used for on-site dust suppression was obtained from a hydrant located off site near the intersection of Highland Springs Boulevard and Second Street in Beaumont, California. This hydrant was permitted for Radian and contractor use by the City of Beaumont. Water was imported by truck on an as-needed basis and stored in on-site tanks. Approximately 1.17 million gallons of water were imported from offsite for dust suppression during the entire removal action.

2.3 Topsoil and Overburden Removal and Replacement

To aid in uncovering any additional burn pits that were not identified during previous investigations, topsoil (soil in the upper foot across the site) and overburden (soil underlying the topsoil) were removed over the entire BPA buffer zone. Topsoil, which contained seeds of the native vegetation, was stockpiled separately from the overburden so that the soils could be replaced in proper order to promote natural revegetation of the site.

Two scrapers were used to remove, stockpile, replace, and compact 1 vertical foot of topsoil and 1 vertical foot of overburden (two feet total) from nine separate sections (called "removal areas") until the entire BPA buffer zone had been uncovered and examined for buried waste. Figure 2-6 is a photograph showing a scraper removing topsoil and overburden. The nine removal areas surrounding the central BPA are shown on Figure 2-7. During the removal activity, the surface soils were examined continuously for any signs of buried debris. If wastes were uncovered, the subcontractor was instructed to cease scraping in the area, the area was barricaded with marking tape and wooden stakes and left for later excavation as described in Section 2.4. Three additional burn pits (shown as pits RA1, AA, and Z in Figure 2-7) were discovered during topsoil and overburden removal in the BPA buffer zone. A photograph of the buried rocket motor casing found in Pit RA1 is shown on Figure 2-8.

If, at a depth of 2 vertical feet, no signs of waste or other disturbance were observed, overburden and topsoil were replaced and compacted in the active removal area before scraping was begun in the next removal area. Placement of the topsoil above the overburden allowed for revegetation of the site without reseeding the soil. Removal areas were backfilled as described in Section 2.8. Approximately 48,600 cubic yards of topsoil and overburden were removed and replaced during this activity.

2.4 Burn Pit Excavation

In July 1992, prior to initiating the removal action, Radian personnel staked and surveyed the 24 suspected burn pit locations in the central BPA that had been identified from aerial photographs or during previous investigations. These locations were used to guide removal activities.

During the removal action, the location of individual burn pits was initially confirmed by using an excavator or backhoe to trench through the center of a staked area until debris or burn zone residue was encountered. Non-hazardous material (burn zone residue, underlying soil, and debris) was segregated from the surrounding soil to the greatest extent possible (as shown in Figure 2-9) to minimize the amount of waste disposed of offsite. Specific wastes (unburned propellant, burn rate modifier), when encountered, were placed into drop boxes as shown in Figure 2-10. If no debris was encountered to a depth of approximately 6 feet BLS, excavation was ceased in that staked area. Historical and remedial investigation information indicated that pits were not deeper than 6 feet.

To ensure that no additional burn pits remained in the central BPA, topsoil and overburden were removed from between identified and excavated burn pits to a depth of 2 feet BLS and thoroughly examined for signs of debris or disturbance. Two additional pits (BB and Y) were found during this exercise. Burn pit excavation in the central BPA was conducted concurrently with topsoil and overburden removal in the BPA buffer zone.

Twenty-one individual burn pits were located during excavation activities. As summarized in Table 2-2, 16 pits were found in close proximity to their suspected locations; 2 pits, Y and BB, were discovered within 20 feet of suspected locations; 3 pits, AA, RA1, and Z, were discovered during topsoil and overburden removal in the BPA buffer zone; and 4 suspected burn pits, Q, R, U, and W, were proven not to exist.

Figure 2-11 illustrates how the suspected burn pit locations corresponded to the actual locations.

Approximately 4,112 tons of non-hazardous material and 18.6 tons of specific wastes were excavated from the burn pits. Figures 2-12 through 2-15 are pictures of the non-hazardous material removed from the BPA. Specific wastes included: a drum containing an oily substance; large chunks of unburned rocket propellant; and a blue burn rate modifier (an iron hexacyanoferrate known as "iron blue"). Iron blue was removed from Pit A and constituted the majority of specific waste. Figures 2-16 through 2-18 are photographs of specific wastes removed from the BPA. Wastes were disposed as discussed in Section 2.7.

Prior to removal action activities, the estimated quantity of material to be removed was approximately 6,370 tons. This estimated tonnage was calculated by multiplying the estimated volume of waste (approximately 4,500 cubic yards) by a conversion factor of about 1.4 tons per cubic yard. The quantity of waste actually removed was approximately 4,130 tons, 65% of the estimated quantity, and was notably less than initially estimated because the waste was diligently segregated from the surrounding soil before disposal. This segregation of waste significantly reduced the amount of material removed from the site for disposal.

Results of the removal action activities also show that the burn pit locations correlated well with previous geophysical data as shown on Figure 2-19. Ten percent of waste (mostly rusted drums) was removed from the deepest pit (Pit OP) the location of which corresponds to the area of highest terrain conductivities.

2.5 Irrigation Pipe Excavation

While not considered a waste from previous burn pit activities, approximately 720 feet of the abandoned irrigation pipe were removed from the BPA.

The pipe ran approximately in the north-south direction through the center of the BPA, and was buried approximately 3 feet BLS. Using an excavator and backhoe, sections of the irrigation pipe (see Figure 2-20) were excavated, segregated from the surrounding topsoil and overburden, and stockpiled with other non-hazardous material for disposal (see Section 2.7). As shown in Figure 2-19, the former pipe location also correlated well with results of the geophysical investigation.

2.6 Confirmation Samples

To confirm that no residual contamination was present in the soil below the excavated wastes, soil samples were collected from the bottom of four burn pits. The burn pits sampled (shown on Figure 2-21 as A, H, OP, and X) were selected on the basis of the waste removed from the pit, waste volume, depth of excavation, and/or other field observations (i.e., unusual odors, discolored soil). A total of 10 samples were collected (2 to 3 from each pit) using a core-barrel slide hammer sampler fitted with brass sleeves as shown in Figure 2-22. Samples were analyzed by state-certified laboratories for total metals, and volatile and semivolatile organic compounds using U.S. EPA Methods 6010, 8240, and 8270, respectively.

Analytical results (summarized on Tables 2-3, 2-4, and 2-5) indicated that total metal concentrations were below the applicable Total Threshold Limit Concentrations and less than 10 times the applicable Soluble Threshold Limit Concentrations, as defined by Title 22 of the California Code of Regulations (CCR, 1991). No volatile or semivolatile organic compounds were detected above method detection limits, thereby confirming that no residual contamination exists below the burn pits. The pits were subsequently backfilled as described in Section 2.8. The quality control data assessment, analytical data sheets, and chain-of-custody forms associated with these samples are included in Appendix A of this report.

2.7 Waste Disposal

The non-hazardous material, comprising mainly soil and debris, was loaded from the stockpiles into transport trucks (as shown in Figure 2-23) generally within a day or two of their excavation. A temporary on-site vehicle scale was installed to weigh the trucks to determine the weight of the material to be disposed prior to leaving the site and to ensure that the loaded trucks were within transportation weight limits. Once the trucks were loaded and weighed, the truck beds were covered, and the covers were secured. Non-hazardous material was transported to BKK, a Class III facility located in West Covina, California, about 73 miles from the site.

At the completion of the waste excavation activities, the drop boxes containing specific wastes were manifested as hazardous waste and transported to Laidlaw Environmental Services Landfill, a Class I facility located in Westmorland, California, approximately 120 miles from the site.

2.8 Backfilling

Once wastes were removed from each pit and analytical samples confirmed that no contamination or wastes remained in the BPA, the burn pit excavations were backfilled with overburden soil. Soil was placed in 8-inch, moisture conditioned lifts, and compacted to a density not less that 90% of the maximum dry density as determined in accordance with ASTM D-1556-82 and ASTM D-2922-81. Compaction tests were performed by Converse Consultants (Converse) using the Sand Cone and Nuclear Gauge methods. Figure 2-24 is a photograph of a nuclear densitometer that was used to perform some of the tests. Results complied with project specifications (Radian, 1992b) as stated in Converse's final geotechnical report (provided in Appendix B). All backfilling activities were performed in accordance with the grading permit issued by the Riverside County Department of Building and Safety. Specific grading permit requirements are discussed in Section 3.4 of this report.

2.9 Well Restoration

After the completion of excavation and disposal activities, the modified wells (described in Section 2.1) were restored to original condition. Restoration activities included: locating each well through surveying; excavating overlying soil to expose the modified well cap; removing the caps; retrofitting the wells with a new PVC casing that extended to the original wellhead elevation (no glue was used); and restoring the wellhead. The restoration dates for each well are shown in Table 2-1. Once the wells were fully restored (as shown in Figure 2-25), the excavations around the new well casings were backfilled in the same manner described in Section 2.8.

2.10 Final Site Grading

After the completion of backfilling and well restoration activities, the site was restored to its previous condition and made suitable for revegetation by using pre-construction survey data to establish the final site elevations and grading disturbed areas of the site to conform to the slope of adjacent undisturbed terrain. These activities were performed in accordance with the grading permit issued by the Riverside County Department of Building and Safety. Figures 2-26 and 2-27 are photos of the site taken after the completion of removal action activities. Figure 2-28 is a photo of the site taken in March 1993 showing that some revegetation has occurred.

BURN PIT REMOVAL ACTION ACTIVITIES	DATES PERFORMED
Mobilize Equipment	November 9 - 25
Well Modification	November 9 - 18
Topsoil & Overburden Removal/ Replacement	Nov. 23 - Dec. 29
Burn Pit Excavation	Dec. 1 - Jan. 12
Confirmation Sampling	Dec. 11, 15, Jan. 4
Non-specific Waste Disposal	Dec. 1 - Jan. 12
Specific Waste Collection	Nov. 26 - Jan. 27
Backfill Burn Pits	January 25 - 27
Well Restoration	Jan. 5 - Feb. 3
Site Grading	January 25 - 27
Specific Waste Disposal	February 1 - 5
Wind/VOC Monitoring	Nov. 9 - Jan. 12
Site Survey	March 1

