NMED/DOE/AIP-94/1

NEW MEXICO ENVIRONMENT DEPARTMENT
DOE ENVIRONMENTAL OVERSIGHT AND MONITORING
Agreement-in-Principle

Assessment of Solid Waste Management Units at the Waste Isolation Pilot Plant

Supporting Documentation for RCRA Facility Assessment

NMED/WIPP 93-001
May, 1994

NMED/WIPP DOE
Oversight and Environmental Surveillance
WIPP Site, P.O. Box 3090
Carlsbad, New Mexico 88221

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Disclaimer

This report was prepared by New Mexico Environment Department staff located at the WIPP site. The technical judgements expressed herein are those of NMED/WIPP oversight staff and do not necessarily reflect those of the State of New Mexico nor any agency thereof. The report is for information purposes only, and is intended solely as supporting documentation to assist the Department of Energy, State of New Mexico and other regulatory agencies in managing active and inactive Solid Waste Management Units at the Waste Isolation Pilot Plant existing as of 3/92.

Executive Summary

This report fulfills a request by the U.S Environmental Protection Agency (EPA) for technical assistance in preparing a RCRA Facility Assessment (RFA) for the Waste Isolation Pilot Plant (WIPP). Prepared by the New Mexico Environment Department (NMED), the report provides a preliminary technical assessment of WIPP Solid Waste Management Units (SWMUs). Solid Waste Management Units are described as:

- a discernable unit "from which hazardous constituents might migrate, irrespective of whether the unit was intended for the management of solid and/or hazardous waste" (EPA, 1986e), and

- "any area at or around a facility at which solid wastes have been routinely and systematically released" (EPA, 1991).

The report contains the required components of an RFA: preliminary review (PR), visual site inspection (VSI), and sampling visits (SV). These activities were conducted by NMED/WIPP oversight staff between September and May, 1993, and are consistent with the State oversight plan implemented at the site. NMED/WIPP staff stationed at the WIPP are funded by an Agreement-in-Principle between the Department of Energy and the State of New Mexico to assure that the public health and safety, and the environment are being protected by DOE programs. The objective of the report is to provide the EPA with the information required to either screen SWMUs from further study, or to support decisions requiring further characterization/mitigative actions.

General Conclusion: This study concludes that shallow groundwater represents a plausible migration and exposure pathway on the WIPP site. Review, inspection and sampling indicate that further characterization is needed for several borehole mudpits, pre-1988 landfills, and one equipment/product storage area. Other recommendations are directed at a reclaimable storage yard, three surface satellite accumulation and storage areas, salt storage areas, and shaft holding ponds.

Migration Pathways and Potential

A survey of borehole data reports indicates that Dewey Lake Formation groundwater is documented at depths between 53 meters (175 feet) and 80 meters (265 feet) on the southwestern and southern portion of the site. The size and continuity of this shallow groundwater zone is not well-defined, and the potential for hydrologic connection to a zone of offsite potable water (680 mg/l TDS) cannot be precluded on the basis of current information. In the event a SWMU site with suspected contamination is exhumed, air dispersion and direct contact are also identified as potential pathways. The preliminary approach of designating migration and exposure potential is used as a measure of relative hazard; the approach is not a detailed indicator of site-specific risk.

Solid Waste Management Units

Table E-1 summarizes which WIPP Solid Waste Management Units (SWMUs) are the focus of concerns and suggested actions resulting from this study. Most currently active SWMUs at the WIPP site are not major issues. Concerns are principally directed at older SWMU groups, some of which were operated and decommissioned before many current management controls were in place. The following synopses reiterate pertinent observations from the technical assessments in Chapter 4 and conclusions in Chapter 5 for each SWMU group.

Table E1
Suggested SWMU Group Actions

Solid Waste Management Unit	Areas of Concern	RCRA Facility Investigation Suggested	Other Suggested Action	Notes
SWMU 001 Mudpits				
P-15, H-11/P-9, P-6, IMC-374, H-14/P-1, DOE-1, Badger Unit, Cotton Baby	■	■	□	Note 1
SWMU 002 Salt and Top Soil Storage Areas				
SWMU 002a (Inactive Salt)	■		□	
SWMU 002b (Active Salt)	■		□	Note 2
SWMU 002c (Inactive Top Soil)	■		□	
SWMU 003 Landfills				
SWMU 003a (Brinderson)	■	■		
SWMU 003b (New Landfill/Inactive)	■	■	□	Note 3
SWMU 004 Storage Yards	■	■	□	Note 4
SWMU 005 Concrete Batch Plants				
SWMU 006 Holding Ponds				
SWMU 006a (Salt Holding Pond)	■		□	
SWMU 006b (Waste Handling Pond)	■		□	
SWMU 007 Evaporation Ponds				
SWMU 008 Surface Satellite Accumulation Area (Facility 474 Complex)	■		□	
SWMU 009 Underground Satellite Accumulation Area				
SWMU 010 Shaft Sump 3				
SWMU 011 Sewage Treatment Facilities				
SWMU 012 Nonhazardous Solid Waste Collection Bins				
SWMU 013 TRU Mixed Waste Management Units	N/A			

Note 1: RFI for select group of mudpits. Continue ongoing reclamation/remediation activities for other mudpits.
Note 2: Develop procedure to exclude potentially hazardous substances from 002b.
Note 3: Continue planned reclamation/remediation activities: slope stability.
Note 4: Discolored soil at Portacamp.

SWMU Group 001 - Mudpits

Based on document review and site-specific visual surveys, this study finds that SWMU Group-001 consists of as many as 50 individual mudpits. Because many sites are graded and revegetated, only twenty-seven mudpit locations on 28 drill pads are conclusively identified. Surficial contamination is apparent at only two sites: oil exploration mudpits for Badger Unit and Cotton Baby. A review of borehole reports and permit records, where available, demonstrates a general lack of control involving management of hazardous materials or waste at most older well sites (pre-1986). In no instances is there supporting documentation at closure to support the assumption that no hazardous constituents have been introduced into the mudpits. To test the validity of process knowledge, a limited sampling program was conducted at selected mudpits in October, 1992. Sampled mudpits include DOE-1 (drilled in 1982), Badger Unit (drilled in 1974) and Cotton Baby (drilled in 1974). Preliminary interpretation of the data indicate the following:

- Trace amounts of substituted benzene compounds (3000-7000 ppb) and aromatic and halogenated hydrocarbons (20-30 ppb maximum) and aliphatic hydrocarbons/diesel (190 ppm maximum).
- Elevated levels of barium (120 ppm maximum), chromium (43 ppm maximum) and lead (51 ppm maximum) above background levels 11 ppm, 3 ppm, and <5 ppm, respectively.
- Elevated levels of organic and heavy metal constituents in native dune sand and/or soil below the mudpit liner.

The concentrations detected are in all cases below RCRA action levels. Nevertheless, the sampling program creates some uncertainty as to whether hazardous constituents may be present at other sites.

Eleven well pads containing between 1-3 mudpits are identified as having a relative moderate-high to moderate-low migration and exposure potential. In addition to proximity to known or suspected shallow groundwater, conditions such as the age of the well pad, information collected on specific mudpit contents, and proximity to established or developable drinking water sources are used as criteria to establish the need for further investigation. A RCRA Facility Investigation (RFI) is suggested for eight mudpit SWMUs: P-15, H-11, H-14/P-1, Cotton Baby, P-6, IMC-374, DOE-1, and Badger Unit. The rationale for selecting these sites are as follows:

- P-15 and H-11 are selected on the basis of established groundwater detected at these locations at around 65-70 meters (220-230 feet) below the surface, proximity to the site boundary, and possible hydrologic connection to the Dewey Lake perched groundwater zone offsite.
- Cotton Baby, DOE-1, and Badger Unit are selected principally on the need to better characterize the unit characteristics and degree of release observed during preliminary RFA sampling.
- P-6, IMC-374, and H-14/P-1 are chosen for their relative proximity to the site boundary (P-6) and/or their location at the possible northern fringe of the Dewey Lake perched zone. P wells (U.S. Geological Survey potash investigation boreholes) reportedly used diesel fuel as a drilling fluid additive.

Lastly, this study finds that the RCRA Part B application omitted a number of boreholes, although the hydropads were identified for H-3d, H-11b4, and P-2. Boreholes H-16, DSP 207, IMC-375 and IMC-377 are completely overlooked.

SWMU Group 002 - Salt and Top Soil Storage Areas

As verified in this assessment, there are four (4) excavated fill storage areas:

- SWMU-002a: SPVD Salt Storage Pile (1981-1985)

- SWMU-002b: Salt Storage Pile (1984-Present)
- SWMU-002c: Top Soil Storage Area (1981-1985?)
- SWMU-002d: SPVD Top Soil Storage Area (1981-1982)

Based on process knowledge, both salt storage and top soil storage SWMUs are described as relatively innocuous units, containing either predominately salt or clean "top soil" fill.The principal suggested action for SWMU group 002 is to establish a DOE/WIPP procedure to exclude hazardous materials, solid waste and other potentially hazardous solids or liquids from SWMU 002b (Active Salt Storage Area). The salt storage sites and one top soil site (SWMU 002c) are found to contain a considerable, but undetermined amount of solid waste. Without photographic or procedural documentation, there exists the possibility that trace amounts of hazardous constituents have been inadvertently placed in these SWMUs along with construction debris. It is suggested that a special effort be made to characterize and document the fill at the time the WIPP facility is decommissioned. Some materials may also be unsuitable for the shaft plugs or reclamation activities planned at the time of facility closure.

SWMU Group 003 - Landfills

Two landfills areas, displaying several different periods of cut-and-fill activity, are verified using aerial photographs:

- SWMU 003a, the Brinderson landfill located in the northeast and northwest corners of sections 32 and 33, and

- SWMU 003b, consisting of an active and inactive landfill.

The primary concerns reflected in table E-1 are directed at units active prior to late 1988, especially those that may have received drilling fluids: SWMU 003a Brinderson Landfill (closed 1987) and SWMU-003b New Landfill (active pre- 1982 through 1990) Undocumented and currently prohibited materials could have been unintentionally emplaced at either of the decommissioned landfills. An operations procedure to screen and exclude hazardous or regulated materials from WIPP landfills was not in place until 1988, well after these units were in operation or closed. Currently prohibited materials include petroleum products, heavy metals (lead), soils or other solids contaminated with hazardous materials, liquid waste, and containers previously holding hazardous materials. In addition, this investigation finds that drilling mud from the excavated waste handling and salt shaft holding ponds may have been disposed of in the older landfills. It is suggested that holding pond residue may exhibit similar characteristics as drilling mudpit contents, including traces of potentially hazardous organic and heavy metal constituents.

Based on migration and exposure potential, Brinderson Landfill is of most concern. Nevertheless, because there is no documentation or procedures to support process knowledge, staff suggest that both decommissioned units be investigated. Another concern is the potential erosion of the landfill fill slopes at SWMU-003b. Staff support DOE plans for slope stabilization to preclude a release caused by exhumation of the landfill.

SWMU Group 004 - Storage Yards and Portacamp

Staff verified the management of three WIPP storage yard SWMUs:

- SWMU 004a: Portacamp Storage Yard (two units),

- SWMU 004b: Reclaimable Storage Yard, and

- SWMU 004c: Grout Storage Yard

The yards have routinely been used to accumulate recyclable or reclaimable materials, maintenance equipment and materials, construction materials, and waste water contaminated with motor oil, hydraulic oil, and diesel fuel. All units were operational prior to the 1991 implementation of DOE/WIPP Procedures WP 02-6 and WP 02-7 (RCRA Compliance): SWMU 004a (active-1976), SWMU 004b (active-1987), and SWMU 004c (active-1987). Based on this review, process knowledge remains the sole supporting evidence for remediation of any spills that have occurred at these sites. Nevertheless, the main concern expressed in Table E-1 is directed at SWMU 004a:

- There is evidence of a past release (discolored soil) on the west side of the SWMU 004a Portacamp (Westinghouse-managed). The RCRA Part B application attributes the source of discoloration to leaks or spills from containers storing virgin oils. While sampling of stained soil from a spill is current procedure, there is no evidence that these older discolored soils have been sampled. Because elevated levels of cadmium were detected in vehicle wash bay sludge previously stored at SWMU-004a, staff believe that a release of hazardous substances into the environment cannot be precluded in the absence of sampling data from the soils. An RFI is suggested to establish the composition and distribution of the discolored soils found in this portacamp.

Other issues involve housekeeping suggestions, and do not involve further investigation of any kind. These issues include:

- Improperly stored concentrated nitric acid was observed on the east side of the SWMU 004a Portacamp Storage Yard (Sandia National Laboratory-managed). Staff suggest the acid be containerized properly and removed to an appropriate storage area.

- Housekeeping could be improved in all locations; however, SWMU 004b (Reclaimables Storage Yard) displayed especially poor housekeeping, including improper segregation of recyclable or reclaimable metals and materials.

- The spent batteries stored at SWMU No. 004-b (Reclaimables Storage Yard) contain sulfuric acid and represent a potential source for a release to the environment. Staff suggest that spent lead acid batteries be removed from the reclaimables yard and handled within the Hazardous Waste Staging Area as a hazardous material.

SWMU Group 005 - Concrete Batch Plants

As evident from Table E-1, there are no concerns directed at any of the three locations used as temporary operating areas for Concrete Batch Plants. Waste generated reportedly consisted of small amounts of spilled concrete and possibly trace amounts of motor oil, grease, and hydraulic fluid from the machinery. No oily or stained soil occurs at the surface of two of the former sites; a third is covered by the waste handling building. The survey of SWMU 005b reveals site reclamation to be successful, with vigorous revegetation occurring. SWMU 005c is not reclaimed, but has been subsequently graded. Abundant spilled concrete and construction material debris still cover the general area of SWMU 005c. The Waste Handling Building and asphalt pavement now cover the other SWMU group: SWMU 005a.

SWMU Group 006 - Salt and Waste Shaft Holding Ponds

The suggested action in Table E-1 involves the potential presence of hazardous organic and heavy metal constituents in the drilling mud contained in holding ponds for the Salt Shaft (SWMU-006a) and Waste Handling shaft (SWMU-006b). The holding ponds each contained as much as 2-3 million gallons of drilling fluid, which as demonstrated from sampling of the mudpits for this study, may contain RCRA constituents. Although much of the material has been excavated and removed, the large volume of materials suggests that some shallow infiltration may have occurred into underlying formations. The holding pond contents remained buried insitu for three years at the Waste Handling Shaft holding pond and eight years at the Salt Shaft holding ponds. Notwithstanding these concerns, this study concludes that the migration and exposure potential by the groundwater pathway is unlikely.

The suggested action in Table E-1 is for consideration of this issue at the time of the WIPP facilitys' decommissioning. Depending on the regulatory driver, decommissioning could involve sampling and remediating, if necessary, subsurface soils within the fenced boundary following removal of surface facilities. A subsurface investigation at this time would be difficult, as much of the original features are now buried under building foundation.

SWMU Group 007 - Evaporation Ponds

Table E-1 indicates there are no concerns noted for any of the three evaporation ponds. Two received grey water from personnel showers (SWMU 007a and SWMU 007b); another currently receives runoff from the main salt storage pile (SWMU 007c). SWMU 007a is now covered by the Waste Handling Building and was not observed; however, the other grey water SWMU was sampled for the RFA. The former location of SWMU 007b, now completely graded, lies within an area that now receives routine outfall from stormwater and domestic water resulting from fire flow performance testing. Iron, barium, and aluminum metals are found above background levels; however, concentrations are well below RCRA action levels. No semi-volatile compounds or aliphatic hydrocarbons are present. The spot sampling appears to support process knowledge for both grey water evaporation ponds. The SWMU 007c evaporation pond is verified to receive only saturated brine and run-off from the adjacent salt storage area.

SWMU Group 008 - Surface Satellite Accumulation and Storage Areas

This assessment verifies the 12 surface satellite accumulation areas and 2 hazardous and flammable waste storage/staging areas designated in the RCRA Part B application. SWMU Group 008 accumulation areas are often associated with locations where hazardous waste is generated, but are also designed to store hazardous materials and accumulate potentially hazardous waste for offsite disposal. In general, current management of these units is efficient and well documented by inspection and sampling activities. Nevertheless, as suggested in Table E-1, there are specific concerns relative to this SWMU group:

- SWMU 008l (Facility 474B) is the current "Hazardous Waste Staging Area", while SWMU 008n (Facility 474A) is proposed for a similar function sometime in the future. Both have the potential for contaminating the adjacent water storage tanks. As stated in the technical assessment, potential contamination is most likely negligible; however, the present design allows a possible exposure pathway to site employees.

  Staff suggest two options to preclude contamination of water contained in storage tanks:

  - install a sealed vent system over the open vent of the water storage tanks, or

  - control 100% of the effluent from the 474 complex with an activated charcoal filtering system.

- This assessment finds an unidentified SWMU located at Facility 474E, a building which contains Satellite Accumulation Area (SAA) #15. Proposed No. 008-o, Satellite Accumulation and Hazardous Materials Storage Areas (Blg. 474-E) should be a solid waste management unit. Quantities of hazardous materials and some hazardous waste are managed at this location. An exposure pathway also exists for Facility 474E, as the individual isolation bays are equipped with unfiltered ventilation systems that exhaust to the atmosphere.

- SWMU 008k is no longer designated as a SAA. If it is no longer a SWMU, weekly inspections and other SAA requirements are not mandated. Given that a mandatory sampling program is not implemented for used oil (WP 02-502: Used Oil Management), and a spill is possible at this location, staff suggest redesignation of the unit as a SWMU.

SWMU Group 009 - Underground Satellite Accumulation Areas

This assessment surveyed all 10 underground Satellite Accumulation Areas (SAA's) and found the areas to be clean and well-managed. Waste is segregated properly in separate containers, all areas utilize approved DOT containers, and appropriate signs and barricades are posted. Nonradioactive waste generated from operational and experimental activities appear to be routinely transferred to accumulation areas. In all cases, exposure potential is extremely low to nonexistent and, as indicated in Table E-1, there are no outstanding concerns.

SWMU Group 010 - Mine Shaft Sumps

All the units in this SWMU group display low release and exposure potential, and no concerns are indicated in Table E-1. Inspections of the Salt Handling Shaft, Waste Handling Shaft, Exhaust Shaft, and the Air Intake shaft sumps revealed clean, well-managed areas. The most pervasive material flooring all the sumps is rock material (salt). Waste reportedly accumulated during the construction phase (cement grout, chemical grout, grease, etc.) is not apparent.

SWMU Group 011 - Sewage Treatment Plant

There are no outstanding concerns indicated in Table E-1. SWMU Group 011 is the waste water treatment system for the WIPP facility. The system receives primarily domestic sewage; however, as indicated in the preliminary review, other nonhazardous substances such as brine are also introduced. This assessment indicates the waste water treatment system at the WIPP sewage lagoon is safeguarded against the introduction of RCRA hazardous wastes or hazardous constituents by procedures and through site training. The nonhazardous quality of the water is verified by periodic sampling and analysis for hazardous constituents. A discharge plan for the facility and DOE orders guide sampling activities at the Sewage Lagoon.

There are several older and currently inactive septic systems at the WIPP site that are now covered by asphalt paving or buildings. As stated in the RCRA Part B application, HWMR-7, Pt. II, 261.4(a)(i) exempts sanitary waste (domestic sewage/chemically uncontaminated) from classification as solid waste.

SWMU Group 012 - Nonhazardous Solid Waste Bins

There are no concerns directed at this SWMU group. Nonhazardous solid waste generated by WIPP site operations is collected by janitorial service personnel, then deposited in waste bins provided by Waste Management of New Mexico, Inc. This assessment verifies that RCRA management and inspection procedures implemented at operational, experimental, and laboratory facilities deter hazardous waste from being placed in waste bins. In addition, general employee training (GET) and site generated waste worker certification reinforce hazardous waste awareness, and encourage use of the satellite accumulation area system onsite.

SWMU Group 013 - TRU Mixed Waste Management Units

This unit is not investigated for the RFA. Although the unit description in the RCRA Part B Permit application identifies adequate safeguards from a solid waste management perspective, detailed assessment of this unit by the team reviewing the permit application may have concerns or actions involving the management of hazardous materials and potentially hazardous waste. The RCRA Part B permit application review is not final at the time of publication of this report.

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1.0 Introduction

The Waste Isolation Pilot Plant (WIPP) is a Department of Energy (DOE) project located in southeastern New Mexico (Figure 1.1). The regulatory framework for the plant includes submission of a RCRA Part B application to the State of New Mexico (DOE/WIPP 91-005). Contained in the application are DOE plans for management of hazardous materials and hazardous waste during plant operations as well as other relevant background information. The subject of this report is the background information provided on WIPP Solid Waste Management Units (SWMU), specifically those units that have been utilized during the pre-operational phase of the WIPP project. Pertinent aspects include operational information relevant to the nature of materials and/or wastes that have been, or continue to be managed at each SWMU, as well as an accounting of past environmental releases and current closure status.

This report is presented in response to a request by the U. S. Environmental Protection Agency (EPA) for technical assistance in the development of a RCRA Facility Assessment (RFA). The report has been prepared by NMED staff stationed at the WIPP site supported by a grant under an "Agreement-in-Principle" between DOE and the New Mexico Environment Department. Field investigations and document review activities supporting this assessment are consistent with a fundamental objective of the AIP program: "to assure the public health and safety, and the environment are being adequately protected by DOE programs in the State of New Mexico"". The ensuing report contains the required components of a RCRA Facility Assessment (RFA) as it relates to an EPA HSWA permit:

- Preliminary review (PR), including research of references cited and additional background documentation;
- visual site inspections (VSI); and
- sampling visits (SV), conducted on a case-by-case basis.

1.1 Purpose and Scope

The RFA procedure is described in EPA guidance documents as a preliminary step in the RCRA corrective action program. As promulgated in the 1984 Hazardous and Solid Waste Amendments (HSWA), the corrective action program focuses on clean-up of unregulated releases from SWMUs to the atmosphere, groundwater, surface water, and soil, including migration of subsurface gas. Solid waste management units are defined as:

> Any discernable waste management unit at a RCRA facility from which hazardous constituents might migrate, irrespective of whether the unit was intended for the management of solid and/or hazardous waste (EPA, 1986e)

In line with the RFA procedure, this report will evaluate conclusions presented in DOE/WIPP 91-005 that there have been, and will not be, any releases from SWMUs of RCRA hazardous wastes or hazardous constituents (HWMR-7, Pt.II, sec. 261.3/HWMR-7, Pt.II, Appendix VIII). The exercise is a preliminary step to ensure that potential releases do not threaten human health or the environment (EPA, 1986e; EPA 1991). The objective of this report is to provide the U.S EPA adequate information to screen SWMUs from further study, or to support decisions for further investigative actions, or corrective actions and/or interim measures, if applicable (EPA, 1986e).

1.2 Technical Approach

This study began with assessing the information provided in the RCRA Part B application for each SWMU, in particular the references that were cited to support DOE/WIPP descriptions and conclusions (Table 1.1). This information was then compared to the technical considerations recommended for RCRA facility assessments

Figure 1.1: WIPP Location Map

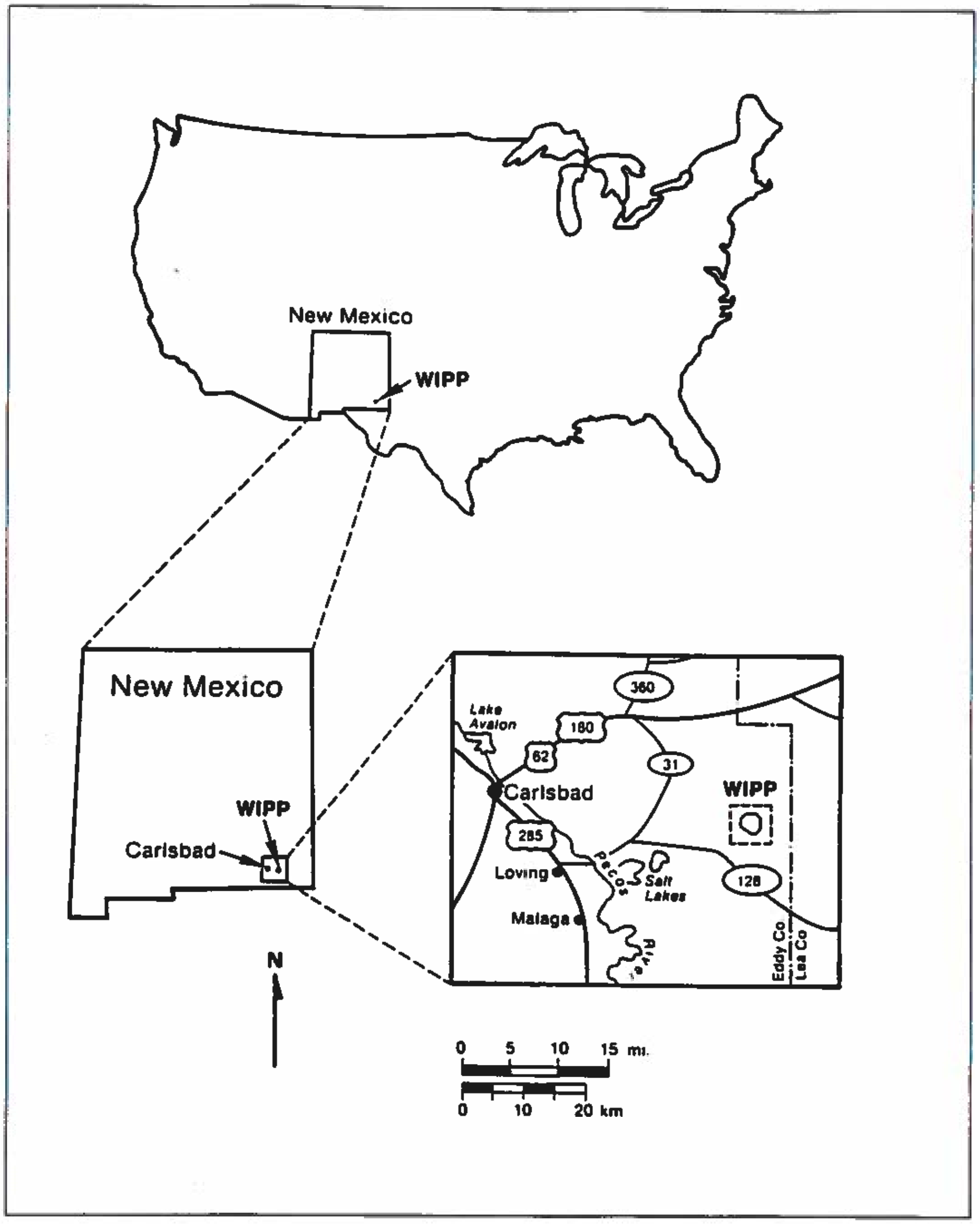


Table 1.1
List of SWMU Groups and Selected Information
Presented in WIPP RCRA Part B

Solid Waste Management Unit		Materials Managed	Documentation/Information Sources	Operational Status
SWMU 001	Mudpits	Solid Waste	Process Knowledge	Decommissioned
SWMU 002	Salt and Top Soil Storage Areas	Solid Waste	Process Knowledge	Active and Inactive
SWMU 003	Landfills	Solid Waste	Procedures/ Environmental Monitoring Reports	Active and Inactive
SWMU 004	Storage Yards	Solid Waste Hazardous Waste Oils	Process Knowledge/ Procedures/ Sampling Data	Active
SWMU 005	Concrete Batch Plants	Solid Waste	Process Knowledge	Decommissioned
SWMU 006	Holding Ponds	Solid Waste	Process Knowledge	Decommissioned
SWMU 007	Evaporation Ponds	Solid Waste	Process Knowledge	Active and Decommissioned
SWMU 008	Surface Satellite Accumulation Area	Hazardous Waste Solid Waste	Process Knowledge/ Procedures	Active
SWMU 009	Underground Satellite Accumulation Area	Hazardous Materials Hazardous Waste Solid Waste	Process Knowledge/ Procedures	Active
SWMU 010	Shaft Sump 3	Solid Waste Hazardous Waste	Process Knowledge (No HW in description)	Active
SWMU 011	Sewage Treatment Facilities	Sanitary Waste Solid Waste	Process Knowledge/ Procedures/ Sampling Data (HW In description)	Active
SWMU 012	Nonhazardous Solid Waste Collection Bins	Nonhazardous Waste	Process Knowledge	Active
SWMU 013	TRU Mixed Waste Management Units	TRU Mixed Waste	Permit Application	Future

provided in guidance by the Environmental Protection Agency (EPA,1986e, EPA 1991) (Table 1.2). Preliminary (document) review (PR), visual site inspections (VSI), and sampling visit (SV) strategies were planned to clarify information or fill data gaps based on this comparison. The WIPP RCRA Part B (DOE/WIPP 91-005) application identifies 13 groups of active, inactive, and future solid waste management units (SWMUs)[1]. Table 1.1 lists the 13 SWMU groups and a condensed tabulation of selected existing information.

The preliminary review of SWMU descriptions in the application revealed that information on "unit characteristics" to be generally adequate. However, the comparison with the EPA technical guidelines (Table 1.2) resulted in the following general observations:

- Many waste descriptions and assessments of release potential appear to rely on process knowledge and procedures, and the grouping of SWMUs by use (e.g., mudpits) does not provide adequate characterization for individual units;
- visual site inspections are not adequately described and documented; and
- only two SWMUs (storage yards-004 and Sewage Treatment Facility-011) have analytical documentation, and that data is not presented.

Table 1.2 summarizes the additional four major considerations that are the subject for improvement in this study: waste characteristics, migration pathways, evidence of past releases, and exposure potential. EPA guidelines are used to develop the site specific technical approaches listed under each category in Table 1.2. Criteria to be used during the PR, VSI, and SV to effectively screen SWMUs from further investigation include:

- Evidence of Past Releases. Does independent documentation and visual evidence acquired during this review agree with DOE/WIPP 91-005 SWMU summaries?
- Waste Characteristics. Does independent sampling, documentation, and visual evidence support descriptions in DOE/WIPP 91-005?
- Migration Pathways and Exposure Potential. Is there a potential for migration of hazardous waste or hazardous constituents to cause exposure to the public?

Table 1.2
Technical Approach

Unit Characteristics	Waste Characteristics	Migration Pathways	Evidence of Past Releases	Exposure Potential
▪Type of unit ▪Design features ▪Operations ▪Period of operation ▪Age of unit ▪Location of unit ▪Physical description ▪Method used to close unit	▪Records documenting waste managed (eg., solid vs hazardous) ▪Verification of process knowledge, permit records, and operational records etc. ▪Toxicological characteristics ▪Physical, chemical, and dispersive properties	▪Geologic setting ▪Hydrogeologic setting ▪Atmospheric conditions ▪Topographic considerations	▪Operational records ▪Closure records ▪Air photo review ▪Visual inspection eg., discolored soil, stressed vegetation ▪Sampling data	▪Proximity to population ▪Proximity to drinking water wells ▪Migration potential

[1]The Twelve (13) SWMU groups include 80 individual units, which are identified by numerical code 001-013. The individual units within each group are listed as 001a, 001b etc.

2.0 Facility Description

The Waste Isolation Pilot Plant is composed of surface and underground facilities designed to accept and dispose of transuranic (TRU) mixed waste from defense-related programs. Located in southeastern New Mexico, the *WIPP site* encompasses a 16 section area (15-34) in the southwest corner of Township 22 South, Range 31 East. Ownership of the area was transferred to the US Department of Energy (DOE) by Congressional Order in 1992, and is currently managed jointly in cooperation with the US Department of Interior, Bureau of Land Management (BLM). Nevertheless, the DOE is solely responsible for the WIPP facility's design, construction, and operation, and the management of activities permitted within the site boundary (Figure 2.1). A DOE/WIPP Land Management Plan is being prepared which will address operational management of the site, including responsibilities previously the domain of the BLM.

2.1 Facilities and Infrastructure

Full-scale site characterization studies between 1976 and 1983 marked the construction of the earliest facilities related to the WIPP site. These studies included the emplacement of a multitude exploratory drillholes, some of which have been plugged while others were completed for long-term observation. Shaft excavations and construction of the WIPP surface facilities and infrastructure began in the early 1980's and the bulk of these activities were completed by 1988.

The principle surface facility at the WIPP site is the Waste Handling Building (Figure 2.2). Nevertheless, a large number of auxiliary structural and infrastructural elements are important to facility operations:

- Exhaust, Air Intake, Salt Handling, and Waste Shafts
- Support, Safety Services, and Engineering Buildings
- Warehouse and Core Storage Buildings
- Water Pump House and Water/Fire Flow Storage Tanks
- Sewage Treatment Plant
- Sewage and Water Lines
- Hazardous and Hazardous Materials Storage Buildings
- Vehicle Fueling Stations
- Machine and Maintenance Shops
- Various Power and Utility Buildings and Transmission Lines
- Various Portable Office and Support Services Trailers

These facilities, all located within a fenced area with restricted access, comprise Zone 1 (Figure 2.1).

The underground disposal facility is located at a depth of 2150 ft feet in bedded salt, and is connected by four shafts to surface hoists and facilities, including the Waste Handling Building (Figure 2.3). The underground facility consists of a network of horizontal NS and EW passageways known as drifts, with smaller rooms excavated in the drift walls (ribs) for various purposes. The southern extent of the repository is reserved for disposal of the TRU mixed waste inventory. One panel of 7 rooms (Rooms 1-7/Panel 1) is currently excavated and will be used to support experiments with radioactive waste as part of a 5-10 year test phase. The northern portion of the mine acts as an underground research facility for nonradioactive insitu experiments. These experiments are related to interactions and containment of the waste in the bedded salt. Several rooms in the central and northern sections of the repository also include machine shops, office space, and construction and maintenance facilities.

2.2 Solid Waste Management Units

The focus of this report is on the Solid Waste Management Unit (SWMU) groups identified in the WIPP RCRA Part B Permit that are related to the early exploratory drilling, excavation of shafts, construction of the surface facilities, and ongoing routine operations. Figures 2.2, 2.3 and 2.4 show SWMUs identified in the WIPP RCRA Part B Application

Figure 2.1: WIPP Land Withdrawal Area

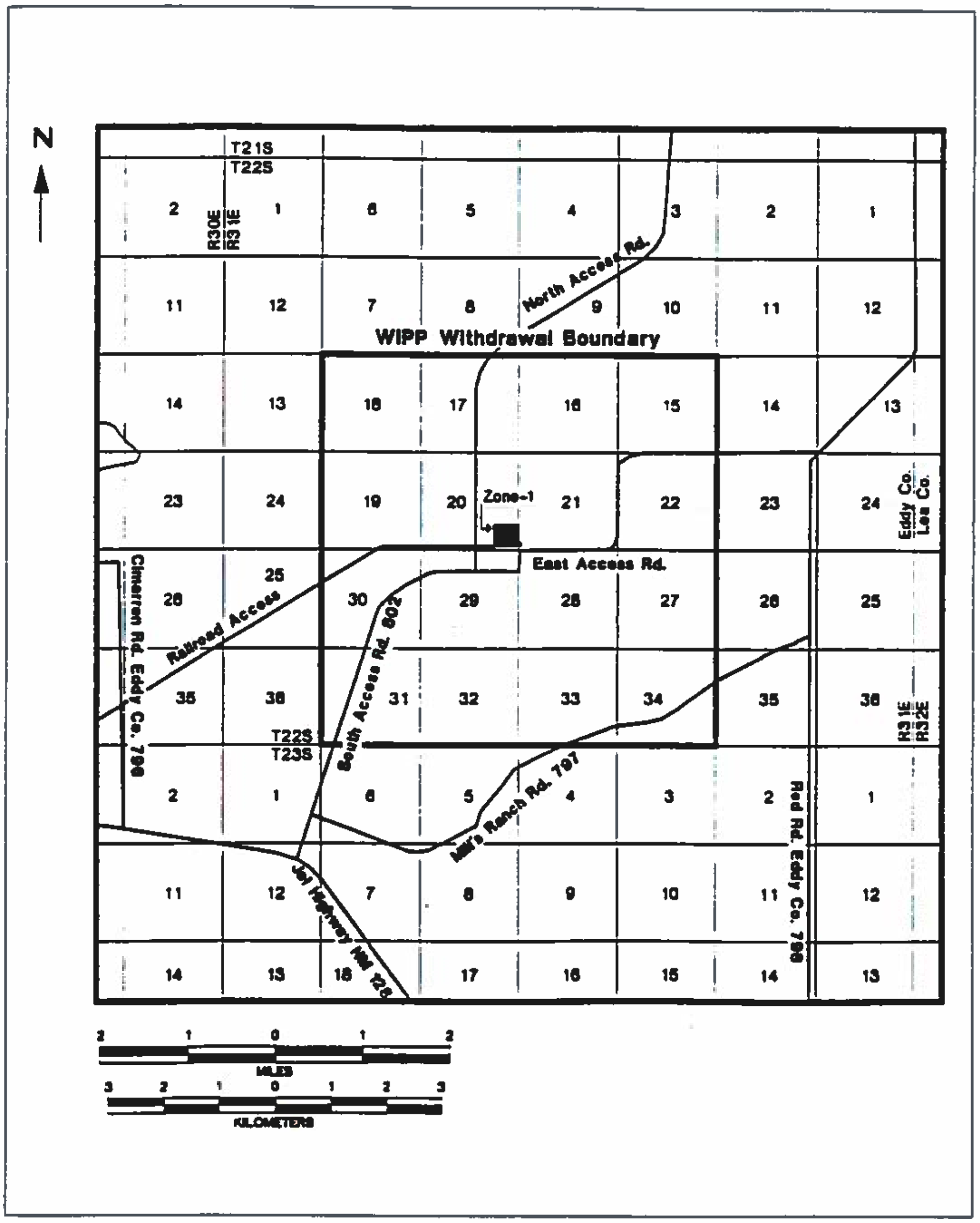


Figure 2.2: WIPP Surface Facilities and Zone 1 SWMUs

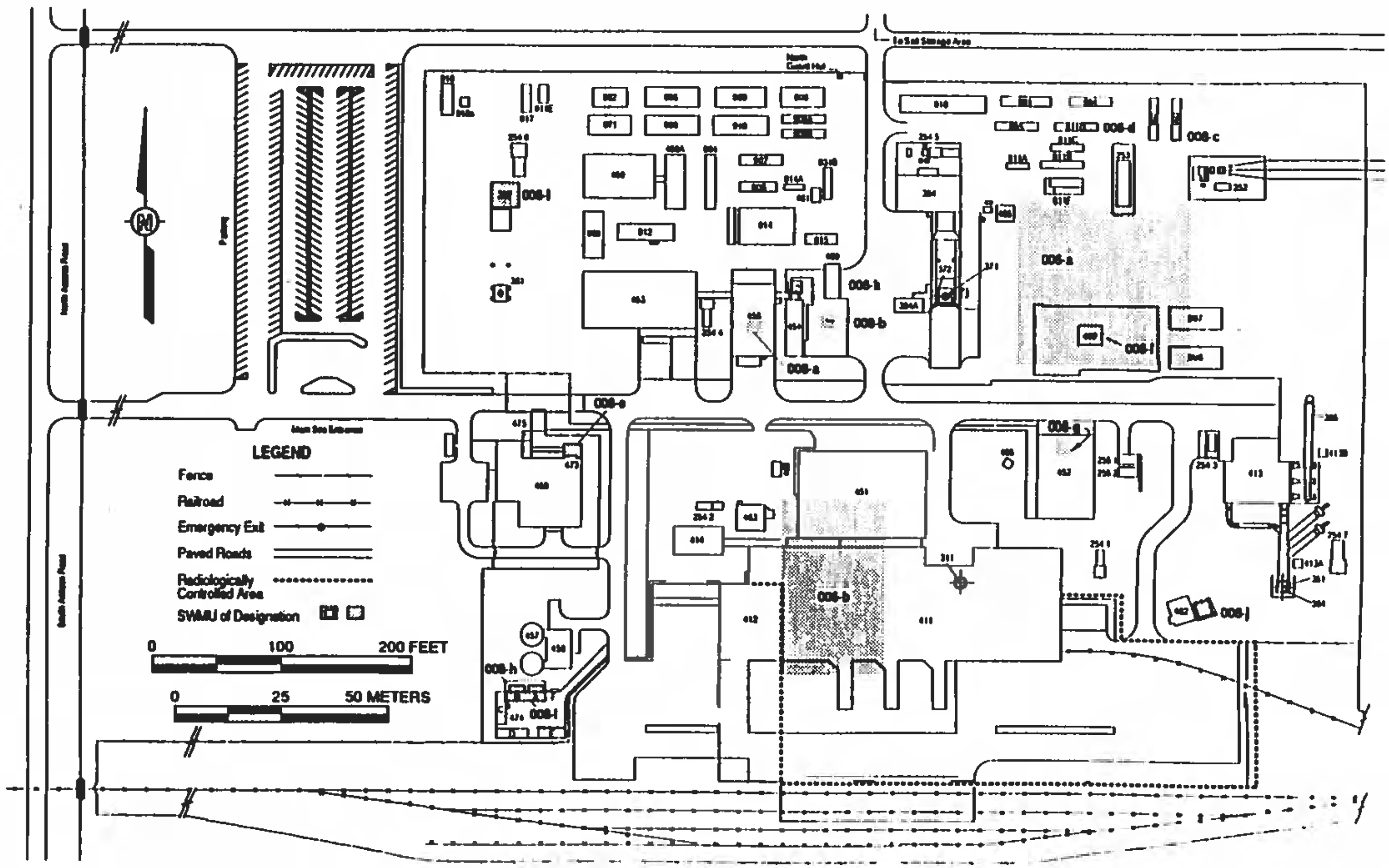


Figure 2.2: WIPP Surface Facilities (Continued)

FACILITIES, USAGE AND STRUCTURE NUMBERS (FY 1990)

SPS UTILITY SUBSTATION	FAC 252
13.8 KV SWITCHGEAR 25P-SWG15/1	FAC 253
AREA SUBSTATION NO.1 25P-SW15.1	FAC 254.1
AREA SUBSTATION NO.2 25P-SW15.2	FAC 254.2
AREA SUBSTATION NO.3 25P-SW15.3	FAC 254.3
AREA SUBSTATION NO.4 25P-SW15.4	FAC 254.4
AREA SUBSTATION NO.5 25P-SW15.5	FAC 254.5
AREA SUBSTATION NO.6 25P-SW15.6	FAC 254.6
AREA SUBSTATION NO.7 25P-SW15.7	FAC 254.7
ON-SITE GENERATOR #1 25-PE 503	FAC 255.1
ON-SITE GENERATOR #2 25-PE 504	FAC 255.2
WASTE SHAFT	FAC 311
EXHAUST SHAFT	FAC 351
AIR INTAKE SHAFT	FAC 361
AIR INTAKE SHAFT/WINCH HOUSE	FAC 362
EFFLUENT MONITORING INSTRUMENT SHED - "A"	FAC 364
EFFLUENT MONITORING INSTRUMENT SHED - "B"	FAC 365
SALT HANDLING SHAFT	FAC 371
SALT HANDLING SHAFT HEADFRAME	FAC 372
SALT HANDLING SHAFT HOISTHOUSE	FAC 384
UNDERGROUND SERVICES OFFICE	FAC 384A
WASTE HANDLING BUILDING	BLD 411
TRUPACT MAINTENANCE BUILDING	BLD 412
EXHAUST SHAFT FILTER BUILDING	BLD 413
MONITORING STATION A	BLD 413A
MONITORING STATION B	BLD 413B
WATER CHILLER FACILITY	FAC 414
SUPPORT BUILDING - OFFICES, ETC.	BLD 451
SAFETY & EMERGENCY SERVICES FACILITIES	BLD 452
WAREHOUSE/SHOPS BUILDING	BLD 453
VEHICLE SERVICE BUILDING	BLD 454
AUXILIARY WAREHOUSE BUILDING - MAINTENANCE	BLD 455
WATER PUMPHOUSE	BLD 456
WATER TANKS (2)	FAC 457
GUARD AND SECURITY BUILDING	BLD 458
CORE STORAGE BUILDING	BLD 459
DBL. WIDE TRAILER - OFFICE	BLD 459A
MAINTENANCE STORAGE	BLD 461
COMPRESSOR BUILDING	BLD 463

AUXILIARY AIR INTAKE	FAC 465
TELEPHONE HUT	BLD 468
ARMORY BUILDING - ARMORY AND LOCK SHOP	BLD 473
HAZARDOUS WASTE STORAGE BUILDING	BLD 474
GATEHOUSE - MAIN SITE ENTRANCE/EXIT	BLD 475
VEHICLE FUEL STATION	FAC 480
EXHAUST SHAFT HOIST EQUIPMENT WAREHOUSE	BLD 482
SULLAIR COMPRESSOR BUILDING	BLD 485
ADMINISTRATION BUILDING	BLD 486
DBL. WIDE TRAILER	TRL 906
SINGLE WIDE TRAILER - OFFICE	TRL 907
SINGLE WIDE TRAILER - OFFICE	TRL 908
SINGLE WIDE TRAILER - CABLE FABRICATION	TRL 908A
SINGLE WIDE TRAILER - LAB AND CABLE FABRICATION	TRL 908B
DBL. WIDE TRAILER - OFFICE	TRL 909
DBL. WIDE TRAILER - OFFICE AND LAB	TRL 910
SINGLE WIDE TRAILER - VACANT - TO BE EXCESSED	TRL 911A
SINGLE WIDE TRAILER - OFFICE	TRL 911B
SINGLE WIDE TRAILER - OFFICE	TRL 911C
SINGLE WIDE TRAILER - AIS STAGING	TRL 911E1
SINGLE WIDE TRAILER - VACANT - TO BE EXCESSED	TRL 911E2
DBL. WIDE TRAILER - COMPUTER CENTER	TRL 911F
SINGLE WIDE TRAILER - CABLE FABRICATION	TRL 911G
DBL. WIDE TRAILER - OFFICE AND CLASSROOMS	TRL 912
TRAILER COMPLEX (7) - OFFICE	TRL 914
SINGLE WIDE TRAILER - OFFICE	TRL 914A
SINGLE WIDE TRAILER - OFFICE	TRL 915
TRAILER COMPLEX (4) - OFFICE	TRL 916
SINGLE WIDE TRAILER - AIS DATA AQUISITION	TRL 917
SINGLE WIDE TRAILER - CHANGE ROOM	TRL 931B
DBL. WIDE TRAILER - OFFICE	TRL 971
DBL. WIDE TRAILER - OFFICE	TRL 982
SINGLE WIDE TRAILER - OFFICE	TRL 984
DBL. WIDE TRAILER - OFFICE	TRL 985
DBL. WIDE TRAILER - OFFICE	TRL 986
DBL. WIDE TRAILER - OFFICE	TRL 988
SINGLE WIDE TRAILER - OFFICE	TRL 991
SINGLE WIDE TRAILER - LAB	TRL 992
SINGLE WIDE TRAILER - LAB	TPL 993
MOBILE STORAGE BUILDINGS	242002 THRU 242017

FAC200.0-1 CURRENT AS OF MAY, 1990

This Illustration for Information Purposes only.