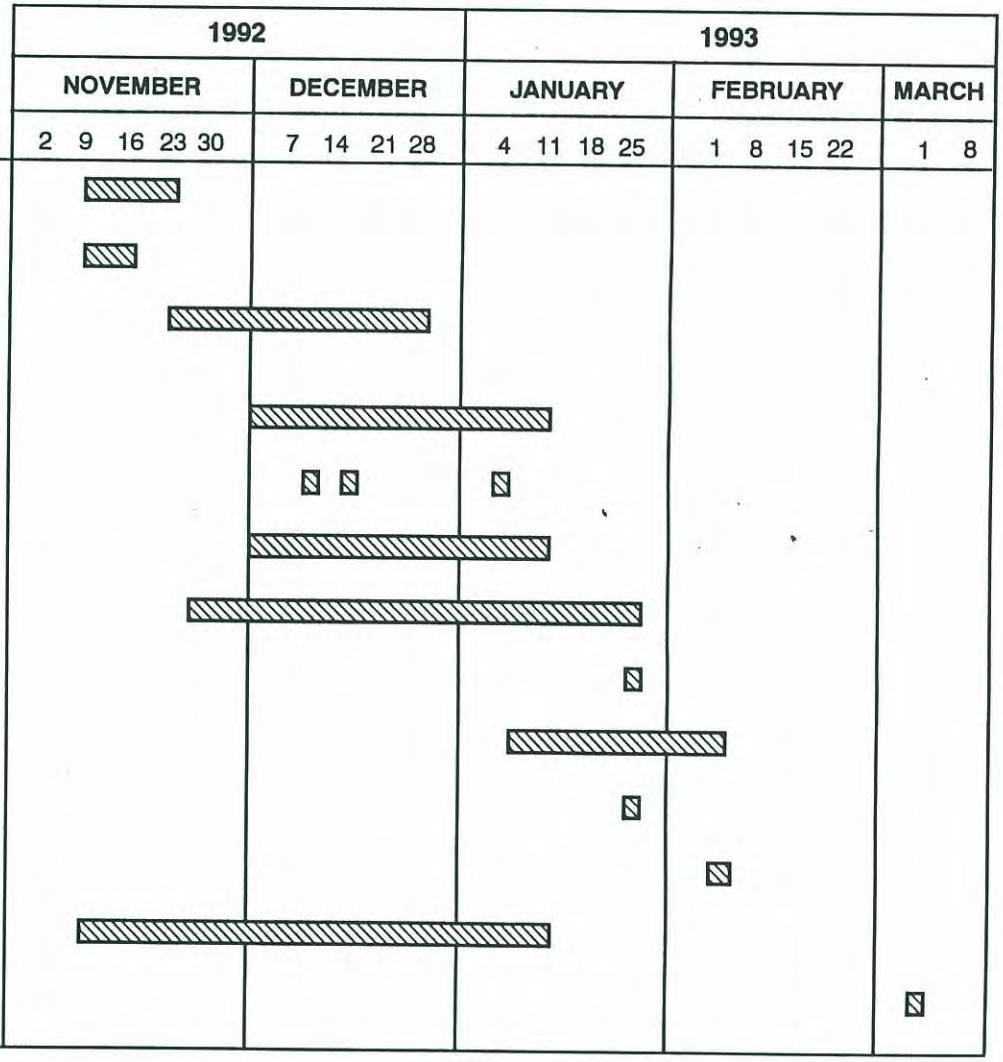

Figure 2-1. Burn Pit Area Removal Action Activities

RADIAN CORPORATION

LOCKSCH4.PM4 - VMG 5/18/93 SAC

Table 2-1

Wells Modified/Restored During Burn Pit Area Removal Action

Well ID Number	Type of Well	Date Inactivated	Date Restored
EW-13	Water Extraction	NOV 10, 1992	FEB 19, 1993
EW-14	Water Extraction	NOV 12, 1992	FEB 19, 1993
EW-15	Water Extraction	NOV 10, 1992	FEB 19, 1993
EW-16	Water Extraction	NOV 10, 1992	FEB 19, 1993
MW-61A	Water Monitoring	NOV 10, 1992	FEB 1, 1993
MW-61B	Water Monitoring	NOV 10, 1992	FEB 1, 1993
MW-61C	Water Monitoring	NOV 10, 1992	FEB 1, 1993
MW-61D	Water Monitoring	NOV 10, 1992	FEB 1, 1993
VEW-6	Vapor Extraction	NOV 11, 1992	FEB 19, 1993
VEW-8	Vapor Extraction	NOV 10, 1992	FEB 19, 1993
VEW-10	Vapor Extraction	NOV 10, 1992	FEB 19, 1993
VEW-11	Vapor Extraction	NOV 11, 1992	FEB 19, 1993
VMW-1	Vapor Monitoring	NOV 10, 1992	FEB 1, 1993
VMW-2	Vapor Monitoring	NOV 11, 1992	FEB 1, 1993
VMW-3	Vapor Monitoring	NOV 11, 1992	FEB 1, 1993
VMW-4	Vapor Monitoring	NOV 11, 1992	FEB 1, 1993
VMW-5	Vapor Monitoring	NOV 11, 1992	FEB 1, 1993
VMW-6	Vapor Monitoring	NOV 11, 1992	FEB 1, 1993
VMW-7	Vapor Monitoring	NOV 11, 1992	FEB 1, 1993
VMW-8	Vapor Monitoring	NOV 11, 1992	FEB 1, 1993
VMW-9	Vapor Monitoring	NOV 11, 1992	FEB 1, 1993
VMW-10	Vapor Monitoring	NOV 12, 1992	FEB 1, 1993
VMW-11	Vapor Monitoring	NOV 12, 1992	FEB 1, 1993
VMW-12	Vapor Monitoring	NOV 12, 1992	FEB 1, 1993
VMW-13	Vapor Monitoring	NOV 12, 1992	FEB 1, 1993
VMW-14	Vapor Monitoring	NOV 12, 1992	FEB 1, 1993
VMW-15	Vapor Monitoring	NOV 11, 1992	FEB 1, 1993
VWM-16	Vapor Monitoring	NOV 11, 1992	FEB 1, 1993
VMW-17	Vapor Monitoring	NOV 10, 1992	FEB 1, 1993
VMW-18	Vapor Monitoring	NOV 10, 1992	FEB 1, 1993
VRW-1	Vapor Recovery	NOV 12, 1992	FEB 1, 1993
VRW-2	Vapor Recovery	NOV 12, 1992	FEB 19, 1993
VRW-3	Vapor Recovery	NOV 11, 1992	FEB 1, 1993

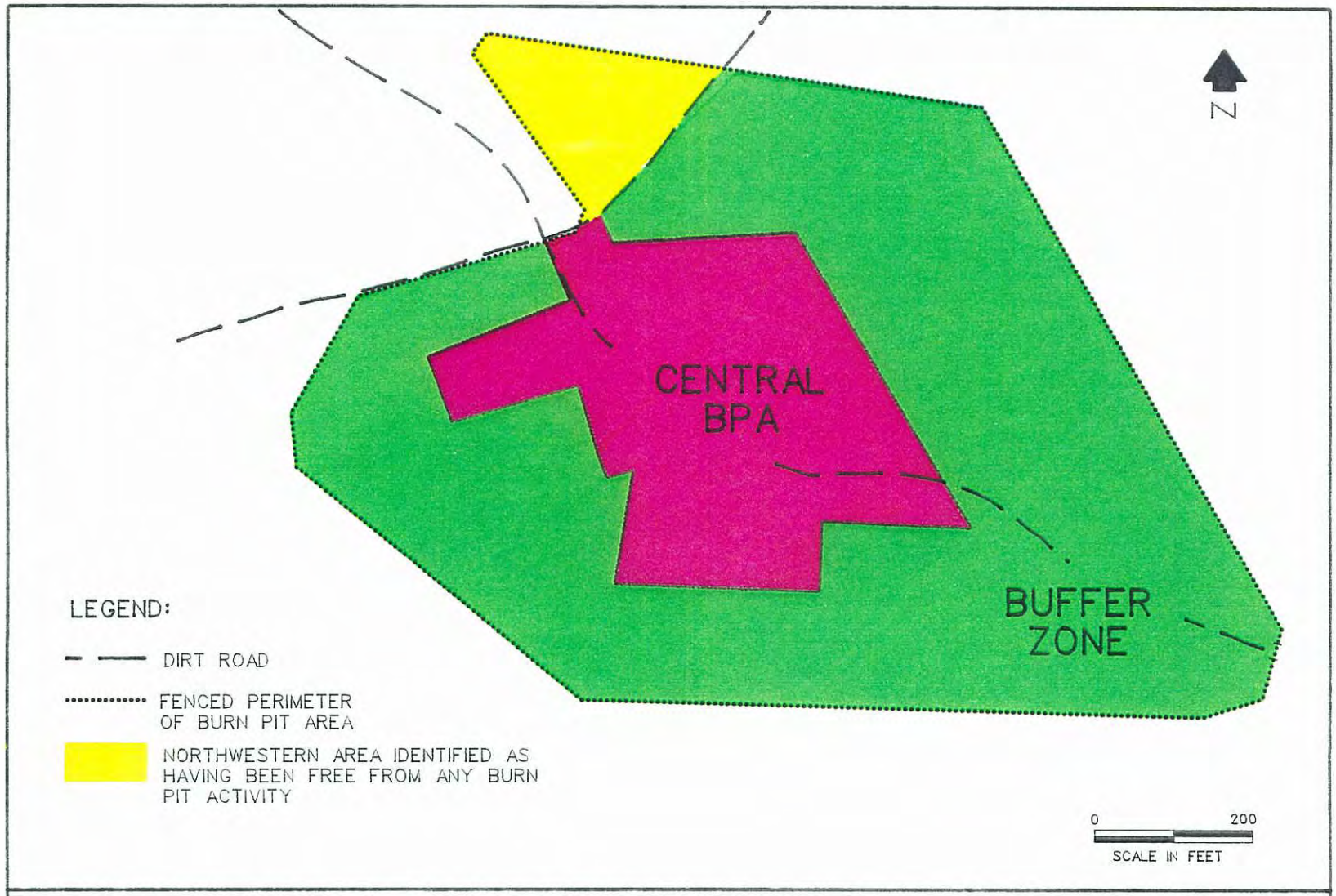

Figure 2-2. Central BPA and Buffer Zone Sections Within the Fenced 16.7-Acre Burn Pit Area

LOCK13 BPBUFF SAC

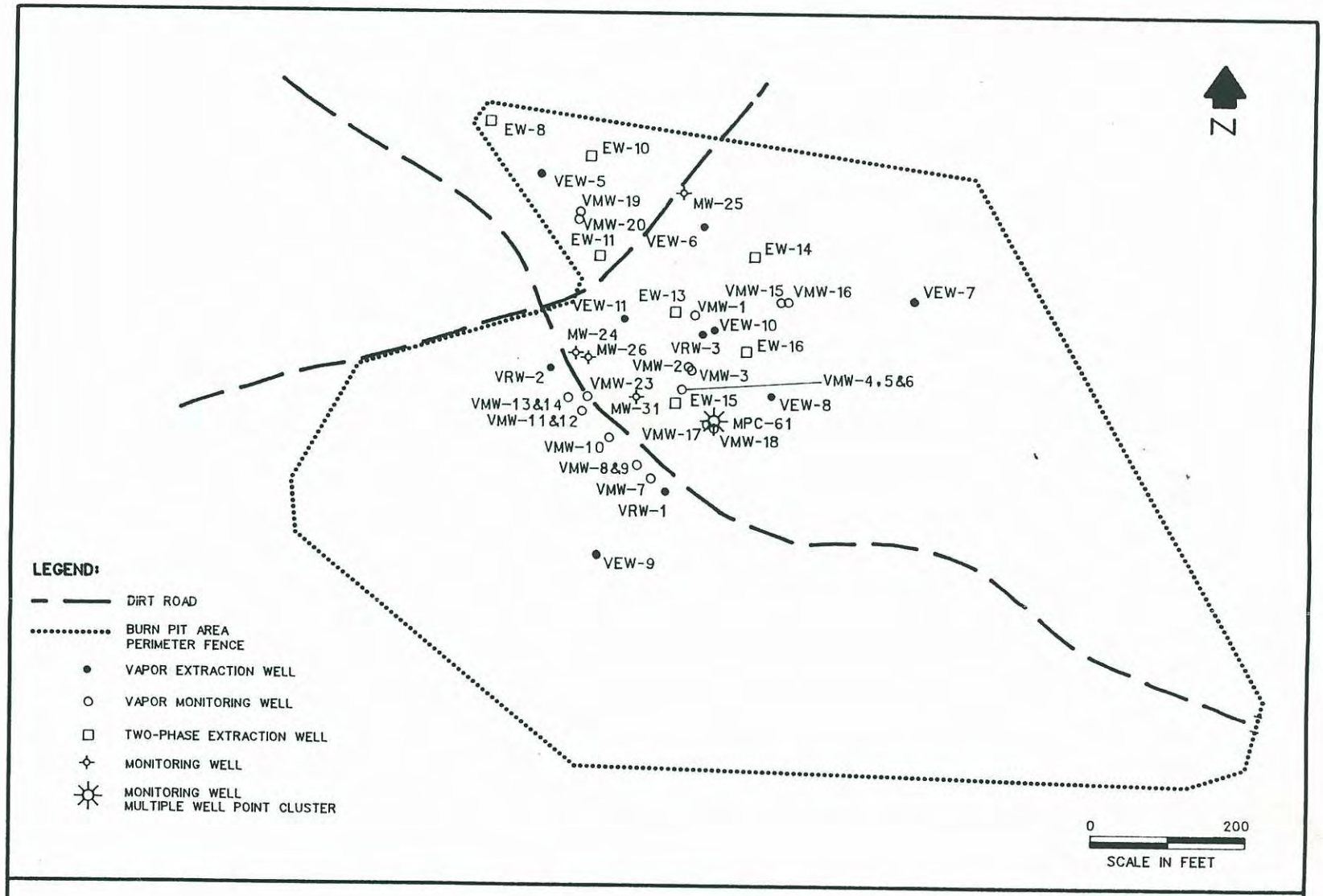

Figure 2-3. Location of Burn Pit Area Wells

LOCK13 BPWELFIG SAC

Figure 2-4. Burn Pit Area Well Modification

Figure 2-5. Soil Removal Around Well During Modification
Notice the white PVC casing and cap.