DOE/WIPP 91-005. The TRU-Mixed Waste Management Unit (SWMU-13) group is not emphasized because the focus of this review is on currently operating units, and the waste handling building and Panel 1 underground areas have not yet received hazardous waste. More importantly, the SWMU 13 group is being addressed in detail in the overall review of the RCRA Part B application, which has not been finalized at the time of this report.

The definition of SWMUs in DOE/WIPP 91-005 is consistent with 40 CFR Part 264 and that stated in the introduction. EPA (1991) states in part "...Such units (SMWUs) include any area at or around a facility at which solid wastes have been routinely and systematically released". However, the DOE/WIPP 91-005 definition further refines the definition as follows:

- All existing or past units intended to store, treat, or dispose of waste materials, regardless of whether they have released hazardous waste or hazardous constituents, including tanks, sumps, septic systems, drain lines, waste accumulation/container storage areas, landfills, surface disposal facilities, surface impoundments, and waste water treatment facilities.

- "Any areas contaminated by releases from any of the above units" (listed in Table 1.1),

- "Product storage areas, only if there is documented evidence of routine (periodic and/or systematic releases...",

- "Existing structures that store waste", and

- "Soil under and around existing or former structures that were contaminated or have had documented releases"

The definition used for a SWMU can influence the interpretation of a release, in that a release determination is made relative to the SWMU boundary (EPA, 1991). If the SWMU includes areas that have been contaminated, then a determination can be made that no release has occurred. The reference to areas and soils contaminated by releases in the refined DOE/WIPP 91-005 definition would support such an interpretation. To ensure that this definition does not bias independent determinations, a release or release potential assessed in this report will not be necessarily based on the DOE/WIPP-defined SWMU boundary. Instead, the emphasis of this assessment will be on migration pathway and exposure potential.

Figure 2.3: WIPP Underground Facilities and SWMUs

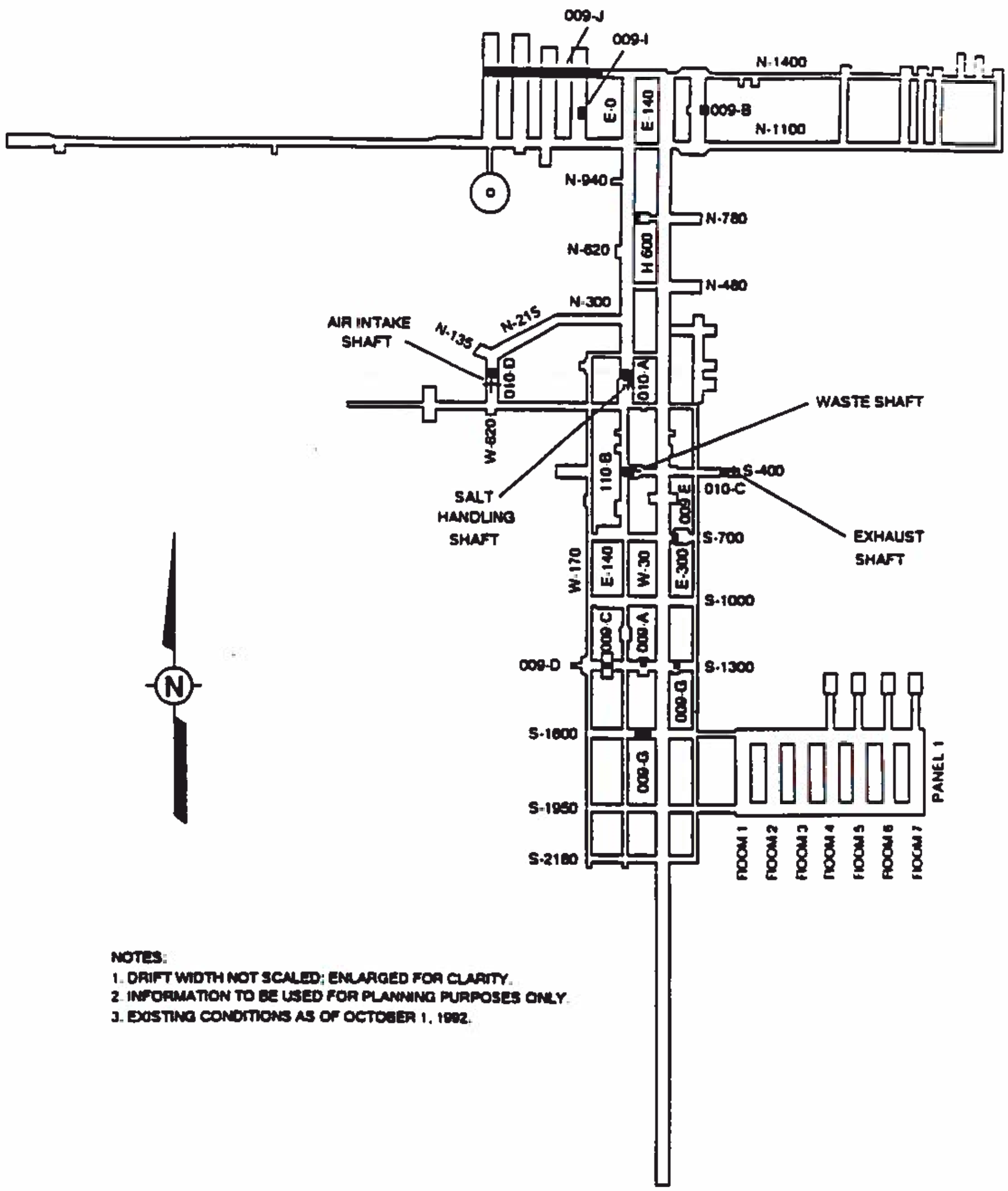
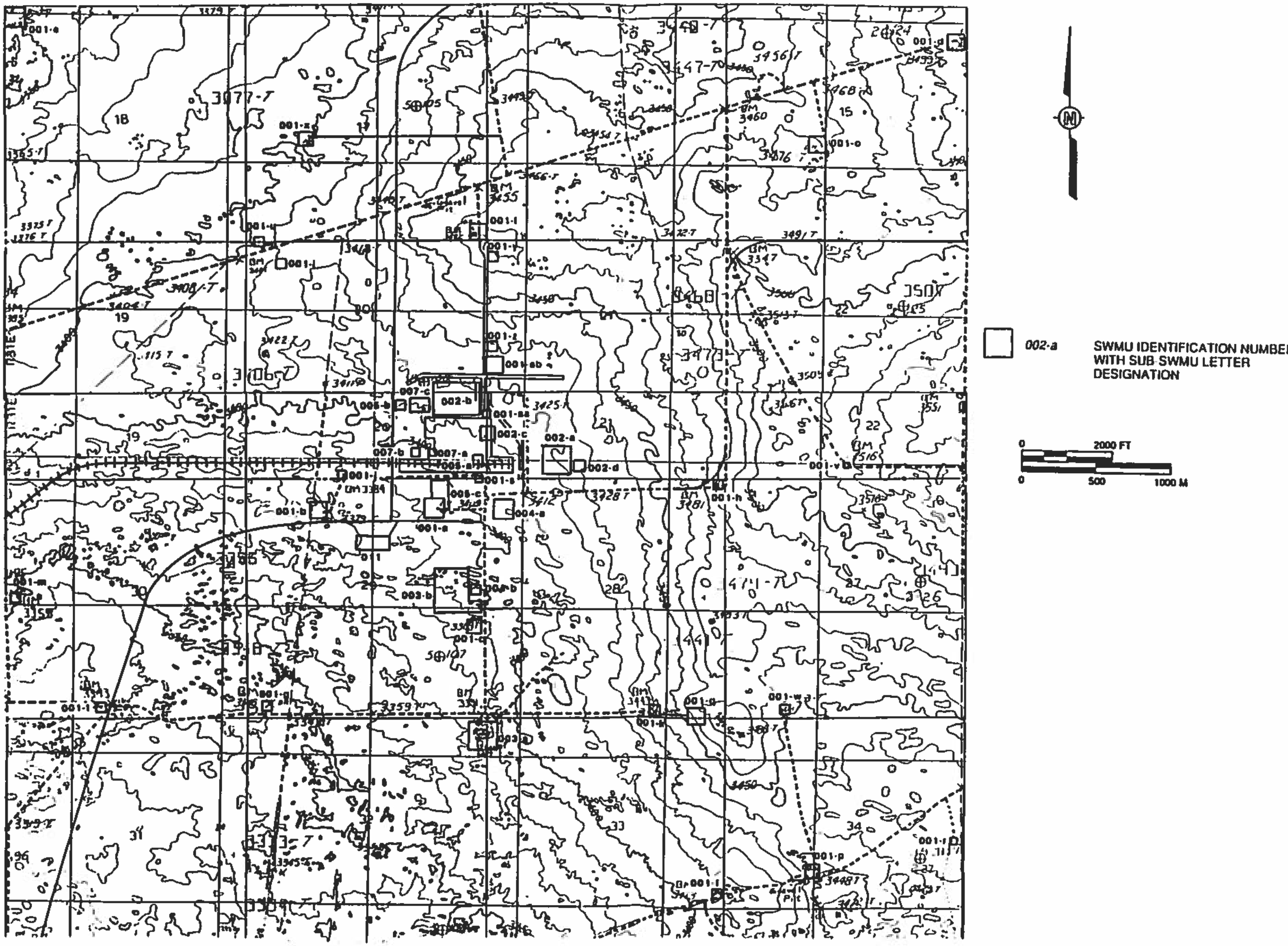


Figure 2.4: WIPP SWMUs within Land Withdrawal Area



3.0 Environmental Setting

The WIPP facility is located in the high desert of southeastern New Mexico. Physiographically, the area occurs within the Pecos River Valley section of the Great Plains Province. The area is also described in the literature as the Los Medanos desert (the dunes). The climate is semi-arid with an average annual precipitation of 11 to 13 inches. The majority of precipitation occurs during frequent thunderstorms during the period June through September, although light rain and snowfall occur during fall and winter. Elevations at the WIPP site range from almost 3550 feet in the east to 3300 feet to the west and southwest. At these elevations in the region, evaporation can greatly exceed precipitation; however, evapotransporation rates vary from positive or negative depending on local geologic conditions. The following discussion summarizes additional environmental characteristics pertinent to the evaluation of site-specific migration pathways and exposure potentials for individual Solid Waste Management Units (SWMUs).

3.1 Topographic Setting

The land surface in the WIPP site area gently slopes to the west and southwest toward the Pecos River. The high desert plateau is locally hummocky, resulting from windblown sands occurring as sand ridges, dune complexes, and circular topographic dune depressions known as sand "blowouts". Topographic relief is often less than 10 to 20 feet. The sand dune features are stabilized in varying degree by local vegetation, which includes mesquite, scrub oak, dune yucca and grasses typical of the northern Chihuahuan desert. A set of unstabilized sand dunes are found just south of the southern WIPP site boundary.

The WIPP site is situated on a stable geomorphic landform interposed between two adjacent and actively developing karst topographic features: a shallow, southwest opening basin known as Nash Draw about 8.0 kilometers (5 miles) to the west, and the southeast-trending San Simon Swale approximately 24 kilometers (15 miles) to the east. Although the stable block including WIPP is not believed to be affected by dissolution of deeper geologic units, shallow solution features are found in the WIPP site area locally. Shallow dissolution includes the local removal of an extensive pedogenic "calcrete" covering most of the area; a circular depression at WIPP-33 located about 300 meters (985 feet) west of the site boundary is one such feature. As implied later in this section, these features (ie. dolines) may locally contribute to more effective downward percolation of rainwater, and may be a "local geologic condition" influencing recharge of shallow groundwater in the area.

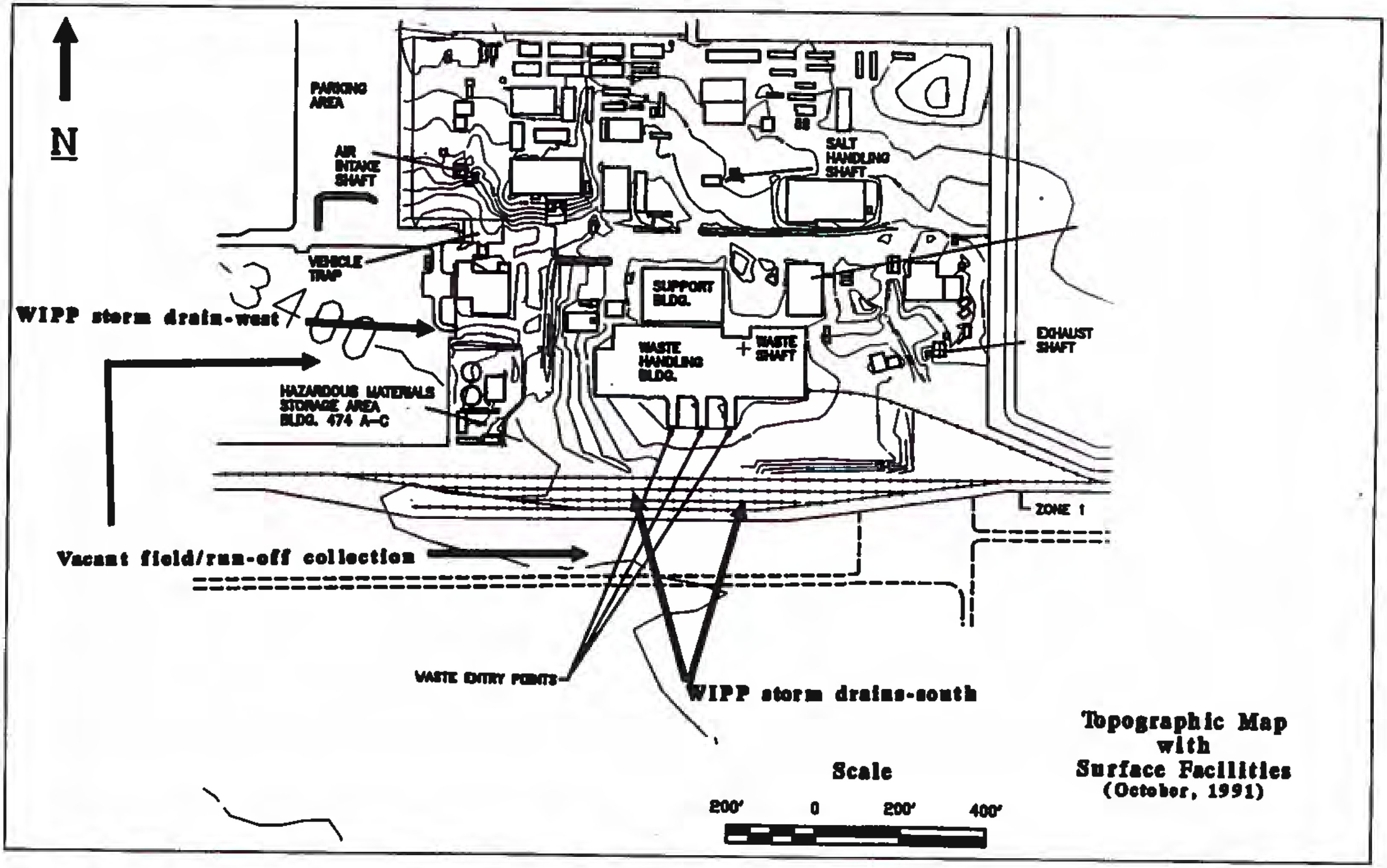
3.2 Surface Water Runoff

There are no well-defined throughgoing drainages on the WIPP site. Rainwater either percolates into the permeable sands directly or occurs as localized sheet wash during occasional heavy rainfall. Runoff may be channeled short distances toward shallow depressions or discontinuous washes which are also internally-drained. Storm water runoff within Zone 1 on the WIPP facility is diverted from surface buildings by a system of concrete and asphalt berms and ditches. This runoff is diverted outside Zone 1 through two storm water outfall locations: one on the western perimeter and one on the southern perimeter (Figure 3.1). These storm water outfalls empty into shallow swales which also received natural and artificial run-off during early shaft excavation and construction activities at the site.

3.3 Geologic and Hydrogeologic Setting

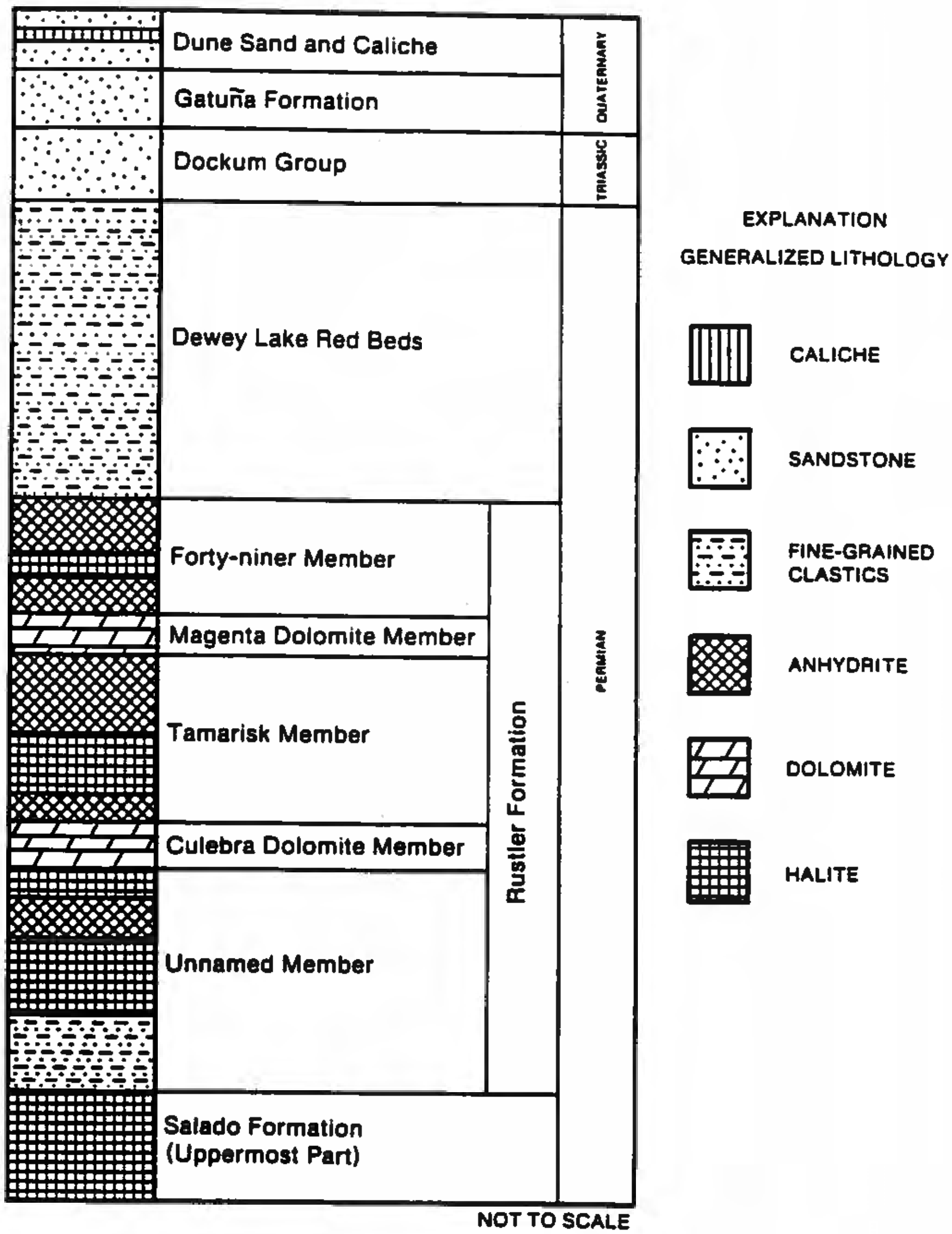
The northern Delaware Basin is part of a broad and deep structural depression filled with 7,300 meters (24,000 feet) of Phanerozoic sedimentary rocks. The upper 600-900 meters (2,000-3,000 feet) consists of thick sections of Upper Paleozoic Carbonates and Evaporites, a deltaic sequence of Permian age sandstone and siltstone, and relatively thin terrestrial sandstones, siltstones, mudrock and conglomerate of Mesozoic and Cenozoic age. A buried pedogenic calcrete (caliche) covers the bedrock surface over much of the area, which is in turn capped by Holocene age and recent windblown sand. The schematic geologic column shown in Figure 3.2 shows the relative stratigraphic position of the formations to be discussed in this section. A more specific description of selected geologic units of consequence to the assessment of release pathways follows.

Figure 3.1: WIPP Facility Stormwater Outfall Locations



Note: One-foot contour intervals outside of fenced boundary are approximate.

Figure 3.2: Generalized Stratigraphy and Lithology at the WIPP (after Davies, 1989)



Holocene Surficial Deposits. Eolian sands of Holocene age are fine to medium-grained and are ubiquitous over the WIPP site. The dune sands are typically 3-4 meters (10-14 feet) thick where encountered in boreholes, but can be thinner within sand dune blowouts, or thicker where concentrated or stabilized as dunes or blowout rims (USGS, 1978). Soil development is poor and permeability is high in this unit overall. A significant system of dunes is located east of James Ranch on the southern boundary of the site, where some investigators have speculated the area may influence localized recharge of shallow perched aquifers. TME 3059 (1980) indicates that no transient zones of saturation were detected in the overlying sands in shallow foundation investigation borings for the facility. Nevertheless, perched conditions may exist in areas where the underlying Mescalero Caliche forms a locally continuous impermeable barrier to downward percolation.

Mescalero Caliche. The Mescalero Caliche underlies the surficial dune sands. The pedogenic calcrete displays varied relief over older bedrocks deposits and engulfs and disprupts the underlying Gatuna or Triassic sandstone formations. Sands and gravels are characteristically well-cemented with a chalky to finely crystalline matrix of calcium carbonate. Although the caliche is invoked as a continuous impermeable barrier over much of the site, the caliche cap may be locally thin or absent (Mercer, 1983). Outcrops within caliche pits also show evidence of extensive fracturing and dissolution porosity.

Pleistocene Gatuna Formation. The Gatuna Formation occurs as a discontinuous deposit of friable poorly sorted, pale reddish brown silty sandstone, with local mudstone and gravelly beds. The rock generally occurs as the shallowest formation on the western side of the WIPP site, where the thickness and distribution of the formation is variable and erratic. Representative thicknesses on the site include: H-6 (6 meters; 21 feet), P-6 (3 meters; 10 feet), P-15 (7 meters; 25 feet), H-14/P-1 (9 meters; 30 feet), P-3 (9 meters; 30 feet), and WIPP-21 and WIPP-12 (7 meters; 23 feet). The Gatuna is also reported at P-2/H-15 (6-10 meters 20-32 feet) and DOE-1 (9 meters; 30 feet) in the southeast quadrant.

Measurements of hydraulic conductivity in the Gatuna Formation encountered in foundation boreholes for the WIPP facility range from 7.8×10^{-6} m/s to 1.0×10^{-8} m/s, although one value as high as 1.8×10^{-5} m/s is reported (Mercer, 1983; TME 3059, 1980). To pool over the Dewey Lake Formation or recharge lower phreatic zones, rainwater would have to percolate through the Gatuna Formation on the western portion of the site. No inflow is documented in the thirty foundation exploration boreholes for the facility, and there is no mention of groundwater in drillers logs compiled for a USGS Potash Resources investigations (TME 3059, 1980; USGS, 1978). Transient percolation of rainwater through the Gatuna has not been monitored at the WIPP site.

Triassic Santa Rosa Formation. Upper Triassic Santa Rosa Formation/Dockum Group rocks overlay the Dewey Lake Beds over the eastern one-half of the WIPP site. Mercer (1983) describes the formation as a sequence of well indurated, cemented, fine to coarse grain sandstone with interbeds of siltstone and mudstone. The formation ranges in thickness from over 60 meters (200 feet) at H-5 in the northeast, and about 40 meters (120 feet) at WIPP 12 and H-15, to less than 15 meters (50 feet) at H-11 and WIPP 21. With the exception of H-18, the formation is reportedly absent altogether west of ERDA-9, where Gatuna rocks lie directly over the Dewey Lake Formation (Mercer, 1983).

The WIPP site is located at the western limit of water bearing sands in the undifferentiated Dockum Group, which includes the Santa Rosa Formation. While the formation/group is a chief source of domestic water in western Lea County and eastern Eddy County, the only evidence for any water bearing zones at the WIPP site occurs on the eastern site boundary. Gamma and neutron geophysical logs indicate minor water bearing zones at P-10 and P-11, and water table conditions are known to exist in a sandstone immediately overlying the Dewey Lake Formation at H-5/P-21 (TME 3059, 1980). A hydrologic test of this thin sandstone unit at the H-5 complex indicates a small yield of less than .1 gallon/min (TME 3059, 1980).

Eight of thirty foundation boreholes for the WIPP facility encountered thin intervals of the Santa Rosa Formation. Measurements of hydraulic conductivity indicate a slightly lower range of values, as compared to the overlying Gatuna Formation: 4.5×10^{-6} m/s to 1.0×10^{-8} (TME 3059, 1980). An estimated porosity of .30 is reported for Triassic Rocks in the WIPP site area (Geohydrology Associates, 1979).

__Permian Dewey Lake Formation__. The Dewey Lake Red Beds are characterized as a deltaic sequence of alternating, thinly bedded siltstone and mudstone with lenticular interbeds of fine-to coarse-grained sandstone (Mercer, 1983; D'Appolonia 1982b). The formation dips gently to the east and thins to the west, where it is also found at relatively shallow depths in boring logs. Dewey Lake Red Beds occur shallowest (6-12 meters; 20-40 feet) at wells H-6/P-13, H-18, P-6, P-15 and H-14. This general trend also continues off the WIPP site boundary to the south. A review of available bore logs indicate moderate depths (20-30 meters; 70-100 feet) along the central axis of the site and occurrences between 40-70 meters (130-220) feet along the eastern site boundary.

Mercer (1983) contends that groundwater occurs perched or semi-perched in lenticular sands in the upper Dewey Lake. Mercer (1983) also suggests that surface recharge may occur where local geologic conditions permit, such as may be occurring in an extensive area of sand dunes near James Ranch just south of the site. Lambert (1992) presumes infiltration through this dune field may explain the meteoric isotopic composition of Dewey Lake groundwater found in nearby Ranch Well. Localized surface recharge is also by supported by observations during detailed geologic logging of the AIS shaft (Holt and Powers, 1990; DOE/WIPP 90-051). Recent meteoric rainwater is offered as one explanation for the occurrence of moisture and wet units described down to 50 meters (165 feet) below the surface in the AIS.

The Dewey Lake Red Bed formation yields water in sufficient volume and quality for domestic and stock wells along the southern WIPP boundary. On the southeastern boundary of the site, Barn Well is used for domestic purposes and Ranch well is used for livestock watering. These closest wells are completed at 30 meters (94 feet) and 65 meters (212 feet), respectively. Abundant gypsum-filled veinlets and fractures observed in dry lower portions of the formation suggest several interpretations relevant to groundwater occurrence:

1) sulfate-rich water has circulated through the formation at some time in the past (Davies, 1989);

2) water undersaturated with respect to sulfate has not dissolved the precipitate in the lower unit; however, Dewey Lake groundwater exhibits values as low as 170 mg/L exist at producing wells; therefore,

3) groundwater in the formation would seem most likely to occur above the gypsum-filled veinlet zone (Holt and Powers, 1990).

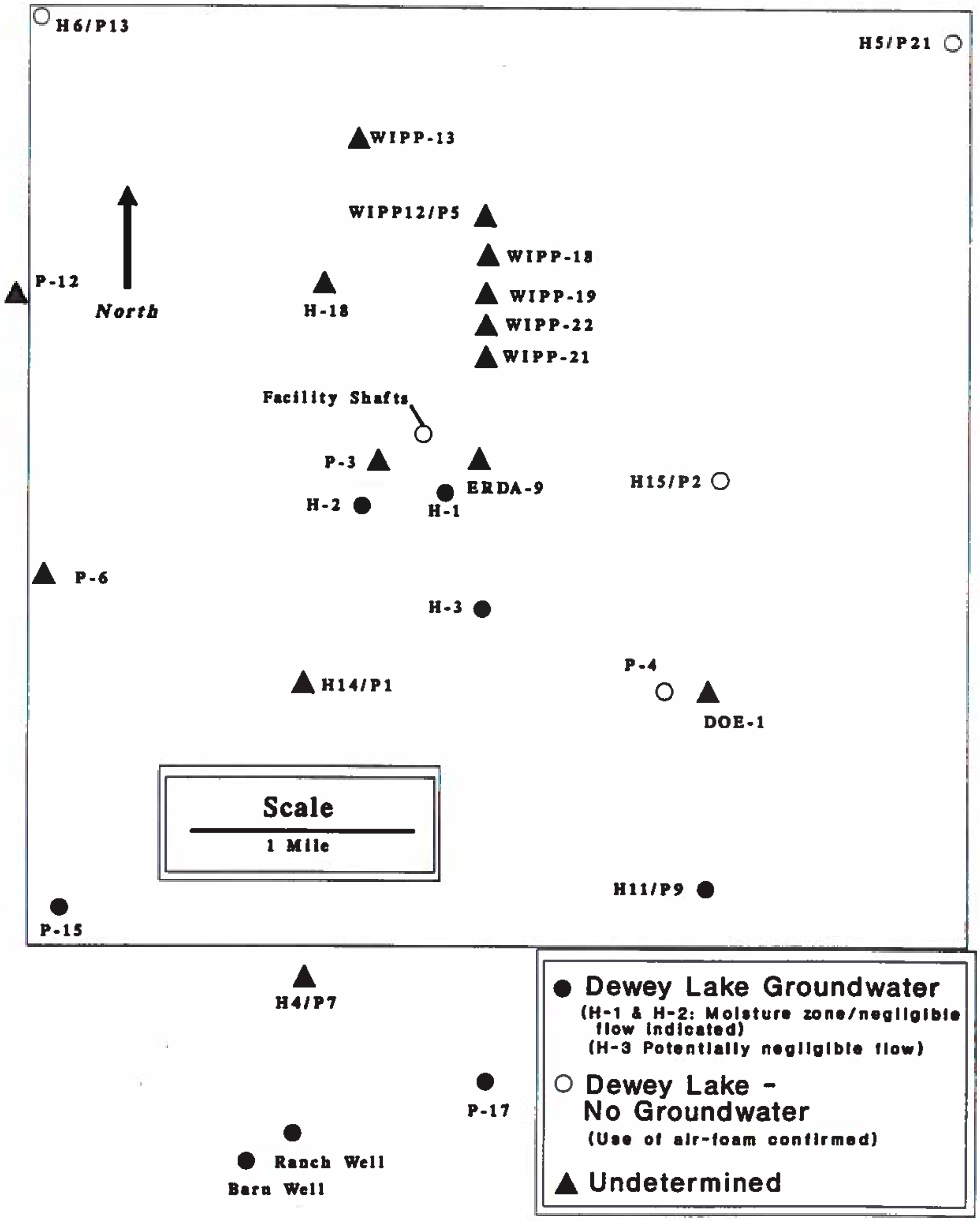
A survey of available wells logs which note shallow occurrences of groundwater suggests perched water bearing zones in the Dewey Lake also occur within the WIPP boundary (Figure 3.3). Groundwater is noted in the Dewey Lake at potash test hole P-15 at 70 meters (230 feet), at P-17 at 80 meters (265 feet), and at 67 meters (220 feet) in the log for P-9 (H-11 hydropad) (USGS, 1978). A flow rate of 25 gallons/minute was noted in the log for P-9. Generally, there is a lack of data on the distribution and hydraulic properties of Dewey Lake groundwater along the remaining southern portion of the site. The only short-term hydraulic test in the Dewey Lake was conducted at well H-14, where Beauheim (1987a) concluded that the presence or absence of a water table remains undetermined. Well H-3d is used as a water level observation well in the Dewey lake, and currently indicates standing water at around 90 meters (300 feet) below the surface. Minor zones of moisture are also documented at the H-1 and H-2 well locations at around 56 meters (185 feet); however, short-term tests to determine fluid yield indicated negligible flow (TME 3059, 1980). It is generally believed that negligible flow also exists at well H-3d; however, no hydraulic pump tests have been conducted at that location.

No references to hydraulic properties of the Dewey Lake Formation at Barn Well and Ranch Well are found in the literature. Packer-permeability tests conducted for the foundation investigation indicate that hydraulic conductivities range from 2.5×10^{-6} m/s to 1.0×10^{-8} m/s. Presumably, water bearing zones would have higher values.

For the purposes of this study, the Dewey Lake formation is taken as the shallowest migration pathway, at least in the southern portion of the site, for the following reasons:

- the data reviewed for this study indicate that localized conditions contribute to the Dewey Lake's importance, albeit limited, as a groundwater resource,

Figure 3.3: Evidence for Shallow Groundwater in the Dewey Lake Formation



Note: The use of air foam for circulation fluid at selected potash wells "P" wells permitted logging of shallow groundwater. Most boreholes drilled for the WIPP project utilized drilling fluid, which precluded detection of shallow groundwater (undetermined).

- the areal distribution and monitoring of the Dewey Lake Formation is sufficiently uncertain to preclude connection between potential, as yet untapped units, and

- transient recharge and flow characteristics of the Dewey Lake are not well documented.

Permian Rustler Formation. The Rustler Formation is stratigraphically placed between the overlying Dewey Lake Formation and underlying Salado Formation. It is the youngest salt-bearing formation in the Delaware Basin. The formation under the 16 section WIPP site is composed of five members, which in descending order include:

Forty Niner: A 14-20 meter (46-66 feet) thick aquitard; predominately anhydrite and secondary gypsum, with smaller thinly bedded units of unconsolidated claystone/mudstone and siltstone (USGS, 1978). Hydraulic conductivity (calculated from transmissivity) ranges from 3 x 10^{-9} m/s to 8 x 10^{-8} m/s (Davies, 1989; Beauheim, 1987 a,b).

Magenta At and near the boundaries of the WIPP site, the Magenta Dolomite Member occurs as a 7.0-8.5 meter (23-28 feet) thick, thinly laminated dolomitic and anhydrite. Thinly bedded siltstone and sandstones and silty dolomites are noted in some boring logs (Mercer, 1983; USGS, 1978). The unit is water bearing at some locations, with groundwater confined in the thin, silty units and along bedding planes. The unit dips gently to the east. Groundwater flow occurs to the west at a gradient of .004 m/m and is thought to discharge downward into the Culebra Dolomite through fractures in the vicinity of Nash Draw (Mercer, 1983; Brinster, 1991).

The Magenta Dolomite characteristically displays low aquifer yields. Hydraulic conductivities range from a high of 5 x 10^{-8} m/s at H-6 in the northwest corner of the site to 1 x 10^{-10} m/s at DOE-2 (Beauheim, 1987b). The only likely Magenta pathway for contaminants to migrate and result in exposure is laterally through the member and downward into the Culebra west of the site at Nash Draw. There are no known livestock or domestic wells completed in the Magenta Dolomite in the vicinity of WIPP.

Tamarisk: A 27-29 meter (87-94 feet) thick aquitard composed of anhydrite and gypsum with thin sequences of claystone, mudstone or siltstone (USGS, 1978). Beauheim (1987b) reports that claystone transmissivities at H-14 and H-16 are too low to measure; possibly one or two orders of magnitude lower than 1 x 10^{-10} m^2/s. Estimated hydraulic conductivity is 1 x 10^{-12} m/s (Brinster, 1991).

Culebra: The Culebra Dolomite Member is a confined water bearing unit of special interest to discussion of migration pathways in general. It is recognized as a persistent and productive hydrologic unit in the region, and has been the focus of performance assessment studies for the repository. The Culebra Dolomite occurs under the WIPP site as a 6.7 - 8.2 meter (22-27 feet) thick sequence of thinly bedded, vuggy microcrystalline dolomite. Abundant solution-pits and localized zones of fracturing and secondary dissolution provide several potential groundwater flow mechanisms, including single porosity/matrix only, single porosity/fractured only, and double-porosity fracture flow (Jones et al., 1992). The Culebra Member dips gently to the east, while ground water flow across the site is to the south and southeast (Crawley, 1988). Hydraulic gradients range from .001 to .004 m/m (La Venue et al., 1990).

Transmissivity data for wells within the WIPP site boundary indicate that hydraulic conductivities in the Culebra Dolomite range from about 1 x 10^{-5} m/s to 1 x 10^{-8} m/s (Beauheim, 1987b; Lappin et al., 1989). The highest hydraulic conductivities ($>$1 x 10^{-6} m/s) can be mapped as discrete areas in southeastern and northwestern portions of the site (Davies, 1989). A number of researchers suggest that downward migration through overlying strata cannot be invoked as a recharge mechanism for the Culebra (Brinster, 1991; Lambert, 1987; Davies, 1989). Unless a pathway through the Magenta (discussed above) is considered, a point source on the surface would have to leach through some 125-200 meters (410-650 feet) of overlying strata in the southwest half of the site; or through as much as 200-270 meters (650-890 feet) of rock in the northeast half of the site, where the member occurs much deeper below the land surface (Davies, 1989).