Figure 2-6. Scraper Removing Topsoil and Overburden

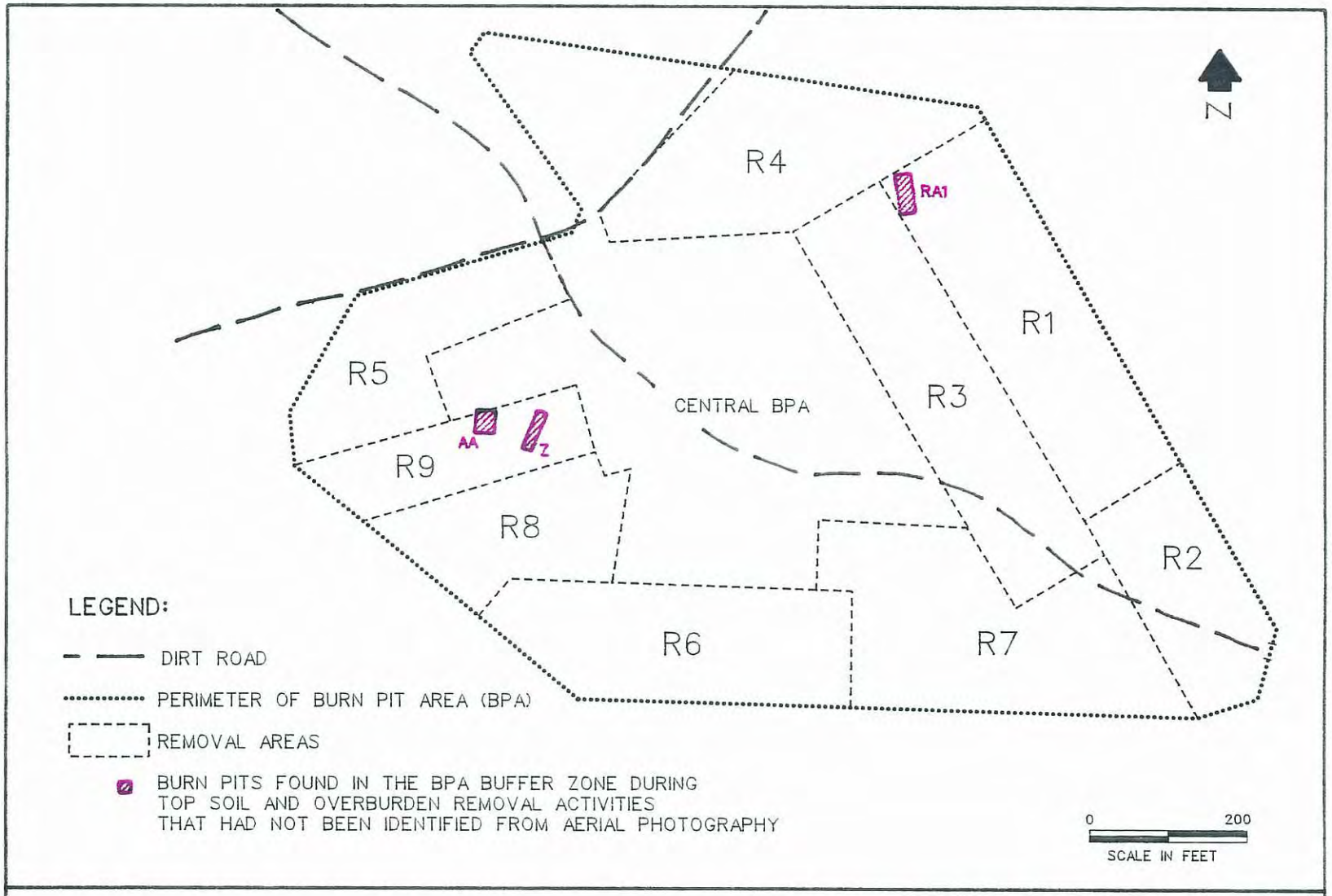

Figure 2-7. Removal Areas and Burn Pits in the BPA Buffer Zone

LOCK13 BPREMOV SAC

Figure 2-8. The Top of Burn Pit RA1 Found During Topsoil/ Overburden Removal (Rocket Casing)

Figure 2-9. Excavator Segregating and Stockpiling Non-Hazardous Material

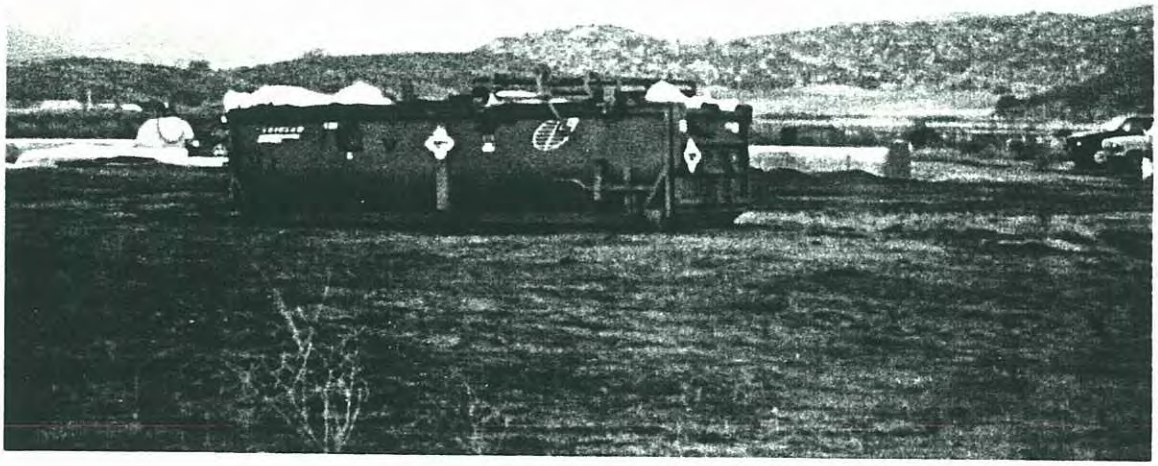

Figure 2-10. Drop Box Used for Specific Waste

Table 2-2

Burn Pit Quantity Comparison of Expected Vs. Excavated Amounts

Original Pit Name	Calculated			Excavated		
	Area[a] (sq.ft.)	Percentage of Total Area	Estimated Quantity (tons)	Pit Name	Amount[b] Removed (tons)	Percent of Expected Found
A	1,586	6.9	442	A	370	84%
B	396	1.7	110	B	49	45%
C	321	1.4	89	C	186	209%
D	193	0.8	54	D	25	46%
E	161	0.7	45	E	12	27%
F	660	2.9	184	FG	272	87%
G	466	2.0	130	FG	combined	combined
H	3,568	15.6	994	H	491	49%
I	396	1.7	110	I	123	112%
J	864	3.8	241	J	224	93%
S	831	3.6	232	ST	321	73%
T	745	3.3	208	ST	combined	combined
K	777	3.4	217	K	75	35%
L	1,106	4.8	308	LM	149	30%
M	667	2.9	186	LM	combined	combined
N	708	3.1	197	NO	101	19%
O	1,163	5.1	324	NO	combined	combined
P	495	2.2	138	OP	408	296%
Q	423	1.9	118	not found	0	0%
R	1,072	4.7	299	not found	0	0%
U	332	1.5	93	not found	0	0%
V	1,000	4.4	279	V	50	18%
W	543	2.4	151	not found	0	0%
X	4,386	19.2	1,222	X	649	53%
Y (New)	225	1.0	0	Y	50	NA
Z (New)	612	2.7	0	Z	101	NA
AA (New)	720	3.1	0	AA	300	NA
BB (New)	600	2.6	0	BB	126	NA
RA1 (New)	918	4.0	0	RA1	25	NA
Wood[c]	NA	NA	0	Wood[c]	25	NA
Total	22,858[a]		6,370		4,132[d]	65%

[a] Does not include new pits.
[b] Amount removed is approximate.
[c] Miscellaneous wood waste not removed from pits.
[d] Includes 18.6 tons of specific waste and 4,112 tons of non-hazardous material.
Combined = Two "original" pits were combined into one.
NA = Not applicable.

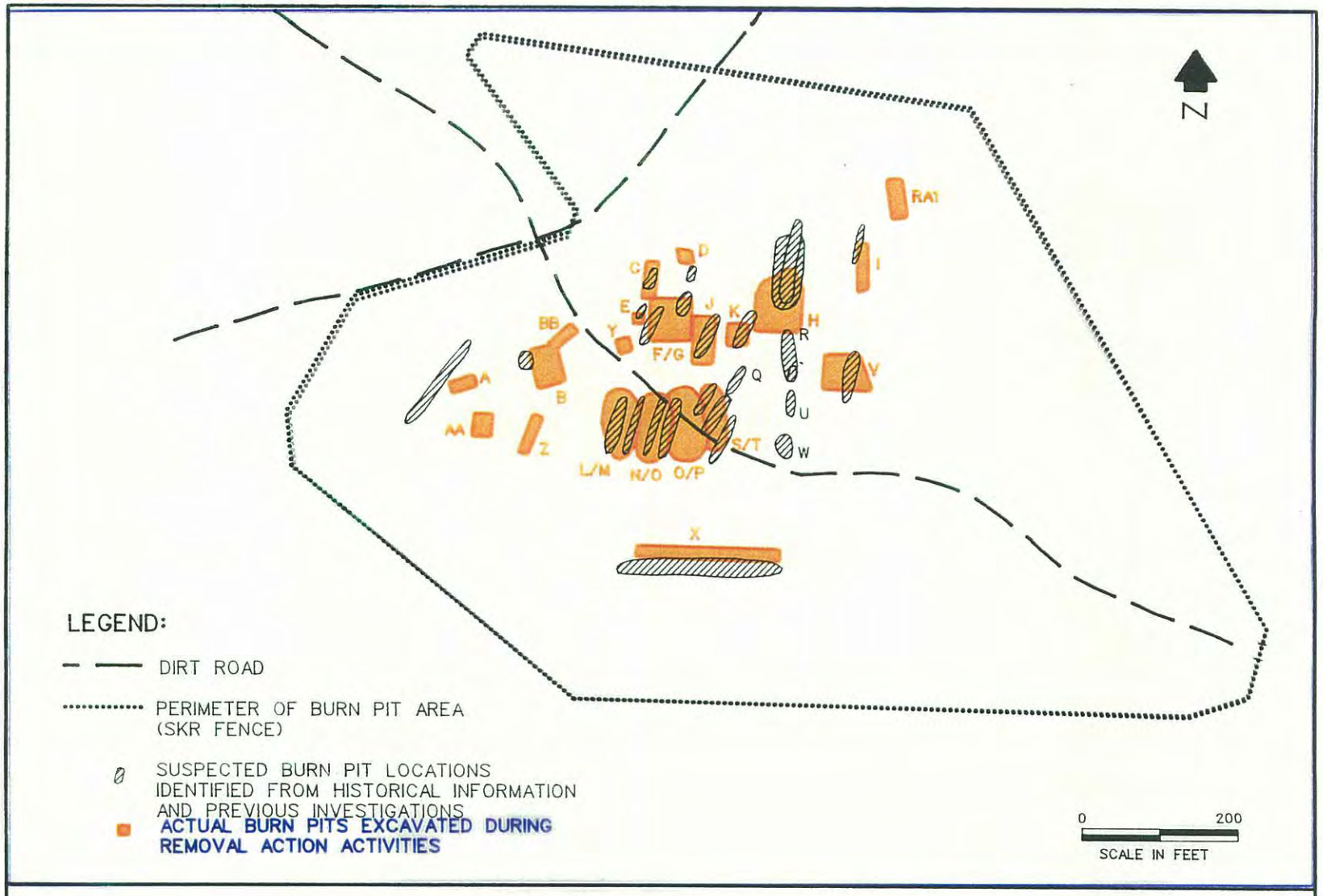

Figure 2-11. Correlation Between Suspected and Actual Burn Pit Locations

LOCK13 BPSUSP SAC

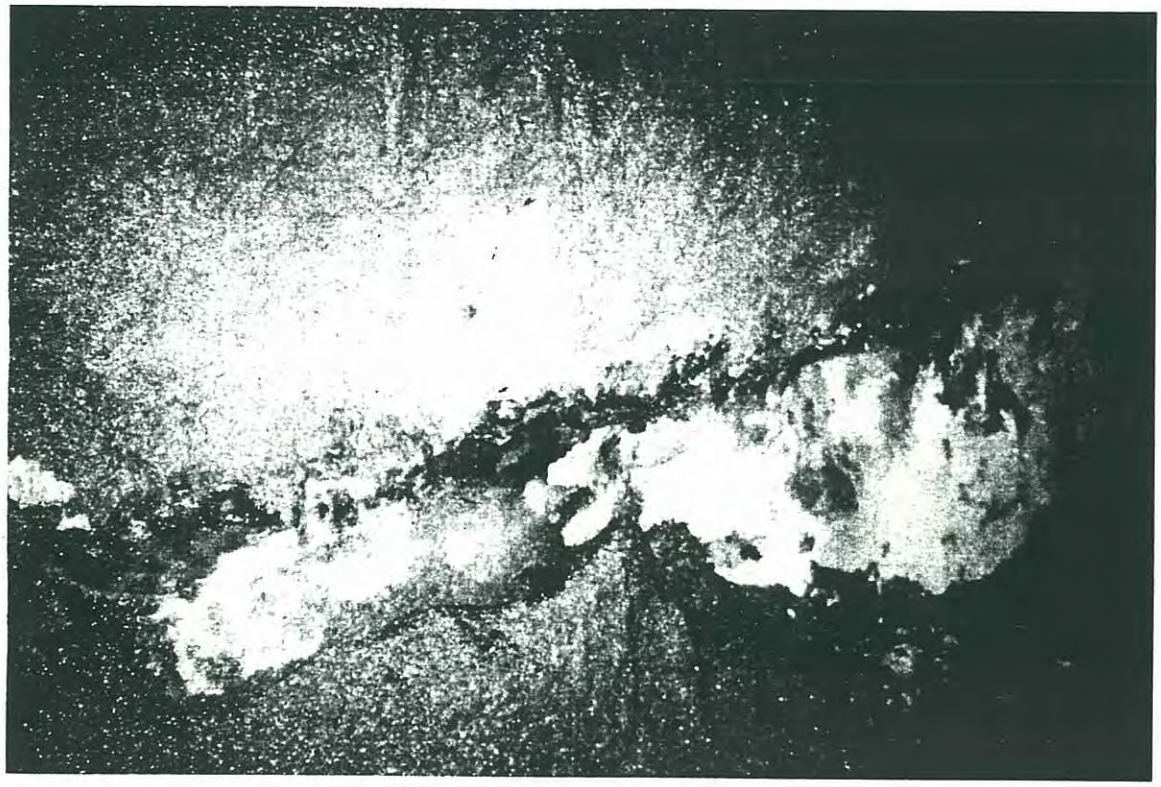

Figure 2-12. Burn Zone Residue

Figure 2-13. Metal Drums and Lids

Figure 2-14. Spent Rocket Motor Casing

Figure 2-15. Scrap Metal and Empty Glass Bottles

Figure 2-16. Specific Waste: Drum Containing Oily Substance

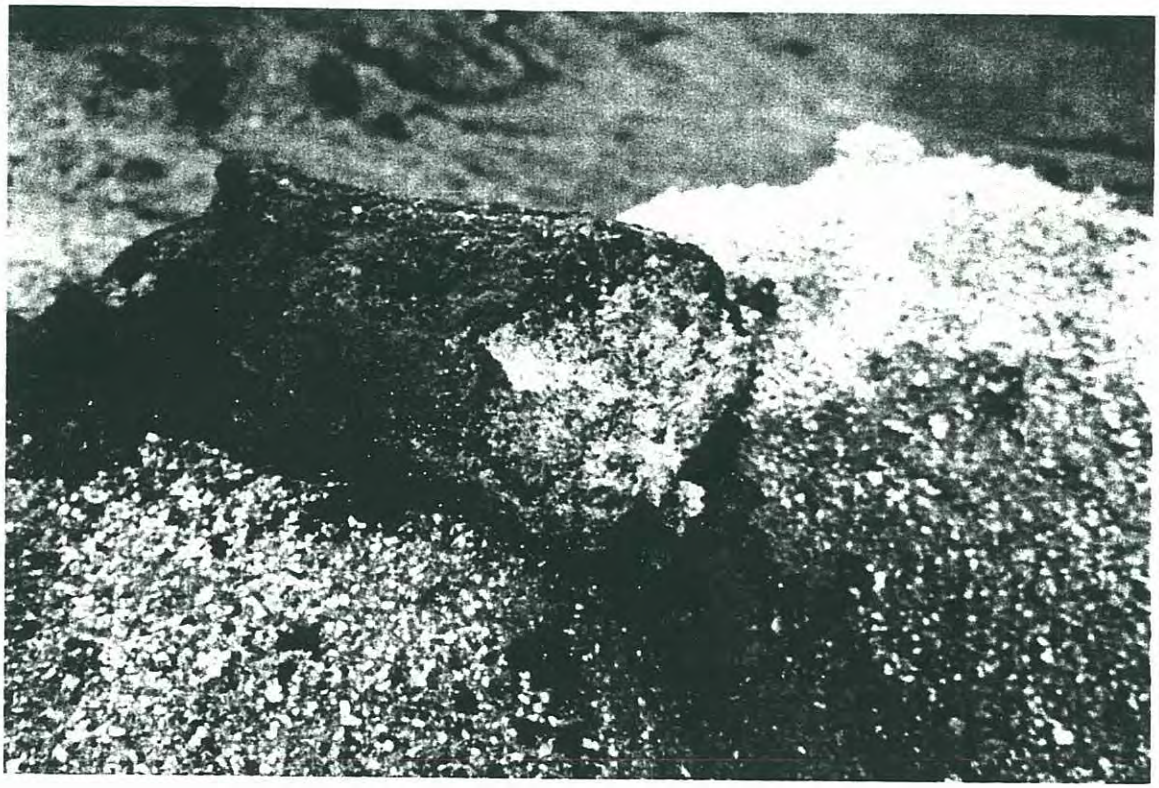

Figure 2-17. Unburned Rocket Propellant

Figure 2-18. "Iron Blue" Burn Rate Modifier

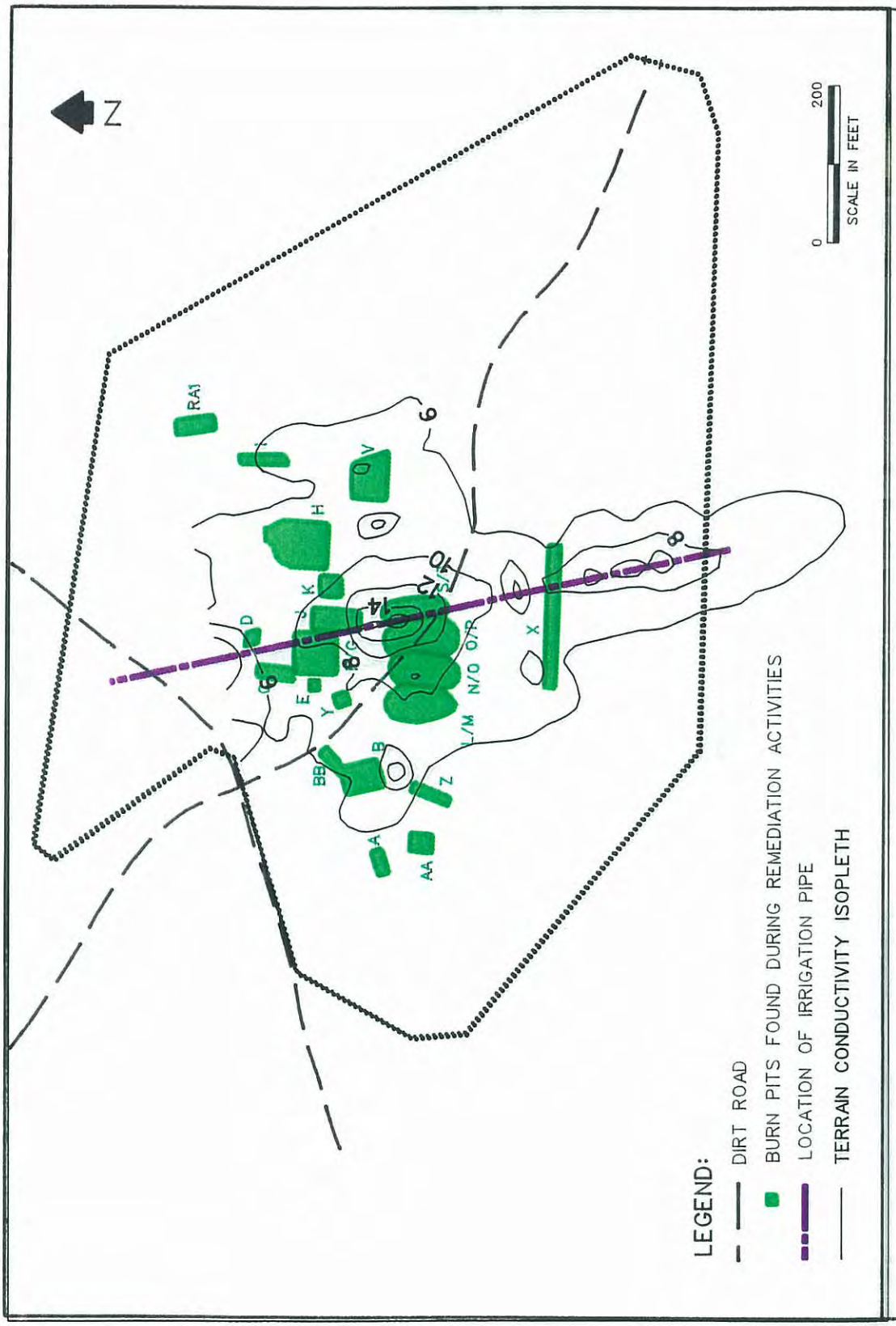

Figure 2-19. Correlation of Burn Pit Locations with Terrain Conductivity Results

LOCK13 BP7FIG SAC

Figure 2-20. Irrigation Pipe (foreground) Removed from BPA

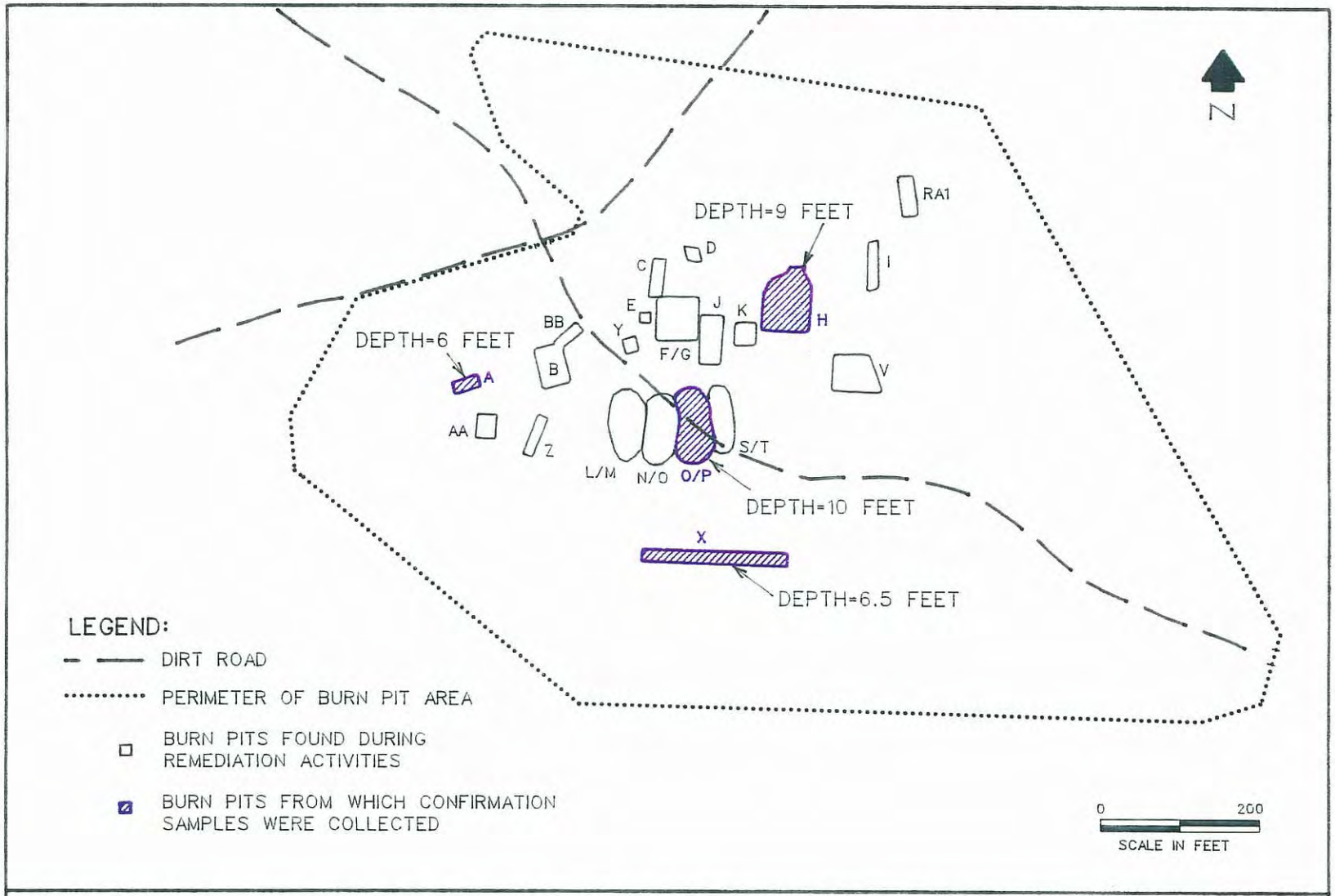

Figure 2-21. Burn Pits from which Confirmation Samples were Collected

LOCK13 BPSAMP SAC

Figure 2-22. Burn Pits Being Sampled with Core-Barrel Sampler Fitted with Brass Sleeves