Unnamed: A 30-40 meter (100-130 feet) thick aquitard composed of interbeds of mudstone and siltstone, occasional anhydrite and halite, and a fine-grained sandstone located at the basal Rustler/Salado contact (USGS, 1978). Calculated hydraulic conductivity (calculated from transmissivity) ranges from around 6×10^{-12} m/s to 1×10^{-11} m/s (Brinster, 1991)

3.4 Land Use and Population

The WIPP site is located in a relatively isolated area of Eddy County, New Mexico. The City of Carlsbad is approximately 37 kilometers (23 miles) west and the City of Loving about 26 kilometers (16 miles) southwest of the site. Three commercial mining operations occur within 16 kilometers (10 miles) of the site, the closest being Western Ag Minerals roughly 6.0 kilometers (3.5 miles) west of the southwest corner of the WIPP site. Twenty-three permanent residents reside within 5.0 kilometers (8.0 miles) of the site. The closest residences are Mills Ranch (population 13), located about a .80 kilometers (.50 miles) from the southwestern corner of the site boundary, and Smith Ranch (population 10), situated some 5.0 kilometers (3.5 miles) west of the northwest corner of the site boundary. A indeteriminate number of maintenance workers for oil and gas wells are also a transient population in the area. Land uses within the WIPP site boundary are limited to livestock grazing and some recreational activities, although oil and gas exploration and extraction activities occur adjacent to the facility boundary.

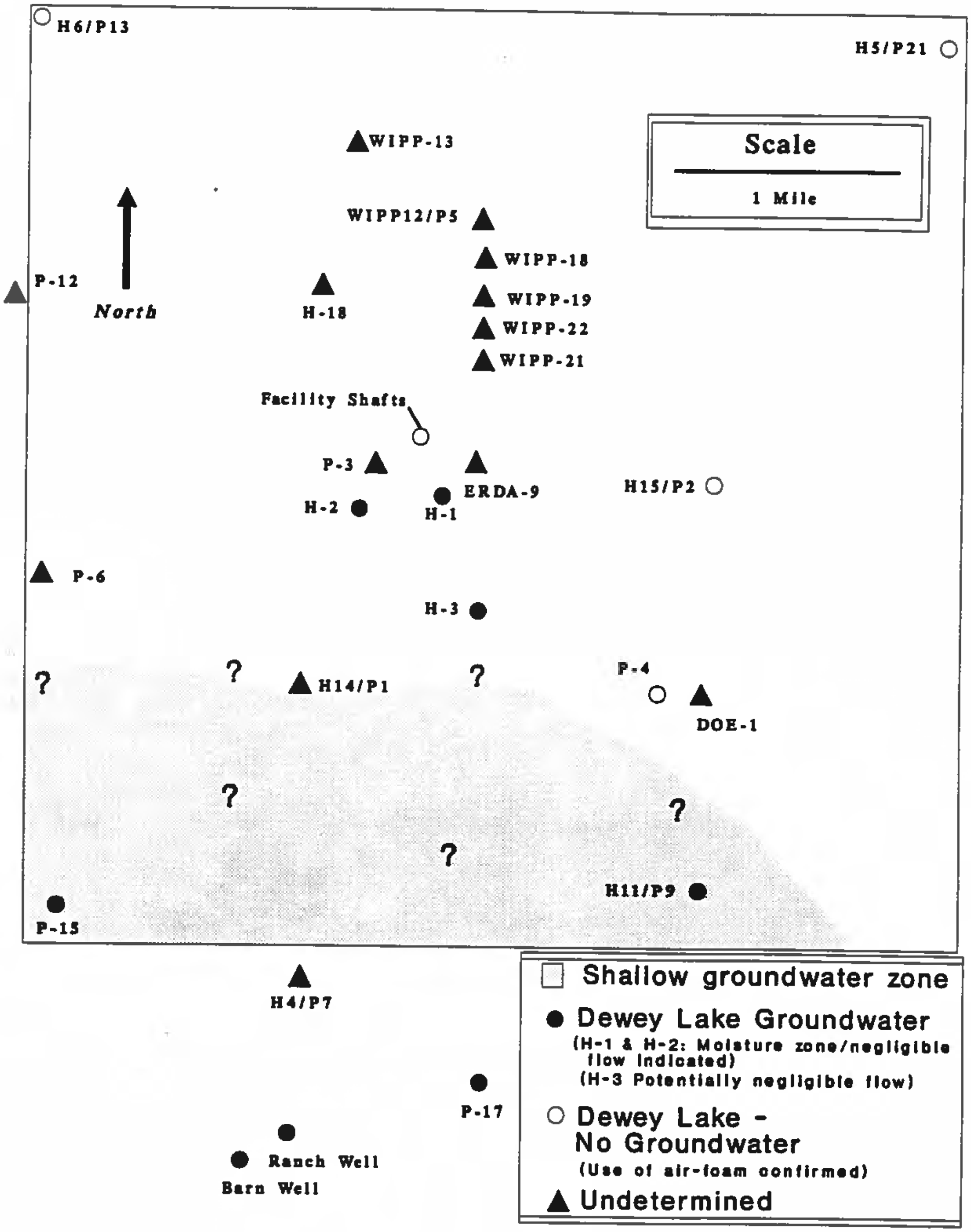
3.5 Migration Pathways and Potential

For the purposes of this study, liquid releases and/or leachate migration through soil and/or eolian sand are credible migration pathways. As such, the preceding discussion on the hydrostratigraphic units in the area of the site are directly applicable to migration potential, as are the site and sampling visits to be discussed later in this report. Because SWMU sites are internally drained, or diverted with engineered berms or culverts, exposure potential from surface runoff is linked to downward migration through soil. The SWMUs listed in Table 1.1 pose no plausible air pathway threat of contamination to the general public. It should be noted, however, that vapors and suspended particles may be dispersed in the event a site with suspected contamination is disturbed in the future.

As described in the previous text, several local ranchers have private wells completed in the Dewey Lake Formation for either livestock watering or drinking water for human consumption. Ranch Well, located near the southwest corner of the WIPP site boundary, is used for livestock watering. Barn Well, located near Ranch Well, supplies Mills Ranch with domestic drinking water. Because of the proximity of existing drinking water wells (approximately 1.5 kilometers/1.0 mile), and the fact that there is no known restriction on the siting of new ranch houses or water wells adjacent to the WIPP boundary, perched aquifers in the Dewey Lake are vulnerable to contamination and present a potential exposure pathway. Smith Ranch and the WIPP site obtain potable water from a city of Carlsbad water line tapping the Ogalla Aquifer 48 kilometers (30 miles) to the north.

Because of its relatively high permeability, the Culebra member of the Rustler Formation has been the focus of migration pathway assessment studies for the WIPP site. However, for the purposes of this study, the Culebra is not a major potential pathway because of the greater depth to the member. In addition, overlying aquitards on the WIPP site, including but not limited to Tamarisk and Forty-Niner members, and mudstone units of the Dewey Lake Formation, possess low vertical transmissivities/hydraulic conductivities. Rather, the Dewey Lake is used as the primary migration and exposure pathway. Figure 3.4 outlines a general area where some uncertainty exists concerning the extent and hydraulic characteristics of the formation. Previous discussion focused on where groundwater has been identified in well

Figure 3.4: Potential Shallow Groundwater Zone used for Migration and Exposure Assessment



logs, and/or where relative values of hydraulic conductivity may contribute to a greater relative migration and exposure potential. This measure of migration potential is for preliminary assessment purposes only, and should not be used where more quantitative methods are more appropriate.

4.0 Solid Waste Management Units

Detailed descriptions of each solid waste management unit (SWMU) in the 16-square-mile WIPP site area are provided in this section. Results from the preliminary review (PR) of background literature, visual site inspections (VSI), and sampling visits (SV) are presented, as are the original waste characterization sheets included in the WIPP RCRA Part B permit application. Each section includes an independent verification of unit descriptions and concludes with an assessment of release, migration, and exposure potential to the environment.

4.1 SWMU Group 001 - Mud Pits

As compiled in table 4.1, twenty-eight (28) drill pads are located within the WIPP site boundary. Each drill pad contains 1-3 mudpits that were used to store drilling fluids during drilling operations. Twenty-one (21) drill pads are associated with WIPP site hydrologic, potash, and geologic investigations and eight of these locations contain multiple well heads. Another borehole adjacent to the Air intake shaft, H-16, is not identified in table 4.1 but is included in this review. Seven (7) plugged wells remain from private-venture potash (5) and hydrocarbon (2) exploration before such activity was prohibited in 1980. These 7 wells were previously the responsibility of the Department of Interior, Bureau of Land Management (BLM) and are underlined in Table 4.9.

The waste description in table 4.2 suggests that mudpits contain sodium and potassium-saturated brine to which a variety of constituents were added, including starch and bentonitic gel; drill cuttings and metal cuttings; and trace amounts of hydraulic fluids, grease, diesel fuel and motor oil. By process knowledge, the RCRA Permit application claims that only solid waste, and no RCRA constituents, are present in the mudpits. In agreement with the RCRA Part B application, this report assumes that a potential release has occurred at all sites. However, for the purpose of this report, a release of RCRA constituents is not precluded and a limited sampling exercise is accomplished to screen for volatiles and heavy metals. The reasoning is as follows:

- Benzene and lead are both common constituents of gasoline and other petroleum products;

- Many closure operations occurred prior to the definition or institution of regulations regarding hazardous materials; and

- Manpower requirements of the two permitting agencies (BLM and State Engineer) do not include constant oversight of the mudpit closure and grading operations, only inspection of the final reclamation.

The information presented in the RCRA Part B application occurs within the context of all mudpits, rather than individual locations. Therefore, one objective of the preliminary review and site surveys is to characterize and verify each drill pad in terms of mud locations and any other available site specific information. A specific goal of the sampling program is to establish a basis for accepting or rejecting the validity of process knowledge.

Preliminary review (PR) focused on borehole data reports, which often included BLM and State Engineer permits records, Sandia daily reports and drillers field notes. Found within some reports are specific prohibitions by Westinghouse against introducing hazardous materials into the mudpits, as well as permit surface restoration clauses obligating the drill rig operator and/or permittee to reclaim mudpit sites. Visual site inspections (VSIs) were conducted by Paul Sanchez and Pat McCasland of the New Mexico Environment Department and are documented with site photographs included in appendix A. Sampling visits (SVs) to DOE-1 (SWMU 001-q), Badger Unit (SWMU 001-o), and Cotton Baby (SWMU 001-p) are also documented with borelogs, large scale site sketches, and laboratory analytical reports.

Table 4.1 Solid Waste Management Unit Group 001 - Mud Pits

(after Table J1-1/WIPP RCRA Part B Permit DOE/WIPP 91-005)

SWMU	LOCATION	HOLE #	# OF PITS	PERIOD OF USE	WELL STATUS	SIZE OF DRILL PAD (ACRES)
001-a	SW, NE, NE, 29	H-1	1	5/76 - 6/76	Open	8
001-b	SW, NE, NW, 29	H-2a H-2b1 H-2b2 H-2c	3	2/77 & 5/84 2/77 7/83 & 5/84 2/77 & 8/83	Sampled once/yr. Sampled once/yr. Open Open	3
001-c	NE, NE, SE, 29	H-3b1 H-3b2 H-3b3	3	8/76 & 4/86 11/83 1/84	Sampled once/yr. Open Sampled once/yr.	3
001-d	SE, NE, NE, 15	H-5a H-5b H-5c P-21	2	6/78 6/78 6/78 10/76	Open Sampled once/yr. Sampled once/yr. Plugged	3
001-e	NW, NW, NW, 18	H-6a H-6b H-6c P-13	2	7/78 7/78 6/78 9/76	Open Sampled once/yr. Sampled once/yr. Plugged	6
001-f	SE, NE, SE, 33	H-11b1 H-11b2 H-11b3 P-9	2	8/83 11/83 1/84 9/76	Open Open Sampled once/yr. Plugged	1
001-g	SW, SW, SW, 29	H-14 P-1	2	9/86 8/76	Sampled once/3 yrs. Plugged	1
001-h	NE, NE, NE, 28	H-15	1	10/86-11/86	Sampled once/3 yrs.	1
001-i	NE, NW, NW, 20	H-18	1	11/87	Sampled once/3 yrs.	1
001-j	SE, SE, SW, 20	P-3	1	8/76-9/76	Plugged	1/2
001-k	SE, SW, SE, 28	P-4	1	8/76-9/76	Plugged	3/4
001-l	SE, SE, SE, 17	P-5 WIPP-12	3	9/76 11/78 & 10/85	Plugged Open	6
001-m	SW, SW, NW, 30	P-6	1	9/76	Plugged	1
001-n	SW, SW, SW, 31	P-15	1	10/76	Plugged	1
001-o	NW, NE, SW, 15	Badger Unit	1	1974	Plugged	2
001-p	SW, NE, SW, 34	Cotton Baby	1	1973-1974	Plugged	3
001-q	SE, SE, SE, 28	DOE-1	2	1982	Open	3
001-r	NE, NE, SE, 34	D-123	1	Unknown (pre-1975)	Plugged	1/2
001-s	SE, SE, SE, 20	ERDA-9	1	4/76 - 6/76	Open	2
001-t	SE, SE, SW, 30	IMC-374	1	Unknown (pre-1975)	Plugged	1
001-u	NW, NW, NW, 20	IMC-376	1	Unknown (pre-1975)	Plugged	1
001-v	SE, SE, SW, 22	IMC-456	1	Unknown (pre-1975)	Plugged	1
001-w	SE, SW, SW, 27	IMC-457	1	Unknown (pre-1975)	Plugged	1
001-x	NW, NE, SW, 17	WIPP-13	2	8/78 & 10/85	Open	4
001-y	NW, NW, NW, 21	WIPP-18	2	4/78 & 10/85	Open	1
001-z	SW, SW, NW, 21	WIPP-19	2	5/78 & 10/85	Sampled once/yr.	1
001-aa	SW, NW, SW, 21	WIPP-21	2	5/78 & 10/85	Open	3
001-ab	NW, NW, SW, 21	WIPP-22	2	5/78 & 10/85	Open	1

See text for further explanation ie. location etc.

Table 4.2: WIPP SWMU Characterization Sheet - 001 Mud Pits

001	MUD PITS
Unit Type:	Mud Pits
Unit Use:	Storage/Settling
Operational Status:	Decommissioned
Use Period:	1970s-1980s
Materials Managed:	Solid Waste
Hazardous Release:	None
Radioactive Release:	None
Information source(s):	Seward, 1982 USGS, 1978 Winstanley and Carrasco, 1986

Unit Description

Refer to Figure for location. Approximately 46 decommissioned mud pits are located on 28 drill pads at the WIPP facility. They were used for settling drill cuttings out of the drilling fluids being used in drilling holes to support hydrologic testing and monitoring, potash evaluation, and drilling for hydrocarbons. Each mud pit was approximately 100 feet by 50 feet by 5 feet. Diesel fuel was added to the drilling mud to reduce dissolution of the water soluble rocks and to help lubricate the drill rods. It is not known how many of the wells were drilled using diesel in the drilling mud. Each mud pit was lined with a plastic sheet and used for one to two months during drilling, then allowed to dry out. To facilitate drying, holes were cut in the bottom of the liner. Once a pit was dry, it was covered with the soil that had been removed to make the berms and then graded to the original contours. The individual mud pits in SWMU No. 001 are listed on Table . It is difficult to determine the exact location of most of the mud pits because of the grading and revegetation that has taken place.

Many of these mud pits were the result of exploration activity that was conducted prior to the selection of the area for the WIPP facility and, therefore, were not created by DOE in support of the WIPP Project.

Waste Description

Materials in the mud pits consisted of sodium- and potassium chloride-saturated brine to which starch, bentonite gel, and diesel fuel were added; drill cuttings; metal cuttings; trace amounts of hydraulic fluid, grease, and motor oil; and the plastic liner.

Release Information

Potential releases from each of the drill sites occurred when the mud pits were drained by cutting holes in the liner. The materials released consisted of saturated brines, which are not considered hazardous under RCRA. All of the solids confined in the plastic liner of the mud pits were buried when the pits were covered with soil and graded.

(after WIPP RCRA Part B Permit DOE/WIPP 91-005)

4.1.1 SWMU-001a (Drill Pad H-1)

Preliminary Review. Drilled in 1976 as a solitary well, H-1 is the oldest Rustler hydrologic test hole. Although no borehole report is available, Mercer and Orr (1979) suggest that Sonora Drilling Company used air and air-mist (soap and water) as circulating media during drilling and reaming. A transient zone of moisture was detected in the Dewey Lake during drilling at 55 meters (180 feet) below the surface (Mercer, 1983). Air photo review shows evidence for four (4) locations on the pad with stressed vegetation, discolored soils, and/or rectangular patterns (air photos, 1982-1985).

Visual Site Inspection. H-1 was visited on 9-27-92. The pad has evidently been used for disposal of discarded concrete and cement slurries. Large portions of the pad may be disturbed to .30 meters (1.0 foot) below the surface from grading. Based on the field investigation, only one (1) potential mudpit is identified near the center of the pad, which is consistent with recollections of WIPP staff present during drilling. A large concrete monument/pier and extensive grading preclude conclusive verification of the size or volume of the unit (appendix 1a).

Sampling Visit. No sampling was conducted at the site. All constituents listed in Table 4.2 are presumed to be present.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high; a release beyond the bottom liner is assumed to have occurred. Eolian soils and the Quaternary Gatuna Formation measure approximately 11 meters (35 feet) at this location.

- Groundwater - The H-1 well pad is situated 11 meters (35 feet) above the Dewey Lake Formation. Migration potential is low relative to other locations onsite: short-term tests to determine fluid yield indicated negligible flow in the Dewey Lake at H-1 (TME 3059, 1980) and migration to the Culebra Dolomite aquifer (206 meters/675 feet below surface) is unlikely.

- Surface water - None

- Air - None

Exposure potential is low: Although air, air mist, and mud gel are the only declared components of the H-1 mudpit, introduction of extraneous hazardous constituents cannot be precluded. Nevertheless, the negligible flow exhibited at H-1 suggests migration, and consequently exposure potential, by the groundwater pathway is not probable. The tracer used after well completion (^{131}I) has a half-life of 8 years.

4.1.2 SWMU-001b (Drill Pad H-2: 2a, 2b1, 2b2, 2c)

Preliminary Review. Drilling for three well heads (H-2a, H-2b1, H-2c) was conducted in 1977 by Pennsylvania Drilling. Hydrologic Data Report #8 (1989) and Mercer and Orr (1979) indicate that air and air-mist (soap and water) were used for circulation during the drilling and reaming of H-2b1. H-2b2 was drilled relatively recently in 1983. Like at H-1, ^{131}I was introduced as a tracer. No information on other drilling fluid constituents or the number and location of the mudpits could be located. Air photo review shows evidence for one large reclaimed land surface with youthful vegetation to the northwest and immediately adjacent to the pad; and one rectangular discolored zone on the southwest side of the pad (air photos, 1982-1985).

Visual Site Inspection. The H-2 well pad was visited on 9-27-92. Based on the field investigation, three (3) potential mudpit areas are identified:

- One irregularly-shaped, but approximately 4.6 x 23 meter (15 x 75 feet) zone on the southwestern side of the pad is discolored and sunken below the pad grade, indicating subsidence of artificially-placed fill. Located just to the southeast of H-2a and H-2b1, the mudpit is located on the portion of the pad nearest to the south access road.

- One or possibly two mudpits are indicated by a large lobe (15 x 21 meters; 50 x 70 feet) extending off the northwest corner of the pad. The area is a natural low and is occupied by youthful vegetation (approximately 7 years old); no older natural plant life occurs within the lobe (e.g. Quercus Harvardii).

- One potential area of positive relief with artificial fill is observed at the center of pad (H-2a), although it may be a vestige of grading for the pad (appendix 4.1.2).

A small area of hydrocarbon stained soil is located at the northernmost corner of the pad (appendix 4.1.2).

Sampling Visit. No sampling was conducted at the site. All constituents listed in Table 4.2 are assumed to be present.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. Eolian soils and the Quaternary Gatuna Formation measure 10 meters (34 feet) in thickness at this location.

- Groundwater - Migration potential is low relative to other locations onsite: The H-2 well pad is situated 10 meters (34 feet) above the Dewey Lake Formation but short-term tests to determine fluid yield indicate negligible flow in this formation (TME 3059, 1980). Migration to the Culebra Dolomite aquifer (190 meters/620 feet below surface) is unlikely.

- Surface water - None

- Air - None

Exposure potential is low: Although other constituents, in addition to soap and mud gel, may occur in mudpits at this site, groundwater exposure potential is low: the transient zone of moisture at H-2 does not represent a significant migration pathway.

4.1.3 SWMU-001c (Drill Pad H-3: H-3b1, H-3b2, H-3b3, H-3d)

Preliminary Review. Four (4) well heads are located on the pad, not three as indicated in the RCRA Part B application. Well H-3d was drilled in 1987 to monitor the Culebra 49er and Dewey Lake formations. Hydrologic Data Report # 8 suggests that Pennsylvania Drilling Company used air-mist and brine mud for circulation media during drilling; however, no information regarding the number or location of the mudpits could be verified. Like at H-1 and H-2, ^{131}I was introduced as a tracer. Air photo review shows evidence for two or three rectangular mudpits (air photos, 1982-1985).

Visual Site Inspection. A site survey on 9-27-92 identified one positive and two potential mudpits/artificial fill zones. One is confirmed at the northwest corner adjacent to H-3b2 covered with wilted and dry vegetation (approximately 3.0 x 12 meters/10 x 40 feet). A second may be located between wells 3b2 and 3b3, expressed as an elongated hump of artificial fill covered with stressed vegetation and mantled with poured concrete fragments. The third is adjacent to H-3d and 3b1 at the entrance of the pad. It is slightly darker than the rest of the pad and is sunken noticeably below grade. The third measures approximately 3.0 x 6.0 meters (10 x 20 feet).

Sampling Visit. No sampling was conducted at the site. All constituents listed in Table 4.2 are presumed to be present.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. The thickness of eolian soils and Quaternary deposits at H-3 measures 7.0 meters (22 feet).

- Groundwater - Migration potential is low to moderate relative to other locations onsite. The Dewey Lake Formation at this location contains measurable groundwater, as indicated in 1988 and 1989 water leveling data (90 meters/300 feet below surface). Water level data suggest low yield on the basis of a leveling off of the water level following an anomolous increase in 1988. Athough it is unlikely that this groundwater is connected or extends to perched zones beyond the WIPP site boundary, a release to the unit is not precluded. Migration to the Culebra Dolomite aquifer (204 meters/670 feet below surface) is unlikely.

- Surface water - None

- Air - None

Exposure potential is low to moderate: Although soap and brine mud may be the only drilling fluid constituents, other constituents are not precluded. Although the mudpits may be located in an area of shallow ground water, the exposure potential could be considered low because of the distance groundwater would have to migrate to the nearest resident population.

4.1.4 SWMU-001d (Drill Pad H-5: H-5a, H-5b, H-5c, P-21)

Preliminary Review. One (1) USGS potash evaluation borehole (P-21) and three (3) hydrologic wells are located on this pad. Drilled in 1978, no borehole data reports could be located for the H-5 wells. USGS (1978) suggests that mudpit constituents for P-21 may include soap from the air, air-mist, and air foam drilling operations, as well as mud gel and brine. No other information regarding drilling fluids for the wells, or the number or location of the mudpits could be located. Air photo review shows evidence for two rectangular mudpits; however, one was identified as a sand dune blow-out (air photos, 1982-1985).

Visual Site Inspection. The H-5/P-21 well pad was visited on 9-23-92. One (1) covered mudpit is conclusively identified. Located off the pad and east of H-5a and H-5c is a sunken, rectangular zone measuring approximately 4.6 x 27 meters (15 x 90 feet)(appendix 4.1.4). The vegetation is different and noticeably more dry and wilted than surrounding plant-life. No second mudpit was located, although extensive grading may conceal one underneath the well pad.

Sampling Visit. No sampling was conducted at the site. All constituents listed in Table 4.2 are assumed to be present.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. The estimated thickness of eolian soils is less than 3.0 meters (10 feet). A caliche zone is reported between 3.0 and 4.6 meters (10 and 15 feet). There are 64 meters (210 feet) of Triassic Dockum Group (Santa Rosa) formation separating the Holocene deposits from a perched water zone at the top of the Dewey Lake.

- Groundwater - Migration potential is low relative to other locations onsite: the Dewey Lake Formation at this location is not water bearing and the perched zone at the base of the Santa Rosa Formation is low yield (< .1

- Surface water - None

- Air - None

Exposure potential is low: Additional constituents in the mudpits cannot be precluded, especially given the lack of documentation available for the H-5 wells. Nevertheless, the mudpit/mudpits are not located in an area of shallow ground water being used, or that could be developed for livestock and domestic purposes. In addition, there is no resident population on this end of the WIPP site.

4.1.5 SWMU-001e (Drill Pad H-6: H-6a, H-6b, H-6c, P-13)

Preliminary Review. One (1) USGS potash evaluation borehole (P-13) and three (3) hydrologic wells are located on this pad. Drilled in 1978, no borehole data reports could be located for the H-6 wells. The mudpit for P-13 may contain soap from the air and air foam drilling operations, mud gel and brine (USGS, 1978). No other specific information regarding drilling fluids, or the number or location of any mudpits was available. There is evidence for one large rectangular mudpit off the northwest corner of the pad (air photos, 1982-1985).

Visual Site Inspection. The H-6/P-13 well pad was visited on 9-23-92. One (1) mudpit zone is positively identified and another is suspected indirectly on the pad itself. One broad hummocky land surface on the northwest corner of the pad is confirmed from the air photo review. The actual boundaries of the mudpit are ill-defined; however, rock debris and surface character suggest a rather broad 325 meter^2 (3500 feet^2) area. As no additional evidence was detected for the second mudpit identified in the RCRA Permit application, the mudpit may be: 1) located under a concrete slab measuring approximately 3.0 x 15 meters (10 x 50 feet) adjacent to H-6b or 2) concealed by grading adjacent to H-6c, where the surface is mantled with cement and concrete debris.

Sampling Visit. No sampling was conducted at the site. All constituents listed in Table 4.2 are assumed to be present.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. The estimated thickness of Holocene eolian soils and Quaternary Gatuna Formation is about 9.5 meters (31 feet). A diffuse calcareous cemented zone is reported to 7.5 meters (25 feet) below the surface; however, no distinct caliche layer is indicated in borelogs (USGS, 1978).

- Groundwater - Migration potential is low relative to other locations onsite. The Dewey Lake Formation at this location is apparently not water bearing, as no mention of groundwater occurs in drillers logs during the air foam circulation of the borehole. Migration to the Culebra Dolomite aquifer (184 meters/604 feet below surface) is not credible.

- Surface water - None

- Air - None

Exposure potential is low: The mudpits are not located in an area of shallow ground water that is used or is potentially developable for livestock and domestic purposes. There is no resident population at this end of the WIPP site.

4.1.6 SWMU-001f (Drill Pad H-11b1, H-11b2, H-11b3, H-11b4, P-9)

Preliminary Review. The P-9 drill pad on the southeastern boundary of the WIPP site was graded in 1976 for a USGS-sponsored potash resource evaluation. Three (3) additional wells (H-11b 1-3) were drilled in 1983 and, in correction to the RCRA Part B Permit application, a fourth well (H-11b4) was drilled in 1988. USGS (1978) indicates that the drilling contractor (Boyles Brothers Co.) used air foam as a circulation fluid for P-9, which commonly consists of a sodium phosphate-based material.

The basic data report for the H-11 well pad complex indicates that the P-9 mudpit was to be reopened for the 1983 drilling operation (Mercer, 1990). Saturated sodium-chloride brine (H-11b4), attapulgite (a viscofier in salt-water fluids), air foam (11b2 and 11b3) and an organic tracer (Trimetafluorobenzoic Acid) are mentioned as various circulation fluid components in the H-11 drillers logs. There is no documentation as to the number or location of the mudpits. Stressed vegetation and discolored soils evident from an air photo review indicate the possibility of 2 (two) mudpits (air photos, 1982-1985).

Visual Site Inspection. The H-11 well pad was surveyed on 9-22-92. Based on the field investigation, one (1) mudpit is positively identified near H-11b2 at the southeast corner of the pad, where a black plastic liner still protrudes from the ground (appendix 4.1.6). Two (2) additional areas are potential buried mudpits: one at the northwest (H-11b4) corner and another at the northeast (H-11b3 and H-11b1) corner of the pad. These two areas appear disturbed, hummocky, and are covered with abundant rock fragments. It is not possible to verify the full size or volume of any of the units.

Sampling Visit. No sampling was conducted at the site. All constituents listed in Table 4.2 are assumed to be present.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high, as a release beyond the bottom liner is assumed to have occurred. Roughly 3.0 meters (10 feet) of Holocene deposits overlay 17 meters (55 feet) of Triassic sandstone at this location. A diffuse caliche zone (50-70% caliche and 50 to 30% sandstone) is reported between 1.5 and 4.5 meters (5.0 to 15 feet) (USGS, 1978).

- Groundwater - Migration potential is moderate relative to other locations onsite. The mudpits are located roughly 20 meters (66 feet) above the shallowest water-bearing formation (Dewey Lake), where downward percolating water may pond, and 67 meters (220 feet) above the nearest known producing zone in that formation. The possibility of migration to the Culebra Dolomite aquifer (223 meters/734 feet below surface) is unlikely, although this southeastern area of the site generally possesses higher values of hydraulic conductivity ($>10^{-6}$ m/s).

- Surface water - None

- Air - None

Exposure potential is moderate to high: The existence of a groundwater-utilizing resident population at this end of the WIPP site suggests the risk could be moderate to high eventhough migration potential is moderate. The mudpits are located within and/or immediately adjacent to an area of shallow ground water proven adequate for livestock and domestic purposes.

4.1.7 SWMU-001g (Drill Pad H-14, P-1)

Preliminary Review. USGS potash evaluation borehole (P-1; abandoned) and hydrologic well H-14 are located on this pad. Diesel fuel was added to a mixture of saturated sodium and potassium chloride brine, starch and salt gel, and attapulgite to reduce the degree of dissolution of the Salado formation during drilling operations for P-1 (WIPP Hydrologic Data Report #5).

H-14 was drilled in 1986 to provide a Culebra Dolomite monitoring well in the southeast quadrant of the site. According to the borehole data report, saturated brine and traced freshwater water were used for the drilling fluid for H-14. Saturated brine is specifically described as a 70-30 mixture of cement slurry and salt with 2% bentonitic gel. An organic tracer (meta-trifluorobenzoic acid 10 mg/l) was added to freshwater for one portion of the hole to measure contamination of the Culebra member from the drilling process. Approximately 4620 gallons of traced drilling fluid were lost to the member, representing about 80 to 90% of the recirculated drilling fluid (WIPP Hydrologic Data Report #5). The RCRA B permit suggests two mudpits are located at this location. There is evidence for rectangular mudpits on the north and east sides of the pad (air photos, 1982-1985).

Visual Site Inspection. One (1) rectangular mudpit is verified from the airphotos on the north side of the pad adjacent to H-14. Another is suspected on the pad itself. During a field survey on 2/3/93, the mudpit on the north side was measured as 9.0 x 30 meters (30 feet x 100 feet) as delineated by a disrupted surface covered with rock fragments. The other possible mudpit for P-1 is indicated by a discolored and sunken area, some 50 feet south of H-14 adjacent to the P-1 monument in the middle of the pad (appendix 4.1.7). No plastic liners were observed on the surface.

Sampling Visit. No sampling was conducted at the site. The borehole data report for H-14 includes a contractual requirement for documenting "additives to drilling fluid". This suggests that H-14 may have been relatively well monitored in terms of introducing deleterious materials into the mud pits.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. The estimated thickness of Holocene eolian soils (3.0 meters/10 feet) and Quaternary Gatuna Formation (9.0 meters/30 feet) is 12 meters (40 feet). A mixed caliche and sandstone zone is reported to 3.0 meters (10 feet) below the surface (USGS, 1978).

- Groundwater - Migration potential is low to moderate relative to other locations onsite. P-1 logs indicate a zone of increased permeability at 53 meters (175 feet), suggesting that air foam was not used. WIPP Hydrologic Data Report #5 comments that very little water was encountered during a pump test in the Dewey Lake in H-14; however, Beauheim (1987a) identifies 100-108.5 meters (327.5-356.0 feet) below the surface as the zone isolated for the hydraulic test. As suggested earlier in this report, groundwater is not expected in low-permeability units of the lower Dewey Lake (pg. 3-5). The pump test at H-14 failed, leading Beauheim (1987a) to conclude that the presence or absence of groundwater at this location remains unknown. Migration to the Culebra Dolomite aquifer (165 meters/540 feet below surface) is not credible.

- Surface water - None

- Air - None

Exposure potential is moderate to low: The groundwater characteristics of the high permeability zone in the upper Dewey Lake Formation is not known with certainty. Likewise, hydraulic connection to offsite perched water tables in the Dewey Lake cannot be precluded. The mudpit for H-14 stands a better chance of being well-managed, as indicated by contractual requirements documented in the borehole data report and the relative recency of drilling. P-1, however, may contain materials that represent a groundwater release concern.

4.1.8 SWMU-001h (Drill Pad H-15 and P-2)

Preliminary Review. One (1) USGS potash evaluation borehole (P-2) and one (1) hydrological monitoring well are located on this pad. The RCRA B permit application does not identify the P-2 borehole. USGS (1978) indicates that air foam was used for P-2; however, Hydrologic Data Report # 5 suggests saturated sodium and potassium chloride brine with starch and salt gel (attapulgite) were also used. As with P-1, diesel fuel was apparently added to inhibit dissolution of the Salado (WIPP Hydrologic Data Report #5).

H-15 was drilled in 1986. Saturated brine and "traced" freshwater are listed as drilling fluid constituents in the H-15 borehole data report. Saturated brine is specifically described as a 70-30 mixture of cement slurry and salt with 2% bentonitic gel. Meta-trifluorobenzoic acid (2 mg/l) was added to measure borehole and aquifer contamination of the Culebra from the drilling process. Approximately 1336 gallons of traced drilling fluid were lost to the formation, representing about 75% of the drilling fluid used (WIPP Hydrologic Data Report #5).

The RCRA B permit application suggests only one mudpit at this location; however, the presence of P-2 was not considered. The literature review did not reveal the number or location of the mudpits for either borehole. Air photo review shows evidence for two small rectangular mudpits adjacent to the east side of the pad and one large reclaimed area east of the H-15 pad (Air Photos 1982-1985).

Visual Site Inspection. The field survey on 9-29-92 identified one probable mudpit and two other possible mudpits. A rectangular area approximately 5.5 x 18 meters (18 x 60 feet) is identified adjacent to and east of the H-15 wellhead on the northeast corner of the pad (appendix 4.1.8). No discolored soil or plastic liner remnants were evident. Another rectangular area on the southeast corner of the pad, or a sunken area in the middle of the pad, may be the mudpit location for P-2. This is consistent with the location of the P-2 well head 7.6 meters (25 feet) south of H-15 (WIPP Hydrologic Data Report #5). In addition, a roughly 100 meter^2 (1000 feet^2) area of fill appears to have been built up east of the H-15 well pad in the reclaimed area evident from air photos.

Sampling Visit. No sampling was conducted at the site. All constituents listed in Table 4.2 are presumed present in the P-2 mud pit. The borehole data report for H-15, however, includes a contractual requirement for documenting "additives to drilling fluid", suggesting that H-15 may have been relatively well monitored in terms of introducing deleterious materials into the mud pits.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. The thickness of Holocene eolian soils and sands is about 3.0 meters (10 feet). Pleistocene Gatuna sand and gravels (6.0 meters/20 feet) and Triassic sandstones (38 meters/126 feet) separate the Holocene deposits from Dewey Lake Formation. A diffuse zone of calcareous cemented sandstone (less than 5% caliche) is described in USGS (1978) between 6.0 and 12 meters (20-40 feet). Consequently, surficial units in this area may display greater permeability than other sites underlain by well-cemented caliche.

- Groundwater - Migration potential is low relative to other locations onsite. The Dewey Lake Formation at this location is not water bearing; water would have been detected because air foam was used to drill through the Dewey Lake Formation for P-2. Migration to the Culebra Dolomite aquifer (260 meters/860 feet below surface) is not credible.

- Surface water - None

- Air - None

Exposure potential is low: The mudpits are not located in an area of shallow ground water developable for livestock and domestic purposes. There is no resident population within the WIPP boundary.

4.1.9 SWMU-001i (Drill Pad H-18)

Preliminary Review. Hydrological monitoring well (H-18) was drilled in 1987 to monitor the Culebra Formation. Pennsylvania Drilling drillers logs mention only saturated brine and "traced" freshwater as drilling fluid constituents in the H-18 borehole data report. Meta-trifluorobenzoic acid (20 mg/l) was added to measure borehole and aquifer contamination of the Culebra from the drilling process (WIPP Hydrologic Data Report #6). The literature review did not reveal the number or location of the mudpits. Air photo review shows evidence for one rectangular mudpit on the south side of the southeast quadrant of the pad (Air Photos 1982-1985).

Visual Site Inspection. A site visit on 2/4/93 verified the presence of one rectangular mudpit unit measuring approximately 7.6 x 21 meters (25 x 70 feet) on the southeast portion of the pad (appendix 4.1.9). Fragments of black and white 20 mil polyethylene liner protruding from the pad and discolored soil delineate the extent of the mudpit.

Sampling Visit. No sampling was conducted at the site.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. The Dewey Lake Formation is located only 6.0 meters (20 feet) below the surface. Approximately 1.5 meters (5.0 feet) of Holocene eolian soils and sands and 4.6 meters (15 feet) of Triassic Sandstone overlay Dewey Lake sandstones and siltstones.

- Groundwater - Migration potential is low relative to other locations onsite. Because water and brine were used as the circulation media for H-18, drillers logs would have been unable to detect the presence of water in the Dewey Lake Formation at this location. Notwithstanding this observation, general trends evident from H-1 and H-2 (low yield) and facility shafts (unsaturated) suggest that Dewey Lake groundwater this far north is unlikely. Migration to the Culebra Dolomite aquifer (210 meters/690 feet below surface) is not credible.

- Surface water - None

- Air - None

Exposure potential is low: Although the presence, depth and possible extent of a Dewey Lake water bearing zone at this location is not known, the exposure potential is low based on the reasoning cited above. As evident from driller contractual requirements, there also appears to be an increasing sensitivity to introducing hazardous or other deleterious materials into the mudpits beginning about 1986, which suggests H-18 may be relatively clean.

4.1.10 SWMU Unidentified in RCRA B Permit (Drill Pad H-16)

The H-16 borehole is not listed in the RCRA B permit application. H-16 was drilled in 1987 to monitor fluid pressures in Rustler Formation Members during excavation and construction of the Air Intake Shaft. The borehole is located about 15 meters (50 feet) northwest of the AIS. Communications with the principal investigator that identified mudpit SWMU's for the RCRA Part B Permit application suggested the H-16 well pad was simply overlooked.

Preliminary Review. WIPP Hydrologic Data Report #6 and site personnel indicate that saturated brine and traced freshwater were used as drilling fluid. Recirculation tanks were used for the freshwater/tracer stage instead of lined mudpits. A July 1987 WIPP project air photo of the facility clearly shows a square (approximately 8.0 x 8.0 meter; 25 x 25 feet) plastic lined pit adjacent to and southwest of H-16 (appendix 4.1.10).

Visual Site Inspection. There are no stained soils or other evidence for the mud pit seen in air photos.

Sampling Visit. No sampling was conducted at the site. All constituents listed in Table 4.2 are presumed present in the H-16 mud pit; however, the location and recency of the borehole suggest it may be relatively clean.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. The thickness of Holocene eolian soils and sands is about 5.5 meters (18 feet). Pleistocene Gatuna sand and gravels (5.7 meters/19 feet) and Triassic sandstones (4.6 meters/15 feet) separate the Holocene deposits from the Dewey Lake Formation.

- Groundwater - Migration potential is low relative to other locations onsite: The Dewey Lake Formation at the facility location is not water bearing. Migration to the Culebra Formation aquifer (214 meters/700 feet below surface) is not credible.

- Surface water - None

- Air - None

Exposure potential is low: The mudpits are not located in an area of shallow ground water and there is no resident population within the WIPP boundary. In addition, it is emphasized that boreholes drilled later than 1986, such as H-16, appear to stand a better chance of being monitored for deleterious materials being introduced into the pits.

4.1.11 SWMU-001j (Drill Pad P-3)

Preliminary Review. Pennsylvania Drilling Company drilled P-3 in August 1976 as part of a 21-well USGS resource evaluation program to investigate the potash resources in the Salado Formation (USGS, 1978). WIPP Hydrologic Data Report #5 suggests that at least some of these resource evaluation boreholes added diesel fuel to the drilling fluid to reduce the degree of dissolution of the salt formation. Drilling fluid consisted of saturated sodium and potassium chloride brine, starch and salt gel (attapulgite). Air photo review shows evidence for one rectangular mudpit on the northwest side of the pad (Air Photos 1982-1985).

Visual Site Inspection. A site survey on 9-27-92 revealed P-3 to be heavily overgrown with vegetation compared to other potash test pads. Survey marker N349 on the pad may be set on top of the abandoned P-3 test hole. No discolored soil or other evidence of the mudpit was encountered, other than the rectangular feature evident from the air photos. The pad area and access road have been extensively graded.

Sampling Visit. No sampling was conducted at the site.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. The Dewey Lake Formation is located 12 meters (40 feet) below the surface. Approximately 3.0 meters (10 feet) of soil and eolian sands and 9.0 meters (30 feet) of the relatively permeable Gatuna Formation directly overlay Dewey Lake claystones and siltstones at this location.