Table 2-3

Burn Pit Confirmation Sample Results for Metals
U.S. EPA Method SW6010

BURN PIT:	A	OP	H	X		
SAMPLE ID:	L6673	OP-5	L6662	X-3	TTLC	10 x STLC
Analyte	Concentration in mg/kg				mg/kg	mg/L
Aluminum	7,200	12,000	13,000	14,000		
Antimony	9.6	ND (7.8)	ND (6.9)	ND (7.8)	500	150
Arsenic	ND (23)	ND (23)	ND (21)	ND (23)	500	50
Barium	65	100	99	130	10,000	1,000
Beryllium	0.28	0.31	0.32	0.36	75	7.5
Boron	ND (46)	ND (47)	ND (41)	ND (47)		
Cadmium	ND (0.38)	ND (0.39)	ND (0.34)	ND (0.39)	100	10
Calcium	1,500	1,500	1,300	1,600		
Chromium	3.0	5.4	6.1	5.7	2,500	5,600
Cobalt	3.1	4.9	4.9	5.4	8,000	800
Copper	2.1	4.4	4.4	3.2	2,500	250
Iron	11,000	16,000	18,000	19,000		
Lead	8.8	4.5	6.9	6.8	1,000	50
Magnesium	3,000	4,300	5,100	5,300		
Manganese	160	240	270	270		
Molybdenum	ND (3.8)	ND (3.9)	ND (3.4)	ND (3.9)	3,500	3,500
Nickel	ND (1.5)	1.6	2.3	3.4	2,000	200
Potassium	4,200	5,500	8,100	7,000		
Selenium	ND (23)	ND (23)	ND (21)	ND (23)	100	10
Silicon	160	460	420	460		
Silver	ND (0.77)	ND (0.78)	ND (0.69)	ND (0.78)	500	50
Sodium	ND (77)	ND (78)	98	ND (78)		
Strontium	11	13	9.2	16		
Thallium	ND (7.7)	ND (7.8)	ND (6.9)	ND (7.8)	700	70
Vanadium	19	25	29	30	2,400	240
Zinc	39	54	60	64	5,000	2,500

ID = Identification number.
mg/kg = Milligrams per kilogram.
mg/L = Milligrams per liter.
ND = Compound was not detected. Detection limit is noted in parenthesis.
TTLC = Total Threshold Limit Concentration.
STLC = Soluble Threshold Limit Concentration.
Blank boxes indicate that TTLC and STLC values are not established for that inorganic species.

Table 2-4

Burn Pit Confirmation Sample Results for Volatile Organic Compounds U.S. EPA Method SW8240

BURN PIT:	A	OP	H	X
SAMPLE ID:	L6674	OP-3	L6661	X-1
Analyte	Concentration in µg/kg			
Acetone	ND (100)	ND (110)	ND (110)	ND (100)
Acrolein	ND (78)	ND (84)	ND (82)	ND (78)
Acrylonitrile	ND (52)	ND (56)	ND (54)	ND (52)
Benzene	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
Bromodichloromethane	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
Bromomethane	ND (10)	ND (11)	ND (11)	ND (10)
Carbon disulfide	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
Carbon tetrachloride	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
Chlorobenzene	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
Chloroethane	ND (10)	ND (11)	ND (11)	ND (10)
2-Chloroethyl vinyl ether	ND (10)	ND (11)	ND (11)	ND (10)
Chloroform	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
Chloromethane	ND (10)	ND (11)	ND (11)	ND (10)
Dibromochloromethane	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
Dibromomethane	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
Trans-1,4,-Dichloro-2-butene	ND (10)	ND (11)	ND (11)	ND (10)
Dichlorodifluoromethane	ND (21)	ND (22)	ND (22)	ND (21)
1,1-Dichloroethane	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
1,2-Dichloroethane	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
1,1-Dichloroethene	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
trans-1,2-Dichloroethene	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
1,2-Dichloropropane	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
cis-1,3-Dichloropropene	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
trans-1,3-Dichloropropene	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
Ethyl benzene	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
Ethyl methacrylate	ND (16)	ND (17)	ND (16)	ND (16)
2-Hexanone	ND (52)	ND (56)	ND (54)	ND (52)
Iodomethane	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
Methyl ethyl ketone	ND (100)	ND (110)	ND (110)	ND (100)
4-Methyl-2-pentanone(MIBK)	ND (52)	ND (56)	ND (54)	ND (52)

Table 2-4

Continued

BURN PIT:	A	OP	H	X
SAMPLE ID:	L6674	OP-3	L6661	X-1
Analyte	Concentration in μg/kg			
Methylene chloride	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
Styrene	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
1,1,2,2-Tetrachloroethane	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
Tetrachloroethene	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
Toluene	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
Tribromomethane(Bromoform)	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
1,1,1-Trichloroethane	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
1,1,2-Trichloroethane	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
Trichloroethene	ND (5.2)	1.2[a] (5.6)	ND (5.4)	ND (5.2)
Trichlorofluoromethane	ND (10)	ND (11)	ND (11)	ND (10)
1,2,3-Trichloropropane	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
Vinyl acetate	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)
Vinyl chloride	ND (10)	ND (11)	ND (11)	ND (10)
Xylenes	ND (5.2)	ND (5.6)	ND (5.4)	ND (5.2)

[a] Compound detected at less than the detection limit of 5.6 μg/kg. This value should be considered an estimate.
ID = Identification number.
μg/kg = Micrograms per kilogram.
ND = Compound not detected. Detection limit is noted in parenthesis.

Table 2-5

Burn Pit Confirmation Sample Results for Semivolatile Organic Compounds U.S. EPA Method SW8270

BURN PIT:	A	OP	H	X
SAMPLE ID:	L6673	OP-4	L6661	X-2
Analyte	Concentration in µg/g			
Acenaphthene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Acenaphthylene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Acetophenone	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
4-Aminobiphenyl	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Aniline	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Anthracene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Benzidine	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Benzo(a)anthracene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Benzo(a)pyrene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Benzo(b)fluoranthene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Benzo(g,h,i)perylene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Benzo(k)fluoranthene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Benzoic acid	ND (1.8)	ND (1.9)	ND (1.8)	ND (1.7)
Benzyl alcohol	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
4-Bromophenyl phenyl ether	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Butylbenzylphthalate	ND (0.35)	ND (0.37)	0.0086[a] (0.37)	ND (0.35)
4-Chloro-3-methylphenol	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
p-chloroaniline	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
bis(2-Chloroethoxy)methane	ND (0.35)	0.13[a] (0.37)	ND (0.37)	ND (0.35)
bis(2-Chloroethyl)ether	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
bis(2-chloroisopropyl)ether	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
1-Chloronaphthalene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
2-Chloronaphthalene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
2-Chlorophenol	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
4-Chlorophenyl phenyl ether	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Chrysene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Di-n-octylphthalate	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Dibenz(a,h)anthracene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Dibenz(a,j)acridine	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Dibenzofuran	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)

Table 2-5

(Continued)

BURN PIT:	A	OP	H	X
SAMPLE ID:	L6673	OP-4	L6661	X-2
Analyte	Concentration in µg/g			
Dibutylphthalate	ND (0.35)	ND (0.37)	0.011[a] (0.37)	ND (0.35)
1,2-Dichlorobenzene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
1,3-Dichlorobenzene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
1,4-Dichlorobenzene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
3,3'-Dichlorobenzidine	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
2,4-Dichlorophenol	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
2,6-Dichlorophenol	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Diethylphthalate	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
p-Dimethylaminoazobenzene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
7,12-Dimethylbenz(a)anthrancene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Dimethylphenethylamine	ND (4.2)	ND (4.5)	ND (4.4)	ND (4.2)
2,4-Dimethylphenol	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Dimethylphthalate	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
4,6-Dinitro-2-methylphenol	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
2,4-Dinitrophenol	ND (0.70)	ND (0.74)	ND (0.74)	ND (0.70)
2,4-Dinitrotoluene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
2,6-Dinitrotoluene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Diphenylamine	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
1,2-Diphenylhydrazine	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Ethyl methanesulfonate	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Bis(2-Ethylhexyl)phthalate	ND (0.35)	ND (0.37)	0.057[a] (0.37)	ND (0.35)
Fluoranthene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Fluorene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Hexachlorobenzene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Hexachlorobutadiene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Hexachlorocyclopentadiene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Hexachloroethane	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Indeno(1,2,3-cd)pyrene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Isophorone	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)

Table 2-5

(Continued)

BURN PIT:	A	OP	H	X
SAMPLE ID:	L6673	OP-4	L6661	X-2
Analyte	Concentration in µg/g			
Methyl methanesulfonate	ND (1.8)	ND (1.9)	ND (1.8)	ND (1.7)
3-Methylcholanthrene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
2-Methylnaphthalene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
2-Methylphenol(o-cresol)	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
4-Methylphenol(p-cresol)	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
N-Nitroso-di-n-butylamine	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
N-Nitrosodimethylamine	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
N-Nitosodiphenylamine	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
N-Nitosodipropylamine	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
N-Nitrosopiperidine	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Naphthalene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
1-Naphthylamine	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
2-Naphthylamine	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
2-Nitroaniline	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
3-Nitroaniline	ND (0.70)	ND (0.74)	ND (0.74)	ND (0.70)
4-Nitroaniline	ND (0.70)	ND (0.74)	ND (0.74)	ND (0.70)
Nitrobenzene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
2-Nitrophenol	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
4-Nitrophenol	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Pentachlorobenzene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Pentachloronitrobenzene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Pentachlorophenol	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Phenacetin	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Phenanthrene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Phenol	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
2-picoline	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Pronamide	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Pyrene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
Pyridine	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)

Table 2-5

(Continued)

BURN PIT:	A	OP	H	X
SAMPLE ID:	L6673	OP-4	L6661	X-2
Analyte	Concentration in μg/g			
1,2,4,5-Tetrachlorobenzene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
2,3,4,6-Tetrachlorophenol	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
1,2,4-Trichlorobenzene	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
2,4,5-Trichlorophenol	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)
2,4,6-Trichlorophenol	ND (0.35)	ND (0.37)	ND (0.37)	ND (0.35)

[a] Compound detected at less than the detection limit. This value should be considered an estimate.
ID = Identification number.
μg/g = Micrograms per gram.
ND = Compound not detected. Detection limit is noted in parenthesis.

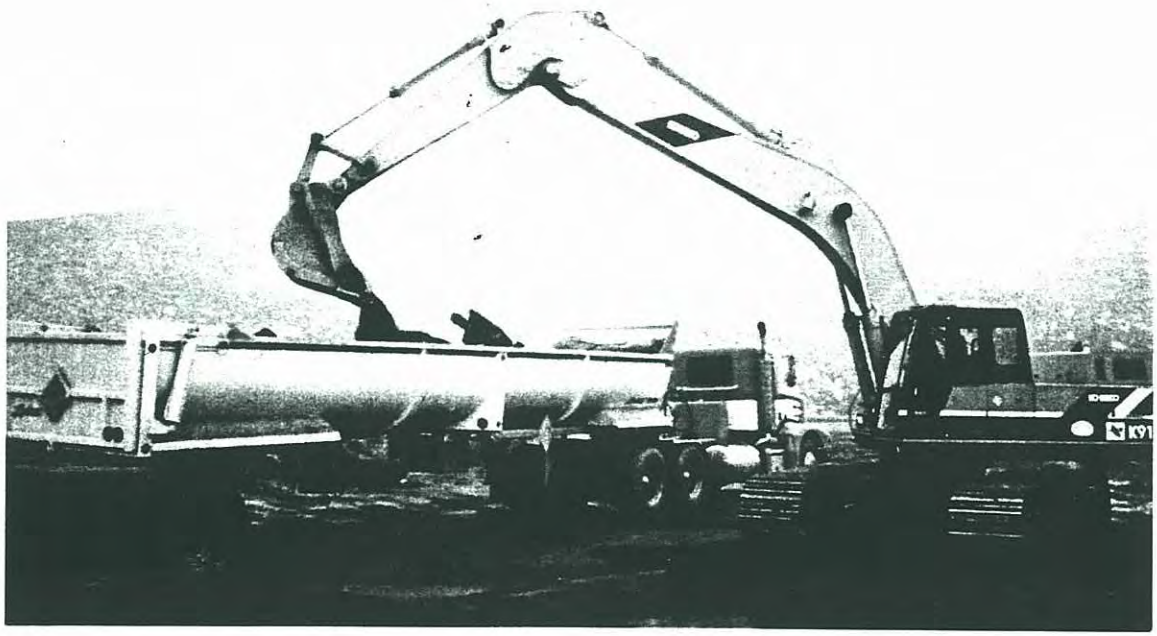

Figure 2-23. Trucks Being Loaded with Non-Hazardous Material

Figure 2-24. Nuclear Densitometer

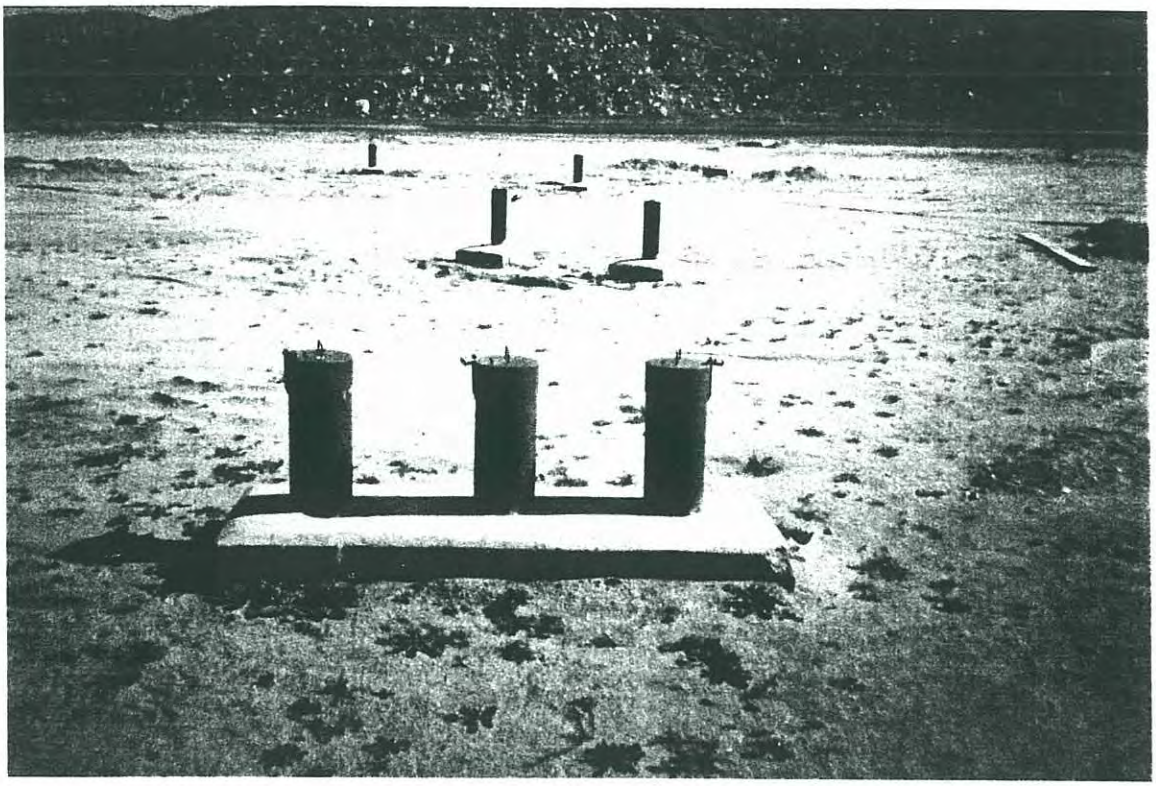

Figure 2-25. Fully Restored Well

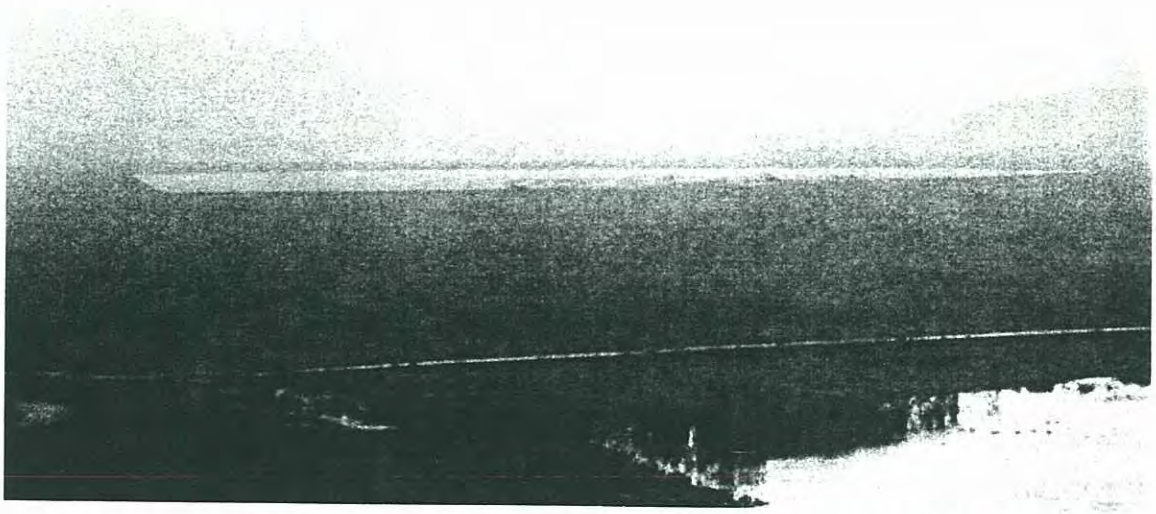

Figure 2-26. Overlooking the Burn Pit Area After Removal Action Activities

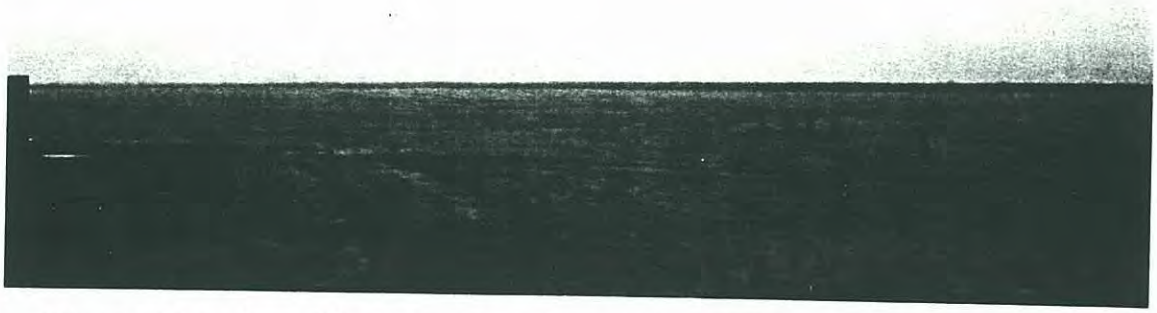

Figure 2-27. Burn Pit Area at the Completion of Removal Action Activities

Figure 2-28. Burn Pit Area - March 1993

3.0 COMPLIANCE WITH APPLICABLE REGULATIONS

All applicable regulations were addressed and complied with during the removal action. The regulatory agencies involved in overseeing on-site activities included:

- Cal/EPA Department of Toxic Substances Control (DTSC), which acted as the lead agency;
- South Coast Air Quality Management District (SCAQMD);
- California Regional Water Quality Control Board (CRWQCB), Santa Ana Region 8 and Los Angeles Region 4;
- U.S. Fish and Wildlife Service (FWS);
- California Department of Fish and Game (CDFG);
- Riverside County; and
- The City of Beaumont.

The regulatory requirements stipulated by each of the above regulatory agencies are generally outlined below. A description of procedures implemented to comply with each requirement then follows. Applicable permits are included in Appendix C.

3.1 South Coast Air Quality Management District

A Rule 1150 Landfill Excavation Permit, covering procedures to be followed during excavation activities to limit the amount of emissions created, was obtained from SCAQMD prior to the initiation of remedial activities. This permit was originally obtained on July 24, 1991; modification approvals were received on March 30, September 17, and December 18, 1992. Compliance with the permit included:

- Notifying SCAQMD prior to the beginning of excavation activities and after the completion;

- Limiting the amount of non-contaminated material stockpiled at any one time to not more than 15,000 cubic yards;

- Conducting excavation activities between the hours of 6:00 AM and 6:00 PM;

- Limiting the area of the excavation work face which exposed specific wastes to not more than 11,000 square feet;

- Not conducting excavation activities when the SCAQMD forecasts for Area 29 predicted first, second, or third stage episodes, or when the SCAQMD required companies in Area 29 to implement their episode plans (SCAQMD forecasts were checked each day, no episodes were predicted during field activities);

- Monitoring wind speed and direction (as shown in Figure 3-1) to ensure that excavation was not conducted when the average wind speed (over 15 minutes) was greater than 20 mph or when the instantaneous wind speed exceeded 25 mph (wind speed monitoring logs are included in Appendix D);

- Monitoring for volatile organics using an organic vapor analyzer (or an approved substitute, in this case an organic vapor monitor/ photoionization detector) (shown in Figure 3-2), downwind of the excavation work areas, and recording readings every 15 minutes. VOC monitoring and OVM calibration logs are included in Appendix E.

- Implementing dust suppression measures (as shown in Figure 3-3) at all times to minimize airborne dust (measures included watering down all roadways, work areas, and excavated material);

- Minimizing material loss during transport by loading trucks so that no material extended beyond the sides or rear and so material was securely covered;

- Loading specific wastes into on-site, sealable drop boxes labeled "Hazardous Materials" and disposing of the boxes at a Class I facility upon completion of the excavation activities; and

- Recording meteorological data (wind speed and direction) using a portable met-station set up in the BPA.

Earthmoving activities were halted on one occasion during the removal action due to excessive wind speeds. On November 30, 1992, Radian instructed Scrivner to halt all excavation and scraping in the BPA for a 2.5 hour duration until the excessive winds subsided. Instantaneous wind speeds up to 38 miles per hour were measured during that time. Organic vapors were not detected above 50 ppm levels at any time during the removal action. SCAQMD was notified of project completion on May 11, 1993.

3.2 California Regional Water Quality Control Board (RWQCB)

The CRWQCB was involved in overseeing runoff and erosion control and waste discharge. As described below, Santa Ana Region 8 regulated stormwater pollution prevention, and Los Angeles Region 4 regulated the disposal of burn pit material at BKK Landfill.

Stormwater Pollution Prevention

Runoff and erosion control measures were required by the CRWQCB, Santa Ana Region 8. The purpose of these measures was to ensure that unnecessary erosion was not caused by excavation activities and that possible contamination of downstream water bodies did not occur. The Notice of Intent to comply with the terms of the general permit to discharge stormwater associated with the burn pit remedial action was received by the State Water Resources Control Board on October 9, 1992. To comply with the requirements, a Stormwater Pollution Prevention Plan (SWPPP) (Radian, 1992c) was developed and followed during the BPA Removal Action.

Procedures outlined in the plan inluded:

- Controlling erosion and sediment;
- Managing and disposing of wastes;

- Managing stormwater; and
- Managing non-stormwater.

Erosion, sediment, and storm and non-stormwater (water used for dust suppression) were controlled using a galvanized steel fence (shown in Figures 3-4 and 3-5) which encompassed the entire 16.7-acre burn pit area (BPA). This fence was principally installed to protect the Stephens' Kangaroo Rat, an endangered species which inhabits the site (as discussed in Section 3.3). However, it served a secondary purpose by also acting as a barrier to water and sediment. The fence which extended 2 feet above and 2 feet below land surface (BLS), prevented the transport of sediment and storm water beyond the 16.6-acre removal area during on-site activities. During the heavy rains of December 1992 through February 1993, the fence proved to be an effective barrier to keep storm water within the 16.7-acre area. As specified in the SWPPP, the condition of the fence as a barrier to stormwater runoff was monitored daily. Non-hazardous material and specific wastes excavated from the burn pits were covered with plastic while stockpiled or placed in drop boxes prior to off-site disposal.