- Groundwater - Migration potential is low relative to other locations onsite. No groundwater was noted in the Dewey Lake Red Beds in drillers logs; however, there is also no confirmation that air foam circulation was used. Nevertheless, trends from H-1 and H-2 suggest groundwater in the Dewey Lake, if present, probably displays negligible flow. Subsurface logs also indicate that the top of the Dewey Lake Red Beds would be relatively impermeable at this location. Migration to the Culebra Dolomite aquifer (195 meters/640 feet below surface) is not credible.

- Surface water - None

- Air - None

Exposure potential is low: Given the onsite trend of groundwater occurrences in the Dewey Lake Formation, a groundwater exposure pathway to the environment or public is unlikely.

4.1.12 SWMU-001k (Drill Pad P-4)

Preliminary Review. Boyles Brothers Drilling Company drilled P-4 in September 1976 as part of a 21-well USGS potash resource evaluation program (USGS, 1978). WIPP Hydrologic Data Report #5 suggests that at least some of these resource evaluation boreholes added diesel fuel to the drilling fluid to reduce the degree of dissolution of the Salado formation. Drilling fluid probably consisted of saturated sodium and potassium chloride brine, starch and salt gel (attapulgite); however, air foam was used to 292 meters (958 feet) below the land surface. Air photo review suggested artificial rectangular features on perimeter of the pad (Air Photos 1982-1985).

Visual Site Inspection. The field survey confirmed a rectangular area of artificial fill approximately 4.6 x 15 meters (15 x 50 feet) on the west side of the pad. No discolored soil or plastic liners were evident. Mixed uncompacted soil, broken caliche and red sandstone on the surface suggest extensive grading (appendix 4.1.12).

Sampling Visit. No sampling was conducted at the site. All constituents listed in Table 4.2 are presumed present in the P-4 mud pit.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. The site is underlain by Holocene soils and eolian sands to 2.0 meters (8.0 feet) and Triassic sandstone between 2.0 and 30 meters (8.0 - 99 feet) below the surface.

- Groundwater - Migration potential is low relative to other locations onsite. No groundwater is noted in drillers logs during air foam circulation between 30 - 186 meters (99 - 609 feet) below the land surface, suggesting no groundwater occurs in the Dewey Lake Formation at this location. Subsurface logs also indicate that the top of the Dewey Lake Red Beds would be relatively impermeable at this location. Migration to the Culebra Dolomite aquifer (236 meters/775 feet below surface) is not credible.

- Surface water - None

- Air - None

Exposure potential is low: No credible groundwater exposure pathway to the environment or public apparently exists at this location.

4.1.13 SWMU-001L (Drill Pad WIPP-12/P-5)

Preliminary Review. Pennsylvania Drilling Company drilled P-5 in 1976, presumably using similar drilling fluid mixtures as other potash evaluation boreholes: saturated sodium and potassium chloride brine, starch and salt gel (attapulgite) and diesel fuel to reduce salt dissolution.

WIPP-12 was drilled on the P-5 well pad in 1978 and deepened in 1981 and 1982 to investigate the Salado and Castile Formations (Caufmann et al., 1990; WIPP Hydrologic Report #7). The WIPP-12 Borehole Data Report and WIPP Hydrologic Data Report #7 indicate that several drilling fluids were used to drill WIPP-12. A salt-based drilling mud was used to a depth of 305 meters (1000 feet), a 10 lb/gallon mix of starch, soda ash, and caustic soda (NaOH - pH control) was used between 305-845 meters (1000-2773 feet), and a brine-salt gel (attapulgite) mixture was used to 1197 meters (3,927 feet). A NaCl-based weighting agent was added to control the flow from a pressurized brine encountered at 918 meters (3011 feet) below the surface. In reference to WIPP-12 drilling fluid, DOE/WIPP 92-007 also suggests that an organic material (lignite) and a density-increasing material such as barite may have been used.

Air photo review revealed the WIPP-12/P-5 well pad to have the largest mud pit feature on the WIPP site. Linear dark bands of soil and stressed or sparse vegetation are noticeable in air photos. D'Appolonia Consulting Engineers (1982a) indicate that 2.5 million gallons of brine outflow from the Castile (45 gallons/minute) were pumped to shallow "reserve pits". DOE/WIPP 92-007 states that the WIPP-12 reserve/mudpit pit complex was filled in 1987, and a portion of the site covered with crushed caliche imported from offsite as an inorganic mulch for reclamation. DOE/WIPP 92-007 also suggests some sampling of the reserve pits occurred.

Visual Site Inspection. Field evidence collected on 9-27-93 indicates the presence of a large mudpit complex on the eastern portion of the site. Hummocky, disturbed linear bands of fill form berms which separate four (4) distinct rectangular mudpit units. The RCRA Part B indicated three mudpits, as shown in Table 4.1 for the entire pad. The mudpits are defined by darker, possibly stained soil, a general lack of vegetation, and continuous linear exposures of white plastic liners along the margins and within the individual units. Discontinuous lengths of plastic liner also appear in the intervening rubbley, bermed zones.

From north to south, the four (4) mudpits have the following dimensions:

- 100 by 23 meters (330 by 75 feet)
- 110 by 12 meters (360 by 40 feet)
- 110 by 11 meters (360 by 36 feet)
- 100 by 23 meters (330 by 75 feet)

Sampling Visit. No sampling was conducted at the site. All constituents listed in Table 4.2 are presumed present in the WIPP-12/P-5 mud pit complex.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. Approximately 4.0 to 4.9 meters (13 to 16 feet) of Holocene eolian soils and sands directly underlie the mudpits. Caliche is reported to occur between 1.5 to 3.0 meters (5.0 and 10 feet) below the surface at P-5 and between 5.0 and 5.8 meters (16 to 19 feet) in WIPP-12 borehole logs. The WIPP-12 borehole data report indicates Gatuna Formation between 5.8 and 8.8 meters (19-29 feet), with the underlying Triassic Sandstone occurring to 51 meters (167 feet) below the surface.

- Groundwater - Migration potential is probably low relative to other locations onsite. Pennsylvania Drilling Company and Salazars Drilling Company may have been unable to detect the presence of water during drilling. Nevertheless, the Dewey Lake Formation is less likely to contain water this far north on the WIPP site. Migration to the Culebra Dolomite aquifer (245 meters/804 feet below surface) is not credible.

- Surface water - None

- Air - None

Exposure potential is low: The likelihood is low that groundwater exists and is connected with the Dewey Lake Red Bed water resource found farther south on the WIPP site. Brine apparently represents the largest perentage of contaminants. However, given the general history of the site, there is a possibility that some deleterious constituents may be encountered in the event the site is ever overexcavated.

4.1.14 SWMU-001m (Drill Pad P-6)

Preliminary Review. Boyles Brothers Drilling Company drilled P-6 in September 1976 (USGS, 1978). As with other USGS potash resource evaluation boreholes, diesel fuel may have been used in the drilling fluid, along with saturated sodium and potassium chloride brine, starch and salt gel (attapulgite). Air photo review revealed a small discolored area on the pad (Air Photos 1982-1985).

Visual Site Inspection. The site is inaccessible by vehicle. The field survey on 9-23-92 revealed a hummocky pad surface suggestive of major rough grading and possible regrading which has disguised the mudpit. The patch of discolored soil evident from air photos near the P-6 well head is not conclusive from the ground, but represents the only possible evidence of the mudpit location (appendix 4.1.14).

Sampling Visit. No sampling was conducted at the site. All constituents listed in Table 4.2 are presumed present in the P-6 mud pit.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. The Dewey Lake Red Beds are relatively shallow at this location. About 2.4 meters (8.0 feet) of unconsolidated Holocene soils and eolian sands and 3.0 meters (10 feet) of Pleistocene Gatuna Formation are reported in the borehole logs (USGS, 1978). There is no description of a caliche unit.

- Groundwater - Migration potential is moderate relative to other locations onsite. No groundwater water is reported in drillers logs; however, air-foam circulation is not mentioned as a drilling method. This suggests that groundwater in the Dewey Lake Red Beds cannot be precluded. Subsurface logs suggest that the top of the Dewey Lake Red Beds may be relatively impermeable at this location. Migration to the Culebra Dolomite aquifer (164 meters/537 feet below surface) is not credible.

- Surface water - None

- Air - None

Exposure potential is moderate: The exposure potential may be high because the presence, depth and possible extent of a Dewey Lake water bearing zone at this location is not known. The P-6 well pad is also within a few hundred feet of the WIPP site boundary, and a future offsite domestic watering well at this location cannot be precluded.

4.1.15 SWMU-001n (Drill Pad P-15)

Preliminary Review. Boyles Brothers Drilling Company drilled the USGS P-15 borehole in October 1976 to investigate the potash resources in the Salado Formation (USGS, 1978). The well was recompleted in 1979 (WIPP Hydrologic Data Report #6). As with other USGS potash test holes, diesel fuel may have been added to the drilling fluid, which probably consisted of saturated sodium and potassium chloride brine, starch and salt gel (attapulgite). P-15 was drilled with air to 123 meters (405 feet) below the land surface, allowing the presence of shallow groundwater to be detected. Air photo review revealed the pad to be largely overgrown with no clear evidence of the mudpit location (Air Photos 1982-1985).

Visual Site Inspection. The site was visited on 9-22-92. The P-15 pad is overgrown with grass, and typical of other USGS potash test holes, there is no clear evidence of the mudpit location. A 3.0 by 6.0 meter (10-20 feet) area of hummocky, loose fill and coarse rubble may indicate the presence of a mudpit on the east side of the flat graded pad (appendix 4.1.15). As with other USGS potash test holes, no plastic liners are evident.

Sampling Visit. No sampling was conducted at the site. All constituents listed in Table 4.2 are presumed present in the P-15 mud pit.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. The Dewey Lake Red Beds are relatively shallow at roughly 10 meters (32 feet) below the surface. Unconsolidated Holocene soils and eolian sands are about 3.4 meters (11 feet) thick. The Gatuna Formation measures 6.4 meters (21 feet) in thickness (USGS, 1978). A discontinuous intermixed zone of sandstone and caliche is described to a depth of about 3.0 meters (10 feet).

- Groundwater - Migration potential is moderate relative to other locations onsite. Groundwater water is reported in the Dewey Lake Red Beds at 69 meters (225 feet) below the surface and may be connected to perched or semi-perched saturated zones used by Ranch Well and Barn Well. Migration to the Culebra Dolomite aquifer (126 meters/413 feet below surface) is less credible.

- Surface water - None

- Air - None

Exposure potential is moderate to high: Located in the southeastern corner of the site, the P-15 well pad is within a few thousand feet of a known domestic water resource utilized by Mills Ranch. As a relative measure, the documented use and proximity of the groundwater resource gives P-15 one of the greater potentials for causing exposure.

4.1.16 SWMU-001o (Drill Pad: Badger Unit)

Preliminary Review. U.S. Geological Survey well records indicate that 1-Badger Unit Federal was drilled in 1973 by Superior Oil Company as a wildcat petroleum exploration well. The total well depth was 4640 meters (15,225 feet) and was abandoned in 1974. There was no documentation of the mudpit closure. Air photo review revealed a large irregular-shaped area of dark brown and dark grey stained soil devoid of vegetation. This area is located adjacent to and north of the well pad (Air Photos 1982-1985).

Visual Site Inspection. The site visit was conducted on 9-23-92. The survey confirmed the presence of a large, stained, unvegetated area, ringed with stressed and wilted vegetation and adjacent to a rectangular 2 foot-high drill pad. Many fragments of intact black polyethylene plastic liner (20 mil) protrude through the surface and occur as much as 6.0 meters (20 feet) outside the stained soil areas. The number of individual mudpits cannot be discerned; however, it is suspected to be a complex of multiple mudpits (RCRA indicates 1 mudpit). The entire complex measures approximately 85 by 122 meters (280-400 feet).

Numerous shallow test pits dug in the main complex indicate the stained soil to be a heterogeneous mixture of red brown, dark brown and dark grey silty sand. Abundant angular fragments of tar-like hydrocarbons and light blue grey grout and lenses of mottled black and dark grey sandy clay occur up to .60 meters (2.0) feet below grade. Hydrocarbon odors appeared to increase at the base of the mudpit, indicated by a black plastic liner approximately .60 meters (2.0 feet) deep in the interior of the complex.

Sampling Visit. The Badger Unit mudpit was sampled on 10-5-92. A sampling and analysis and quality assurance plan were developed beforehand to identify analytical objectives and sample collection, field extraction and sample handling procedures. Several boreholes were colocated to retrieve the required volume of soil for the environmental, split, and duplicate samples collected by the New Mexico Environment Department and

Westinghouse DOE/WIPP. The colocated boreholes were augered to approximately 2.4 meters (8.0 feet) below mudpit grade. Grab samples were collected by judgement within each borehole as indicated in the composite graphic log (appendix 4.1.16). NMED analytical results from the State Scientific Laboratory Division (SLD) and a summary table comparing NMED and DOE analyses are included in appendix 4.1.16. The types of analyses and preliminary review of sample data are as follows:

- **Aromatic and Halogenated Purgeables (VOC Screen EPA 601/2)**

  The data collected from .45 meters (1.5 feet) below the surface indicates that no VOC compounds are detected above the States' SLD practical quantitation Limit (PQL) (Method Detection Limit = 260 ppb). A laboratory remark indicates that a late eluting substituted aromatic molecule was measured between 6000-7000 ppb in the C3 substituted benzene region. Discussions with the laboratory indicate this observation to be inconclusive. Apparently, any number of constituents (semi-volatiles, napthelene etc.) may cause this detection, in addition to compounds with substituted functional groups (ie. -OH or $-NH_2$) attached to the aromatic ring. Examples of substituted benzenes are phenol, toluene and styrene. Westinghouse DOE/WIPP data demonstrate a much lower detection limit by identifying several aromatic and halogenated puregables between 3 and 30 ppb.

- **Aliphatic Hydrocarbons (Semi-VOC Screen EPA 8015)**

  Gas chromatographic analyses indicate that an aliphatic sample collected within the mudpit (.36 meters/1.2 feet below surface) contained a C15-C30 hydrocarbon at less than 20 ppm. Using a SLD gas chromatographic and flame ionization detection technique, the material does not match hydrocarbon patterns for diesel fuel, gasoline, or lubricating oil. Conversely, Westinghouse DOE/WIPP analyses indicate a 190 ppm concentration for diesel within the mudpit, which decreases to 14 ppm at 1.0 meter (3.2 feet) below the liner (appendix 4.1.16).

- **Heavy Metals (ICAP Scan)**

  Relative to one background control soil sample collected from a dune blow-out, Badger unit shows within the mudpit higher levels of barium (72 ppm maximum/11 ppm background), chromium (15 ppm maximum/3 ppm background), lead (51 ppm maximum/<5 ppm background), and zinc 51 ppm maximum/6 ppm background). These values decrease noticeably at 1.5 meters (5.0 feet) below the liner (appendix 4.1.16).

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. Relatively dense eolian sands were logged to 2.5 meters (8.0 feet) below grade, but may measure up to 4.6 meters (15 feet) deep. The caliche zone was not encountered during the mud pit investigation and BLM well log records begin at the top of the Salado 312 meters (1024 feet) below the land surface.

- Groundwater - Migration potential is low relative to other locations onsite. The Dewey Lake Red Beds occur relatively deep and are less likely to contain water this far north on the WIPP site. A private livestock well (Smith Well Section 15.1); however, reportedly yielded potable water from 51 meters (167 feet) below the surface from Triassic strata as late as 1976 (Lambert, 1992). No other information on this well is available.

- Surface water - None

- Air - None

Exposure potential is low to moderate: Given the general character of the site, there is a strong possibility that some deleterious constituents may be encountered in the event the site is ever overexcavated.

4.1.17 SWMU-001p (Drill Pad: Cotton Baby)

Preliminary Review. Cotton Baby (1-Grace Cotton Baby Federal) was drilled in 1973 by Micheal Grace Company as a wildcat petroleum exploration well. The total well depth was 1364 meters (4,475 feet) and was abandoned in 1974. There was no documentation of the mudpit closure and USGS/BLM records indicate that the restoration of the mudpits was never completed. The layout plan submitted to the US Geological Survey Conservation Division (ie. BLM) shows that a trash pit was planned adjacent to the two proposed mudpit cells. Air photo review revealed several potential mudpits features (Air Photos 1982-1985).

Visual Site Inspection. The survey on 9-22-92 confirmed the presence of two soil stained mudpits (one (1) mudpit indicated in RCRA B). Plastic liner remnants and stressed and wilted vegetation ring and delineate the largely unvegetated pits. A smaller rectangular mudpit #1 (east) measures 4.6 by 17 meters (15-55 feet). A larger irregular-shaped mudpit #2 to the west of mudpit #1 measures 18 by 26 meters (60-85 feet). Petroleum crude residue is exposed at the edges of mudpit #2 and a faint hydrocarbon scent is noticed over the mudpits. Much debris (bottles, deadman rigging, oil filters etc.) occurs on the well pad and mudpit sites.

The surface soil appears to be a heterogeneous mixture of loose red brown and dark brown silty sand. Underlying the surficial sand cover at .30 meters (1.0 feet) below grade is a sandy fat clay, with dark grey and black laminations and pockets in a grey matrix. The hydrocarbon scent increases with depth. A fibrous 20 mil black plastic liner marks the bottom of the mudpit to .70 meters (2.3 feet) below grade; however, a faint hydrocarbon odor can still be detected at 1.5 meters (5.0 feet) below grade in dense native eolian sands.

Sampling Visit. The Cotton Baby mudpit was sampled on 10-5-92 using the same sampling and analysis plan and procedures described in the Badger Unit and DOE-1 sections. Several boreholes were colocated to retrieve the required volume of soil for the environmental, split, and duplicate samples collected by the New Mexico Environment Department and Westinghouse DOE/WIPP. The colocated boreholes were augered to approximately 1.7 meters (5.7 feet) feet below mudpit grade. The location of the grab samples, NMED data, and a qualititative comparison of NMED and DOE analytical results are included in appendix 4.1.17. The types of analyses and preliminary review of sample data are as follows:

- **Aromatic and Halogenated Purgeables (VOC Screen EPA 601/2)**

A VOC sample was collected between .24 to .36 meters (.70-1.2 feet) under the plastic liner mudpit cap. The sample was a mixture of silty sand and mottled, black sandy clay. As with Badger Unit, the shallow sample indicates that no VOC compounds are detected above the States' SLD Practical Quantitation Limit (PQL) (Method Detection Limit = 200-260 ppb), however, various benzene substituted aromatic molecules are detected. Twenty late eluting compounds in the C3 substituted benzene region are measured up to 5000 ppb but are not identified. Another VOC sample was collected within the undisturbed zone underlying the mudpit. Three late eluting compounds in the C-3 substituted benzene region are detected at 5000-7000 ppb at about .70 meters (2.2 feet) below the liner. As the discussion for Badger Unit explains, this observation is inconclusive. Westinghouse DOE/WIPP data indicate a large number of VOCs between 1 and 27 ppb within the mudpit. An equipment rinsate blank indicates; however, that measurements for methylene chloride, chloroform and o-xylene may be spurious (see Badger Unit data). The natural dune sand under the mud pit was porous, moist to wet, and exhibits a faint hydrocarbon smell. DOE/WIPP data show trace levels of VOCs still present, but decreasing at .60 meters (2.0 feet) below the mudpit liner.

- **Aliphatic Hydrocarbons (Semi-VOC Screen EPA 8015)**

An aliphatic sample collected at .45 meters (1.5 feet) below the surface appeared to be a viscoelastic mixture of hydrocarbons and fat clay. State gas chromatographic analyses indicate a detected aliphatic constituent did not match common hydrocarbon patterns for diesel fuel, gasoline, or lubricating oil. The estimated concentration for the detected C15-C30 hydrocarbon is less than 20 ppm. The State sample collected .80 meters (2.5 feet) below the mudpit liner exhibited a faint hydrocarbon smell; however, again only an unidentified C15-C30 hydrocarbon pattern less than 20 ppm is detected. Colocated Westinghouse DOE/WIPP samples inexplicably show diesel fuel concentrations of 96 ppm and 12 ppm within and below the mudpit, respectively.

- **Heavy Metals (ICAP Scan)**

  Relative to one background control soil sample collected from a dune blow-out, Cotton Baby shows within the mudpit higher levels of barium (43 ppm maximum/11 ppm background), chromium (18 ppm maximum/3 ppm background), copper (15 ppm/ 1 ppm background), lead (20 ppm maximum/<5 ppm background), nickel (13 ppm/<2 ppm background), vanadium (19 ppm maximum/ 4 ppm background) and zinc (31 ppm maximum/6 ppm background). These concentrations decrease at 1.0 meter (3.2 feet) below the liner (appendix 4.1.17).

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. This assessment is confirmed by quantitative measurement of substituted benzene compounds below the liner, and the faint hydrocarbon odor detected in native eolian sands to the bottom of the hole (1.5 meters/ 5.0 feet). The closest borehole (H-11) suggests that Holocene eolian sands may measure up to 3.0 meters (10 feet) thick at the Cotton Baby well pad, with approximately 18 meters (60 feet) of underlying Triassic sandstone. The closest well also suggests that caliche may not be as well developed as other portions of the site.

- Groundwater - Migration potential is moderate relative to other locations onsite. As with H-11, the mudpits may be located within 15 to 20 meters (50-66 feet) above the shallowest water-bearing formation (Dewey Lake), and roughly 67 meters (220 feet) above the nearest known groundwater producing zone in that formation. The possibility of migration to the Culebra Dolomite aquifer (224 meters/734 feet below surface) is unlikely, although this southeastern area of the site generally possesses higher values of hydraulic conductivity ($>10^{-6}$ m/s).

- Surface water - None

- Air - None

Exposure potential is moderate to high: The existence of a groundwater-utilizing resident population at this end of the WIPP site suggests the risk could be high eventhough migration potential is moderate. The mudpits are located within and/or immediately adjacent to an area of shallow ground water proven adequate for livestock and domestic purposes. In addition, given the general character of the site, there is a strong possibility that some deleterious constituents may be encountered in the event the site is ever overexcavated.

4.1.18 SWMU-001q (Drill Pad DOE-1)

Preliminary Review. DOE-1 was drilled in 1982 to collect stratigraphic, structural and hydrologic data (TME 3159, 1982). The borehole was drilled to 1239 meters (4065 feet) below the land surface to examine the nature of the Castile Formation underlying the Salado, including attributes associated with an inferred anticlinal structure. Salazar Brothers reportedly rotary drilled between 15 and 345 meters (49-1130 feet), using a spud mud mixture of fresh water gel, soda ash, and paper as a drilling fluid. From 345 meters (1130 feet) to the bottom of the borehole, a mixture of salt water gel, starch, KCl brine and lime was reportedly used (TME 3159, 1982). The Borehole Data Report for DOE-1 specifically includes a Westinghouse Electric Corporation Drilling Contractor Clause which prohibits the introduction of hazardous materials into the mudpits.

Appendix B of TME 3159 (1982) described a plan for two mud pits to accommodate 1.2 meters (4.0 feet) of drilling fluids. One was to measure 46 by 14 meters (150-45 feet), and a second reserve pit to encompass an area 23 by 15 meters (50-75 feet). Both were to be lined with 8 mil reinforced polyethylene "to ensure fluids do not seep into surrounding soils" (TME 3159, 1982). Air photo review revealed several potential mudpits features, including areas of stained soil and open excavations (Air Photos 1982-1985).

Visual Site Inspection. DOE-1 was visually site inspected on 9-27-92 and again on 10-6-92. Four different mudpit cells exist as open excavations up to .90 meters (3.0 feet) deep. Three mudpits located on the north portion of the pad may be considered contiguous, the dimensions of the conglomerate mudpit complex measuring about 12 x 37 meters (40 x 120 feet). The second pit, probably the reserve pit, appears to be excavated in the adjacent dune complex and measures roughly 15 x 21 meters (50 x 70 feet). It is not clear whether the pad-located mudpits were completely filled and exhumed or just left open. Approximately 3.0 meters (10 feet) of rocky fill is piled up on the northwest corner of the pad and has not been reclaimed.

The pad-located mudpits are delineated by and include fragments of black and white 7 mil polyethylene. The mudpits appear to be heavily soil-stained in areas and contain stressed or sparse vegetation. Several test holes suggest that the mudpits are up to .70 meters (2.5) feet thick, the main body being a mixture of red brown fat clay and black/grey sludge. The brown, black and grey clay/viscoelastic mixture is present to about .65 meters (2.0-2.5 feet). The mudpit contents exuded a very strong hydrocarbon smell, which was confirmed by trace measurements of benzene-like vapors detected downhole by an MSA model A/Benzene Tube OVA. These observations appear to contradict official records (TME 3159, 1982) which declare that only soda ash, paper and salt-based drilling mud were used as the drilling fluid and introduced into the mudpits.

In a correction to the Borehole Data Report for DOE-1 (TME 3159, 1982), the site survey revealed that no Pleistocene Gatuna Formation exists at this location. The cut slope on the east side of the pad reveals insitu red brown Triassic Santa Rosa/Dockum Group sandstone. The pad-located mudpits appear to lie directly on a porous caliche, with well developed marcopores (1-2 cm), which engulfs the Triassic sandstone. This is consistent with the depth of refusal encountered during augering for the sampling visit. The auger could not penetrate a dense red sandstone (Santa Rosa?) located at about .80 meters (2.7 feet) below the mudpit grade.

Sampling Visit. Several boreholes were colocated to retrieve the required volume of soil samples collected by the New Mexico Environment Department and Westinghouse DOE/WIPP on 10-6-92. RCRA sampling procedures and sampling analysis plans for the RFA sampling event were developed and followed. To collect the VOC and aliphatic samples, "syringes" were pressed into soil cores inplace within the auger sample head. The samples were then placed directly into 40 ml VOC vials filled with extraction fluids: methyl alcohol was used for aromatic compounds and carbon disulfide for aliphatic hydrocarbons. Colocated DOE/WIPP samples were not field extracted.

The colocated boreholes were augered to approximately .80 meters (2.7 feet) feet below mudpit grade. Appendix 4.1.18 includes a graphic log of sample horizons, NMED laboratory reports, and a qualitative comparison of NMED and colocated Westinghouse DOE/WIPP analytical results. The types of analyses and preliminary review of sample data are as follows:

- **Aromatic and Halogenated Purgeables (VOC Screen EPA 601/2)**

  A VOC sample was collected within a black and grey clay/sludge mixture at about .45 meters (1.5 feet). The State laboratory report indicates that no VOC compounds are detected above the Practical Quantitation Limit (PQL) (Method Detection Limit 245-500 ppb). As with Badger Unit and Cotton Baby, various benzene substituted aromatic compounds are detected within and below the mudpit. Two late eluting compounds in the C3 substituted benzene region (3000-4000 ppb) are detected shallow. Three late eluting compounds in the C-3 substituted benzene region (5000-7000 ppb) are reported below the mudpit liner. The dark brown clayey sand under the mudpit was porous, moist to wet, and exhibited a faint hydrocarbon smell. The sample was collected just below the liner and near insitu sandstone bedrock. Westinghouse DOE/WIPP data detected VOC concentrations in the range of 1-29 ppb, two orders of magnitude below the concentrations of the substituted benzenes (3000-7000 ppb).

- **Aliphatic Hydrocarbons (Semi-VOC Screen EPA 8015)**

  An aliphatic sample collected at .30 meters (1.0 feet) below the surface contained black and grey pockets of a hydrocarbon-like material in a heterogeneous matrix of grey fat clay and red sandy clay. Gas chromatographic analyses suggests the material contains a hydrocarbon in the range C15-C30 at 25 ppm. A sample collected just below the mudpit liner (-.64 meters/2.1 feet) in undisturbed friable sandstone exhibited a faint hydrocarbon smell. State laboratory analyses indicate the C15-C30 hydrocarbon is less than 20 ppm at this location. Although the State laboratory report concludes that the detected hydrocarbon is not diesel fuel, gasoline, or lubricating oil hydrocarbons, DOE/WIPP laboratory results inexplicably report diesel fuel concentrations of 26 ppm and 13 ppm within and below the mudpit, respectively.

- **Heavy Metals (ICAP Scan)**

  Relative to one background control soil sample collected from a dune blow-out, DOE-1 shows within the mudpit higher levels of barium (120 ppm maximum/11 ppm background), chromium (43 ppm maximum/3 ppm background), lead (20 ppm maximum/<5 ppm background), vanadium (14 ppm maximum/ 4 ppm background) and zinc (20 ppm maximum/6 ppm background). Most concentrations decrease at 0.8 meters (2.5 feet) below the liner; however, chromium, vanadium, and zinc increase to 53 ppm, 21 ppm, and 26 ppm, respectively (appendix 4.1.18).

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. A release has occurred below the bottom of the mudpit defined by the liner. The mudpits lie directly on either fractured bedrock sandstone or porous caliche engulfing the sandstone; the evidence for this interpretation is from the cut slope exposure on the well pad. Given this interpretation, about 34 meters (113 feet) of Triassic Santa Rosa Sandstone separate the underlying Dewey Lake Red Beds from the mudpit horizon: no Gatuna Formation is present.

- Groundwater - Migration potential is low to moderate relative to other locations onsite. The P-4 borehole located just 150 meters (500 feet) west of DOE-1 indicates that the Dewey Lake Formation at this location may not be water bearing. Migration to the Culebra Dolomite aquifer (252 meters/828 feet below surface) is not credible.

- Surface water - None

- Air - None

Exposure potential is low to moderate: Although the adjacent P-4 borehole suggests that DOE-1 is not underlain by a Dewey Lake saturated zone, this fact is not known with certainty. The exposure potential is moderate because the character and distribution of shallow groundwater at the northern fringe of the Dewey Lake groundwater zone may invalidate extrapolation from P-4. The exposure potential could be low because of the distance groundwater would have to migrate to the nearest resident population. There is a possibility that some deleterious constituents may be encountered in the event the site is ever overexcavated.

4.1.19 SWMU-001r (Drill Pad D-123)

Preliminary Review. No records were available on D-123 (DSP-123). Air photo review highlighted several linear patterns and discolored features as mudpits (Air Photos 1982-1985).

Visual Site Inspection. A site survey on 9-22-92 revealed DSP-123 to be a potash test hole for one of the local mining operations. The pad is covered with dune sand and accommodates a livestock watering tank. Systematic scraping of the sand cover revealed a zone of artificial fill partially underlaying the livestock tank in the middle of the pad. No liners or stained soil were evident. The only indication of fill was the apparent artificial mixture of angular fragments of redbrown and tan sandstone.

Sampling Visit. No sampling was conducted at the site; however, discussions with local potash firms indicate that KCL/NaCl drilling mud solutions are standard industry practice. Similar to other private venture potash test holes, the pads are relatively clean and well reclaimed. For the purposes of this report; however, the suite of potential mudpit contents listed in table 4.2 is considered present.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. The pad is seated directly on what appears to be fractured, red brown, sandstone bedrock (Santa Rosa?). No drilling logs are available.

- Groundwater - Migration potential is moderate relative to other locations onsite. The closest available subsurface log (H-11) indicates that the shallowest water bearing zone could be located 76 meters (220 feet) deep in the Dewey Lake Formation.

- Surface water - None

- Air - None

Exposure potential is moderate: The existence of a potentially developable groundwater resource at this end of the WIPP site, and the proximity of the mudpits to the site boundary, suggest the exposure potential could be moderate.

4.1.20 SWMU-001s (Drill Pad ERDA-9)

Preliminary Review. ERDA-9 was the first WIPP exploratory borehole. It was drilled and logged in 1976 for information on the Permian Evaporites and recompleted in 1986 as a Culebra observation well. WIPP Hydrologic Data Report #5 reports that salt-based drilling mud was used for the first 314 meters (1033 feet). The well was then deepened to 877 meters (2877 feet) using an oil-emulsion drilling mud, which included diesel fuel as a primary additive. SAND79-0270 reports a proposed "earthen emergency pit" to support the "closed mud system". A discolored rectangular zone just to the north-northwest of the well head, observed in 1982 air photos, suggests the emergency pit was used. The feature measured about 15 x 44 meters (50 x 145 feet) in area.

In 1986, ERDA-9 was flushed with about 50,000 liters of freshwater followed by 24,000 liters of a .27 mg/liter solution of MilChem-MD degreaser (Caufmann, et al. 1990). A review of June and July 1986 site air photographs suggests that the liquids introduced and flushed in 1986 may have been recirculated in tanks: no excavations or stained/wetted soils are evident.

Visual Site Inspection. The ERDA-9 well site is just outside the WIPP zone 1 fence. No surficial evidence for the location of the 1976 mudpit is evident. The rectangular discolored zone identified in air 1982 photos is now covered by the railroad embankment.

Sampling Visit. No sampling was conducted at the site. For the purposes of this report, the suite of potential mudpit contents listed in table 4.2 is considered present.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. The ERDA-9 Borehole Data Report describes 3.0 meters (10 feet) of fill and 1 meter (3.0 feet) of chalky caliche underlain by Gatuna Formation from 8.2 - 16.5 meters (27 - 54 feet) at the drill pad. Construction records from the closest geotechnical foundation borehole (B-18) suggest the friable Gatuna silty sands at the site may have a hydraulic conductivity of 7.0 x 10^{-7} m/s (SAND79-0270; TME 3059, 1980).

- Groundwater - Migration potential is low relative to other locations onsite. The Dewey Lake Formation does not exhibit prodigious groundwater flow at this location, as indicated by the H-1 borehole. Migration to the Culebra Dolomite aquifer about 270 meters (880 feet) below the surface is not credible.

- Surface water - None

- Air - None

Exposure potential is low to moderate: No pathway to the environment or public exists at this location. Nevertheless, given the potential use of unreported materials and oil emulsion liquid for drilling fluids, the exposure potential may be high to workers involved in a overexcavation of the embankment area.

4.1.21 SWMU-001t (Drill Pad IMC-374)

Preliminary Review. No substantive records were located on IMC-374. Air photo review suggested zones of stressed vegetation, but field inspection later revealed this may be related to localized grading down to the subsurface caliche (Air Photos 1982-1985).

Visual Site Inspection. The IMC-374 potash test hole was surveyed on 9-23-92. Several shoveled test pits revealed that the pad has been extensively graded and regraded since mudpit closure, acting to camouflage the location of the mudpit. A possible location is within an area of hummocky sand along the west side of the pad measuring about 4.6 x 20 meters (15 x 70 feet) (appendix 4.1.21). No liners were evident anywhere onsite; however, an area of stained soil and a used oil filter on the north side of the pad were evident.

Sampling Visit. No sampling was conducted at the site. Similar to other private venture potash test holes, the pads are relatively clean and well reclaimed. For the purposes of this report; however, the suite of potential mudpit contents listed in table 4.2 is considered present.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. The pad appears to sit directly on caliche, suggesting that the mudpit bottom may be founded in a relatively thin Pleistocene Gatuna sandstone at this location. No drilling logs are available to confirm this interpretation.

- Groundwater - Migration potential is moderate to low relative to other locations onsite. The closest available subsurface log (H-14/P-1) indicates a zone of increased permeability at 53 meters (175 feet) in the Dewey Lake Formation. The migration potential is moderate due to the inability to preclude groundwater at the site, and the possibility of hydrologic connection with the perched Dewey Lake groundwater zone on the southern and possible western borders of the site. Migration to the Culebra Dolomite aquifer, as much as 160 meters (530 feet) below the surface, is not credible.

- Surface water - None

- Air - None

Exposure potential is moderate to low: Groundwater in the Dewey Lake may occur at this location. If hydrologic connection with the Dewey Lake perched aquifer found farther south and possibly west is assumed, the exposure potential would be moderate relative to other mudpit locations onsite.

4.1.22 SWMU-001u (Drill Pad IMC-376)

Preliminary Review. No substantive records were located on IMC-376. Air photo review suggested a north-trending zone of stressed vegetation in the interior of the mupdit (Air Photos 1982-1985).

Visual Site Inspection. A survey of IMC-376 on 9-23-92 revealed it to be a relatively clean and well reclaimed drill pad. However, there is evidence for a possible mudpit remnant in the interior of the pad that lines up well with the linear zone identified in the air photos. The zone of discolored soil and youthful/sparse vegetation is identified in part in appendix 4.1.22. No liners were evident anywhere onsite.

Sampling Visit. Discussions with local potash firms indicate that KCL/NaCL drilling mud solutions are standard industry practice for potash test holes. Potash industry staff also indicate that diesel fuel additives have never been used. For the purposes of this report; however, the suite of potential mudpit contents listed in table 4.2 is considered present.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. The nearest logged borehole (H-18) suggests a thin interval of Santa Rosa sandstone separates the mudpits from the underlying Dewey Lake Formation.

- Groundwater - Migration potential is probably low relative to other locations onsite. The Dewey Lake Formation is not likely to be water bearing this far north on the WIPP site. Migration to the Culebra Dolomite aquifer (200 meters/686 feet below surface) is not credible.

- Surface water - None

- Air - None

Exposure potential is low: Low exposure potential is indicated because of the low likelihood that the Dewey Lake is water bearing and connected to potential offsite sources. However, the existence, depth and possible extent of a water bearing zone in the Dewey Lake Formation is not known at this location.

4.1.23 SWMU-001v (Drill Pad IMC-456)

Preliminary Review. No substantive records were located on IMC-456. Air photo review revealed no clear evidence for the mudpit location, except for a discolored zone on the eastern portion of the pad. This could also be attributed to grading of the pad (Air Photos 1982-1985).

Visual Site Inspection. The IMC-456 potash test hole was surveyed on 2-04-93. No liners were evident anywhere onsite, and direct evidence of the mudpit location was not found due to extensive grading for the road that cuts across the pad. Similar to other private venture potash test holes, this pad is relatively clean and well reclaimed.

Sampling Visit. For the purposes of this report, the suite of potential mudpit contents listed in table 4.2 is considered present.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. Surface debris outcropping on the pad suggest that Triassic sandstone directly underlies the pad. The IMC-456 mudpit may be founded in this formation. No drilling logs are available to confirm this interpretation.

- Groundwater - Migration potential is low relative to other locations onsite. The Dewey Lake Formation at this location is not likely to be water bearing. Migration to the Culebra Dolomite aquifer, measured at the nearest logged borehole (H-15) to be as much as 260 meters/860 feet below the surface, is not credible.

- Surface water - None

- Air - None

Exposure potential is low: IMC-456 is not located in an area of shallow ground water developable for livestock and domestic purposes. There is no vehicular access to this portion of the WIPP site as the access road has been reclaimed.

4.1.24 SWMU-001w (Drill Pad IMC-457)

Preliminary Review. No substantive records were located on IMC-457. Air photo review suggested a linear zone of anomalous vegetation in the interior of the mudpit (Air Photos 1982-1985).

Visual Site Inspection. A survey of IMC-457 on 9-22-92 revealed the pad to be built up to about .30 meters (1 foot) above the natural land grade. The only possible evidence for the mudpit is a zone of positive relief in the interior of the pad. As with the other potash test holes, there are no liners and grading has evidently eliminated most evidence. Nevertheless, at IMC-457, the zone of positive relief is correlated with discolored soils (from grading) and youthful/atypical vegetation (appendix 4.1.24).

Sampling Visit. Although KCL/NaCl drilling mud solutions are standard industry practice for potash test holes, the suite of potential mudpit contents listed in table 4.2 is considered present for migration and exposure assessments.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. The nearest logged borehole (DOE-1) 500 meters (1700 feet) west suggests a thick interval of Triassic sandstone separates the mudpits from the underlying Dewey Lake Formation.

- Groundwater - Migration potential is low to moderate relative to other locations onsite. Observations at P-4 to the west of IMC-457 suggest that the Dewey Lake Formation may not be water bearing at this location. Nevertheless, based on observations at H-3 and H-14, the distribution of saturated zones at the northern fringe of known perched groundwater in the Dewey Lake is not known with certainty. The Culebra Dolomite aquifer (DOE-1 logs suggests 252 meters/828 feet below surface) is not credible.

- Surface water - None

- Air - None

Exposure potential is low to moderate: Moderate exposure potential is indicated because of the unknown distribution of Dewey Lake groundwater at this location on the WIPP site.

4.1.25 SWMU-001x (Drill Pad WIPP-13)

Preliminary Review. WIPP-13 was drilled in late 1978 to the upper part of the Salado Formation and later deepened to 1176 meters (3,860 feet) in 1979. The borehole was later plugged in 1985 below the Culebra to create a monitoring well (Caufmann et al., 1990; D'Appolonia, 1982a; WIPP Hydrologic Report #5). Records indicate that salt based drilling fluid was used during initial drilling and a brine-gel mixture was used for later reaming and deepening of the hole in 1979 (D"Appolonia, 1982a; WIPP Hydrologic Report #5). A 8600 liter 20% concentration hydrochloric acid solution was used in 1986 to complete the well for monitoring purposes (Caufmann et al., 1990). Air photos from 1986 show no evidence for reopening of the mudpits during this time period. Air photo review does show evidence for discolored soil at the entrance to the pad from the access road.

Visual Site Inspection. A site visit on 9-29-92 confirmed the location of two adjacent rectangular depressions at the entrance to the pad and just east of the WIPP-13 well head. The mudpits are sunken approximately .45 meters (1.5 feet) below pad grade and form a mudpit complex measuring 30 x 36 meters (100 x 120 feet). No vegetation is growing on the mudpits and the soil is visibly stained dark grey locally. Black plastic liners protrude through the surface and delineate the mudpit. A livestock tank is located on the WIPP-13 drill pad.

Sampling Visit. No sampling was conducted at the site. All constituents listed in Table 4.2 are presumed present in the WIPP-13 mud pit complex. The general character of the site suggests the possibility that some materials deleterious to the environment may be present.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. The mudpit bottom probably lies near the Mescalero Caliche contact with the overlying Holocene eolian sands and soils. The caliche occurs between 1.5 and 3.7 meters (5 and 12 feet) below the surface. The Gatuna Formation occurs between 3.7 and 12 meters (12-39 feet) and Triassic Sandstone between 12 and 22 meters (39-72 feet) below the surface.

- Groundwater - Migration potential is probably low relative to other locations onsite. Drillers would have been unable to detect water in the Dewey Lake formation due to the drilling fluids used; nevertheless, the Dewey Lake Formation is less likely to contain water this far north on the WIPP site. Migration to the Culebra Dolomite aquifer (213 meters/700 feet below surface) is not credible.

- Surface water - None

- Air - None

Exposure potential is low: The likelihood is low that groundwater exists and is connected with the Dewey Lake Red Bed water resource found farther south on the WIPP site. The noticeablely darker soil and lack of vegetation within the the mudpit area suggest care should be taken to avoid direct exposure in the event the site is overexcavated.

4.1.26 SWMU-001y (Drill Pad WIPP-18)

Preliminary Review. WIPP-18 was drilled in 1978 to investigate the possibility of a fault cutting through the Rustler Formation. WIPP-18, WIPP-19, WIPP-22 and WIPP-21 were drilled to between 300 and 400 meters (1000 x 1400 feet) in depth to bracket the location and/or intercept the fault. WIPP-18 is the northernmost well pad of this set of wells. Air photo review showed evidence for a rectangular pattern on the northeast corner of the pad (Air Photos 1982-1985).

Visual Site Inspection. A site visit on 3-3-93 confirmed the location of artificial fill along the eastern margin of the pad. The mudpit, estimated to be measure about 4.6 x 15 meters (15 x 50 feet), is covered with noticeably less vegetation than the surrounding area. The location is conclusive from test pits which reveal a white plastic liner below a thin cover of dune sand (appendix 4.1.26). There was no stained soil or other evidence for any deleterious materials. A second mudpit was not identified, although the northeastern rectangular area of built up fill is not precluded.

Sampling Visit. No sampling was conducted at the site. All constituents listed in Table 4.2 are presumed present in the WIPP-18 mud pit.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. The borehole data report for this well is not available. Nevertheless, nearby logs suggest WIPP-18 mudpits may be founded near the contact between eolian sands and a 2.0 meter (7.0 feet) thick zone of Mescalero Caliche.

- Groundwater - Migration potential is low relative to other locations onsite. Although drillers would have been unable to detect water in the Dewey Lake formation due to the drilling method used, the Dewey Lake Formation is less likely to contain water this far north on the WIPP site. Migration to the Culebra Dolomite aquifer located about 230 meters (750 feet) below the surface is not credible.

- Surface water - None

- Air - None

Exposure potential is low: The likelihood is low that groundwater exists and is connected with the Dewey Lake Red Bed water resource found farther south on the WIPP site.

4.1.27 SWMU-001z (Drill Pad WIPP-19)

Preliminary Review. WIPP-19 was drilled in 1978 to investigate the possibility of a fault interpreted to pass through the Salado and Rustler Formation. WIPP-19 was drilled to about 315 meters (1034 feet). (Air Photos 1982-1985).

Visual Site Inspection. A site visit on 3-3-93 confirmed that a mudpit feature measuring approximately 6.0 x 20.0 meters (20 x 65 feet) is located on the east side of the pad. The area is just off the pad and is covered with windblown sand and stressed (wilted), youthful vegetation (appendix 4.1.27). Salt flakes occur dispersed in discontinuous pockets of clayey sand and salt gel within the mudpit. Two small circular depressions just to the south of the pad contain thin deposits of unused salt gel powder. An area of stressed vegetation near the well head is not discounted as a second mudpit remnant. In some instances, abandoned mudpits appear to store percolating rain water and support localized patches of stressed weeds on well pads.

Sampling Visit. No sampling was conducted at the site. All constituents listed in Table 4.2 are presumed present in the WIPP-19 mud pit.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. The borehole data report for this well suggests that the WIPP-19 mudpit may be founded near the contact between eolian sands and Mescalero Caliche underlying the pad. About 2.1 (7.0 feet) of caliche engulfs the upper part of the underlying Triassic sandstone, which extends to 29 meters (96 feet) below the surface.

- Groundwater - Migration potential is low relative to other locations onsite. The Dewey Lake Formation is less likely to contain water this far north on the WIPP site. Migration to the Culebra Dolomite aquifer, located about 230 meters (750 feet) below the surface, is not credible.

- Surface water - None

- Air - None

Exposure potential is low: The likelihood is low that groundwater exists and is connected with the Dewey Lake Red Bed water resource found farther south on the WIPP site.

4.1.28 SWMU-001aa (Drill Pad WIPP-21)

Preliminary Review. WIPP-21 was drilled in 1978, along with WIPP-18, WIPP-19, and WIPP-22, to investigate the possibility of a fault passing through the Salado and Rustler Formation. WIPP-21 was drilled to 318 meters (1046 feet) in depth and is located at the southeast corner of the north salt storage area. Air photo review showed evidence for a rectangular pattern on the pad (Air Photos 1982); however, extensive grading has substantially altered this area.

Visual Site Inspection. A site visit on 3-3-93 did not confirm the location of the 2 mudpits declared in the RCRA Part B Permit application. A site photograph was taken of the well pad on 3-3-93 (appendix 4.1.28).

Sampling Visit. No sampling was conducted at the site. All constituents listed in Table 4.2 are presumed present in the WIPP-21 mud pit.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. The borehole data report for this well suggests that the WIPP-21 mudpit may be founded near the contact between eolian sands and Mescalero Caliche underlying the pad. About 1.8 meter (6.0 feet) of caliche engulfs the upper part of the underlying Gatuna sandstone, which extends to 11 meters (39 feet) below the surface. An additional 10 meters (34 feet) of Triassic sandstone underlies the Gatuna.

- Groundwater - Migration potential is low relative to other locations onsite. The Dewey Lake Formation is less likely to contain water this far north on the WIPP site. Migration to the Culebra Dolomite aquifer, located about 220 meters (730 feet) below the surface, is not credible.

- Surface water - None

- Air - None

Exposure potential is low: The likelihood is low that groundwater exists and is connected with the Dewey Lake Red Bed water resource found farther south on the WIPP site.

4.1.29 SWMU-001ab (Drill Pad WIPP-22)

Preliminary Review. WIPP-22 was drilled in 1978, along with WIPP-18, WIPP-19, and WIPP-21, to investigate the possibility of a fault passing through the Salado and Rustler Formation. WIPP-22 was drilled to 440 meters (1450 feet) in depth. Air photo review showed evidence for a rectangular pattern on the southeastern corner of the pad (Air Photos 1982-1985).

Visual Site Inspection. A rectangular zone of youthful, stressed vegetation was identified on the east side of the pad on 3-3-93. A mixture of clay and sand was encountered just under a thin apron of windblown sand; no deleterious constituents were found. The single mudpit feature is estimated to measure 6.0 x 20.0 meters (20 x 65 feet). The second mudpit identified in the RCRA B Permit was not substantiated, although a zone of artificial fill on the southeastern corner of the pad cannot be discounted.

Sampling Visit. No sampling was conducted at the site. All constituents listed in Table 4.2 are presumed present in the WIPP-22 mud pit.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. The WIPP-21 mudpit is probably founded near the contact between surficial eolian sands/soils and the underlying Mescalero Caliche. About 1.8 meter (6.0 feet) of caliche engulfs the upper part of the underlying Triassic sandstone, which extends to 24 meters (81 feet) below the surface.

- Groundwater - Migration potential is low relative to other locations onsite. The Dewey Lake Formation is less likely to contain water this far north on the WIPP site. Migration to the Culebra Dolomite aquifer, located about 230 meters (740 feet) below the surface, is not credible.

- Surface water - None

- Air - None

Exposure potential is low: The likelihood is low that groundwater exists and is connected with the Dewey Lake Red Bed water resource found farther south on the WIPP site.

4.1.30 Miscellaneous Observations

Abandoned Well Pad Section 32.3. An abandoned well pad is located in section 32, quadrant 3, between H-14 and H-4. A site visit on 2-26-93 revealed no obvious well head; however, a wood frame on the north side of the pad appears to enclose a partially filled/collapsed hole. A rectangular subpad on the southeast side of the main pad may be rough graded fill; however, no stained soil or other evidence of mudpit was identified. No information was found for this well pad feature.

4.2 SWMU Group 002 - Salt and Top Soil Storage Areas

The SWMU Data Characterization Sheet compiled for the WIPP RCRA B application is presented in Table 4.3. As described in the data sheet, there are four (4) excavated fill storage areas:

- SWMU-002a: SPVD Salt Storage Pile (1981-1985)
- SWMU-002b: Salt Storage Pile (1984-Present)
- SWMU-002c: Top Soil Storage Area (1981-1985?)
- SWMU-002d: SPVD Top Soil Storage Area (1981-1982)

Based on process knowledge, both salt storage and top soil storage SWMUs are described as relatively innocuous units, containing either predominately salt or clean "top soil" fill. Process knowledge is also used to declare that no hazardous waste or hazardous constituents exist or have been released at any of the storage sites. Trace amounts of miscellaneous petroleum products; however, are acknowledged at salt storage areas. Appendix 4.2 includes a 1991 air photo of the four rock and soil storage units.

Verification for this RFA study relies on a review of documents and procedures, 1982-1991 air photos, and site inspections. The only guidance document found concerning past, present and future management of the salt and top soil storage piles is the WIPP Final Environmental Impact Statement (1980; DOE/EIS - 0026). That document describes using one salt pile as backfill for the disposal rooms (SMWU-002a), and implies using the active salt-storage pile to the north of the facility (SWMU-002b) to fill portions of the shafts during decommissioning of the facility. It is uncertain whether the two "top-soil storage areas" will be reseeded to return the sites to their natural condition. In any case, background review finds no WIPP procedures or guidelines to support process knowledge, such as the screening procedure used to exclude hazardous materials from landfills (see section 4.3).

4.2.1 SWMU-002a ("SPVD" Salt Storage Pile)

Preliminary Review. The following information is surmised from a review of old air photos and plans described in DOE/EIS-0026 (1980). SWMU 002a appears to have received mined rock from the excavation of the waste handling, salt, and exhaust shafts, as well as excavated salt from the main drifts and experimental area in the repository horizon. The pile contains up to 340,000 tons of "claystone, anhydrite and salt" (DOE/EIS-0026, 1980). In a correction to the RCRA B application (table 4.3), air photo review suggests that SWMU-002a (SPVD Salt Pile) became inactive between June and December, 1985, coincident with the completion of the exhaust shaft.

Visual Site Inspection. A visual site survey on 2-26-93 identified abundant polyethylene plastic liners protruding from the salt pile (appendix 4.2.1). No stained rock or soil occurs on the surface or within the berms surrounding the site. An inspection of open cavities eroded into the pile revealed only construction debris (ie. waste concrete, concrete slabs, decomposing steel and rebar etc.)
Sampling Visit. No sampling was conducted at the site.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. Soluble salts and constituents leached from the rock and construction debris probably occur in native soil underlying the unit. Isopach maps of the site indicate that perhaps up to 6.0 meters (20 feet) of Gatuna formation and 30 meters (100 feet) of Triassic sandstone underlie storage pile SWMU-002a. The thickness of caliche at this location is probably about 1.0 meter (3.0 feet).

- Groundwater - Migration potential is low. The Dewey Lake Formation is less likely to contain water this far north on the WIPP site. Migration to the Culebra Dolomite aquifer, located about 236 meters (775 feet) below the surface, is not credible.

Table 4.3: WIPP SWMU Characterization Sheet - 002
Salt and Top Soil Storage Areas

002	SALT AND TOP SOIL STORAGE AREAS
Unit Type:	Storage Areas
Unit Use:	Storage
Operational Status:	Active
Use Period:	1981-present
Materials Managed:	Solid Waste
Hazardous Release:	None
Radioactive Release:	None
Information source(s):	Process knowledge Annual aerial photos Westinghouse, 1984

Unit Description

Refer to Figure for location. Two areas have been used for salt storage at the WIPP facility. The older area (002-a), located due east of Zone I, was active during the early excavation phases of the underground, starting in 1981. This area holds about 155,000 cubic yards of salt and covers about 7 acres. It was used until the main salt storage area (002-b) became active in April, 1984. This salt storage area, located north of Zone I, is still active, contains about 402,000 cubic yards of salt, and covers about 15 acres. Berms and a holding pond are used to control run-off from the main salt storage area, but just a berm is used for the older area.

Two other areas have been used to store top soil from the WIPP facility. The first area (002-c), first used in 1981, was located 470 feet due east of the Salt Handling Shaft and covered approximately three acres. Most of this stockpile has been covered by the expansion of Zone I; the east end of it is still visible at the eastern boundary of Zone I. A second area (002-d), located on the east side of SWMU No. 002-a, has been used since 1981 to store the top soil removed to clear the salt pile location. It covers about 3.1 acres.

Waste Description

Based on process knowledge, material stored at the salt storage sites is primarily salt with trace amounts of hydraulic oil, motor oil, diesel, and scrap steel. The impurities in the salt are from the heavy equipment used for excavation of the repository and transport of the salt to the salt pile. Material stored at the top soil storage areas is only top soil.

Release Information

Releases of RCRA hazardous waste or hazardous constituents have not occurred at these sites. There is an area of vegetation kill along the outer edge of the berm near the older salt storage area that appears to have been caused by the salt. The maximum extent of the vegetation kill was an area of approximately 50 feet by 100 feet. The vegetation kill area is decreasing in size as it recovers.

(after WIPP RCRA Part B Permit DOE/WIPP 91-005)

- Surface water - None

- Air - None

Exposure potential is low: Without photographic or procedural documentation during the active period of this unit (1981-1985), there exists the possibility that "trace amounts" of potentially hazardous constituents were placed in SWMU-002a along with construction debris. Nevertheless, exposure likelihood is low through the groundwater pathway, although exposure may occur in the event the site is ever overexcavated.

4.2.2 SWMU-002b (Salt Storage Pile)

Preliminary Review. The active salt pile to the north of the facility (SWMU 002b) is to contain primarily salt excavated during mining of the repository horizon (DOE/EIS-0026, 1980). A review of air photos and excavation history suggests that the southwest quadrant of SWMU-002b was the first section to receive salt fill in 1984. Between 1984 and December 1986, the western 2/3 of the unit received excavated salt from the repository horizon. Air photos suggest that the eastern 1/3 of the unit began to receive fill by July, 1988. The occurrence of Rustler and Dewey Lake rocks in this section support the presumption that fill excavated from the AIS exists in SWMU 002b. A slurry and rock mixture also appears on this eastern section in the 1988 air photo, which is consistent with a rock slurry reportedly produced during boring of the Air Intake Shaft (AIS).

Visual Site Inspection. The following objects were documented during the visual site survey on 2-26-93: wood, batteries for miners lights, gloves, fabric liner, plastic 5 gallon cans and other solid waste from the excavation and maintenance of shafts (ie. decomposing roof bolts, steel rebar, fence). As with SWMU-002a, it is not possible to estimate the amount of solid waste by visual observation. Based on surface evidence, the percentage is small. No stained rock or fill was observed on the surface or within the berms surrounding the site (appendix 4.2.2).

Sampling Visit. No sampling was conducted at the site.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. Soluble salts and other constituents have probably leached to underlying soils. The caliche cap in this area is about 1.8 meters (6.0 feet) thick. The WIPP-21 well, located immediately adjacent to SWMU-002b, suggests that about 24 meters (81 feet) of Triassic sandstone exist below the storage pile.

- Groundwater - Migration potential is low. The Dewey Lake Formation is less likely to contain water this far north on the WIPP site. Migration to the Culebra Dolomite aquifer, located about 230 meters (740 feet) below the surface, is not credible.

- Surface water - None

- Air - None

Exposure potential is low: Because there has been no procedure to screen potentially hazardous substances from SWMU 002b, trace amounts of such constituents are not precluded. Nevertheless, it is believed that only a small amount of potentially hazardous constituents may contaminate the salt and solid waste. In any case, the groundwater exposure potential is low due to the lack of groundwater in the Dewey Lake Formation.

4.2.3 SWMU-002c (Top Soil Storage Area)

Preliminary Review. No information is found to verify information on SWMU-002c adjacent to the Zone 1 Facility Boundary (appendix 4.2). Air photo review suggests the site has been undisturbed since June 1985.

Visual Site Inspection. A visual site survey on 2-26-93 revealed a notable occurrence of polyethylene plastic liners protruding from the top soil storage area (appendix 4.2.3). Other solid waste was also present in this older soil storage area: waste concrete, concrete slabs and decomposing rebar. No stained soil or fill was evident.

Sampling Visit. No sampling was conducted at the site.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high, as soluble constituents could leach to underlying soils. Isopach maps of the site indicate that about 1.0 meter (3.0 feet) of caliche, 4.6 meters (15 feet) of Gatuna Formation and 30 meters (100 feet) of Triassic sandstone underlie top soil storage SWMU-002c.

- Groundwater - Migration potential is low. The Dewey Lake Formation does not contain groundwater this far north on the WIPP site. Migration to the Culebra Dolomite aquifer, located about 220 meters (730 feet) below the surface, is not credible.

- Surface water - None

- Air - None

Exposure potential is low: SWMU-002c contains a fair amount of solid waste, not just top soil, as indicated in the RCRA Part B Application. As the solid waste observed during the RFA was not allowed in this unit, it is reasonable to suggest that trace amounts of undocumented and potentially hazardous constituents were also introduced along with the construction debris. Nevertheless, exposure potential by way of groundwater is low. Exposure potential by direct contact is a possibility only if the site is excavated.

4.2.4 SWMU-002d (Top Soil Storage Area - "SPVD" Soil)

Preliminary Review. No information on this unit was found, other than that provided in the RCRA Part B Application. Air photos as early as November, 1982 show no significant alteration or addition to SWMU-002d.

Visual Site Inspection. No construction debris was evident during the survey conducted on 3-26-93. The site appears as a clean, natural dune complex (appendix 4.2.4).

Sampling Visit. No sampling was conducted at the site.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is low.

- Groundwater - Migration potential is low.

- Surface water - None

- Air - None

Exposure potential is low: There is no evidence of any construction debris. The lack of any visible construction debris suggests that potentially hazardous constituents were not introduced into this unit. Even if a RCRA release is assumed, exposure potential would be low, as there is no shallow groundwater in this area of the site.

4.3 SWMU Group 003 - Landfills

The Landfill SWMU Data Characterization Sheet from the WIPP RCRA B application is presented in Table 4.4. Process knowledge and aerial photos are used to document that no releases of hazardous waste or hazardous constituents have occurred at either of the two landfill locations. As part of the RFA visual site inspection, photographs of these two locations are included in appendix 4.3. The locations include:

1) SWMU-003a, the Brinderson landfill located in the northeast and northwest corners of sections 32 and 33, and

2) SWMU-003b, consisting of an active and inactive landfill.

To verify the unit description for the RFA preliminary review, staff rely primarily on procedures and 1982-1991 air photos. A DOE/WIPP landfill operations procedure WP 06-108 "Construction Landfill Operations" (11/91 Revision 1) is implemented to screen and exclude hazardous or regulated materials from the active landfill. Prohibited materials include petroleum products, heavy metals (lead), soils or other solids contaminated with hazardous materials, liquid waste, and containers previously holding hazardous materials. The landfill operations procedure was first implemented on 11/88, administered under DOE/WIPP procedure WP 02-503 (now vacated). Another relevant DOE/WIPP procedure, WP 02-5 "NonRadioactive Hazardous Materials Environmental Compliance Manual", was implemented in 2/92. Appendix 4.2 shows the location of the two landfills in a 1991 aerial photograph. Appendix 4.6 contains an enlarged air photograph showing the condition of the SWMU-003b landfill in November, 1983.

4.3.1 SWMU-003a Brinderson Landfill

Preliminary Review. Air photo review indicates at least two phases of cut and fill activity on the Brinderson landfill since 1982. Earliest air photos of the site from November, 1982 reveal an elongate pit opened in the central portion of the landfill. The excavation measures about 90 x 60 meters (300 x 200 feet), the long axis of which opens to the northeast. Air photos suggest this area of the landfill was closed by late 1985. Because the holding pond for the Waste Handling Building was excavated by June, 1985, drilling mud materials could have been disposed of in this unit. However, air photos do not confirm this presumption, and the inactive landfill unit at SWMU-003b may also have received fill from overexcavation of the handling facility.

Air photos suggest that a second smaller pit on the east side of the complex became active by late 1985. A significant increase in the size of the second excavation is evident in a 12/86 air photograph (90 x 60 meters/300 x 200 feet). The entire site appears completely regraded by June 1987 and revegetation from seeding is apparent by 1989. Air photos from 1992 suggest the area around the first excavation may have less vegetation than the surrounding landfill area.

Visual Site Inspection. Surface exposures of the Brinderson landfill (2-26-93) reveal a sparsely vegetated land surface dotted with occasional, scattered construction debris (appendix 4.3). Mostly grasses and a few honey mesquite and shinnery oak shrubs are apparent, but much less than the surrounding landscape. The construction debris includes plastic buckets, concrete slabs, metal paint cans, electrical wiring, wood and steel rebar. No stained soil or other evidence of materials potentially deleterious to the environment are directly evident.

Sampling Visit. No sampling was conducted at the site.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. The Gatuna Formation is apparently absent based on isopach maps compiled by Griswold (1977). Based on this review, a release to the underlying bedrock of trace amounts of materials harmful to the environment is not precluded. Procedures to screen hazardous materials were not in place until 1988, well after SWMU 003a was closed.

Table 4.4 WIPP SWMU Characterization Sheet - 003 Landfills

003	LANDFILLS
Unit type:	Landfill
Unit use:	Disposal
Operational status:	Active
Use period:	1976-present
Materials managed:	Solid Waste
Hazardous release:	None
Radioactive release:	None
Information source(s):	Annual aerial photos DOE, 1988 Flynn, 1989 Westinghouse, 1991a

__Unit Description__

Refer to Figure J-1 for location. Two areas have been used as landfills at the WIPP facility. The older location, called the Brinderson Landfill (003-a), is located 1 mile due south of Zone I. Prior to use as a landfill, the area was used as a quarry for road bed materials. It was an active landfill from 1976 to January 1988 and covers about 4 acres. The closure of the Brinderson Landfill was approved by the U.S. Department of Interior, Bureau of Land Management (BLM). Since it was closed, the Brinderson Landfill has been covered over and reseeded. The new landfill (003-b) is located 1/2 mile south of Zone I. The new construction landfill is actually two landfills. One, to the south of the current one, was excavated on BLM land and operated under a BLM permit until 1989. It was closed at the request of the BLM and a new landfill was opened on land designated by the BLM as part of the DOE Exclusive Use Area in Public Land Order 6403. Ground was first broken for the new landfill area in November, 1982; it is still active and covers about 15 acres. All necessary permits were obtained from the BLM for both landfills.

__Waste Description__

Both of the landfills have been used to bury construction debris consisting of foundation excavation soils, waste concrete, scrap wood, and metal. In addition, it has been reported that small amounts of non-construction debris (most likely office wastes) were dumped in the Brinderson Landfill. No asbestos materials are known to have been disposed of in the landfills. Administrative controls in WP 02-5, Nonradioactive Hazardous Materials Environmental Compliance Manual, prohibit the disposal of RCRA hazardous waste or hazardous constituents in the construction landfill (Westinghouse, 1991a).

__Release Information__

Releases of RCRA hazardous waste or hazardous constituents have not occurred at these sites.

(after WIPP RCRA Part B Permit DOE/WIPP 91-005)

- Groundwater - Migration potential is moderate. Triassic sandstone occurs shallow, underlain by the Dewey Lake Red Beds about 12 meters (40 feet) below the surface (Griswold, 1977). Because there is no information precluding the existence of groundwater at this location on the WIPP site, it is conceivable that perched water may exist and is connected with perched Dewey Lake groundwater found on the southern perimeter of the WIPP site. Migration to the Culebra Dolomite aquifer, located about 200 meters (670 feet) below the surface, is not credible.

- Surface water - None

- Air - None

Exposure potential is low to moderate: The considerable distance to the WIPP perimeter (1.4 km/.90 miles) suggests that the likelihood of exposure by the groundwater pathway is probably low. Nevertheless, hydrologic characteristics of the Dewey Lake Formation at this location are uncertain. The underlying caliche has also been extensively disturbed, and undocumented materials have been introduced into both excavations. Staff believe these factors indicate a moderate exposure potential for SWMU-003a.

4.3.2 SWMU-003b New Landfill (Active and Inactive Units)

Preliminary Review. As stated in the RCRA Part B application, the SWMU-003b landfill is composed of two landfills. The currently active landfill is north of the inactive unit and within the DOE Exclusive Use Area (see appendix 4.2). The inactive southern area of the site, operated under BLM Permit outside the DOE exclusive-use area, shows the earliest evidence of landfill activity in June, 1985 aerial photographs. Several rows of discarded piles of soil and/or debris are also apparent in 1985 air photos immediately east of the currently active landfill. This older area (approximately 9.0 x 60 meters/ 30 x 200 feet), located within the exclusive-use area on the north side of the landfill, appears completely graded by 1989. The currently active L-shaped excavation on the north side of the landfill is first apparent in late 1990 air photos.

By June 1986, the inactive unit on the southern perimeter is characterized by a large rectangular pit, measuring approximately 150 meters (500 feet) long and 60 meters (200 feet) wide (6-10-86 air photos). The excavated pit is filled with what appears to be a grey slurry/mud mixture, perhaps drilling mud overexcavated for construction of the Waste Handling Building. A second excavation measuring 60 x 30 meters (200 x 100 feet) appears in the inactive landfill in 1989. Because the Salt Handling hold pond (SWMU-006a) was excavated in 1989, drilling mud from that unit may have been disposed of in this second excavation. The inactive landfill site appears fully closed in 1990 (appendix 4.3). Current 1993 DOE/WIPP plans are to reclaim the southern half of the landfill using land treatment and revegetation techniques.

Visual Site Inspection. Photographs were taken of the active and inactive landfill areas on 3-1-93 and 5-19-93. The inactive landfill is graded level up to 1 meter (3.0 feet) above grade of the surrounding area (appendix 4.3.2). A 2:1 fill slope bounds portions of the southwest-facing side of the inactive unit. Many fragments of fibrous polyethylene liner protrude through the land surface. The graded surface is without vegetation and erosion of the fill slope is evident in a 1991 air photo (appendix 4.2).

Construction debris observed at the active landfill includes excavated soil, file cabinets, concrete slabs, wood and steel rebar and empty 55-gallon drums. No stained soil or other evidence of materials potentially deleterious to the environment are evident in the open pit (appendix 4.3.2).

Sampling Visit. No sampling was conducted at the site.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high for the inactive landfill, and low for the active landfill. Procedures to screen hazardous materials were not in place at WIPP until 1988, several years after operations commenced at the inactive landfill at SWMU-003b. In addition, the older landfill may have received large quantities of drilling mud from the shaft holding ponds. RFA sampling of other borehole mudpits suggests trace amounts of suspect materials harmful to the environment (e.g. organics and heavy metals) may be present in drilling fluids (appendices 4.1.16 - 4.1.18). A release of potentially hazardous constituents to the underlying Dewey Lake bedrock, which would involve migration through 7.0 meters (22 feet) of eolian soils and Quaternary deposits, cannot be precluded.

- Groundwater - Migration potential is low to moderate. As indicated by groundwater borehole H-3d, located 200 meters (650 feet) to the south, the Dewey Lake Formation at this location contains measurable groundwater. Detail such as the rate of flow is not known; however, the general trend is for unsaturated conditions closer to the WIPP site. Migration to the Culebra Dolomite aquifer approximately 205 meters (670 feet) below surface is unlikely.

- Surface water - None

- Air - None

Exposure potential is low to moderate: The considerable distance to the WIPP perimeter (2.3 km/1.5 miles) suggests that the groundwater exposure likelihood is probably low, even considering the possibility of detectable flow in the Dewey Lake. In any case, undocumented materials and drilling mud were placed in the inactive landfill. The possibility of potentially hazardous constituents in the inactive landfill suggests a low to moderate exposure potential. Certainly, direct exposure is more probable in the event the site is ever overexcavated.

4.4 SWMU Group 004 - Storage Yards and Portacamp

As summarized in Table 4.5, there are three WIPP storage yards: the Portacamp Storage Yard (two units), Reclaimable Storage Yard, and the Grout Storage Yard. The yards have routinely been used to accumulate recyclable or reclaimable materials, maintenance equipment and materials, construction materials, and waste water contaminated with motor oil, hydraulic oil, and diesel fuel. All units were operational prior to the 1991 implementation of DOE/WIPP Procedures WP 02-6 and WP 02-7 (RCRA Compliance): SWMU 004a (active-1976), SWMU 004b (active-1987), and SWMU 004c (active-1987). Based on this review, process knowledge remains the sole supporting evidence for remediation of any spills that have occurred at these sites. No verification of sampling claimed in the RCRA Part B Application was conducted.

The Visual Site Inspection (VSI) and photographs were courtesy and support of the WIPP. The Visual Site Inspection occurred on March 25, 1993 with representatives of Westinghouse and Sandia National Laboratory present and with their assistance.

4.4.1 SWMU No. 004-a, Portacamp Storage Yard

Preliminary Review. The Portacamp Storage Yard consists of two separately managed units: Eastside by Sandia National Laboratory and Westside by Westinghouse. Security consists of an eight-feet high chain link fence which surrounds the 300 feet X 300 feet storage yard complex. An interior fence separates the two yards. Entry to the East compound is by drive through lockable gates on the North end. Entry to the West compound is by drive through lockable gates on the southwest corner. Both compounds are secured with a padlock and chain. In addition, security personnel conduct regular surveillance of the areas.

Hazardous and nonhazardous wastes have been managed continuously at this location since 1976. Administration of RCRA compliance procedures (WP 02-6 and WP 02-7) began at both yards in 1991. DOE/WIPP Procedure WP-502 (1992) states that nonregulated used oil will be routinely transferred to the westside portacamp for shipment offsite for recycling. If a generator or other party suspect that used oil contains one or more hazardous constituents (40 CFR 261, Subpart D), the drums are transferred to the Hazardous Waste Staging Area located in building 474-B (SWMU 008-l). Vehicle wash bay sludge contaminated with motor oil, hydraulic oil, and diesel fuel are currently prohibited from either portacamp. Previous sampling of the sludge detected elevated levels of cadmium. Listed below are potentially hazardous wastes historically stored in the portacamp:

- Used hydraulic oil - (55 gallon drums)
- Used motor oil - (55 gallon drums)
- Used glycol based oils - (55 gallon drums)
- Used antifreeze - (55 gallon drums)
- Discontinued oils - (55 gallon drums)

Visual Site Inspection. Refer to Appendix 4.4.1 for photographic documentation of the unit. The entire surface of this unit is covered by a compacted caliche base material. Specific observations for each side of the Portacamp follow.

- West side of Portacamp (Westinghouse) - The westside contains a 100 feet X 20 feet, open-sided, sheet metal-roofed shed 14 feet high located in the southwest corner of the compound. Stored beneath this shed are unused HEPA filters, new hazardous waste handling containers, operational and maintenance equipment, and an electric

Table 4.5 WIPP SWMU Characterization Sheet - 004
Storage Yards

004	STORAGE YARDS
Unit type:	Storage Areas
Unit use:	Storage
Operational status:	Active
Use period:	1976-present
Materials managed:	Solid Waste Hazardous Waste Oils
Hazardous release:	Potential
Radioactive release:	None
Information source(s):	Process knowledge Annual aerial photos Sampling/laboratory analysis data Westinghouse, 1992a

<u>Unit Description</u>

Refer to Figure J-1 for location. Two areas outside of Zone I are presently used for storage. One storage yard, the portacamp (004-a), is located about 1,000 feet southeast of Zone I. The yard is used to store construction and maintenance materials, including approximately 100 drums of virgin petroleum products, and as temporary storage for wastewater and waste oils awaiting laboratory analysis. The waste oils are recycled if free of hazardous contamination. The area is approximately 2 acres in extent and has been active since 1976. The other area, the reclaimables yard (004-b), is located 1/2 mile due south of Zone I, just east of the new landfill (SWMU No. 003-b). The yard is about 1/2 acre in extent and is used as temporary storage for materials that can be recycled or reclaimed. It has been in use since February, 1987.

<u>Waste Description</u>

The wastes stored at the portacamp are water contaminated with motor oil, hydraulic oil, and diesel fuel from the vehicle wash bays; used hydraulic oil; used motor oil; glycol-based oils; used antifreeze; and discontinued oils. In 1987, the excess chemical grout from grouting the Exhaust Shaft and the Waste Handling Shaft was stored in this yard prior to being shipped off site for disposal as hazardous waste.

The materials in the reclaimables yard consist of used batteries, empty 55-gallon drums, and scrap metal. Some of the 55-gallon drums are used for fork-truck practice and are filled with caliche or lead pellets.

<u>Release Information</u>

There have been no releases of RCRA hazardous waste or hazardous constituents from either area; however, small areas of stained soil under the pallets where the virgin petroleum products are stored indicate there have been minor releases of oil and petroleum products (non-RCRA regulated materials) from the drums. Any releases from the area used for staging wastewater and waste oils are remediated as per the applicable WIPP facility procedure. Materials collected from the remediation activities are managed in accordance with procedures in WP 02-6 and 02-7 (Westinghouse, 1992a).

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transformer substation. Storage of construction and maintenance materials is the primary use of the southern part of the yard; sheet steel stock, pipe, and labeled 55 gallon drums of sand are evident. The north central area is used as a holding area for nonhazardous waste water and nonregulated oils awaiting appropriate disposal or reclamation contingent upon sampling analytical results, if deemed necessary. Four barrels of oil, labeled nonhazardous, were present the day of the VSI. Labeled nonhazardous waste drums are stored on wooden pallets, which sit directly on the caliche pad. A 18 foot X 20 foot portable building is in the northeast corner of the compound and is used to store various operational stock materials and spill response kits. A dilapidated portable trailer located in the east central portion, contains only a small quantity of trash, none of which appeared hazardous. The visual site inspection revealed surficial discoloration of the caliche pad in and around the nonhazardous waste drum storage area, but the stained areas are not extensive. No evidence for current storage of hazardous waste or hazardous materials are found in this area of the portacamp. Refer to Appendix 4.4.1 for photographic documentation.

- East side of Portacamp (Sandia National Laboratory) - The eastside contains water well drilling materials and supplies, office equipment, six air conditioning refrigeration units, electric cable, and other construction and maintenance supplies used to support Sandia's activities. Next to the drive through gate at the North end are a series of buildings that contain various electrical equipment and supplies as well as laboratory equipment. One potential issue observed during the visual site inspection was a styrofoam box containing 1 gallon of concentrated nitric acid and 3 quarts of concentrated hydrochloric acid. The containers appeared to be in the original unopened shipping boxes. No other instances of potentially inappropriate storage of hazardous materials was observed. Likewise, no visual evidence of a release of hazardous substances was observed in the buildings or on the caliche pad.

Sampling Visit. - No sampling was conducted at this site.

Release and Exposure Assessment.

- Soils - Release potential is high on the Westinghouse portion of the portacamp. Because there is evidence of discoloration, a release of hazardous substances into the soil cannot be precluded. The caliche is partially removed at this location, and the original thickness is on the order of .30-.60 meters (1-2 feet). If past spills have not been voluminous, any release may tend to accumulate in the caliche. However, the caliche unit in this area may also be locally thin, fractured and/or porous which would allow some downward percolation below the unit.

- Groundwater - Release and migration potential is low. Although the site is about 780 meters (2550 feet) north of wel H-3d, which exhibits a water level at around 90 meters (300 feet) below the surface in the Dewey Lake, the formation is less likely to contain flowing groundwater at this location. Migration to the Culebra Dolomite aquifer about 270 meters (880 feet) below the surface is not credible.

- Surface Water - None

- Air - None

Exposure potential is low to moderate: Notwithstanding evidence for past releases at this location, no credible groundwater pathway exists for exposure. If the site is overexcavated, site workers may potentially be directly exposed or exposed by inhalation of contaminated dust. Future routine exposure is unlikely, given Site-Generated Hazardous Waste/Materials training and RCRA compliance procedures.

4.4.2 SWMU No. 004-b, Reclaimables Storage Yard

Preliminary Review. Records and aerial photographs confirm that this unit was constructed and came into use in February of 1987. The area is covered with a compacted caliche base and is surrounded by an eight-feet high chainlink fence with a drive through lockable gate on the east side. It covers about ½ acre and is used to store reclaimable metals (iron, steel, aluminum, and copper); excess site office equipment, furniture, and computers; old electric carts; and automotive-size spent batteries. The metals, batteries, and carts (with eight batteries each) are stored outside and the other items are stored inside five portable metal buildings (CONEXs).

Visual Site Inspection. The visual survey identified 26 used electric carts (containing batteries), an electric air compressor, 40 to 50 3-feet by 3-feet square styrofoam blocks, eight bags of concrete on a wooden pallet covered with a poly tarp, and 16 used automotive batteries stored on a wooden pallet with no containment controls. A sealed plastic gallon jug of cleaner containing EDTA is also present, awaiting disposal, as it is banned within the Zone 1 Boundary. The area is secured with a chain and padlock at all times and is routinely surveyed by security personnel. There are no visual indications of past releases of hazardous substances. The spent sulfuric acid-containing batteries, however, represent a source for a potential future release to the environment. In general, the site survey suggests poor housekeeping and potentially improper segregation of recyclable or reclaimable metals and materials.

Sampling Visit. No sampling was conducted.

Release and Exposure Assessment.

- Soils - Release potential is low.

- Groundwater - Release to and migration by way of groundwater is low to moderate. The reclaimable yard is 200 meters (650 feet) north of the nearest borehole containing shallow groundwater (H-3), where groundwater occurs relatively deep and is characterized by negligible flow. Migration to the Culebra Dolomite aquifer about 270 meters (880 feet) below the surface would not be credible.

- Surface Water - None

- Air - Release potential is low; however, acid-type batteries do produce gas.

Exposure potential is low: Given the yards' use as a warehouse to store hazardous materials until disposal (sulfuric acid-batteries), a release and exposure potential exists. There is, however, no evidence of a past release and properly implemented management practices and procedures decrease the likelihood of a future release. Site safety procedures require proper Personal Protective Equipment for activities involving potential direct exposure to acid or inhalation of produced gases.

4.4.3 SWMU No. 004-c, Grout Storage Yard

Preliminary Review. This unit is located due North of the Reclaimables Yard (SWMU No. 004-b) and covers approximately 1 acre. Its primary use since 1987 has been for storage of grout materials and grouting equipment (Table 4.5).

Visual Site Inspection. Evident in the photographs of appendix 4.4.3 are grouting equipment and supplies, three 250 barrel steel tanks, and 20 white 55-gallon drums of sand used for waste handling practice. The soils showed no evidence of discoloration indicating past releases. The stored grout is cementatious and alkaline in nature. Material Safety Data Sheets indicate the grout to be nonhazardous.

Sampling Visit. No sampling was conducted at this location.

Release and Exposure Assessment.

- Soils - Release potential to the soil is low.

- Groundwater - Release potential to the groundwater is low as there is no evidence of a release within this unit.

- Surface Water - None

- Air - None

Exposure potential is extremely low to nonexistent: The type of grout being managed and stored is not considered hazardous and there is no evidence a past release has occurred. This suggests that the exposure potential is minimal to nonexistent.

4.5 SWMU Group 005 - Concrete Batch Plants

Three locations have been used as temporary operating areas for Concrete Batch Plants from 1984 - 1989. According to Table 4.6, waste generated consisted of small amounts of spilled concrete and possibly trace amounts of motor oil, grease, and hydraulic fluid from the machinery. Although trace amounts of substances listed above were presumably released during normal operations, most releases consisted of nonhazardous mixes of water, concrete, sand, and gravel.

4.5.1 SWMU No. 005-a, Concrete Batch Plant (WHB)

Preliminary Review. This unit was active from early 1984 to December, 1984. An aerial photograph of the WIPP Site indicates the presence of the plant, however, no further information is available.

Visual Site Inspection. The Waste Handling Building and asphalt pavement now cover the location and a VSI is not possible.

Sampling Visit. No sampling was conducted.

Release and Exposure Assessment.

- Soils - Release potential is high.
- Groundwater - Migration potential is low. The area is now sealed over with concrete and asphalt preventing surface infiltration of rain water.
- Surface Water - None
- Air - None

Exposure potential is extremely low to nonexistent.

4.5.2 SWMU No. 005-b, Concrete Batch Plant

Preliminary Review. This plant was operated from late 1988 to early 1989. Located due west of the main salt storage area (SWMU 002-b) and evaporation pond (SWMU 007-c), the plant covered approximately 2 acres. Small amounts of mixed concrete, gravel, sand, cement contaminated waste water and trace amounts of lubricants and diesel fuel were released into the soil.

Visual Site Inspection. Small quantities of mixing sand and gravel are visible on the surface as well as small pieces of concrete. The site can be delineated by the reclamation vegetation and the anti-erosional furrows in the surface. Runoff will be conducted South to the entrance road embankment then East to the main salt storage pile evaporation pond (SWMU -007-c). The vegetation shows reclamation of the site to be successful.

Sampling Visit. Unnecessary.

Release and Exposure Assessment.

- Soil - Release to the soil has occurred, however, no evidence of trace amounts of petroleum or concrete mixing waste remains. Vigorous vegetation growth suggests the absence of deleterious substances.
- Groundwater - Release potential to the groundwater is low due to the absence of saturated zones in the of Dewey Lake Formation at this location. Migration to the Culebra formation is not credible.