Waste Discharge

A Waste Discharge Permit, covering procedures to be followed during the transport and disposal of burn pit waste at BKK Landfill, was obtained from CRWQCB Los Angeles Region 8 prior to initiating waste disposal activities. This permit was obtained on November 24, 1992. Compliance with the permit included:

- Implementing a monitoring program and providing a Waste Disposal and Monitoring Report following the completion of disposal operations at the final point of disposal.

The Waste Disposal and Monitoring Report was submitted to the RWQCB on May 20, 1993.

3.3 U.S. Fish and Wildlife Service

The Stephens' Kangaroo Rat (SKR), which is listed as "threatened" by the California Department of Fish and Game, and "endangered" by the United States Fish and Wildlife Service (FWS), is known to inhabit the valley where the BPA is located. Because of the potential for harming the SKR during remedial activities, all SKR had to be removed from the BPA before removal actions could begin. This was done by a FWS-permitted biologist (Dr. Michael O'Farrell) in cooperation with Radian. The 16.7-acre area over which the remediation work would occur was surrounded by a special "SKR- proof" fence, made of sheet metal, which extended 2 feet above ground and 2 feet below ground (as shown in Figures 3-4 and 3-5). The fence was considered "SKR proof" because SKR are said to be unable jump higher than 2 feet and do not burrow deeper than 2 feet BLS. The SKR inside the fenced area were then trapped by Dr. O'Farrell and released outside of the fenced area, leaving the BPA virtually free of SKR. The fence remained erect for the duration of the remedial activities. Access to the area was controlled through two gates which were open only during work hours and remained closed from dusk to dawn to prevent repopulation of the BPA by the nocturnal SKR.

In addition to ensuring the integrity of the fence, all personnel working on site were instructed to comply with the following conditions:

- Confine activities to existing roads and the fenced BPA;
- Do not knowingly destroy or disturb a SKR burrow; and
- If a live SKR was encountered during remedial activities, stop all work and notify Radian's representative, who would contact the proper personnel at the U.S. Fish and Wildlife Service for further guidance.

No SKR were encountered during the removal action.

3.4 Riverside County

Riverside County was involved in overseeing two major parts of the removal action activities including:

- Well Modification and Restoration; and
- Site Grading (includes excavation, and backfilling).

Well Modification and Restoration

Well modification and restoration activities were conducted under the supervision and direction of Riverside County representatives. Detailed well modification and restoration specifications are included in the Contract Documents and Specifications (Radian, 1992b). Following these specifications ensured that the integrity of the wells were not compromised during modification or restoration, and that they could continue to be used for monitoring groundwater and soil vapor contamination beneath the BPA. At the completion of restoration activities, the wells were inspected by a Riverside County representative, who confirmed that the wells were suitable for their intended purpose. Figures 3-6 and 3-7 are schematic diagrams of completely restored monitoring and extraction wells, respectively.

Site Grading

A preliminary grading permit covering procedures to be followed during excavation and grading activities to control erosion, drainage, and settling, was obtained from Riverside County Department of Building and Safety before earthmoving activities were initiated. The preliminary permit was obtained on November 19, 1992. Procedures followed to comply with the permit included:

- Performing excavation, backfilling, and grading operations in accordance with UBC Chapters 26 and 70 and County Ordinance 457;

- Ensuring that the final geotechnical report confirmed compliance with engineering specifications and was certified by a registered engineer (included in Appendix B); and

- Providing County with final site topography and reports documenting site activities. Final site topography is shown on Figure 3-8.

Riverside County was notified of project completion on March 28, 1993. A letter report, *Final Site Topography Plot Plan and Geotechnical Compaction Report* was submitted to the county on May 17, 1993.