Table 4.6 WIPP SWMU Characterization Sheet - 005
Concrete Batch Plants

005	CONCRETE BATCH PLANTS
Unit type:	Concrete Batch Plants
Unit use:	Storage/Production
Operational status:	Decomissioned
Use period:	1984-1989
Materials managed:	Solid Waste
Hazardous release:	None
Radioactive release:	None
Information source(s):	Process knowledge Annual aerial photos

Unit Description

Refer to Figure J-1 for location. Three areas at the WIPP facility have been used as temporary locations for cement batch plants. The first area (005-a) was located in the southeast corner of Zone I where the Waste Handling Building is now located. It was active from early 1984 to December, 1984. The second area (005-b) was located just west of Zone I and the main salt storage area (SWMU No. 002-b) and the evaporation pond (SWMU No. 007-c). It covers about 2 acres and was active from late 1988 to early 1989. Since the plant has been removed from this location the area has been reclaimed. The south of Zone I, next to the drill pad for well H-1 (SWMU No. 001-a). It covers about 5 acres, was active from January, 1985 to early 1987, and is currently used as an aggregate storage area.

Waste Description

Releases of RCRA hazardous waste or hazardous constituents have not occured at these sites. The waste consists of small amounts of spilled concrete and possibly trace amounts of motor oil and grease that leaked from the trucks and equipment.

Release Information

The only releases from these sites consist of spillage that occurred during filling of the trucks and stockpiling materials. The material released was water mixed with concrete, sand, and gravel and is considered nonhazardous. In addition, trace amounts of non-RCRA regulated motor oil, grease, and diesel may have leaked from the trucks during loading.

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- Surface Water - None.

- Air - None.

Exposure potential is extremely low to nonexistent.

4.5.3 SWMU No. 005-c, Concrete Batch Plant

Preliminary Review. This plant consisted of the machinery and sand and gravel stockpiles, and covered about 5 acres. It is located adjacent to the drill pad for well H-1, 800 feet due South of the Zone 1 fence. The facility was in operation from January, 1985 to early 1987. It is now being used to store road quality aggregate and junk automobiles used during site emergency response drills. Waste managed consisted of small amounts of spilled concrete, waste water containing concrete, and oils and greases from the vehicles and machinery.

Visual Site Inspection. The plant appears to have been located in the southwest corner near H-1, as there is evidence of spilled concrete and mixing sand and gravel covering the surface. A search for oily or otherwise contaminated soil revealed no evidence. Encroachment of Harvard shinnery oak is occurring on the southern end separating the H-1 hydropad and the northern area used for aggregate storage. Large concrete fragments are piled in the southwest corner and some asphalt paving occurs on the southeast corner. The northern 2/3 of the unit is used to store pea gravel, cold mix asphalt coated pea gravel, top soil, mixing gravel, and road base material. Historically and from time to time, this area is used by construction and maintenance contractors as a base of operation. An empty diesel labeled fuel tank and a 55 gallon drum of motor oil were located south, inside a 10 ml plastic lined 4 feet high bermed area with proper signage. The diesel tank was empty. All areas of the unit were searched for evidences of hazardous substance releases, but none were found. Generally, the unit is orderly and well maintained.

Sampling Visit. No sampling was conducted within this unit.

Release and Exposure Assessment.

- Soil - Release potential is high. Any staining of the plant pad is likely concentrated in the caliche.

- Groundwater - Release potential is low. The wastes generated at this site have been cleaned up. A release into the Dewey Lake formation is not probable at this location.

- Surface Water - None.

- Air - None.

Exposure potential is extremely low to nonexistent.

4.6 SWMU Group 006 - Salt and Waste Shaft Holding Ponds

This section verifies the history and management of the ponds used to store drilling fluids during the excavation of the waste handling and salt shafts. This investigation finds that holding ponds were not required for the air intake shaft (AIS) and exhaust shaft because the holes were raise-bored from the excavation level upward. Air photos during the time period 1982-1988 are used to verify the unit description for the preliminary review. Because the units are decommissioned, modified by excavation and covered by surface facilities, no field verification and sampling were conducted. Appendix 4.6 contains an enlarged air photograph showing the condition of the holding ponds in November, 1983.

4.6.1 SWMU-006a Salt Shaft Holding Pond

Preliminary Review. DOE/EIS-0026 (1980) suggests that as much as 2.4 million gallons of drilling fluid were used for constructing the salt shaft. Earliest air photos from November 1982 show the holding pond as a bermed oval. Measuring approximately 64 x 30 meters (210 x 100 feet) in 1982, the holding pond had a capacity of 210,000 ft^3 or 1.6 million gallons. The waste description in table 4.7 describes drilling fluid in the holding ponds to consist of brine, bentonite, and traces of grease and hydraulic fluid. The RFA sampling for the borehole mudpits; however, suggests that potentially hazardous organic and heavy metal constituents may also be trace constituents. As described in the RCRA B SWMU data sheet (table 4.7), drilling mud constituents stored in the holding ponds probably infiltrated below the liner before overexcavation of the units.

A late 1983 air photo shows the area previously occupied by the holding pond in the northeastern quadrant of the site (appendix 4.6). The area is graded level and included in a zone of dark fill. The mudpit remained buried insitu until 1989, when construction of the engineering building commenced. Air photos suggest that a northeast portion of the holding pond may remain buried onsite, but that the majority of the unit was moved to the inactive landfill at SWMU-003b. A 9-16-89 air photograph of the engineering building shows the foundation occupying only a portion of the area underlain by the Salt Shaft holding pond.

Visual Site Inspection. There are no present surface exposures or evidence of the salt holding pond.

Sampling Visit. No sampling was conducted.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. The 3.0 meter (10 foot) depth of the holding pond suggests that the unit was overexcavated into the caliche zone. Because the unit held drilling mud material for over eight years before it was excavated, some migration downward through the caliche occurred. Infiltration of leachate from the holding pond into underlying units is a credible possibility. Nearly 6.0 meters (20 feet) of silty, friable sandstone and 10 meters (30 feet) of the Triassic sandstone overlay the Dewey Lake Formation within Zone 1.

- Groundwater - Migration potential is low. There is no saturated zone in the Dewey Lake Red Beds at this location. Although percolation of rainwater could have conceivably carried some leachate downward prior to excavation, most of the unit is now removed and covered by the engineering building. While downward migration is still a possibility for the presumably buried northeast remnant, lateral migration is unlikely. Migration to the Culebra Dolomite aquifer, located about 200-220 meters (680-730 feet) below the surface, is not credible.

- Surface water - None

- Air - None

Table 4.7 WIPP SWMU Characterization Sheet - 006
Salt and Waste Shaft Holding Ponds

006	HOLDING PONDS
Unit type:	Holding Ponds
Unit use:	Storage/Settling
Operational status:	Decommissioned
Use period:	1981-1984
Materials managed:	Solid Waste
Hazardous release:	None
Radioactive release:	None
Information source(s):	Process knowledge Annual aerial photos Westinghouse, 1984

Unit Description

Refer to Figure J-2 for location. During the drilling of the first two shafts at the WIPP facility, brine was used as a drilling fluid and each shaft had a separate holding pond for the brine. The holding pond for the Exploratory Shaft (006-a), now called the Salt Handling Shaft, covered 1-1/2 acres, was about 10 feet deep, and was located 75 feet east of the current Salt Handling Shaft. This pond was active from June 1981 to April 1983. The holding pond for the Ventilation Shaft (006-b), the current Waste Handling Shaft, covered 1/2 acre and was 10 feet deep. It was located 115 feet west of the current Waste Handling Shaft. It was active from December 1981 until late 1984. Both ponds were allowed to dry and were then covered with soil. Both areas were later excavated for construction purposes. The Engineering Building was constructed on top of 006-a and the Waste Handling Building was constructed on top of 006-b.

Waste Description

Based on process knowledge, material stored in the holding ponds consisted of saturated brine with bentonite added, drill cuttings, and trace amounts of hydraulic oil and grease that may have leaked from the drilling equipment. The solid material left in the mud pits after drilling still contained a high percentage of water at the time they were covered. This resulted in a gelatinous material consisting of the drill cuttings, bentonite, and water being encountered during excavation for the Engineering Building foundation. The gelatinous material was excavated and disposed of in the construction landfill.

Release Information

Releases of RCRA hazardous waste or hazardous constituents have not occurred at these sites. Potential releases from these ponds may have occurred because holes were cut in the lining after the water had evaporated. The holes were cut to prevent the ponds from holding water after they were covered over. The solids confined in the plastic liner of the holding ponds were buried when the ponds were covered with soil and graded. The material released was sodium-and potassium-saturated brine, which is considered nonhazardous.

(after WIPP RCRA Part B Permit DOE/WIPP 91-005)

Exposure potential is low: The exposure likelihood is low, even in the worst-case event where trace amounts of hazardous components are presumed buried within a vestige of the salt holding pond in Zone 1. The materials may, however, be encountered if the pad in the northeast corner is ever excavated for construction purposes.

4.6.2 SWMU-006b Waste Handling Shaft Holding Pond

Preliminary Review. November 1982 air photos are the earliest photo documentation of the waste handling shaft holding pond. The holding pond is a bermed rectangular pit measuring approximately 85 x 45 meters (280 x 150 feet). Air photo review verifies the unit as active until at least mid-1984. By the next annual air photo (6-7-85), the pond is excavated and construction had begun on the waste handling building. The excavated drilling mud may have been moved to either SWMU-003b (inactive landfill) or SWMU-003a (Brinderson landfill) (see sections 4.3.1 and 4.3.2). Appendix 4.6 shows the condition of the holding pond on 11-7-83.

Visual Site Inspection. The former waste shaft holding pond is covered.

Sampling Visit. No sampling was conducted.

Release and Exposure Assessment. Release and migration potential are as follows:

- Soils - Release potential is high. The holding pond held drilling mud material for nearly three years before it was excavated, suggesting some migration downward through the caliche occurred. The level to which the holding pond leachate would infiltrate is unknown; however, generally 6.0 meters (20 feet) of silty, friable sandstone and 10 meters (30 feet) of more indurated, coarse sandstone overlay the Dewey Lake Formation within Zone 1.

- Groundwater - Migration potential is low. The Dewey Lake Formation is not saturated at this location. In addition, the contents have been removed and any remaining residue is covered by asphalt and concrete pavement. Migration to the Culebra Dolomite aquifer, located about 200-220 meters (680-730 feet) below the surface, is not credible.

- Surface water - None

- Air - None

Exposure potential is low: Trace amounts of potentially hazardous constituents may have leached into the underlying bedrock before the unit was overexcavated. However, there is only a negligible risk of groundwater contamination, given the lack of a saturated zone in the Dewey Lake Formation at this location.

4.7 SWMU Group 007 - Evaporation Ponds

This group consists of three evaporation ponds. Two received grey water from personnel showers; another currently receives runoff from the main salt storage pile. According to Table 4.8, no hazardous materials were routinely introduced into any of the ponds.

4.7.1 SWMU No. 007-a, Evaporation Pond

Preliminary Review. This unit is now covered by the Waste Handling Building and the paved area southwest of the WHB. Used to evaporate water from the domestic showers, this pond was approximately 4.0 feet deep and covered about one-half acre. The pond was present from late 1983 to early 1984. Based on process knowledge, the waste in the unit consisted of soap, cleaning solutions, and trace amounts of oil. The domestic grey water waste was discharged into a natural low area that served to contain the contents of the unit. Releases of RCRA constituents or hazardous wastes are not known to have occurred at this site.

Visual Site Inspection. Aerial photographs of the WIPP site during 1984 indicate the existence of the pond. Further inspection was not possible as the location has been built over.

Sampling Visit. Unnecessary.

Release and Exposure Assessment.

- Soils - Being an unlined impoundment, the potential for release to the soil is certain.
- Groundwater - Release and migration potential is low; surface structures effectively inhibit downward migration of rainfall and a saturated groundwater zone in the Dewey Lake Formation does not occur at this location.
- Surface Water - None.
- Air - None.

Exposure potential extremely low to nonexistent.

4.7.2 SWMU No. 007-b, Evaporation Pond

Preliminary Review. This unit is located 770 feet due West of the Waste Handling Building and received water from personnel showers (grey water). Table 4.8 indicates the pond covered an area of approximately one-half acre and existed from late 1983 to early 1984. Process knowledge is used to declare that no hazardous wastes were routinely released into this pond.

Visual Site Inspection. Aerial photographs from 1984 indicate the presence of the pond. Reclamation efforts consisted of leveling the pond. This location now receives about 70% of the WIPP site storm water runoff. Revegetation of the area has occurred.

Sampling Visit. This area, designated in the NMED/WIPP Soil Sampling and Analysis Plan as the Facility West sampling location, was sampled during October of 1992. The analytical suite included; Heavy metals (ICP Scan plus Arsenic) and Semi-Volatile Base/Neutral (EPA 625) and Aliphatic Hydrocarbons. A control sample was taken at a location ½ mile West of the WIPP Zone 1 in undisturbed dunal sand. The results indicated Iron, Barium, and Aluminum to be above the background control sample results. No semi-volatile compounds or aliphatic hydrocarbons were detected.

Table 4.8 WIPP SWMU Characterization Sheet - 007
Evaporation Ponds

007 EVAPORATION PONDS

Unit type:	Evaporation Ponds
Unit use:	Storage/Disposal
Operational status:	Active
Use period:	1981-present
Materials managed:	Solid Waste
Hazardous release:	None
Radioactive release:	None
Information source(s):	Annual aerial photos Westinghouse, 1984

Unit Description

Refer to Figure J-1 for location. Three ponds have been used for evaporation of water. The oldest pond (007-a) was located in the southwest corner of Zone I. It covered about 1/2 acre and was about 4 feet deep. It received water from the employee showers in temporary buildings and was active from 1981 to 1983. The area is presently covered by the Waste Handling Building and the paved area southwest of the Waste Handling Building. Another pond (007-b), which also received water from the showers, was located about 770 feet due west of the Waste Handling Shaft. This pond was present from late 1983 to early 1984. The third pond (007-c) is used to collect run-off from the main salt storage area. It is located on the west side of the main salt storage area (SWMU No. 002-b), covers 3 acres, and is 5 feet deep. It has been active since May 1984.

Waste Description

Based on process knowledge, the waste in the inactive ponds (007-a and 007-b) consisted of water containing soap, nonhazardous cleaning solutions, and trace amounts of oil. The third pond (007-c) receives runoff from the main salt storage area, consisting primarily of unsaturated salt brine.

Release Information

Releases of RCRA hazardous waste or hazardous constituents have not occurred at this site.

(after WIPP RCRA Part B Permit DOE/WIPP 91-005)

Release and Exposure Assessment.

- Soils - A release of elevated iron, barium and aluminum has occurred, but are well below RCRA action levels.

- Groundwater - A groundwater release is not credible due to the concentrations observed, the depth to groundwater, and the absence of a saturated zone in the Dewey Lake formation at this location.

- Surface Water - Although the site is within a facility drainage, release potential is low because soluble materials in the soil would tend to migrate downward rather than laterally.

- Air - None.

Exposure potential is extremely low to nonexistent.

4.7.3 SWMU No. 007-c, Evaporation Pond

Preliminary Review. Active since May 1984, this unit is located 500 feet NW of the Salt Handling Shaft and is contiguous with the western boundary of the main salt storage pile (SWMU 002-b). The unit is an excavated pond covering a square of 3 acres and is 5 feet deep. Runoff consisting of Sodium and Potassium-based brines from the main salt storage pile are retained in this basin to allow evapotranspiration of the waste liquid (a non RCRA waste). Since March of 1992, approximately 40,000 gallons of brine from the unsealed Air Intake Shaft has been pumped into the basin each week, with temporary permission from the NMED. Plans are to discharge these waste brines into the evaporation lagoon (construction to be complete by June 1993) at the Sewage treatment plant. The modification has been approved by NMED. The unit is constructed to contain the waste brine, during a heavy rain storm event, with an extremely low potential for an outfall to the neighboring biological communities.

Visual Site Inspection. Inspection of the area occurred during a dry period and the pond held no water. Brine crystals are evident in the dry sandy bottom of the pond where the AIS brine enters the pond. No vegetation is growing within the bermed area, however, Mule deer tracks criss-cross the pond. Vegetation within 10 feet of the pond seem to be unaffected.

Sampling Visit. This unit was not sampled.

Release and Exposure Potential.

- Soils - Release potential is high. The soil is saturated with brine.

- Groundwater - Release potential to groundwater is low.

- Surface Water - Release potential is extremely low due to structural containment.

- Air - None

Exposure potential is extremely low to nonexistent.

4.8 SWMU Group 008 - Surface Satellite Accumulation and Storage

The RCRA Part B Application describes 12 surface satellite accumulation areas and 2 hazardous and flammable waste storage/staging areas (Table 4.9). SWMU Group 008 accumulation areas are often associated with locations where hazardous waste is generated. When a drum is full at an SAA, it is transferred to a Hazardous Waste Staging Area (SWMU No. 008-l) for content verification and shipment offsite for disposal. This review verifies that DOE/WIPP procedures cited in Table 4.9 require weekly inspections to verify quantities listed on the SAA inventory log. The units are governed daily by specific section managers and inspected weekly by Transportation and Hazardous Material Handling personnel. Visual inspections revealed that each location is properly barricaded and signed. All designated SWMUs in this group had appropriate Material Safety Data Sheets. All drum containers (20 and 30 gallons) inspected had in place, properly installed, latchable sealing rings. Adequate management practices and site training (Site Generated Hazardous Waste Worker) suggest the potential for an environmental release or personnel exposure from SAA locations is low.

This section identifies one SWMU that is not identified in the RCRA Part B application (Table 4.9). This SWMU is located at Facility 474E and contains Satellite Accumulation Area (SAA) #15. The proposed SWMU 008o is described in Section 4.8.15. Another corrective observation is that SWMU 008k is no longer designated as a SAA, as declared in Table 4.9.

4.8.1 SWMU No. 008-a, Satellite Accumulation Area (Blg. 455)

Preliminary Review. Waste managed here includes oily rags, aerosol cans, and solvent-soaked rags.

Visual Site Inspection. Appendix 4.8.1 shows one 55-gallon drum and two cleaning stations (*Safety-Clean Inc.*). *Safety-Clean Inc.* delivers and disposes of the solvent product and waste, which is self-contained in the red 20-gallon drums located under each solvent-cleaning station. The drum is sealed properly and no evidence of a past release is observed.

Sampling Visit. No sampling was done within this unit.

Release and Exposure Assessment.

- Soils - None
- Groundwater - None
- Surface Water - None
- Air - None

Exposure potential is extremely low to nonexistent.

4.8.2 SWMU No. 008-b, Satellite Accumulation Area (Blg. 454)

Preliminary Review. SWMU 008b was located outside building 454 but is currently inactive. The unit was used to store used oils from site vehicles and mining equipment.

Visual Site Inspection. SWMU 008b is confirmed inactive. No SAA, waste containers or any other evidence for the location of the former SWMU is apparent (appendix 4.8.2) No evidence for an environmental release was noted at the former SWMU.

Table 4.9 WIPP SWMU Characterization Sheet - 008
Surface Satellite Accumulation Areas

008	SURFACE SATELLITE ACCUMULATION AREAS
Unit type:	Storage Areas
Unit use:	Storage
Operational status:	Active
Use period:	1988-present
Materials managed:	Hazardous Waste Solid Waste
Hazardous release:	None
Radioactive release:	None
Information source(s):	Process knowledge Westinghouse, 1992a Westinghouse, 1992b Westinghouse, 1991b

Unit Description

Refer to Figure J-2 for location. The satellite accumulation areas on the surface all use DOT-approved containers for storing all hazardous waste. Specifics of the satellite accumulation areas are listed on Table J1-2.

Waste Description

The wastes collected in surface satellite accumulation areas consist of chlorinated solvents, motor oil, hydraulic oil, oily rags, aerosol cans, antifreeze, and developing fluid. Satellite accumulation areas are managed (e.g., inspected, sample collection and analysis) in accordance with procedures in WP 02-6 and 02-7, Resource Conservation and Recovery Act (RCRA) Compliance Manual (Westinghouse, 1992a). Corrective actions for potential releases are described in WP 02-8, WIPP Spill Prevention, Control, and Countermeasures Plan (Westinghouse, 1991b) (for nonhazardous releases) and WP 02-12, WIPP Contingency Plan (Westinghouse, 1992b) (for hazardous releases).

Release Information

Releases of RCRA hazardous waste or hazardous constituents have not occurred aat these sites.

(after WIPP RCRA Part B Permit DOE/WIPP 91-005)

Table 4.9 Surface Satellite (Continued)

SWMU	Date Started	Location	Status	Material Stored
008-a	1988	Maintenance Warehouse Bldg. 455	Active	Satellite accumulation area (SAA) for oily rags, aerosol cans, solvent soaked rags
008-b	1988	Outside Bldg. 454, east side	Inactive	SAA for used oils
008-c	1988	Sandia Calibration Lab Bldg. 993	Active	SAA for aerosol cans and solvents
008-d	1989	Sandia Cable Shop Bldg. W083	Inactive	SAA for aerosol cans and solvents
008-e	1988	Security Armory Bldg. 473	Active	SAA for powder solvents, gun oil, and oily rags
008-f	1992	Drafting Area Engineering Bldg. 486	Inactive	SAA for solvent concentrates, developing fluid, and aerosol cans
008-g	April 1989	Emergency Services Bldg. vehicle wash bay	Active	SAA for aerosol cans and minor amounts of used motor oil, grease, and hydraulic oil
008-h	1988	Southwest of the water storage tanks	Inactive	Staging area for hazardous waste awaiting shipment to a designated treatment, storage, or disposal (TSD) facility.
008-i	1991	Air Intake Shaft Hoist House	Active	SAA for aerosol cans and solvent-soaked rags
008-j	1991	Electric Shop—West side Bldg. 482	Active	SAA for aerosol cans and solvent-soaked rags
008-k	1992	Outside Bldg. 454—North side	Active	Storage area for petroleum products and SAA for used oils
008-l	1992	Building 474-B—Hazardous Waste Staging Area	Active	Less-than-90 day storage area for hazardous waste awaiting shipment to a designated TSD
008-m	1992	Bldg. 454 - Maintenance Tool Crib	Active	SAA for spent aerosol cans
008-n	1993	Bldg. 474 - Hazardous Waste Staging Area	Future	Less-than-90-day storage area for hazardous waste awaiting shipment to a designated TSD

(after Table J1-2 DOE/WIPP 91-005/Rev. 3)

Sampling Visit. No sampling of this unit was conducted.

Release and Exposure Assessment.

- Soils - None
- Groundwater - None
- Surface Water - None
- Air - None

Exposure potential is extremely low to nonexistent.

4.8.3 SWMU No. 008-c, Satellite Accumulation Area (Blg. 993)

Preliminary Review. This SWMU is located inside trailer # 993, the Sandia calibration laboratory. Materials managed include acetone, methylene chloride, and various solvents. These hazardous materials are stored in approved flammable storage cabinets. Wastes managed include solvent-soaked rags and tissues and aerosol cans. This SWMU is referred to as SAA #5 by the WIPP Transportation and Hazardous Materials Handling Section.

Visual Site Inspection. Refer to photographs in Appendix 4.8.3. The VSI confirms the information contained in the Preliminary Review and also notes that good management practices are being followed.

Sampling Visit. No sampling was conducted within this unit.

Release and Exposure Assessment.

- Soils - None
- Groundwater - None
- Surface Water - None
- Air - None

Exposure potential is extremely low to nonexistent.

4.8.4 SWMU No. 008-d, Satellite Accumulation Area (Blg. W083)

Preliminary Review. This unit was located in Blg. W083, the Sandia Cable Shop, and is now inactive. The unit managed aerosol cans, oil and solvent soaked rags.

Visual Site Inspection. Refer to photographs in Appendix 4.8.4. No evidence of a past release is observed. The area is clean and neat.

Sampling Visit. No sampling was conducted within this unit.

Release and Exposure Assessment.

- Soils - None

- Groundwater - None

- Surface Water - None

- Air - None

Exposure potential is extremely low to nonexistent.

4.8.5 SWMU No. 008-e, Satellite Accumulation Area (Blg. 473)

Preliminary Review. This unit is known as the Security Armory Building, which is located in Blg. 473, contiguous with the Guard and Security Building and Cafeteria Complex. Security personnel clean firearms at this location. Stored here are nitro-based powder solvents, gun oil, and ammunition. Hazardous Waste generated includes oil-soaked rags and aerosol cans. This unit is referred to as SAA #2 by the WIPP Transportation and Hazardous Materials Handling Section.

Visual Site Inspection. Refer to photographs in Appendix 4.8.5. The VSI confirms the PR information. The area appears clean and well managed.

Sampling Visit. No sampling was conducted within this unit.

Release and Exposure Assessment.

- Soils - None

- Groundwater - None

- Surface Water - None

- Air - None

Exposure potential is extremely low to nonexistent.

4.8.6 SWMU No. 008-f, Satellite Accumulation Area (Blg. 486)

Preliminary Review. This unit is located in the Drafting Area of the Engineering Building 486. The unit was active for a short period in 1992; however, it is currently inactive. Wastes managed included solvent concentrates, developing fluid, and aerosol cans.

Visual Site Inspection. Refer to photographs in Appendix 4.8.6. The VSI revealed that the equipment is not being used and waste is not generated. No evidence of a past release is observed.

Sampling Visit. No sampling was conducted within this unit.

Release and Exposure Assessment.

- Soils - None

- Groundwater - None

- Surface Water - None

- Air - None

Exposure potential is extremely low to nonexistent.

4.8.7 SWMU No. 008-g, Satellite Accumulation Area (Safety Blg.)

Preliminary Review. This unit is located in the vehicle parking and wash bay area of the Emergency Services Building 452. Waste managed include aerosol cans, rags and tissues contaminated with motor oil, hydraulic oil, and greases. Waste water and accumulated sump sludge are managed in separate seal-ring 55-gallon drums. This unit is referred to as SAA #6 by the WIPP Transportation and Hazardous Materials Handling Section.

Visual Site Inspection. Refer to photographs in Appendix 4.8.7. The VSI found the concrete floor of the area to be clean and operations well organized with no evidence of routine releases.

Sampling Visit. No sampling was conducted within this unit.

Release and Exposure Assessment.

- Soils - None
- Groundwater - None
- Surface Water - None
- Air - None

Exposure potential is extremely low to nonexistent.

4.8.8 SWMU No. 008-h, Inactive Hazardous Waste Storage Area

Preliminary Review. Background review indicates that a small white storage trailer used to be located outside the fenced Facility 474 complex, just 15 feet west of the water storage tanks. The unit was used from 1988 through 1992 as a site-generated hazardous waste accumulation and staging area. Full drums or containers were accumulated here for content verification and shipment off site to an approved treatment, disposal, or disposal (TSD) facility.

Visual Site Inspection. Refer to photographs in Appendix 4.8.8 and 4.3.1 (Aerial photograph). A visit to this location during late 1991 by staff revealed a sealed unit with a self-contained basin designed to catch liquids released during accidental spills or from leaking containers. The building was set directly on the soil. Interior ventilation of the building was not observed. The building is no longer present and the surface area is graded. No surficial evidence of a release is apparent in the former location.

Sampling Visit. Sampling was not conducted within this unit.

Release and Exposure Assessment.

- Soils - A release to the soil from the former building is considered unlikely; a spill or leak would have been contained in the catchment basin under the storage area.
- Groundwater - None

- Surface Water - None

- Air - None

Exposure potential is extremely low to nonexistent.

4.8.9 SWMU No. 008-i, Satellite Accumulation Area (AIS)

Preliminary Review. SAA #3 is used to accumulate aerosol cans and oily rags. Various oil and lubricant products are also stored at this location for periodic maintenance of the Air Intake Shaft Hoist line spool. Oil and grease dripping from the bearings and spool are routinely contained with rags and absorbent and placed in waste containers.

Visual Site Inspection. Appendix 4.8.9 shows flammable storage cabinets and a spill control station. The 55-gallon drum is properly sealed. The concrete floors are clean and the area appears to be well managed. There is no visual indication of routine releases at this location.

Sampling Visit. This unit was not sampled.

Release and Exposure Assessment.

- Soils - None

- Groundwater - None

- Surface Water - None

- Air - None

Exposure potential is extremely low to nonexistent.

4.8.10 SWMU No. 008-j, Satellite Accumulation Area (Blg. 482)

Preliminary Review. This unit is located outside of the site Electric Shop (Building 482). This SWMU is referred to as SAA #12 by the WIPP Transportation and Hazardous Materials Handling Section. As described in Table 4.9, wastes managed include aerosol cans and oil and solvent-soaked rags. As of June 1993, the unit also includes newly-designated SAA #12b, which houses a florescent tube crusher previously contained at SAA #1 (SWMU 008m). The filtered tube crusher is located in a more thoroughly ventilated area than exists at SAA #1 (SWMU 008m/Facility 454).

Visual Site Inspection. Photographs in Appendix 4.8.10 show an approved plastic lockable box type unit, 4 feet high X 3 feet wide X 5 feet long. The bottom half of the box serves as containment in the event a drum leaks. Aerosol cans and oily rags are confirmed as waste types at SWMU 008j. No visual sign of a past release at this location is observed.

Sampling Visit. No sampling was conducted within this unit.

Release and Exposure Assessment.

- Soils - None

- Groundwater - None

- Surface Water - None

- Air - None

Exposure potential is extremely low to nonexistent.

4.8.11 SWMU No. 008-k, Petroleum Product/Used Oil (Blg. 454)

Preliminary Review. Table 4.9 is correct in noting that the unit is used as a dispensing location for various petroleum products and as a storage area for used oils (recyclable anti-freeze is also stored). Table 4.9 is incorrect in that SWMU 008k is no longer an official satellite accumulation area (SAA). No weekly inspections or other accompanying management requirements required of SAAs are implemented at this storage location. Recyclable used oil, however, continues to be accumulated at 008k, and presumably full drums of waste oil are eventually shipped to the appropriate staging area for off-site disposal.

Visual Site Inspection. The unit is located outside and north of building 454, underneath a sheet metal covered concrete floored area. The VSI confirms the waste description in the PR. The following was observed: 1) 6 - 55 gallon drums of waste oil stored on a 4-feet by 4-feet grating placed over a shallow (1-foot high) square plastic basin to contain a leak or spill; and 2) 6 - 55 gallon drums of petroleum product, lying horizontally in racks with gate valves and down spouts for filling containers (appendix 4.8.11). A steel catchment tray, 10-feet long by 2-feet wide by 1-foot high, is located beneath the row of down spouts to retain container overflow and spills.

Sampling Visit. This unit was not sampled.

Release and Exposure Assessment.

- Soils - Low potential

- Groundwater - None

- Surface Water - None

- Air - None

Exposure potential is low.

4.8.12 SWMU No. 008-l, Hazardous Waste Staging Area (Blg. 474B)

Preliminary Review. This unit is within the Facility 474 staging area complex. As noted in Table 4.9, properly contained and segregated hazardous waste are stored for no more than 90 days prior to shipment to a designated TSD. This unit is the site generated hazardous waste staging area and is managed by the WIPP Transportation and Hazardous Materials Handling Section. Full drums or containers are accumulated here for content verification and shipment off site to an approved treatment, disposal, or disposal (TSD) facility.

Visual Site Inspection. The Facility 474 complex is surrounded by an 8 feet high chainlink fence, in the southwest corner of Zone 1, with entrance through drive through gates secured with a padlock and chain. The area is paved with asphalt and concrete.

Building 474B is a ventilated metal cubicle adjacent to the north fence of the 474 complex (Appendix 4.8.12). Spill control kits, a personnel shower, and an eyewash station are present. The building is floored with metal grates which cover a containment basin designed to retain liquid spills or container leaks. If a liquid release did occur from the containment basin or a spill outside the unit, the site is designed to channel flow down gradient to a containment sump. The units are aspirated with ventilation fans prior to entrance and during verification of the container contents. A fire suppression system is present. The units inspected were clean and well managed. No evidence of a release was present. Refer to Appendix 4.8.12 for additional photographs of associated structures within the 474 complex.

Sampling Visit. Sampling was not conducted within this unit.

Release and Exposure Assessment.

- Soils - None
- Groundwater - None
- Surface Water - None
- Air - Hazardous vapors exhausted to the atmosphere may permeate water stored in storage tanks.

Exposure potential is low: Water supply tanks located within 30 feet of this SWMU are equipped with downturned vent pipes open to the atmosphere. Although the storage tanks are used primarily for maintenance of fire-flow capability, some water is used for site drinking water. A measurable volume of hazardous vapors aspirated from within the sealed hazardous waste storage cubicles may permeate stored water by way of the tank venting system. Although potential contamination of the stored water is probably negligible, this represents a possible exposure pathway to site employees.

4.8.13 SWMU No. 008-m, Maintenance Tool Crib SAA #1(Blg. 454)

Preliminary Review. This unit is located inside building 454, the Maintenance Tool Crib, and is designated as SAA #1 by the WIPP Transportation and Hazardous Materials Handling Section. Wastes managed include aerosol cans and fluorescent tubes, the latter of which are transported to this area and ground up in a fluorescent tube disposal machine. This unit has subsequently moved to building 482 (see section 4.8.11/SWMU No. 008-j).

Visual Site Inspection. Appendix 4.8.13 shows one 55-gallon drum used to store spent aerosol cans and two storage lockers containing flammable materials. The VSI reveals that florescent tube detritus is also crushed and segregated from other waste streams at this location. No evidence of a past release is observed in the area surrounding SWMU 008m. Onsite inspection revealed a clean and well-managed work environment.

Sampling Visit. This unit was not sampled.

Release and Exposure Assessment.

- Soils - None
- Groundwater - None
- Surface Water - None

- Air - None

Exposure potential is extremely low to nonexistent.

4.8.14 SWMU No. 008-n, Future Hazardous Waste Staging (Blg. 474-A)

Preliminary Review and Visual Site Inspection. This unit is located next to and east of building 474-B (SWMU 008-l) within the facility 474 hazardous materials storage and staging area. The building is in place awaiting construction of water and electric supplies for the lighting, fire suppression, and ventilation systems. This unit will have release and exposure potentials similar to SWMU 008-h and SWMU 008-l, summarized in sections 4.8.8 and 4.8.12 of this document, respectively.

Sampling Visit. This unit was not sampled.

Release and Exposure Assessment.

- Soils - None

- Groundwater - None

- Surface Water - None

- Air - Hazardous vapors will be aspirated to the atmosphere.

Exposure potential is low: As with Building 474B (SWMU 008l), potential contamination of the stored water by way of the water storage tank venting system, although most likely negligible, represents a possible exposure pathway to site employees.

4.8.15 *Unidentified* SWMU - Proposed No. 008-o (Blg. 474-E)

Preliminary Review. This unit is not listed as a solid waste management unit in the RCRA Part B application, despite it being listed as Site Accumulation Area #15. The unit is located on the south side of the 474 Complex and is used to store hazardous materials awaiting use or reuse. Contents in storage include such products as Purple K fire suppression compound and new lead acid batteries.

Visual Site Inspection. Refer to photographs in Appendix 4.8.12-E. The VSI reveals a well managed and clean facility. The unit is within a metal building comprised of three isolation bays with roll up doors facing north. Each bay is approximately 10 feet wide X 20 feet long X 12 feet high, with underlying concrete sumps to retain liquids from container breaches or spills. All isolation bays are equipped with individual unfiltered ventilation systems that exhaust to the atmosphere. All units are also protected by an automatic fire suppression system.

SAA #15 is located in the East Bay and consists of three isolated labeled drums: one for Mercury-contaminated wastes, one for Nickel Cadmium batteries, and one for Freon aerosols. A unopened 5 gallon container of Methyl Ethyl Ketone is also stored at SAA #15 awaiting return to manufacturer or shipment to an approved TSD facility. The Middle Bay is used to store new acid (Sulfuric) filled automotive and larger batteries. Purple K fire extinguishing compound is also apparent. The West Bay is currently being used to store acid filled batteries. No evidence of a release of hazardous substances within or outside any bays is observed.

Sampling Visit. This unit was not sampled.

Release and Exposure Assessment.

- Soils - None

- Groundwater - None

- Surface Water - None

- Air - Hazardous vapors are aspirated to the atmosphere.

Exposure potential is low: As with SWMU 008l and 008n, potential contamination of stored water by way of the water storage tank venting system is credible. Although most likely negligible, this pathway could cause an exposure to site employees.

4.9 SWMU Group 009 - Underground Satellite Accumulation Areas

This SWMU group consists of 10 Satellite Accumulation Areas (SAA's) located in the underground mined repository (Table 4.10). Wastes generated underground result from operational and experimental activities, all of which are nonradioactive. Listed in detail in Table 4.10 are materials stored in underground SWMUs. This review verifies that referenced inspection and corrective action procedures are adequate: WP 02-6 and 02-7, WP 02-8, and WP 02-12. This review also substantiates implementation of management procedures: each unit is inspected weekly by WIPP Transportation and Hazardous Materials Handling personnel; all areas visited utilize approved DOT containers; wastes are segregated properly in separate containers; and appropriate signs and barricades are posted.

In general, release potential of this SWMU group is nonexistent for soils, groundwater, and surface water due to the fact that they are located 2,150 feet below the surface. A release to air, with subsequent human exposure, is extremely low based on limited quantities of waste and the effective mine exhaust system (airflow through the mine varies from 60,000 to 425,000 CFM). In all cases, exposure potential is extremely low to nonexistent. Because underground units are generally consistent and well managed, the following sections depart from the previous report outline, and describe only the visual site inspection. No sampling was deemed necessary at any of the locations.

4.9.1 SWMU No. 009-a, Satellite Accumulation S1300/W30

Visual Site Inspection. SWMU 009a (SAA # 7B) is located in an Underground Maintenance Shop. The area was orderly and well kept with no visual evidence of past releases. As shown in appendix 4.9.1, spent aerosol cans are accumulated at this location. Flammable storage cabinets are used to store oils and aerosol solvents and lubricants.

4.9.2 SWMU No. 009-b, Satellite Accumulation E300 Shop

Visual Site Inspection. This SWMU consists of two SAAs located in the Experimental Programs Shop. SAA #11B is used to store spent aerosol cans; SAA #11A stores oily and solvent soaked rags (appendix 4.9.2). The VSI revealed a large, well kept shop area containing desks, bookcases, storage cabinets, work tables, welding equipment, two self-contained recirculating solvent baths for parts cleaning, and a metal machining lathe. The solvent baths are covered when not in use and the spent solvents are exchanged as needed and reclaimed by the service provider. Gases generated during welding are filtered through a hooded vacuum system placed adjacent to the welder. No signs of past releases are evident in the salt composing the shop floor.

4.9.3 SWMU No. 009-c, Satellite Accumulation S1300/W170 Intersection

Visual Site Inspection. The VSI confirms that the area is used to store waste batteries, flammables, and oily rags. Oily rags are accumulated at SAA #9. The batteries are stored on grates above stainless steel basins designed to contain spills and leaks (appendix 4.9.3). The area was clean and well managed with no indication of past releases.

4.9.4 SWMU No. 009-d, Satellite/Materials Storage West S1300/W170

Visual Site Inspection. The VSI substantiates the storage of petroleum products (oil, accumulated waste oil, and diesel) at this location. Appendix 4.9.4 shows several 55-gallon drums of bulk oil and diesel stored on grates above stainless steel basins. This area appears well managed and shows no visual indication of past releases. The oil and diesel drums are not exposed to high ambient temperatures sufficient to cause vaporization.

Table 4.10 WIPP SWMU Characterization Sheet - 009
Underground Satellite Accumulation Areas

009	UNDERGROUND SATELLITE ACCUMULATION AREAS
Unit type:	Storage Areas
Unit use:	Storage
Operational status:	Active
Use period:	1983-present
Materials managed:	Hazardous Materials Hazardous Waste Solid Waste
Hazardous release:	None
Radioactive release:	None
Information source(s):	Process knowledge Westinghouse, 1992a Westinghouse, 1992b Westinghouse, 1991b

Unit Description

Refer to Figure J-3 for location. The underground satellite accumulation areas are located at various locations in the waste repository. The satellite accumulation areas in the underground all use DOT-approved containers for storing all hazardous waste. Unit information for these areas is provided in Table J1-3.

Waste Description

The materials stored in the underground satellite accumulation areas are nonradioactive, site-generated wastes that include new and used storage batteries; waste motor oil; waste hydraulic oil; naphtha-based solvents; oily rags; aerosols; wastewater contaminated with motor oil; grease; diesel; hydraulic oil and salt; and silicon grout. Satellite accumulation areas are managed (e.g., inspected, sample collection and analysis) in accordance with procedures in WP 02-6 and 02-7, Resource Conservation and Recovery Act (RCRA) Compliance Manual (Westinghouse, 1992a). Corrective actions for potential releases are described in WP 02-8, WIPP Spill Prevention, Control, and Countermeasures Plan (Westinghouse, 1991b) (for nonhazardous releases) and WP 02-12, WIPP Contingency Plan (Westinghouse, 1992b) (for hazardous releases).

Release Information

Releases of RCRA hazardous waste or hazardous consituents have not occurred at these sites.

(after WIPP RCRA Part B Permit DOE/WIPP 91-005)

Table 4.10 Underground Satellite (Continued)

SWMU	Dates	Location	Status	Material Stored
009-a	1988-present	S1300/W30 Maintenance Shop	Active	Satellite accumulation area (SAA) for naphtha-based solvents, oily rags, and aerosol cans
009-b	1990-present	E300 Experimental Programs Shop	Active	SAA for aerosol cans
009-c	1989-present	S1300/W170 Intersection	Active	SAA for spent lead acid storage batteries and waste oil
009-d	1989-present	West End of S1300/W170	Active	Storage area for petroleum, oil, and lubricants and SAA for one drum of used oil
009-e	1991	E140/S700 Cart Maintenance	Active	SAA for aerosol cans and solvent-soaked rags
009-f	1990	S1600/W30 Underground Wash Rack	Active	Water contaminated with salt, grease, hydraulic oil, motor oil, and diesel
009-g	1990	S1300/E140	Inactive	SAA for solvent-soaked rags, naphtha-based solvents, and aerosol cans
009-h	1989-present	N780 Welding Shop	Active	SAA for aerosol cans and solvent-soaked rags
009-i	1983-1988	SPDV Rm. 1 Old Maintenance Shop	Inactive	SAA for solvent-soaked rags, naphtha-based solvents, aerosol cans, and used oils
009-j	1983-1988	West End N1420	Inactive	SAA for scrap metal, used oil, solvents, grout, cement, and blasting powder

(after Table J1-3 DOE/WIPP 91-005/Rev. 3)

4.9.5 SWMU No. 009-e, Satellite/Hazardous Materials Storage E140/S700

Visual Site Inspection. Electric carts used in the underground are maintained in this area. SAA #13-A, B, & C are located within this unit and are used to accumulate aerosols, wash bay sludge, and oil and solvent soaked rags. Appendix 4.9.5 shows that water and sludge from washing the carts is retained in a basin below the grating. The waste liquid and sludge are segregated into DOT-approved containers and sampled, if deemed necessary, to determine if the wastes are hazardous. Each SAA within this unit appears well managed and no visual evidence of previous releases is evident.

4.9.6 SWMU No. 009-f, Satellite Accumulation S1600/W30

Visual Site Inspection. SAA #14 is located in an area used to wash underground mining and transportation equipment. During normal operation, water contaminated with salt, grease, hydraulic oil, motor oil, and diesel would accumulate in a stainless steel reservoir located under the equipment. SAA #14 functions to accumulate the wash waste and sludge, which is treated as hazardous waste. The VSI finds SAA #14 to be nonoperational: the wash rack and sump are free of waste water and sludge and the 55-gallon drum shown in appendix 4.9.6 is empty. No evidence of a past release of hazardous substances is observed.

4.9.7 SWMU No. 009-g, Satellite Accumulation S1300/E140

Visual Site Inspection. Appendix 4.9.7 shows maintenance supplies and equipment stored at this inactive unit. No hazardous materials or waste are currently being managed here. Although the area was used for accumulating solvent-soaked rags, aerosal cans and used oils, no evidence for a release of these substances is noted during the VSI. The floor surface is discolored, presumably from traffic and water residue leftover from dust control.

4.9.8 SWMU No. 009-h, UG, Satellite Accumulation/Storage N780

Visual Site Inspection. This unit is located at the West end of N780 between E0 and E140. During welding, the process vapors are vacuumed into a filtering machine to prevent exposing the workers to unfavorable conditions. The VSI confirms the unit is used to accumulate aerosols and rags soaked with solvent and oil prior to disposal or recycling. SAA #10 is used to accumulate spent aerosols. No evidence of a past release of hazardous substances is observed.

4.9.9 SWMU No. 009-i, SPVD Room 1, Old Maintenance Shop

Preliminary Review. This unit was located in SPVD Room 1, a maintenance shop for mine equipment and instruments. Typical wastes in active maintenance shops include rags contaminated with oil and naphtha-based solvents, spent aerosols, and used oil. Due to a back instability, all hazardous wastes and materials were reportedly removed from SPDV Room 1 prior to collapse of the back. The methods used to manage the SWMU are not known, as current procedures were not in place when the unit became active in 1983.

Visual Site Inspection. The VSI was conducted from outside the barricaded room: no human access is currently permitted. Remaining inside this unit are the concrete slab floor, electrical wiring, several 55-gallon drums, and several unused 5 gallon plastic bottles. Chainlink fencing material used to prevent rock fragments from falling, is also remaining in the room. No evidence of a past release could be confirmed.

4.9.10 SWMU No. 009-j, Satellite Accumulation West End N1420

Visual Site Inspection. There is no remnant of the inactive satellite storage area SWMU 009j described in Table 4.10. No evidence of leakage from naptha-based solvents or used oils delineate the former location of the unit.

Appendix 4.9.10 shows forty-five 55-gallon drums stored in the general area of the former SWMU 009j (SPVD room #4/L-4). The drums are filled with solidified grout leftover from grouting experiments in rooms L-2 and L-3. Ph values of the cementatious grout reportedly can be as high 12.5. This end of drift N1420 also stores metal stock, boring equipment and temporarily stores other materials used in experiments. Material Safety Data Sheets for all materials currently used in nearby experiments were provided, for review, by Sandia and Westinghouse. A review of the MSDSs revealed that all materials being used were nonhazardous; Ph values ranged from 3.5 to 8.0. All wastes resulting from drilling bore holes, laying the concrete foundation in L-3, and other activities in the area are placed in appropriate containers and transported to a designated SAA.

4.10 SWMU Group - 010, Mine Shaft Sumps

As summarized in Table 4.11, this SWMU group consists of four respective sumps located at the bottoms of the Salt Handling Shaft, the Waste Handling Shaft, the Exhaust Shaft, and the Air Intake shaft. These sumps reportedly received wastes primarily during the construction phase and consisted of welding debris, scrap metal, concrete from the shaft lining, cement grout, chemical grout, grease, wash water, brine from the Rustler Formation, and salt. Because all the units display low release and exposure potentials, this section departs from the previous report outline, and describes only the preliminary review and visual site inspection. No sampling was deemed necessary at any of the locations.

4.10.1 SWMU No. 010-a, UG, Salt Handling Shaft Sump, 0/0

Preliminary Review. This unit is located at the base of the Salt Handling Shaft (SHS) at "0/0" (Mine Focal) (Figure 2.3). The unit is the diameter of the SHS (10 feet) and extends 148 feet below the facility horizon. The sump will be filled when the facility is decommissioned. The sump has received routine waste since the SHS was excavated in 1981, consisting of the materials listed in Table 4.11. No release controls exist, however the sump is cleaned periodically on an as needed basis.

Visual Site Inspection. The VSI revealed that the sump has received 48 feet of material and is now only 100 feet deep. A ladder is used to descend into the sump to facilitate maintenance, shaft inspections, and ground control. No evidence of waste described in the PR was observed or apparent in the SWMU photograph in appendix 4.10.1. The material in the sump appears to be composed mainly of salt from spillage of the transport bucket.

4.10.2 SWMU No. 010-b, UG, Waste Handling Shaft Sump

Preliminary Review. This unit is located at S400/E30 at the bottom of the Waste Handling Shaft (WHS)(Figure 2.3). The diameter of the WHS is 20 feet and extends 119 feet below the facility horizon. According to the RCRA Part B application, the sump has received waste summarized in Table 4.11 since 1982.

Visual Site Inspection. The VSI revealed a small pool of brine water and several brine weep crystals on the shaft wall near the 110 feet level. No deleterious waste was observed and nor evidence of a past release. Apparently the sump is routinely cleaned to maintain a 119-foot depth to accommodate the hoist counter weights.

4.10.3 SWMU No. 010-c, UG, Exhaust Shaft Sump

Preliminary Review. This unit is located at the base of the Exhaust Shaft (ES), S400/E480, and ends at the facility horizon (Figure 2.3) Waste are derived mainly from ES maintenance activities with debris accumulating in the ES sump. The sump is 18 feet in diameter. Wastes reportedly include salt, concrete, cement grout, chem-grout, brine from the Rustler Formation, grease, and oil.

Visual Site Inspection. The VSI show no evidence of past releases of the listed waste above. Shaft inspections and sump maintenance and cleaning are conducted routinely.

4.10.4 SWMU No. 010-d, UG, Air Intake Shaft Sump

Preliminary Review. This unit is at the base of the Air Intake Shaft (AIS) located at 0/W620 (Figure 2.3). Waste from experimental work and shaft maintenance has been accumulating since 1989 in the 20-foot diameter sump.

Table 4.11 WIPP SWMU Characterization Sheet - 010 Shaft Sumps

010	SHAFT SUMPS
Unit type:	Shaft Sumps
Unit use:	Collection/Storage
Operational status:	Active
Use period:	1981-present
Materials managed:	Solid Waste Hazardous Waste
Hazardous release:	None
Radioactive release:	None
Information source(s):	Process knowledge Westinghouse, 1984 DOE, 1987

Unit Description

Refer to Figure J-3 for location. Four shafts have been completed to the WIPP acility underground. The Salt Handling and the Waste Handling Shafts have sumps (010-a and 010-b) that extend below the facility horizon (148 feet and 119 feet, respectively). The sumps have been cut into the salt of the repository and have not been lined. The other two shafts, the Exhaust Shaft and the Air Intake Shaft, end at the facility horizon and do not have sumps. The bottoms of these shafts are 010-c and 010-d, respectively. The bottoms of all four shafts have received construction debris. The Salt Handling and Waste Handling Shafts have been grouted and there is no wastewater accumulation. The solid material cleaned up from the bottom of the shafts without sumps is disposed of on the main salt storage area. The Air Intake Shaft currently receives brine from the Rustler Formation. On January 17, 1992, the New Mexico Environment Department issued an approved Discharge Plan to expand the WIPP sewage facility. The discharge plan allows for the disposal of Air Intake Shaft brine waters in the evaporation lagoon and the expanded sewage facility. Until the new sewage lagoon expansion is complete, the discharge plan permits the disposal of wastewater generated by observation well pumping at the site in the evaporation basin (SWMU No. 007-c), west of the main salt storage area (SWMU No. 002-b). Unit information for these SWMUs is listed on Table J1-4. Engineering drawings of the Waste Handling and Exhaust Shafts are included in Appendix D3 of this permit application.

SWMU	Dates	*Location and Description	Status	Material Stored
010-a Salt Handling Shaft	1981	0/0 Sump extends 148 feet below the facility horizon.	Active	Welding residue, scrap wood and metal, salt, Class C cement, chemical-seal, bentonite, grease, and oil
010-b Waste Handling Shaft	1982	S400/E30 Sump extends 119 feet below the facility horizon.	Active	Concrete, salt, cement grout, chemical grout, brine from Rustler Formation, wash water, grease, and oil
010-c Exhaust Shaft	1985	S400/E480 Shaft ends at the facility horizon.	Active	Salt, concrete, cement grout, chemical grout, brine from Rustler Formation, grease, and oil
010-d Air Intake Shaft	1989	0/W620 Shaft ends at the facility horizon.	Active	Salt, brine from Rustler Formation, concrete, grease, and oil

(after WIPP RCRA Part B Permit DOE/WIPP 91-005)

Visual Site Inspection. The VSI revealed a 20-foot diameter depression 6 inches deep lined with bradus cloth (appendix 4.10.4). No evidence of any potentially deleterious materials listed in Table 4.11 was observed. The most pervasive material flooring the sump appears to be salt. Regular inspection and cleaning, on an as needed basis, appears to be occurring.

4.11 SWMU Group 011 - Sewage Treatment Facility

SWMU Group 011 is the sole waste water treatment system for the WIPP facility. The system receives primarily domestic sewage; however, as indicated in the preliminary review, other nonhazardous substances such as brine are also introduced. There are several older and currently inactive septic systems at the WIPP site that are now covered by asphalt paving or buildings. Seven permits were issued to the WIPP site between July of 1981 and July of 1988 for these domestic sewage septic systems. As stated in the RCRA Part B application, HWMR-7, Pt. II, 261.4(a)(i) exempts sanitary waste (domestic sewage/chemically uncontaminated) from classification as solid waste.

4.11.1 SWMU No. 011, Sewage Treatment Facility

Preliminary Review. This unit is located approximately 2,000 feet Southwest of the Salt Handling Shaft. A review of the discharge plan for the facility confirms the description of the unit provided in Table 4.12. Release controls include dynaloy liner for the primary and polishing ponds. The effluent pond has no release control, except the pond dikes which contain the water. The effluent pond does allow a permitted environmental release by infiltration into the soil and by evapotranspiration. Background review indicates the system is safeguarded against the introduction of RCRA hazardous wastes or hazardous constituents by procedures and through site training. The nonhazardous quality of the water is verified by periodic sampling and analysis for hazardous constituents.

Visual Site Inspection. The VSI confirms the construction and operation as presented in the PR (appendix 4.11). A modification of the facility to increase flow capacity has been approved by the New Mexico Environment Department and is nearing completion. It will add two more lined evaporation ponds and add a liner to the existing evaporation pond. This is to accommodate disposal of waste brine generated during annual observation well sampling and for disposal of brine from the AIS facility. The unlined AIS will be sealed by the end of September 1993 and no longer generate brine. The entire facility is constructed above grade with caliche gravel and is surrounded by an eight foot high chainlink fence with lockable drive through gates. The facility is approximately 500 feet East to West and 125 feet North to South. No visible evidence of an environmental release was observed.

Sampling Visit. This unit was not sampled.

Release and Exposure Assessment.

- Soils - The unlined evaporation pond has allowed a permitted release.
- Groundwater - Migration potential is low relative to other locations onsite: the nearby H-2 well pad is situated 10 meters (34 feet) above the Dewey Lake and 180 feet above a transient zone of saturation in that formation. Short-term tests to determine fluid yield, however, indicate negligible flow at this location (TME 3059, 1980). Migration to the Culebra Dolomite aquifer (190 meters/620 feet below surface) is unlikely.
- Surface Water - Design of the facility will accommodate a 100-year storm event and a release is unlikely.
- Air - The annual presence of migratory birds and daily use by resident bird species suggests that the facility does not release harmful emissions or nuisance odors into the air.

Exposure potential is extremely low.

Table 4.12 WIPP SWMU Characterization Sheet - 011
Sewage Treatment Facility

011	SEWAGE TREATMENT FACILITY
Unit type:	Sewage Treatent Facility
Unit use:	Treatment
Operational status:	Active
Use period:	May 1985-present
Materials managed:	Sanitary Waste Suspected Solid Waste
Hazardous release:	None
Radioactive release:	None
Information source(s):	Process knowledge Westinghouse, 1992a

Unit Description

Refer to Figure J-1 for location. The sewage treatment facility consists of five ponds, primary cells 1A and 2A, polishing cells 1B and 2B, and the effluent pond. The primary and polishing cells are lined with Dynaloy and each has a capacity of 9,250 gallons. The facility is located about 1/4 mile southwest of Zone I and covers an area of about 4 acres. No chemicals are added to the effluent for treatment. The effluent pond is unlined and has a capacity of 18,500 gallons. A discharge plan for the WIPP facility was submitted to the New Mexico Environment Department on January 7, 1992. The discharge plan identifies all WIPP facility discharge streams. The New Mexico Environment Department approved the plan on January 17, 1992.

Waste Description

The sewage treatment facility treats sanitary waste. Neutralized film developer, solvents, and oils are reported to have been disposed of through this system in the past.

Release Information

Releases of RCRA hazardous waste or hazardous constituents have not occurred at this site. The releases from this unit are part of the treatment process and consist of infiltration of the water from the unlined effluent pond. The water is considered nonhazardous. The water undergoes routine sampling and analysis as described in WP 02-6 and 02-7. If hazardous constituents are detected, the water will be handled as site-generated hazardous waste in accordance with procedures in WP 02-6 and 02-7 (Westinghouse, 1992a).

(after WIPP RCRA Part B Permit DOE/WIPP 91-005)

4.12 SWMU Group 012 - Nonhazardous Solid Waste Bins

Nonhazardous solid waste generated by WIPP site operations is collected on site by janitorial service personnel, then deposited in waste bins provided by Waste Management of New Mexico (Table 4.13). A contractual agreement between DOE/WIPP and Waste Management of New Mexico requires that no hazardous waste will be deposited in the waste bins. All operational and experimental site activities with potentially hazardous waste streams are managed, inspected, and sampled to exclude hazardous waste from the waste bins. Waste bins consist of 6 and 30 cubic-yard capacity steel dumpsters. The 30-cubic-yard bins are open topped with a black poly netting cover. The 6-cubic-yard bins have hinged lids. Drain plugs are present on both style bins and are used only during cleaning operations by the service provider off site at their base of operations.

4.12.1 SWMU No. 012-a, Surface Nonhazardous Solid Waste Bins

Preliminary Review. Appendix 4.12 shows the location of surface bins as of 1991. There are currently two 30-cubic-yard rolloff bins, located 200 feet northeast of the Engineering Building. Ten 6-cubic-yard end dump bins are located due east of the Safety Building # 452.

Visual Site Inspection. No evidence of past releases is observed. The bins are routinely emptied by the service provider and on an as needed basis.

Sampling Visit. This group was not sampled.

Release and Exposure Assessment.

- Soils - None
- Groundwater - None
- Surface Water - None
- Air - None

Exposure potential is extremely low to nonexistent.

4.12.2 SWMU No. 012-b, Underground Nonhazardous Solid Waste Bins

Preliminary Review. There are, from time to time, as many as six 6-cubic-yard bins at various locations underground. The bins are routinely exchanged with empty ones on the surface.

Visual Site Inspection. The VSI revealed no past releases or evidence of mismanagement at any of the bin locations.

Sampling Visit. This group was not sampled.

Release and Exposure Assessment.

- Soils - None
- Groundwater - None
- Surface Water - None

Table 4.13 WIPP SWMU Characterization Sheet - 012 Nonhazardous Solid Waste Collection Bins

012	NONHAZARDOUS SOLID WASTE COLLECTION BINS
Unit type:	Collection Bins
Unit use:	Storage
Operational status:	Active
Use period:	Jan. 1985-present
Materials managed:	Nonhazardous Waste
Hazardous release:	None
Radioactive release:	None
Information source(s):	Process knowledge

<u>Unit Description</u>

Not shown on figure. There are two 30-cubic-yard rolloff bins and eighteen 6-cubic-yard end dump bins located at various locations around the WIPP facility. These units are portable and their locations vary. After it is collected, the waste is disposed of at the Dark Canyon Landfill located south of the city of Carlsbad. These solid wastes do not contain RCRA-regulated hazardous waste or hazardous constituents.

<u>Waste Description</u>

Nonhazardous solid waste is collected in the bins at the WIPP facility.

<u>Release Information</u>

Releases of RCRA hazardous waste or hazardous constituents have not occurred at these sites.

(after WIPP RCRA Part B Permit DOE/WIPP 91-005)

5.0 Conclusions/Areas of Concern

The following section summarizes observations for each SWMU group and highlights important conclusions and areas of concern identified in the RFA. Most currently active Solid Waste Management Units (SWMUs) at the WIPP site are not major issues. Procedures, training and a positive ethic for managing hazardous materials onsite are emphasized by DOE/WIPP management. Notwithstanding this observation, some SWMU groups defined in the RCRA Permit application were operated and decommissioned before many current management controls were in place. Areas of concern are principally directed at these older units. Table 5.1 provides a reference to those SWMUs emphasized in this section, where either a RCRA Facility Investigation (RFI) is suggested or other actions are encouraged.

Table 5.1
Suggested SWMU Group Actions

Solid Waste Management Unit	Areas of Concern	RCRA Facility Investigation Suggested	Other Suggested Action	Notes
SWMU 001 Mudpits P-15, H-11/P-9, P-6, IMC-374, H-14/P-1, DOE-1, Badger Unit, Cotton Baby	■	■	□	Note 1
SWMU 002 Salt and Top Soil Storage Areas SWMU 002a (Inactive Salt) SWMU 002b (Active Salt) SWMU 002c (Inactive Top Soil)	 ■ ■ ■		 □ □ □	Note 2
SWMU 003 Landfills SWMU 003a (Brinderson) SWMU 003b (New Landfill/Inactive)	 ■ ■	 ■ ■	 □	Note 3
SWMU 004 Storage Yards	■	■	□	Note 4
SWMU 005 Concrete Batch Plants				
SWMU 006 Holding Ponds SWMU 006a (Salt Holding Pond) SWMU 006b (Waste Handling Pond)	 ■ ■		 □ □	
SWMU 007 Evaporation Ponds				
SWMU 008 Surface Satellite Accumulation Area (Facility 474 Complex)	■		□	
SWMU 009 Underground Satellite Accumulation Area				
SWMU 010 Shaft Sump 3				
SWMU 011 Sewage Treatment Facilities				
SWMU 012 Nonhazardous Solid Waste Collection Bins				
SWMU 013 TRU Mixed Waste Management Units	N/A			

Note 1: RFI for select group of mudpits. Continue ongoing reclamation/remediation activities for other mudpits.
Note 2: Develop procedure to exclude potentially hazardous substances from 002b.
Note 3: Continue planned reclamation/remediation activities: slope stability.
Note 4: Discolored soil at Portacamp.

5.1 SWMU Group 001 - Mudpits

Based on document review and site-specific visual surveys, this study finds that SWMU Group-001 consists of as many as 50 individual mudpits. Because many sites are graded and revegetated, only twenty-seven mudpit locations on 28 drill pads are conclusively identified. U.S Geological Survey and IMC potash drill pads are extensively graded. The size and volume reported for many mudpits are approximate; in many cases only subtle differences in vegetation, surface expression or other indirect evidence identify the mudpit. Background review suggests that diesel fuel was used and stored at ERDA-9 and possibly all potash "P" well mudpits. Surficial contamination is apparent at only two oil exploration mudpits: Badger Unit and Cotton Baby. Unlike most other drill pads, these sites have apparently not been reclaimed.

A review of borehole reports and permit records, where available, demonstrates a general lack of control involving management of hazardous materials or waste at most well sites. An increased sensitivity to proper management is evident in Westinghouse contractural requirements beginning in 1986; however, in no instances is there supporting documentation at closure to support the assumption that no hazardous constituents have been introduced into the mudpits. To test the validity of process knowledge, a limited sampling program was conducted at mudpits in October, 1992 at DOE-1 (drilled in 1982), Badger Unit (drilled in 1974) and Cotton Baby (drilled in 1974). Preliminary interpretation of the data indicate the following:

- Trace amounts of substituted benzene compounds (3000-7000 ppb) and aromatic and halogenated hydrocarbons (20-30 ppb maximum) and aliphatic hydrocarbons/diesel (190 ppm maximum)

- elevated levels of barium (120 ppm maximum), chromium (43 ppm maximum) and lead (51 ppm maximum) above background levels 11 ppm, 3 ppm, and <5 ppm, respectively.

- elevated levels of organic and heavy metal constituents in native dune sand and/or soil below the mudpit liner

The sample data indicate that a release of potentially hazardous RCRA constituents has occurred beyond the bottom mudpit liner at these sites. Although the concentrations measured are in all instances below proposed RCRA action levels, the full extent of the release cannot be established from the RFA sampling conducted for this study. In addition, the sampling program supports the assertion that hazardous constituents may be present at other sites. In addition to proximity to known or suspected shallow groundwater, conditions such as the age of the well pad, information collected on specific mudpit contents, and proximity to established or developable drinking water sources are used as criteria to identify areas of concern in Figure 5.1. A RCRA Facility Investigation (RFI); however, is suggested for only eight of the eleven mudpit SWMUs identified: P-15, H-11, H-14/P-1, Cotton Baby, P-6, IMC-374, DOE-1, and Badger Unit. The rationale for selecting these sites are as follows:

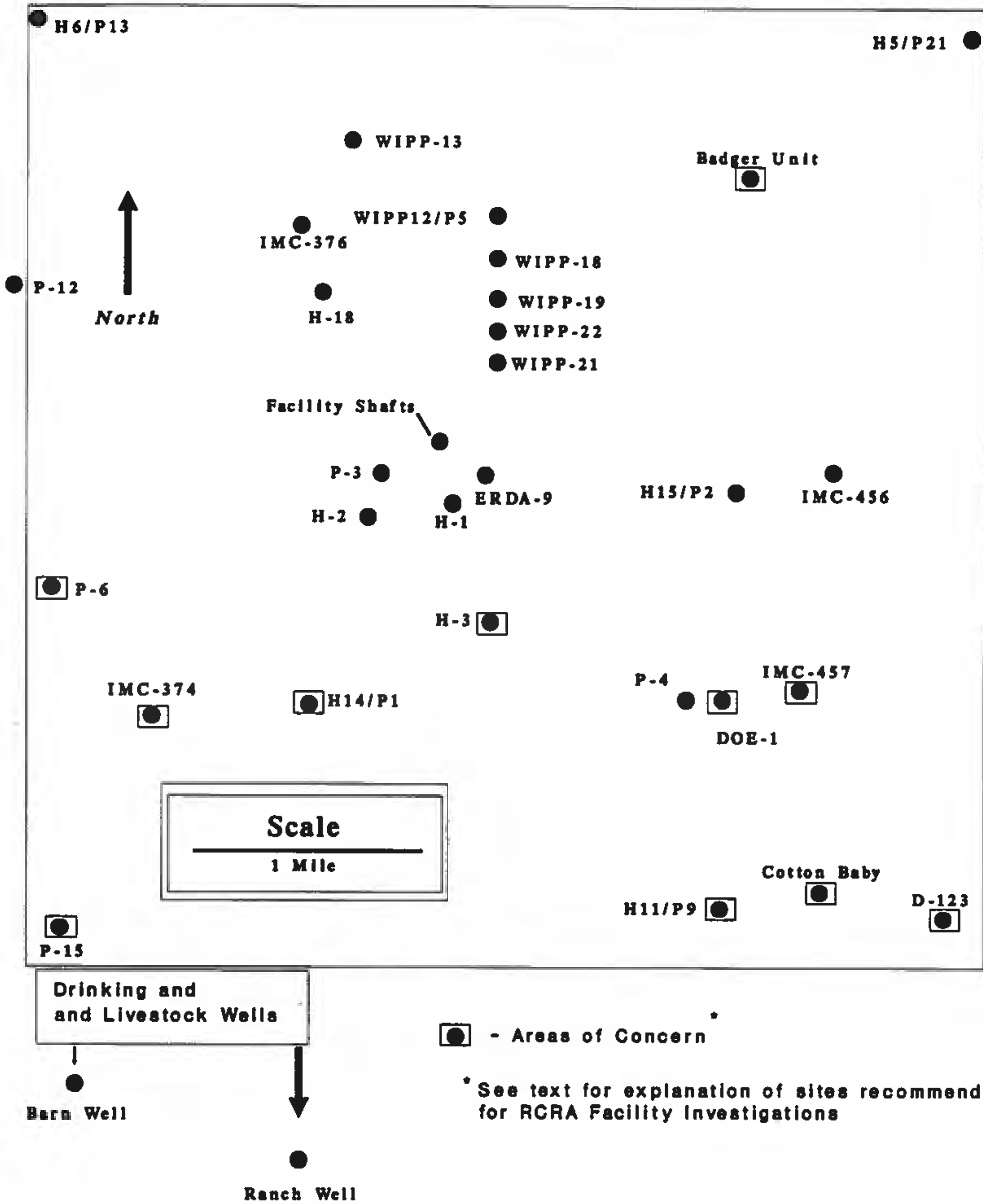
- P-15 and H-11 are selected on the basis of established groundwater detected at these locations at around 65-70 meters (220-230 feet) below the surface, proximity to the site boundary, and possible hydrologic connection to the Dewey Lake perched groundwater zone offsite.

- Cotton Baby, DOE-1, and Badger Unit are selected principally on the need to better characterize the unit characteristics and degree of release observed during preliminary RFA sampling.

- P-6, IMC-374, and H-14/P-1 are chosen for their relative proximity to the site boundary (P-6) and/or their location at the possible northern fringe of the Dewey Lake perched zone. P wells (U.S. Geological Survey potash investigation boreholes) reportedly used diesel fuel as a drilling fluid additive.

Lastly, this study finds that the RCRA Part B application omitted boreholes H-3d, H-11b4, and P-2, and completely overlooked borehole pads H-16, DSP 207, IMC-375 and IMC-377. Further information is required.

Figure 5.1 Borehole Mudpits and Areas of Concern



* See text for explanation of sites recommended for RCRA Facility Investigations

5.2 SWMU Group 002 - Salt and Top Soil Storage Areas

The salt storage sites are found to contain a considerable, but undetermined amount of solid waste. One top soil site (SWMU-002c) also contains solid waste. Without photographic or procedural documentation, there exists the possibility that trace amounts of hazardous constituents were placed in these SWMUs along with construction debris. Although it is unlikely that any of the construction materials or trace hazardous constituents pose a threat to the environment, it does reflect on housekeeping. A procedure is not implemented to screen potentially hazardous constituents from the units, such as Construction Landfill Operations procedure WP 06-108. This issue will be become more important as the TRU Waste management Unit becomes active and further high volume mining of the repository commences.

Conclusion: Due to the shear volume of material involved, a RCRA Facility Investigation would be difficult. A sampling program may not adequately characterize the unit, considering the trace amounts of potentially hazardous substances which are presumed to be present. Considering the relatively low exposure risk, it is suggested that a special effort be made to characterize the fill at the time the facility is decommissioned. Some materials may also be unsuitable for the shaft plugs or reclamation activities planned at the time of facility closure. In the interim, a DOE/WIPP procedure should be developed to exclude hazardous materials, solid waste and other potentially hazardous solids or liquids from SWMU 002b.

5.3 SWMU Group 003 - Landfills

Both landfill sites are located a considerable distance from the WIPP boundary, suggesting that migration and exposure by the groundwater pathway is improbable. Nevertheless, undocumented materials could have been unintentionally emplaced at SWMU-003a (Brinderson Landfill: closed in 1987) and the inactive unit at SWMU-003b (active pre- 1982 through 1990). The WIPP operations procedure to screen hazardous materials from landfills was not in place until 1988, well after these units were in operation or closed. Based on air photo review, holding pond settlings may have also been placed in both landfills: 1) in the inactive landfill unit at SWMU-003b and/or 2) in the initial excavation worked in the central area of the Brinderson Landfill (SWMU-003a). The borehole mudpit investigation for this RFA suggests that holding pond residue may exhibit similar characteristics, including traces of potentially hazardous organic and heavy metal constituents.

Conclusion: The areas of concern are aimed at those units active prior to late 1988, especially those that may have received drilling fluids: SWMU-003b (inactive) and Brinderson Landfill (central excavation/closed 1985). Based on migration and exposure potential, Brinderson Landfill is of most concern. Nevertheless, because there is no documentation or procedures to support process knowledge, both units should be investigated. Another concern is the potential erosion of the landfill fill slopes at SWMU-003b. Staff supports slope stabilization to preclude a release caused by exhumation of the landfill.

5.4 SWMU Group 004 - Storage Yards and Portacamp

Generally the storage yards are well managed and secure. However, some Areas of Concern and recommendations are identified as follows:

- There is evidence of a past release (discolored soil) on the west side of the SWMU 004a Portacamp (Westinghouse-managed). The RCRA Part B application attributes the source of discoloration to leaks or spills from containers storing virgin oils. While sampling of stained soil from a spill is current procedure, there is no evidence that these older discolored soils have been sampled. DOE/WIPP spill remediation and sampling procedures WP 02-6 and WP 02-7 were first implemented in 12/31/91. Because elevated levels of cadmium were detected in vehicle wash bay sludge previously stored at SWMU-004a, staff believe that a release of hazardous substances into the environment cannot be precluded in the absence of sampling data from the soils. An RFI is suggested to establish the composition and distribution of the discolored soils found in this portacamp.

- Improperly stored concentrated nitric acid was observed on the east side of the SWMU 004a Portacamp Storage Yard (Sandia National Laboratory-managed). Staff suggest the acid be containerized properly and removed to an appropriate storage area.

- Housekeeping could be improved in all locations; however, SWMU 004b (Reclaimables Storage Yard) displayed especially poor housekeeping, including improper segregation of recyclable or reclaimable metals and materials.

- The spent batteries stored at SWMU No. 004-b (Reclaimables Storage Yard) contain sulfuric acid and represent a potential source for a release to the environment. Staff suggest that spent lead acid batteries should be removed from the reclaimables yard and be handled within the Hazardous Waste Staging Area as a hazardous material.

5.5 SWMU Group 005 - Concrete Batch Plants

No oily or stained soil occurs at the surface of the two uncovered concrete batch plant locations. The survey of SWMU 005b reveals site reclamation to be successful, with vigorous revegetation occurring. SWMU 005a is not reclaimed, but has been subsequently graded. Abundant spilled concrete and construction material debris still cover the general area of SWMU 005c. The Waste Handling Building and asphalt pavement now cover the former SWMU 005a location, which prevented direct verification of process knowledge. Nevertheless, there are no concerns directed at SWMU 005c or other units of this SWMU group.

5.6 SWMU Group 006 - Salt and Waste Shaft Holding Ponds

Based on the size of the features observed on aerial photographs, the holding ponds for the Salt Shaft (SWMU-006a) and Waste Handling shaft (SWMU-006b) each contained as much as 2-3 million gallons of drilling fluid. The underlying issue is whether the drilling fluids contained suspect organic and heavy metal constituents, and have the potential for migrating and/or harming the environment. No direct evidence was encountered to preclude the possibility that traces of potentially hazardous constituents, similar to those found in mudpits sampled for the RFA, were unintentionally placed into the holding ponds.

Some potentially hazardous remnant materials may remain present at both sites where settlings were not completely excavated. Athough much of the material has been excavated and removed, the large volume of materials suggests that some shallow infiltration may have occurred into underlying formations. The holding pond contents remained buried insitu for three years and eight years at the Waste Handling Shaft and the Salt Shaft holding ponds, respectively. Notwithstanding these concerns, this study concludes that the migration and exposure potential by the groundwater pathway is unlikely.

Conclusion: Because most of the contents have been removed and much of the original features are now buried under building foundations, a RCRA facility investigation may be difficult. It is noted that there will likely be a comprehensive closure plan implemented at the time of the WIPP facilitys' decommissioning. Depending on the regulatory driver, the closure plan could involve sampling and remediating, if necessary, subsurface soils within the fenced boundary following removal of surface facilities.

5.7 SWMU Group 007 - Evaporation Ponds

One of two evaporation ponds used to discharge grey water was sampled for the RFA. The former location of SWMU 007b, now completely graded, lies within an area that now receives routine outfall from stormwater and domestic water resulting from fire flow performance testing. Iron, barium, and aluminum metals are found above background levels; however, concentrations are well below RCRA action levels. No semi-volatile compounds or aliphatic hydrocarbons are present. The spot sampling appears to support process knowledge for both grey water evaporation ponds. The SWMU 007c evaporation pond is verified to receive only saturated brine and run-off from the adjacent salt storage area. There are no Areas of Concern for the evaporation pond SWMU Group.

5.8 SWMU Group 008 - Surface Satellite Accumulation and Storage Areas

In general, current management of these units is efficient and well documented by inspection and sampling activities. Nevertheless, as suggested in Table 5.1, there are specific concerns relative to this SWMU group:

- SWMU 008l (Facility 474B) is the current "Hazardous Waste Staging Area", while SWMU 008n (Facility 474A) is proposed for a similar function sometime in the future. Both have the potential for contaminating the adjacent water storage tanks. As stated in the technical assessment, potential contamination is most likely negligible; however, the present design allows a possible exposure pathway to site employees.

  Staff suggest two options to preclude contamination of water contained in storage tanks:

  - install a sealed vent system over the open vent of the water storage tanks, or

  - control 100% of the effluent from the 474 complex with an activated charcoal filtering system.

- This assessment finds an unidentified SWMU located at Facility 474E, a building which contains Satellite Accumulation Area (SAA) #15. Proposed No. 008-o, Satellite Accumulation and Hazardous Materials Storage Areas (Blg. 474-E) should be a solid waste management unit. Quantities of hazardous materials and some hazardous waste are managed at this location. An exposure pathway also exists for Facility 474E, as the individual isolation bays are equipped with unfiltered ventilation systems that exhaust to the atmosphere.

- SWMU 008k is no longer designated as a SAA, based on the interpretation that oil being managed is a recyclable product, and therefore exempt from RCRA regulations. If it is no longer a SWMU, weekly inspections and other SAA requirements are not mandated. Given that a mandatory sampling program is not implemented for used oil (WP 02-502: Used Oil Management), and a spill is possible at this location, staff suggest redesignation of the unit as a SWMU.

5.9 SWMU Group 009 - Underground Satellite Accumulation Areas

This assessment surveyed all 10 underground Satellite Accumulation Areas (SAA's) and found the areas to be clean and well managed. Waste is segregated properly in separate containers, all areas utilize approved DOT containers, and appropriate signs and barricades are posted. Nonradioactive waste generated from operational and experimental activities appear to be routinely transferred to accumulation areas. In all cases, exposure potential is extremely low to nonexistent and there are no Areas of Concern within the units of this group.

5.10 SWMU Group 010 - Mine Shaft Sumps

Inspections of the Salt Handling Shaft, Waste Handling Shaft, Exhaust Shaft, and the Air Intake shaft sumps revealed clean, well-managed areas. The most pervasive material flooring all the sumps is rock material (salt). Waste reportedly accumulated during the construction phase (cement grout, chemical grout, grease, etc.) is not apparent. All the units display low release and exposure potential, and no Areas of Concern are expressed for this SWMU group.

5.11 SWMU Group 011 - Sewage Treatment Plant

This assessment indicates the waste water treatment system at the WIPP sewage lagoon is safeguarded against the introduction of RCRA hazardous wastes or hazardous constituents by procedures and through site training. The nonhazardous quality of the water is verified by periodic sampling and analysis for hazardous constituents. A discharge plan for the facility and DOE orders guide sampling activities at the Sewage Lagoon. There are no Areas of Concern for this facility.

5.12 SWMU Group 012 - Nonhazardous Solid Waste Bins

There are no Areas of Concern within the units of this group. RCRA management and inspection procedures implemented at operational, experimental, and laboratory facilities deter hazardous waste from being placed in waste bins. In addition, general employee training (GET) and site generated waste worker certification reinforce hazardous waste awareness, and encourage use of the satellite accumulation area system onsite.

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7.0 Appendices

4.1 SWMU Group 001 - Mudpits
4.2 SWMU Group 002 - Salt and Top Soil Storage Piles
4.3 SWMU Group 003 - Landfills
4.4 SWMU Group 004 - Storage Yards
4.5 SWMU Group 005 - Concrete Batch Plants
4.6 SWMU Group 006 - Holding Ponds
4.7 SWMU Group 007 - Evaporation Ponds
4.8 SWMU Group 008 - Satellite Accumulation Areas - Surface
4.9 SWMU Group 009 - Satellite Accumulation Areas - Underground
4.10 SWMU Group 010 - Shaft Sump
4.11 SWMU Group 011 - Sewage Lagoon
4.12 SWMU Group 012 - Solid Waste Collection Bins

(Note: Appendices are keyed to technical assessments presented in Section 4.0 "Solid Waste Management Units". Contents include photographs from site visits and soils logs and sampling data from investigations of mudpits.)