Figure 3-1. Monitoring Wind Speed and Direction

Figure 3-2. Monitoring for Volatile Organic Compounds

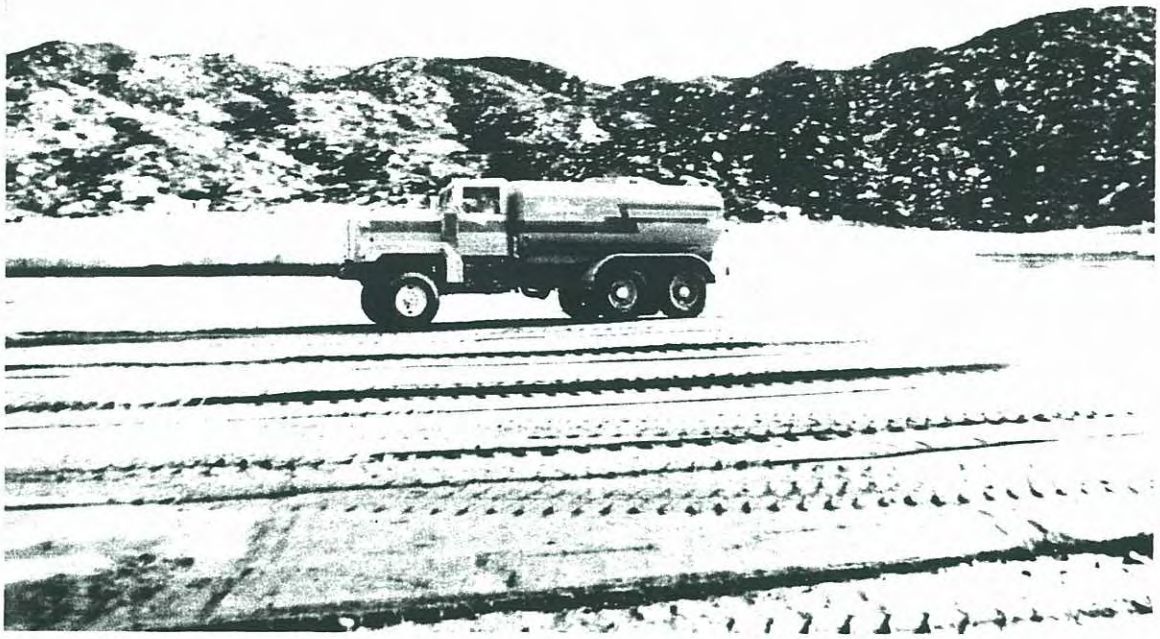

Figure 3-3. Dust Suppression Measures

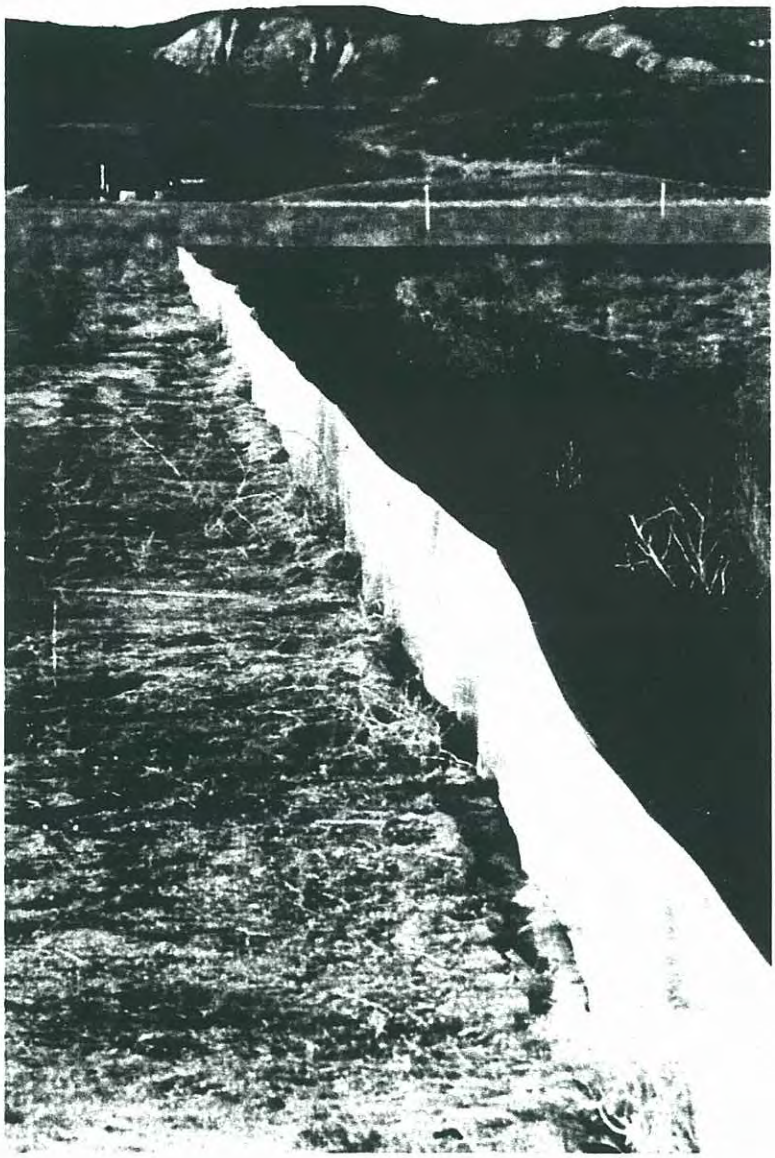

Figure 3-4. "SKR Proof" Fence Surrounding Burn Pit Area

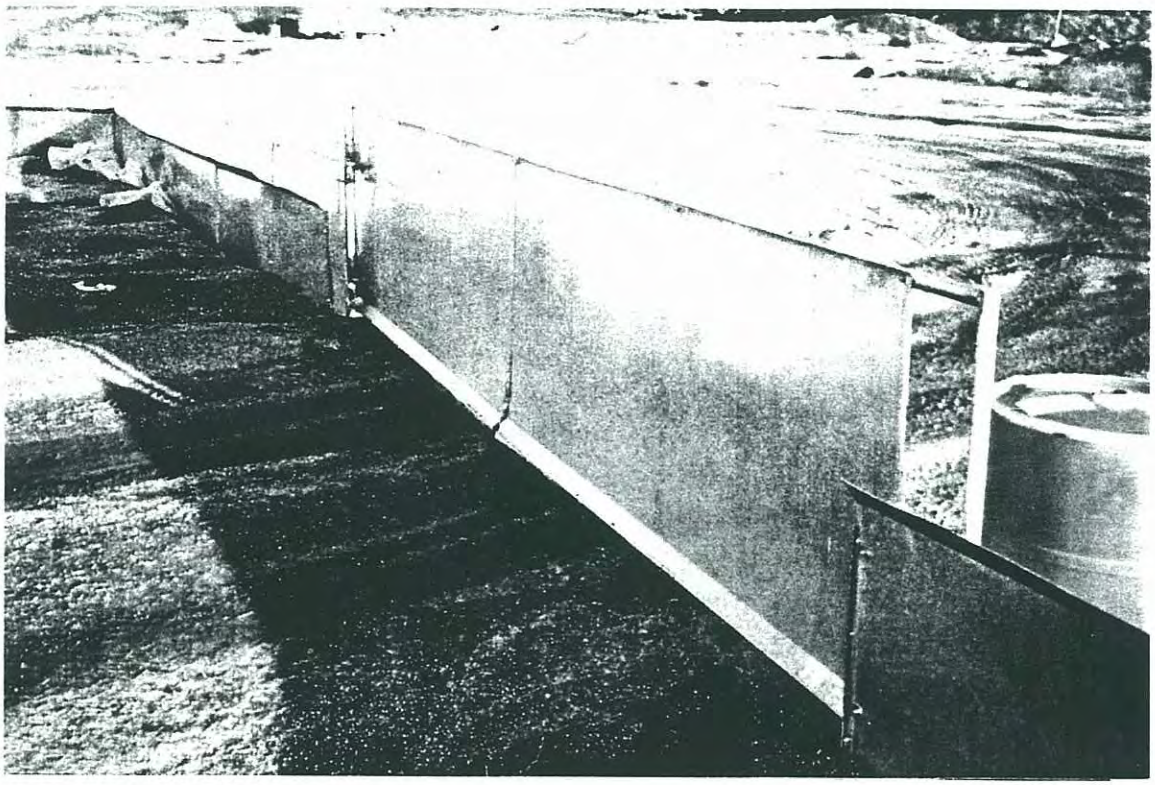

Figure 3-5. One of Two Gates Secured Every Evening

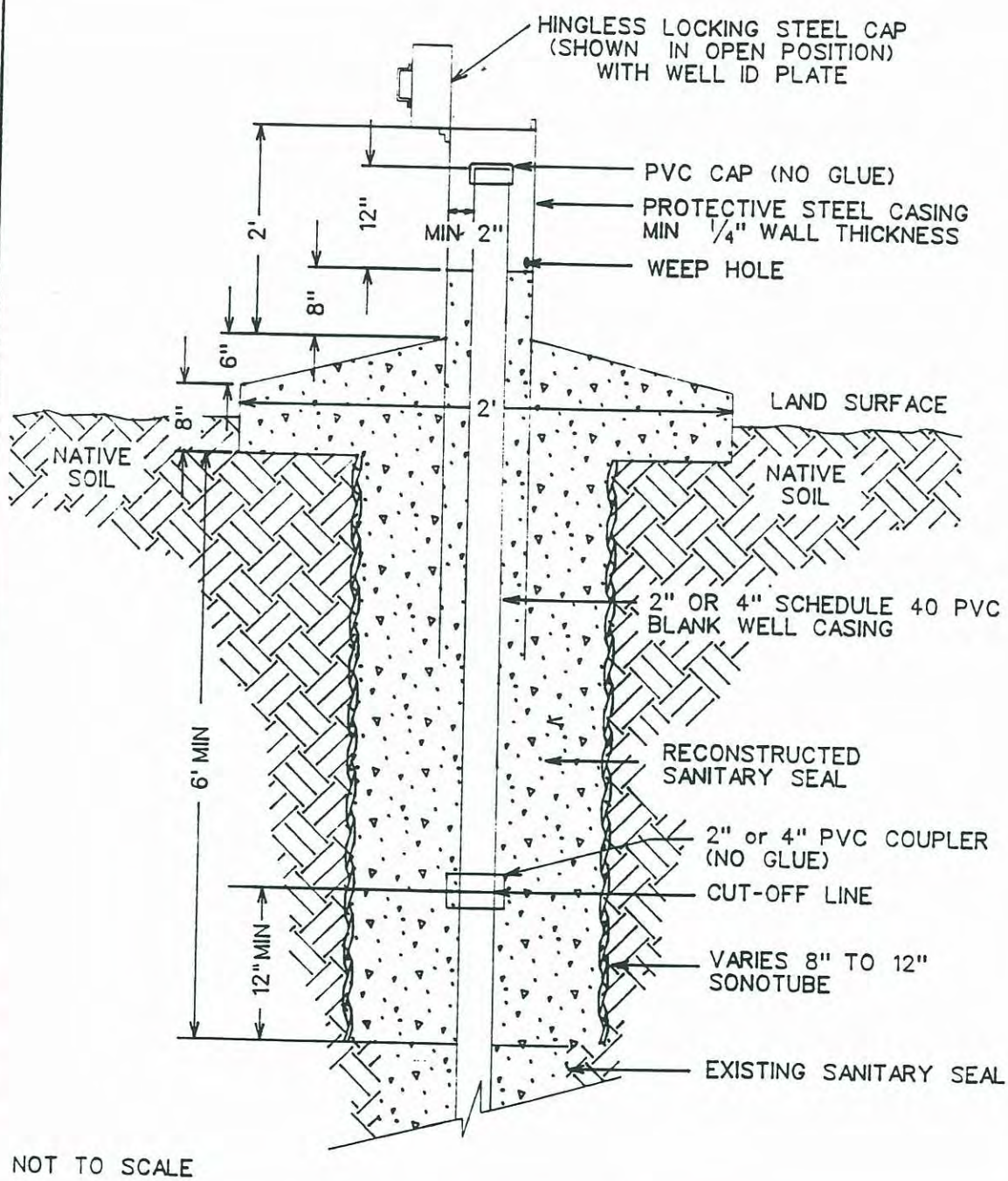

Figure 3-6. Well Completion for Monitoring Well After Burn Pit Removal Action

VRL LOCK9 WELMW 7/22/92

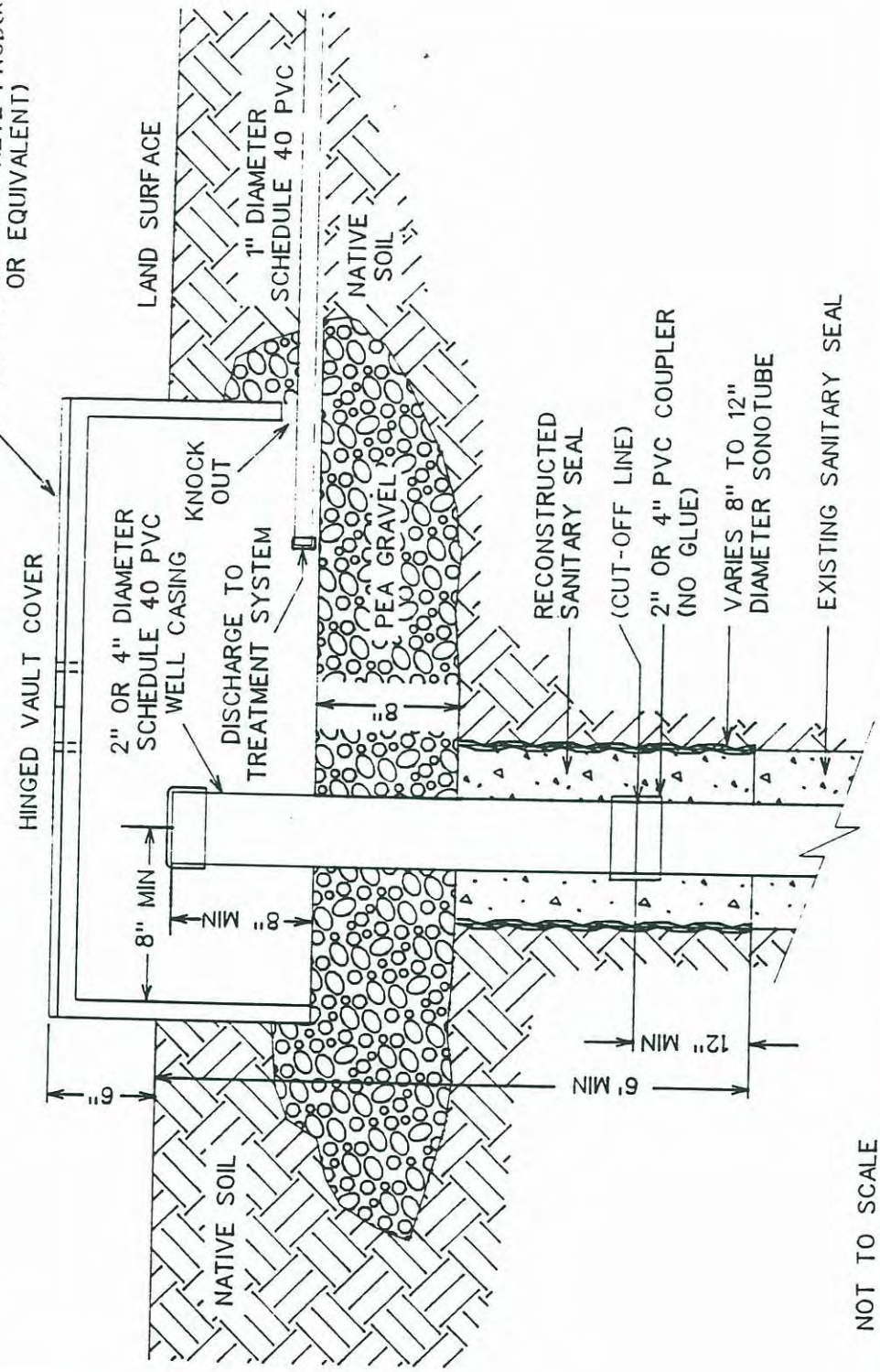

Figure 3-7. Well Completion for Extraction Well After Burn Pit Removal Action

VRL LOCK9 WELRECV 7/22/92

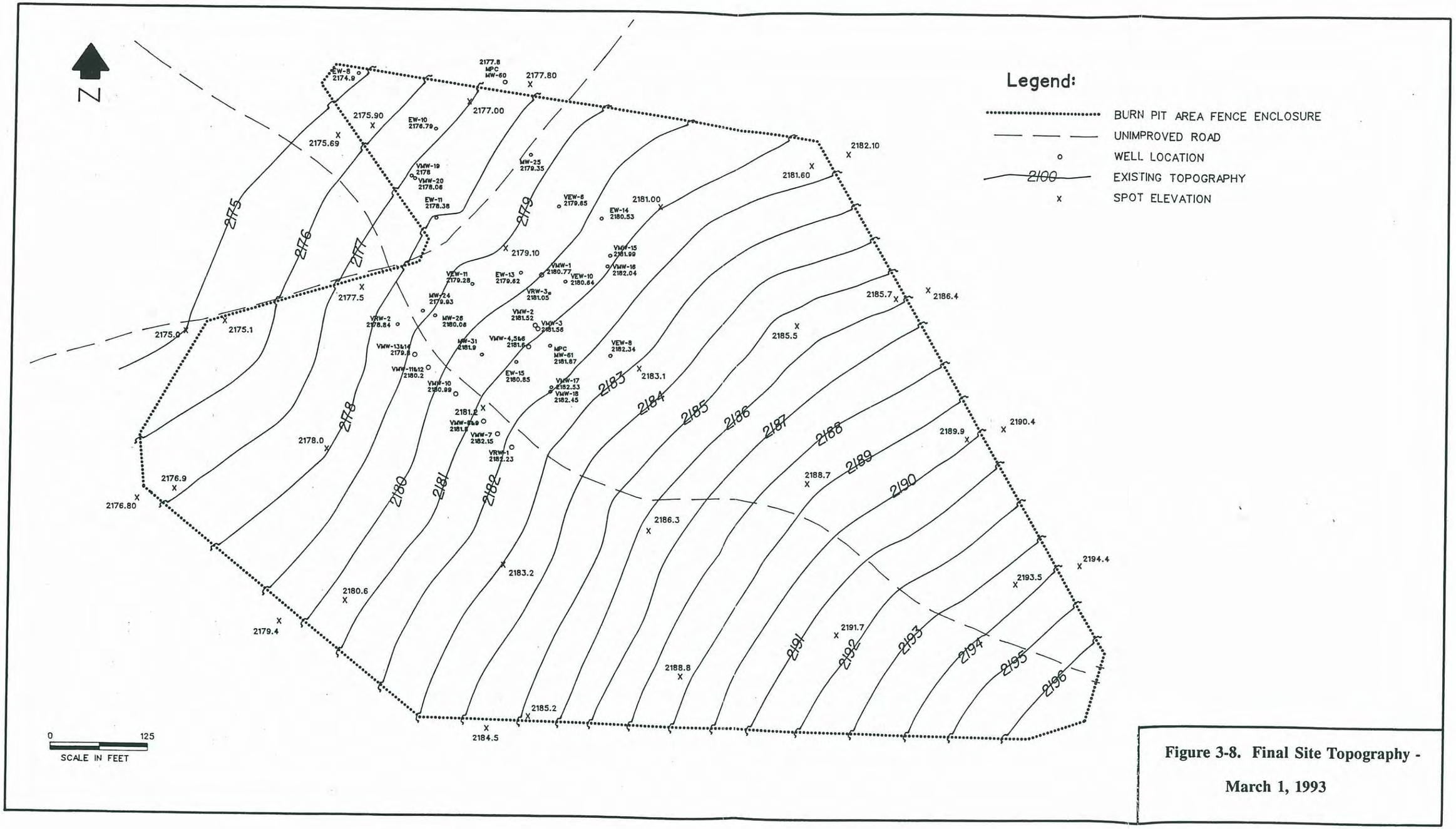

Figure 3-8. Final Site Topography - March 1, 1993

LOCK13 BPTOPFIG SAC

4.0 REFERENCES

California Code of Regulations, Title 22, Section 261.126 Appendix 11, 1991.

Radian Corporation (Radian), 1986a. *Lockheed Propulsion Company, Beaumont Test Facilities, Historical Report*, September 1986.

Radian, 1986b. *Lockheed Propulsion Company, Beaumont Test Facilities, Preliminary Remedial Investigation*, December 1986.

Radian, 1990. *Lockheed Propulsion Company, Beaumont Test Facilities, Source and Hydrogeologic Investigation*, February 1990.

Radian, 1991a. *Lockheed Beaumont No. 1, Burn Pit Area, Excavation and Management Plan, Draft*, March 1991.

Radian, 1991b. *Burn Pit Area Removal Action Plan*, April 1991.

Radian, 1992a. *Lockheed Beaumont No. 1 Site Remedial Action Plan*, May 1992.

Radian, 1992b. *Contract Documents and Specifications. Lockheed Beaumont No. 1 Facility Burn Pit Area Removal Action*, July 1992.

Radian, 1992c. *Stormwater Pollution Prevention Plan*. November 1992.

Radian, 1992d. *Lockheed Beaumont No. 1 Burn Pit Remediation Work Plan*, November 1992.

U.S. Geological Survey, 1953. San Jacinto 7.5 minute topographic map, photorevised 1979.