Appendix 4.1

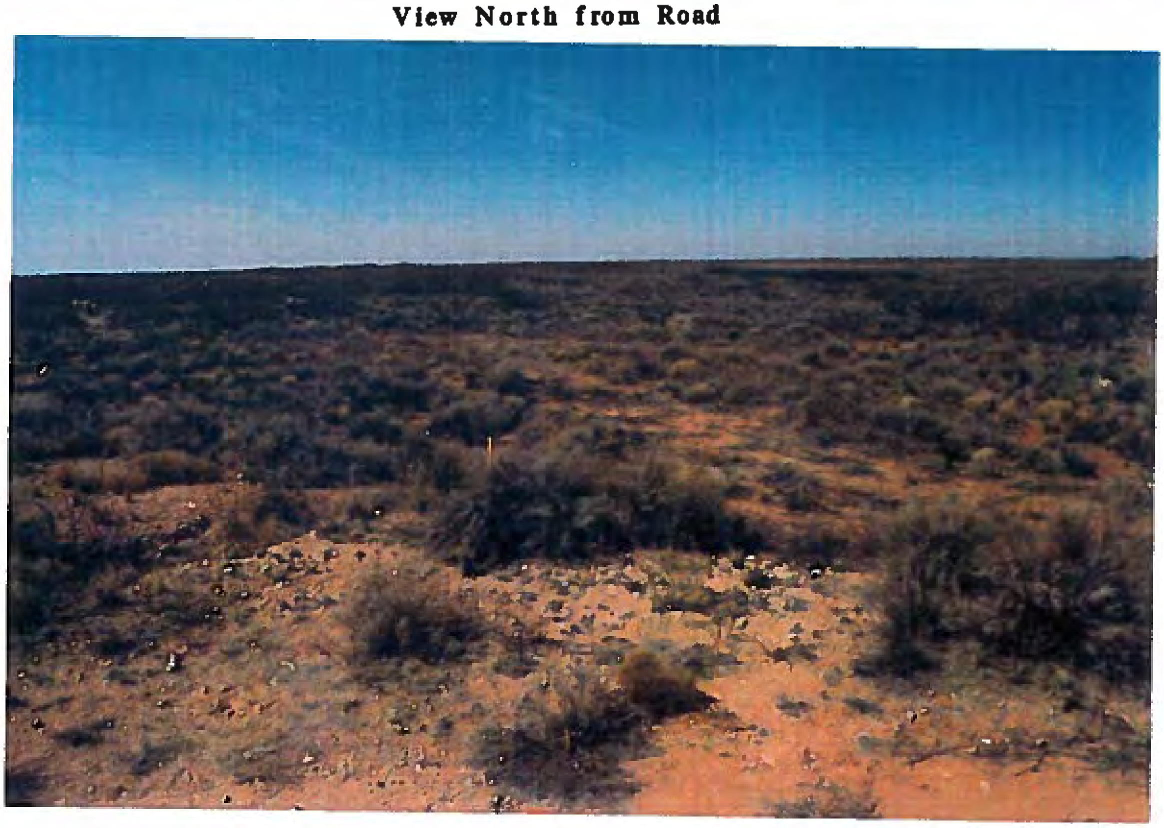
Mudpits

Appendix 4.1.1
H-1 Site Photograph

View North

Appendix 4.1.2
H-2 Site Photograph

View North from Road



View N80W

Appendix 4.1.3
H-3 Site Photograph

View West

Appendix 4.1.4
H-5/P-21 Site Photograph

View South on East Side of Pad

Appendix 4.1.5
H-6/P-13 Site Photograph

View North

View Northwest from North Side of Pad

Appendix 4.1.6
H-11/P-9 Site Photograph

View N65W H-11b2 in Foreground

Appendix 4.1.7
H-14/P-1 Site Photograph

View N60E

Appendix 4.1.8
H-15 /P-2 Site Photograph

View N55E

View North

Appendix 4.1.9
H-18/P-21 Site Photograph

View to Southeast

Appendix 4.1.10
H-16 Site Photograph

July 2nd, 1987 Site Photo Follows

Appendix 4.1.11
P-3 Site Photograph

View West

Appendix 4.1.12
P-4 Site Photograph

View North on West Side of Pad

Appendix 4.1.13
P-5/WIPP-12 Site Photograph

View East of Portion of Mudpit Complex

Close-up of Furrow Above

Appendix 4.1.14
P-6 Site Photograph

View N60E

Appendix 4.1.15
P-15 Site Photograph

View N40E

Appendix 4.1.16
Badger Unit/RFA Sampling Event

Site Photograph

Site Sketch

Borelog

Analytical Results

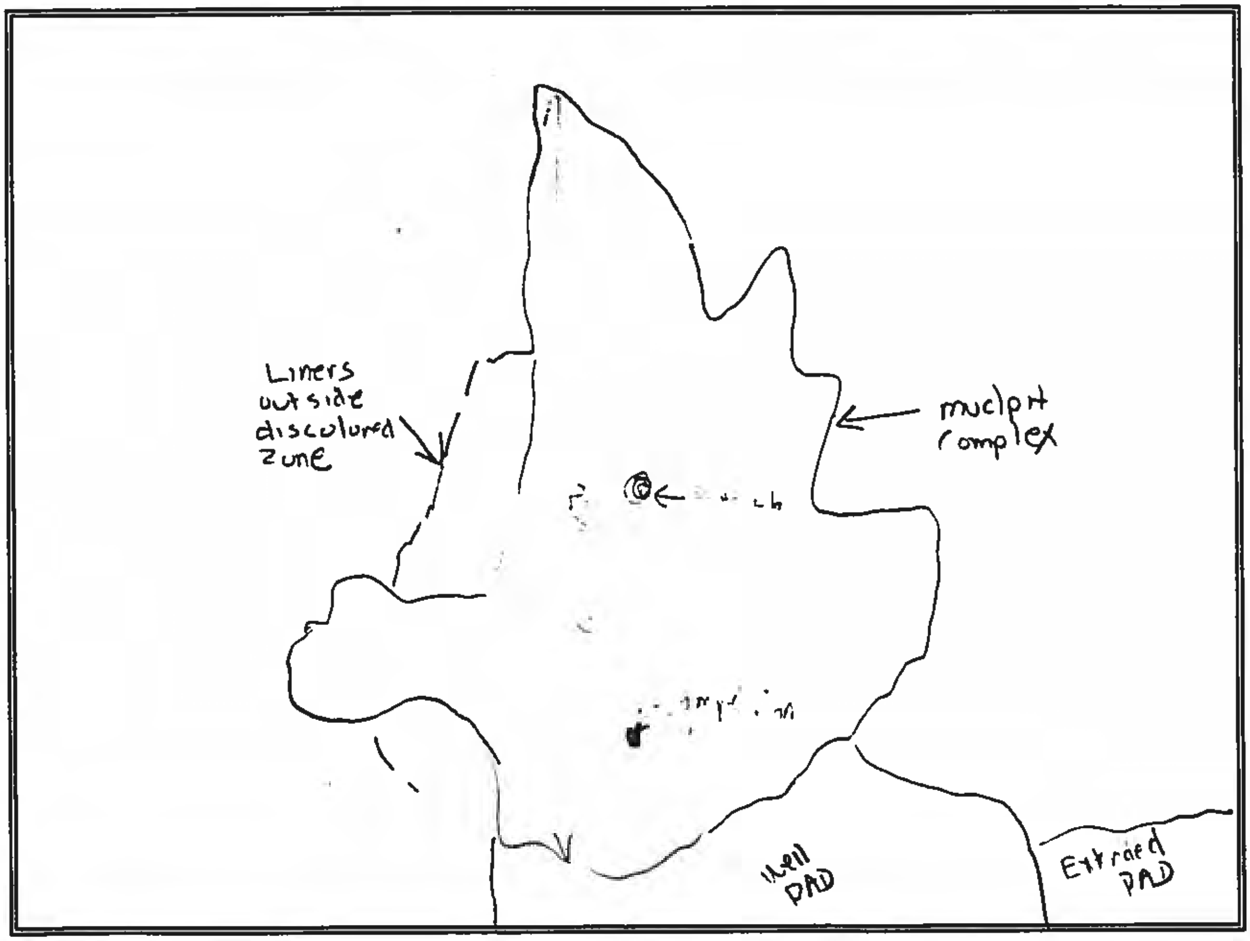
Appendix 4.1.16
Badger Unit Site Photograph

View North

Sampling Location
Site Sketch
Scale: ~~[illegible]~~ 1"=100'

N

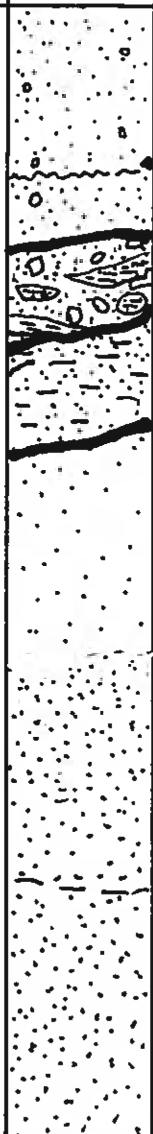
New Mexico Environment Department
Location: Badger Unit
Date:
Comments: Sample Location in what appears to be middle of mudpit Complex with abundant liners exposed, soil is dark gray and discolured.



New Mexico Environment Department
DOE/WIPP Oversight
TEST PIT/AUGERED BORING LOG AND DATA SHEET

Project No.550040	Location.Badger Unit	Boring No.1	Sheet 1 of 1

Feature.Mudpit Petroleum Exp.	Method.Hand Auger
Date (Time) Logged.10/5/92	Logged By.PBS
Area Designation.	Monitoring.Yes/ Dreger Tube (H2S)

Depth	Depth and Soil Class	Graphic Log	Sample Taken	Description of Materials Visual Observations	OVA
0	SP-SM Poorly sorted silty sand		Plastic Liner	Sand: Light brown, silty fine to medium, loose, dry, porous, with occasional angular rock fragments (1-2mm) and no odor. Artificial dune sand fill/windblown sand cover over 7 mil black plastic (polyethylene) liner (0-1.0ft)	
1'	SP-SM/CL Poorly sorted silty sand and minor sandy lean clay (CL)		VOC and Aliphatic Hydrocarbon Samples	Sand: Red brown, silty fine to medium, loose, moist, porous, slight hydrocarbon odor, with increasing angular rock fragments (1-3cm) and occasional inclusions and stratifications of grey sand and black sandy clay (1-2cm). Disrupted and partially mixed artificial fill with hydrocarbon/drilling mud (1.0-1.5ft).	
	CH Fat sandy clay		Heavy Metals (ICAP and As) Samples.	Sandy Fat Clay: Dark brown, fine to medium sand, soft and plastic, moist to wet, abundant black and grey mottling and stratification, hydrocarbon smell increases. Drilling mud and hydrocarbon spoils (1.5-2.0ft).	
2'	SP Poorly sorted sand			Sand: Light brown to tan, fine to medium, moist, loose, porous, homogeneous with no rock fragments, and hydrocarbon smell decreases. Natural undisturbed to slightly disturbed dune sand (to BOH)	
3'				Light tan, medium dense	
4'	SP-SM Poorly Sorted Silty Sand			Slightly silty sand: pale tan, fine to medium, medium dense, moist, homogeneous.	
5'					

Remarks: Heavy lines refer to significant transitions.
No significant organic vapors were measured at the surface of the borehole.

Augered Boring Badger Unit (ID) Continued 5-10 ft	Sheet_2_of_1_

Depth and Soil Class	Graphic Log	Sample Taken	Description of Materials Visual Observations	OVA
5'				
		Aliphatic Sample		
6' SP-SM			Sand: Light tan, fine to medium, medium dense to dense, moist, medium porosity, homogeneous except for occasional organics (roots). Continuation of natural sandstone/beginning of well consolidated older dune sand.	
		VOC Sample		
7'				
SP-SM		Heavy Metal ICAP/As	Sand: Light red tan to tan, fine to medium, medium dense to dense, moist to very moist, and mottled with 1 cm diameter circular iron oxide stains.	
8'	BOH			
9'				
10'				

Appendix 4.1.16: Badger Unit Comparison: Concentrations of Aromatic and Halogenated Puregeables and Aliphatic Hydrocarbons [1]

Analyte	Shallow[2] 1.0-1.5 ft (μg/kg- ppb)	Colocated[3] (μg/kg)	Deep[2] 6.5-7.0 ft (μg/kg)	Colocated[3] (μg/kg)
Aromatic and Halogenated Purgeables	No VOC compounds detected above PQL[4] (MDL = 260 ppb) One late eluting compound in the C3 substituted benzene region detected at 6000-7000 ppb: unidentified.	111-trichloroethane - 1 12-dichloroethane - 30 methylene chloride - 2 trichlorofuoromethane - 2 m-xylene - 2 p-xylene - 2 benzene - 3	------ ------ ------ ------	------ ------ ------ ------

Analyte	Shallow[2] 1.0-1.5 ft (mg/kg- ppm)	Colocated[3] (mg/kg)	Deep[2] 5.5-6.0 ft (mg/kg)	Colocated[3] (mg/kg)
Aliphatic Hydrocarbons	Gasoline - ND Diesel - ND Lub. Oil - ND Unknown Pattern (C15-C30) - <20	Diesel - 190 ppm	----- ----- -----	Diesel - 14 ppm

1 Concentrations volatiles reported in μg/kg - ppb; aliphatics ppm ----- Not Analyzed

2 NMED Sample. EPA 601/2 for volatiles. Aliphatic hydrocarbon analyses includes all hydrocarbons in the C5-C30 molecular weight range. Note: Gas chromatography and flame ionization detector screening technique results are provisional.

3 Co-located Sample collected by Westinghouse DOE/WIPP

4 Practical Quantitation Limit (PQL) with Minimum Detection Limit (MDL) as indicated.

Methylene chloride, chloroform, Tetrahydrofuran and o-xylene detected in equipment rinsate blank.

Badger Unit: Comparison of Concentrations

Heavy Metal	MCL[1] (mg/L)	Other (mg/L)	Mudpit[2] 1.5-2.0 ft (µg/g)	Colocated[3] (mg/kg)	Below Mudpit[2] 7.0-7.5 ft (µg/g)	Colocated[3] (mg/kg)	Background[3] (mg/kg)
Arsenic	.05	App.[4]	2.3000	<10	-----	<10	<10
Barium	1.0	App.	68.00	72	-----	22	11
Beryllium	N/A	P015	<5.00	<0.5	-----	<0.5	<.5
Cadmium	.005	App.	<5.00	<0.5	-----	<0.5	<.5
Chromium	.10	App.	12.00	15	-----	8	3
Cobalt	N/A	App.	3.00	3	-----	2	<1
Copper	1.0	App.	9.00	8	-----	2	1
Iron	.30	App.	6900.00	6700	-----	6500	2000
Lead	.05	App.	42.	51	-----	<5	<5
Nickel	N/A	App.	10.00	10	-----	4	<2
Vanadium		App.	12.00	14	-----	17	4
Zinc	5.0	App.	51.00	51	-----	14	6
Aluminum			5100.00	5500	-----	7600	1700
Boron			24.00	29	-----	18	<5
Calcium			43200.00	42000	-----	2100	220
Magnesium			9300.00	11000	-----	2400	280
Manganese			100.00	130	-----	25	19
Silicon			480.00	420	-----	390	290
Strontium			200.00	230	-----	22	2

[1]Maximum Contaminant Level: Promulgated July, 1992 40 CFR 161.
[2] NMED Sample within mudpit/ [3] Co-located Sample collected by Westinghouse DOE/WIPP ----- Not Analyzed
[4] Listed in 40 CFR 261 appendix VIII and/or 40 CFR 264 appendix IX

P.O. Box 4700
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700 Camino de Salud, NE
(505)-841-2500
ORGANIC CHEMISTRY SECTION (505)-841-2570

January 26, 1993

Request ID No. 039319

ANALYTICAL REPORT
SLD Accession No. OR-92-2367

Distribution
(_) User 55802
(■) Submitter 536
(※) SLD Files

To: P. Sanchez
ED - DOE Project; Carlsbad
NM - Envir. Dept.; WIPP
P.O. Box 3090 MS #180
Carlsbad, NM 88220

From: Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: A water, purgeable sample submitted to this laboratory on October 15, 1992

DEMOGRAPHIC DATA

COLLECTION
On: 6-Oct-92 *By:* San . . .
At: 2:00 hrs. *In/Near:* Carlsbad

LOCATION
Waste Isolation Pilot Plant

ANALYTICAL RESULTS: Aromatic & Halogenated Purgeable (EPA-601/2) Screen (754)

Parameter	Value	Note	MDL	Units
Methylene chloride (CH2C12)	1.70		1.00	ppb
Chloroform	0.20	T	1.00	ppb
Tetrahydrofuran	9.90		5.00	ppb
o-Xylene	10.80		1.00	ppb

See Laboratory Remarks for Additional Information

Notations & Comments:
MDL = Minimal Detectable Level.
A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified;
T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.
Evidentiary Seals: Not Sealed[Y]; Intact: No[ ], Yes[ ] & Broken By: ________ Date: ______

Laboratory Remarks: Badger Unit ~~Rinsate Blank~~

VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: NM SCIENTIFIC LABORATORY DIVISION Contract: N/A
Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: N/A
Matrix: (soil/water) Water Lab Sample ID: OR-92-2367
Sample wt/vol: 5.0 (g/mL) mL SLD Batch No: 310
Level: (low/med) Low Date Received: 10/15/92
% Moisture: not dec. N/A dec. N/A Date Extracted: N/A
Extraction: (SepF/Cont/Sonc) N/A Date Analyzed: 10/20/92
GPC Cleanup: (Y/N) No pH: ____ Dilution Factor: 1
CONCENTRATION UNITS:
(ug/L or ug/Kg): ug/L

(Continued on page 2.)

This sample was analyzed for the following compounds using EPA Methods 601 & 602

CAS NO.	COMPOUND	CONC.	QUALIFIER
67-64-1	Acetone	5.0	U
71-43-2	Benzene	1.0	U
108-86-1	Bromobenzene	1.0	U
74-97-5	Bromochloromethane	1.0	U
75-27-4	Bromodichloromethane	1.0	U
75-25-2	Bromoform	1.0	U
78-93-3	2-Butanone (MEK)	5.0	U
104-51-8	n-Butylbenzene	1.0	U
135-98-8	sec-Butylbenzene	1.0	U
98-06-6	tert-Butylbenzene	1.0	U
1634-04-4	tert-Butyl methyl ether (MTBE)	5.0	U
56-23-5	Carbon tetrachloride	1.0	U
108-90-7	Chlorobenzene	1.0	U
67-66-3	Chloroform	0.2	J
95-49-8	2-Chlorotoluene	1.0	U
106-43-4	4-Chlorotoluene	1.0	U
96-12-8	1,2-Dibromo-3-chloropropane	1.0	U
124-48-1	Dibromochloromethane	1.0	U
106-93-4	1,2-Dibromoethane	1.0	U
74-95-3	Dibromomethane	1.0	U
95-50-1	1,2-Dichlorobenzene	1.0	U
541-73-1	1,3-Dichlorobenzene	1.0	U
106-46-7	1,4-Dichlorobenzene	1.0	U
75-71-8	Dichlorodifluoromethane	1.0	U
75-34-3	1,1-Dichloroethane	1.0	U
107-06-2	1,2-Dichloroethane	1.0	U
75-35-4	1,1-Dichloroethene	1.0	U
156-59-4	cis-1,2-Dichloroethene	1.0	U
156-60-5	trans-1,2-Dichloroethene	1.0	U
78-87-5	1,2-Dichloropropane	1.0	U
142-28-9	1,3-Dichloropropane	1.0	U
590-20-7	2,2-Dichloropropane	1.0	U
563-58-6	1,1-Dichloropropene	1.0	U
1006-01-5	cis-1,3-Dichloropropene	1.0	U
1006-02-6	trans-1,3-Dichloropropene	1.0	U
100-41-4	Ethylbenzene	1.0	U
87-68-3	Hexachlorobutadiene	1.0	U
98-82-8	Isopropylbenzene	1.0	U
99-87-6	4-Isopropyltoluene	1.0	U

(Continued on page 3.)

75-09-2	Methylene chloride	1.7	
90-12-0	1-Methylnaphthalene	1.0	U
91-57-6	2-Methylnaphthalene	1.0	U
91-20-3	Naphthalene	1.0	U
103-65-1	n-Propylbenzene	1.0	U
100-42-5	Styrene	1.0	U
630-20-6	1,1,1,2-Tetrachloroethane	1.0	U
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U
127-18-4	Tetrachloroethene	1.0	U
109-99-9	Tetrahydrofuran (THF)	9.9	
108-88-3	Toluene	1.0	U
87-61-5	1,2,3-Trichlorobenzene	1.0	U
120-82-1	1,2,4-Trichlorobenzene	1.0	U
71-55-6	1,1,1-Trichloroethane	1.0	U
79-00-5	1,1,2-Trichloroethane	1.0	U
79-01-6	Trichloroethene	1.0	U
75-69-4	Trichlorofluoromethane	1.0	U
96-18-4	1,2,3-Trichloropropane	1.0	U
95-63-6	1,2,4-Trimethylbenzene	1.0	U
108-67-8	1,3,5-Trimethylbenzene	1.0	U
75-01-4	Vinyl chloride	1.0	U
95-47-6	o-Xylene	10.8	
N/A	p- & m-Xylene	1.0	U

Qualifier Definitions:

B - Indicates compound was detected in the Lab Blank as well as in the sample.

D - Indicates value taken from a secondary (diluted) sample analysis.

E - Indicates compound concentration exceeded the range of the standard curve.

J - Indicates an estimated value for tentatively identified compounds, or for compounds detected and identified but present at a concentration less than the quantitation limit.

N - Indicates that more than one peak was used for quantitation.

U - Indicates compound was analyzed for, but not detected above the concentration listed (Quantitation Limit).

QUALITY CONTROL SUMMARY FOR VOLATILES SCREEN

METHOD BLANK: A laboratory method blank was analyzed along with this sample to assure the absence of interfering contaminants

(Continued on page 4.)

from lab reagents, instruments, or the general laboratory environment. Unless listed below, no contaminants were detected in this blank above the reported detection limit.

COMPOUND DETECTED	CONCENTRATION (PPB)
No Compounds Detected	

SURROGATE RECOVERIES:

SURROGATE	CONCENTRATION	% RECOVERY
Bromofluorobenzene	25.0 ppb	125.4
2-Bromo-1-chloropropane	25.0 ppb	92.7

SPIKE RECOVERY: The % recoveries for compounds in the batch spike were from 80% to 120% with the exception of the compounds listed below:

COMPOUND	CONCENTRATION	% RECOVERY
vinyl chloride	30.0 ppb	79.5
1,1-dichloroethene	24.7 ppb	127.9
acetone	24.3 ppb	157.4
benzene	24.7 ppb	124.5
ethylbenzene	24.7 ppb	122.5
o-xylene	24.3 ppb	121.1
isopropylbenzene	24.9 ppb	125.0
1,2,4-trimethylbenzene	24.8 ppb	120.8
sec-butylbenzene	24.9 ppb	127.3
n-butylbenzene	25.5 ppb	122.7

Analyst: Gary Eden
Gary C. Eden
Analyst, Organic Chemistry

Reviewed By: Ken Sherrell
Richard F. Meyerhein 12/21/92
Supervisor, Organic Chemistry Section

STATE OF NEW MEXICO DEPARTMENT OF HEALTH

SCIENTIFIC LABORATORY DIVISION

P.O. Box 4700 700 Camino de Salud, NE
Albuquerque, NM 87196-4700 [505]-841-2500
ORGANIC CHEMISTRY SECTION [505]-841-2570

January 26, 1993

Request
ID No. 039260

ANALYTICAL REPORT
SLD Accession No. OR-92-2366

Distribution
(__) User 55802
(■) Submitter 536
(※) SLD Files

To: P. Sanchez
ED - DOE Project; Carlsbad
NM - Envir. Dept.; WIPP
P.O. Box 3090 MS #180
Carlsbad, NM 88220

From: Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: A soil sample submitted to this laboratory on October 15, 1992

DEMOGRAPHIC DATA

COLLECTION		*LOCATION*
On: 5-Oct-92	*By:* San . . .	Waste Isolation Pilot Plant
At: 12:30 hrs.	*In/Near:* Carlsbad	

ANALYTICAL RESULTS: Aromatic & Halogenated Purgeable [EPA-601/2] Screen (754)

Parameter	Value	Note	MDL	Units
Aromatic Volatiles (17)	0.00	N	250.00	ppb
Methylene chloride (CH2C12)	510.00		250.00	ppb

See Laboratory Remarks for Additional Information

Notations & Comments:

MDL = Minimal Detectable Level.

A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified;
T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.

Evidentiary Seals: Not Sealed☒; Intact: No☐, Yes☐ & Broken By: ______________ Date: ________

Laboratory Remarks: Badger Unit 0-5 Shallow

One late eluting compound in the C3 substituted benzene region at 6000-7000 ppb was detected by the photoionization detector, but not identified.

VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: NM SCIENTIFIC LABORATORY DIVISION Contract: N/A
Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: N/A
Matrix: (soil/water) Soil Lab Sample ID: OR-92-2366
Sample wt/vol: 12.02 (g/mL) g SLD Batch No: 310
Level: (low/med) Low Date Received: 10/15/92
% Moisture: not dec. 15.6 dec. N/A Date Extracted: N/A
Extraction: (SepF/Cont/Sonc) N/A Date Analyzed: 10/20/92
GPC Cleanup: (Y/N) No pH: ____ Dilution Factor: 1
CONCENTRATION UNITS:

(Continued on page 2.)

(ug/L or ug/Kg): ug/Kg

This sample was analyzed for the following compounds using EPA Methods 601 & 602

CAS NO.	COMPOUND	CONC.	QUALIFIER
67-64-1	Acetone	1250.0	U
71-43-2	Benzene	250.0	U
108-86-1	Bromobenzene	250.0	U
74-97-5	Bromochloromethane	250.0	U
75-27-4	Bromodichloromethane	250.0	U
75-25-2	Bromoform	250.0	U
78-93-3	2-Butanone (MEK)	1250.0	U
104-51-8	n-Butylbenzene	250.0	U
135-98-8	sec-Butylbenzene	250.0	U
98-06-6	tert-Butylbenzene	250.0	U
1634-04-4	tert-Butyl methyl ether (MTBE)	1250.0	U
56-23-5	Carbon tetrachloride	250.0	U
108-90-7	Chlorobenzene	250.0	U
67-66-3	Chloroform	250.0	U
95-49-8	2-Chlorotoluene	250.0	U
106-43-4	4-Chlorotoluene	250.0	U
96-12-8	1,2-Dibromo-3-chloropropane	250.0	U
124-48-1	Dibromochloromethane	250.0	U
106-93-4	1,2-Dibromoethane	250.0	U
74-95-3	Dibromomethane	250.0	U
95-50-1	1,2-Dichlorobenzene	250.0	U
541-73-1	1,3-Dichlorobenzene	250.0	U
106-46-7	1,4-Dichlorobenzene	250.0	U
75-71-8	Dichlorodifluoromethane	250.0	U
75-34-3	1,1-Dichloroethane	250.0	U
107-06-2	1,2-Dichloroethane	250.0	U
75-35-4	1,1-Dichloroethene	250.0	U
156-59-4	cis-1,2-Dichloroethene	250.0	U
156-60-5	trans-1,2-Dichloroethene	250.0	U
78-87-5	1,2-Dichloropropane	250.0	U
142-28-9	1,3-Dichloropropane	250.0	U
590-20-7	2,2-Dichloropropane	250.0	U
563-58-6	1,1-Dichloropropene	250.0	U
1006-01-5	cis-1,3-Dichloropropene	250.0	U
1006-02-6	trans-1,3-Dichloropropene	250.0	U
100-41-4	Ethylbenzene	250.0	U
87-68-3	Hexachlorobutadiene	250.0	U

(Continued on page 3.)

98-82-8	Isopropylbenzene	250.0	U
99-87-6	4-Isopropyltoluene	250.0	U
75-09-2	Methylene chloride	510.0	
90-12-0	1-Methylnaphthalene	250.0	U
91-57-6	2-Methylnaphthalene	250.0	U
91-20-3	Naphthalene	250.0	U
103-65-1	n-Propylbenzene	250.0	U
100-42-5	Styrene	250.0	U
630-20-6	1,1,1,2-Tetrachloroethane	250.0	U
79-34-5	1,1,2,2-Tetrachloroethane	250.0	U
127-18-4	Tetrachloroethene	250.0	U
109-99-9	Tetrahydrofuran (THF)	1250.0	U
108-88-3	Toluene	250.0	U
87-61-5	1,2,3-Trichlorobenzene	250.0	U
120-82-1	1,2,4-Trichlorobenzene	250.0	U
71-55-6	1,1,1-Trichloroethane	250.0	U
79-00-5	1,1,2-Trichloroethane	250.0	U
79-01-6	Trichloroethene	250.0	U
75-69-4	Trichlorofluoromethane	250.0	U
96-18-4	1,2,3-Trichloropropane	250.0	U
95-63-6	1,2,4-Trimethylbenzene	250.0	U
108-67-8	1,3,5-Trimethylbenzene	250.0	U
75-01-4	Vinyl chloride	250.0	U
95-47-6	o-Xylene	250.0	U
N/A	p- & m-Xylene	250.0	U

Qualifier Definitions:

B - Indicates compound was detected in the Lab Blank as well as in the sample.
D - Indicates value taken from a secondary (diluted) sample analysis.
E - Indicates compound concentration exceeded the range of the standard curve.
J - Indicates an estimated value for tentatively identified compounds, or for compounds detected and identified but present at a concentration less than the quantitation limit.
N - Indicates that more than one peak was used for quantitation.
U - Indicates compound was analyzed for, but not detected above the concentration listed (Quantitation Limit).

QUALITY CONTROL SUMMARY FOR VOLATILES SCREEN

(Continued on page 4.)

METHOD BLANK: A laboratory method blank was analyzed along with this sample to assure the absence of interfering contaminants from lab reagents, instruments, or the general laboratory environment. Unless listed below, no contaminants were detected in this blank above the reported detection limit.

COMPOUND DETECTED	CONCENTRATION (PPB)
No Compounds Detected	

SURROGATE RECOVERIES:

SURROGATE	CONCENTRATION	% RECOVERY
Bromofluorobenzene	25.0 ppb	126.6
2-Bromo-1-chloropropane	25.0 ppb	92.9

SPIKE RECOVERY: The % recoveries for compounds in the batch spike were from 80% to 120% with the exception of the compounds listed below:

COMPOUND	CONCENTRATION	% RECOVERY
vinyl chloride	30.0 ppb	79.5
1,1-dichloroethene	24.7 ppb	127.9
acetone	24.3 ppb	157.4
benzene	24.7 ppb	124.5
ethylbenzene	24.7 ppb	122.5
o-xylene	24.3 ppb	121.1
isopropylbenzene	24.9 ppb	125.0
1,2,4-trimethylbenzene	24.8 ppb	120.8
sec-butylbenzene	24.9 ppb	127.3
n-butylbenzene	25.5 ppb	122.7

Analyst: Gary Eden
Gary C. Eden
Analyst. Organic Chemistry

Reviewed By: [signature]
Richard F. Meyerhein 12/21/92
Supervisor. Organic Chemistry Section

STATE OF NEW MEXICO DEPARTMENT OF HEALTH

SCIENTIFIC LABORATORY DIVISION

P.O. Box 4700
Albuquerque, NM 87196-4700
700 Camino de Salud, NE
[505]-841-2500
ORGANIC CHEMISTRY SECTION [505]-841-2570

February 12, 1993

Request
ID No. 039262

ANALYTICAL REPORT
SLD Accession No. OR-92-2361

Distribution
(※) User 55802
(■) Submitter 536
(※) SLD Files

To: P. Sanchez
ED - DOE Project; Carlsbad
NM - Envir. Dept.; WIPP
P.O. Box 3090
Carlsbad, NM 88221

From: Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: A soil sample submitted to this laboratory on October 15, 1992

User:
ED Har. & Rad. Materials Bur.
ED DOE Project, H&R Materials
P.O. Box 26110
Santa Fe, NM 87502

DEMOGRAPHIC DATA

COLLECTION		LOCATION
On: 5-Oct-92	*By:* San . . .	Badger Unit 0-5 Shallow
At: 12:45 hrs.	*In/Near:* Carlsbad	

ANALYTICAL RESULTS: Aliphatic Hydrocarbon (>10 Carbons) Screen (751)

Parameter	Value	Note	MDL	Units
See Laboratory Remarks for Additional Information				

Notations & Comments:

MDL = Minimal Detectable Level.

A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified;
T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.

Evidentiary Seals: Not Sealed ☑; Intact: No ☐, Yes ☐ & Broken By: ______________ Date: ______

Laboratory Remarks: BADGER UNIT 0-5 Shallow

HYDROCARBON FUEL SCREEN ANALYSIS DATA SHEET

Lab Name: NM SCIENTIFIC LABORATORY DIVISION Contract: N/A
Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: N/A
Matrix: (soil/water) Soil Lab Sample ID: OR-92-2361
Sample wt/vol: 6.6 (g/mL) g SLD Batch No: 318
Level: (low/med) Low Date Received: 10/15/92
% Moisture: not dec. ______ dec. 11.6 Date Extracted: 10/19/92
Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/28/92

(Continued on page 2.)

GPC Cleanup: (Y/N) No pH:_____ Dilution Factor: 1
Extraction Solvent: CS2

CONCENTRATION UNITS:
(mg/L or mg/Kg): mg/kg

This sample was analyzed for hydrocarbons in the C5 to C30 mole `ar weight range using Gas Chromatography with a Flame Ionization Detector (FID). Since the FID is a nonspecific detector, all compound identifications should be considered as tentative. An attempt has been made below to assign the hydrocarbons found in the sample to an appropriate fuel fraction when the gas chromatograhic fingerprint pattern of the sample closely matches a fuel standard. When the hydrocarbons in the sample do not closely match any known specific fuel, the results will be reported as a hydrocarbon range.

TENTATIVELY IDENTIFIED FUEL FRACTIONS

The following fuel fractions were tentatively identified by FID

FUEL FRACTION	CARBON RANGE	EST. CONC.	% of All H-C's
GASOLINE	C5-C12	ND	0.0
JP-4	C5-C15	ND	0.0
STODDARD SOLVENT	C9-C12	ND	0.0
KEROSENE/JET-A	C9-C19	ND	0.0
DIESEL FUEL	C10-C23	ND	0.0
LUBRICATING OIL	C19-C29	ND	0.0
UNKNOWN PATTERN	C15-C30	*	100

* idicates that the concentration was less than 20 ppm.

Analyst: Robert A. Morris
Robert A. Morris
Analyst, Organic Chemistry

Reviewed By: Richard F. Meyerhein
Richard F. Meyerhein 11/12/92
Supervisor, Organic Chemistry Section

STATE OF NEW MEXICO

DEPARTMENT OF HEALTH

SCIENTIFIC LABORATORY DIVISION

P.O. Box 4700
Albuquerque, NM 87196-4700

700 Camino de Salud, NE
[505]-841-2500

AIR & HEAVY METALS SECTION [505]-841-2553

April 26, 1993

Request
ID No. 039264

ANALYTICAL REPORT
SLD Accession No. IC-92-0969

Distribution
( ) User 55802
(■) Submitter 536
(✱) SLD Files

To:
Paul Sanchez
NM - Envir. Dept.; WIPP
P.O. Box 3090 MS #180
Carlsbad, NM 88220

From: Air & Heavy Metals Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: A soil sample submitted to this laboratory on October 15, 1992

User:
ED Har. & Rad. Materials Bur.
ED DOE Project, H&R Materials
P.O. Box 26110
Santa Fe, NM 87502

DEMOGRAPHIC DATA

COLLECTION
On: 5-Oct-92 *By:* San . . .
At: 12:35 hrs. *In/Near:* Carlsbad

LOCATION
Badger Unit 0-5 Shallow

ANALYTICAL RESULTS in uG/Gram

Analysis	Value	Analysis	Value	Analysis	Value
Aluminum	5100.00	Copper	9.00	Silver	< 5.00
Barium	68.00	Iron	6900.00	Strontium	200.00
Beryllium	< 5.00	~~Lead~~	~~16.00~~ JFA	Tin	< 5.00
Boron	24.00	Magnesium	9300.00	Vanadium	12.00
Cadmium	< 5.00	Manganese	100.00	Zinc	51.00
Calcium	>9999.99	Molybdenum	< 5.00	Arsenic	2.3000
Chromium	12.00	Nickel	10.00		
Cobalt	3.00	Silicon	480.00		

Laboratory Remarks: Digested. 87.2% solids.
Calcium by ICP = 43200.00 ug/g
Lead by AA = 42. ug/g

Reviewed By: Revised for Pb. JFA
Jim F. Ashby 03/10/93
Supervisor, Air & Heavy Metals Section

4/26/93

Appendix 4.1.17
Cotton Baby/RFA Sampling Event

Site Photograph

Site Sketch

Borelog

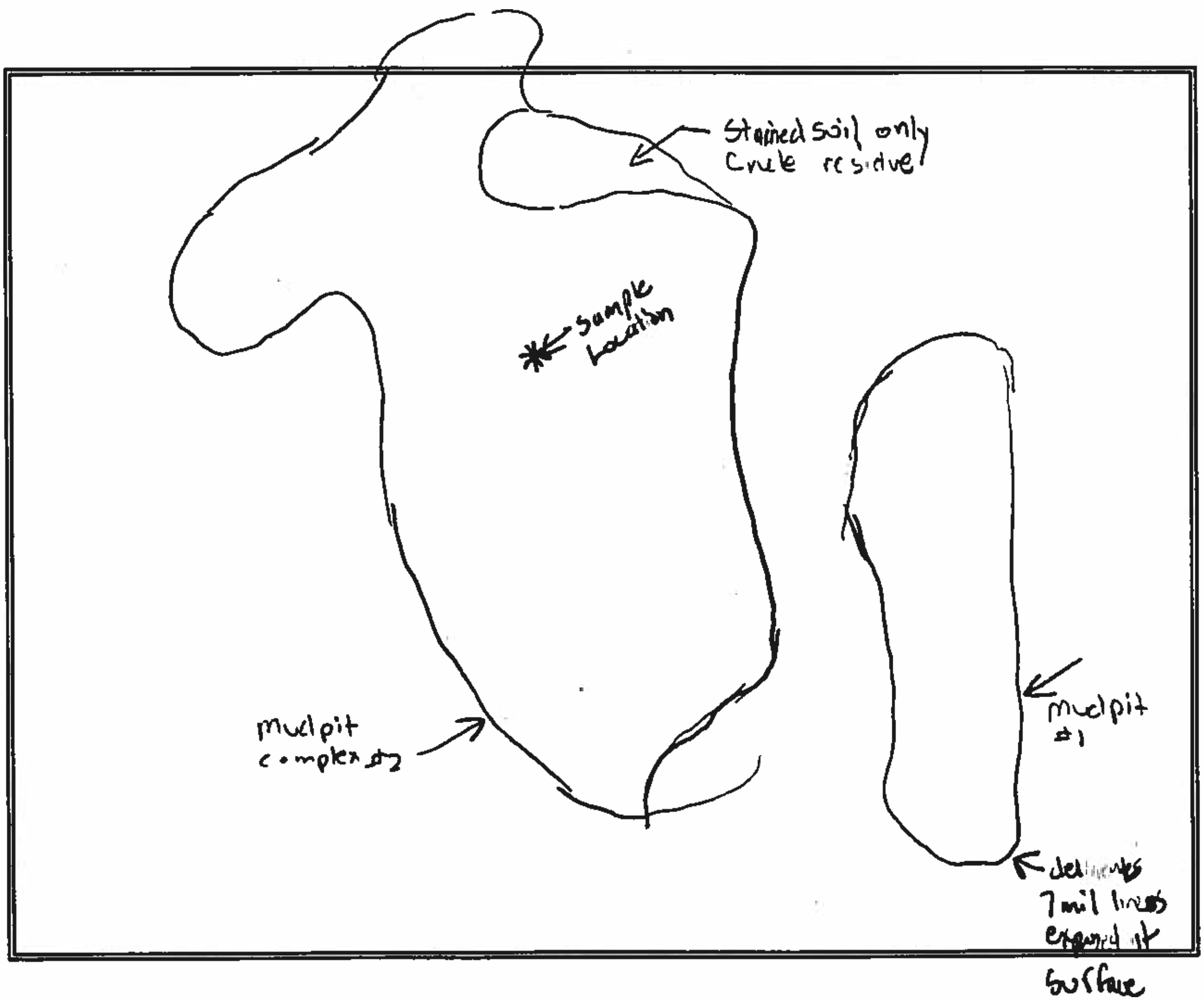
Analytical Results

Appendix 4.1.17
Cotton Baby Site Photograph

View West

Sampling Location
Site Sketch
Scale: 1" = 20'

New Mexico Environment Department
Location: Cotton Baby
Date: 10
Comments:



New Mexico Environment Department
DOE/WIPP Oversight
TEST PIT/AUGERED BORING LOG AND DATA SHEET

Project No. 550040	Location. Cotton Baby	Boring No. 1	Sheet 1 of 1

Feature. Mudpit Petroleum Exp.	Method. Hand Auger
Date (Time) Logged. 10/5/92	Logged By. PBS
Area Designation.	Monitoring. Dreger Tube/H2S

Depth and Soil Class	Sample Taken	Description of Materials Visual Observations	OVA
0 SP-SM Poorly sorted silty sand	Plastic Liner VOC Sample	Sand: Red brown, silty fine to medium, loose, dry, porous, (moisture increases a - 3"), angular rock fragments (1cm max) and no odor. Artificial dune sand fill/windblown sand cover over 7 mil black plastic (polyethylene) liner (0-1.0ft)	
1' CH Fat sandy clay	Aliphatic Hydrocarbon Sample Heavy Metals (ICAP and As) Sample.	Sandy Fat Clay: Dark grey to black, fine to medium sand, soft and plastic, wet, laminated black stringers in grey matrix locally and grey and black mottling, hydrocarbon smell strong (see photo of auger bit #7). Drilling mud and hydrocarbon spoils (1.0-2.2ft).	ϕ
2' SP Poorly sorted sand	Plastic Liner (10 mil fiborous) Collected in Heavy Metal Sample	Sand: Dark red brown, fine to medium, moist to wet, loose, porous, faint hydrocarbon smell. Natural undisturbed to slightly disturbed dune sand (to BOH)	
3'			
4'	VOC Sample		ϕ
5'	Aliphatic Sample	Occasional organics (roots)	ϕ

Augered Boring Cotton Baby (ID) Continued 5-10 ft	Sheet_2_of_1_

Depth and Soil Class	Graphic Log	Sample Taken	Description of Materials Visual Observations	O V A
5' SC Clayey Sand	BOH	Heavy Metal (ICAP/As)	Sand: Red brown, fine to medium, medium dense, moist, faint hydrocarbon smell.	Ø
6'				
7'				Ø

Remarks:

Cotton Baby Comparison: Concentrations of Aromatic and Halogenated Puregeables and Aliphatic Hydrocarbons [1]

Analyte	**Shallow[2]** .70-1.2 ft (μg/kg- ppb)	**Colocated[3] (μg/kg)**	**Deep[2]** 4.0-4.5 ft (μg/kg)	**Colocated[3] (μg/kg)**
Aromatic and Halogenated Purgeables	No VOC compounds detected above PQL[4] (MDL = 260 ppb) 20 late eluting compounds in the C3 substituted benzene region detected trace-5000 ppb: unidentified.	12-dichloroethane - 1 chloroform - 1 methylene chloride - 1 trichloroflorornethane - 1 o-xylene - 11 m-dichlorobenzene- 24 m-xylene - 23 p-dichlorobenzene - 23 p-xylene - 16 benzene - 27 ethylbenzene - 26 methylbenzene - 11 (toulene)	No VOC compounds detected above PQL[4] (MDL = 200 ppb) Three late eluting compounds in the C3 substituted benzene region detected 5000-7000 ppb: unidentified.	12-dichloroethane - 18 methylene chloride - 1 o-xylene - 2 m-dichlorobenzene- 3 m-xylene - 3 p-dichlorobenzene - 4 p-xylene - 2

Analyte	**Shallow[2]** 1.2-1.8 ft (mg/kg- ppm)	**Colocated[3] (mg/kg)**	**Deep[2]** 4.5-5.0 ft (mg/kg)	**Colocated[3] (mg/kg)**
Aliphatic Hydrocarbons	Gasoline - ND Diesel - ND Lub. Oil - ND Unknown - <20 Pattern (C15-C30)	Diesel - 96 ppm	Gasoline - ND Diesel - ND Lub. Oil - ND Unknown - <20 Pattern (C15-C30)	Diesel - 12 ppm

1 Concentrations volatiles reported in μg/kg - ppb; aliphatics ppm ----- Not Analyzed

2 NMED Sample. EPA 601/2 for volatiles. Aliphatic hydrocarbon analyses includes all hydrocarbons in the C5-C30 molecular weight range. Note: Gas chromatography and flame ionization detector screening technique results are provisional.

3 Co-located Sample collected by Westinghouse DOE/WIPP

4 Practical Quantitation Limit (PQL) with Minimum Detection Limit (MDL) as indicated.

Methylene chloride, chloroform, Tetrahydrofuran and o-xylene detected in equipment rinsate blank.

Cotton Baby: Comparison of Concentrations

Heavy Metal	MCL[1] (mg/L)	Other (mg/L)	Mudpit[2] 1.9-2.2 ft (μg/g)	Colocated[3] (mg/kg)	Below Mudpit[2] 5.1-5.5 ft (μg/g)	Colocated[3] (mg/kg)	Background[3] (mg/kg)
Arsenic	.05	App.[4]	2.1000	<10	.7700	<10	<10
Barium	1.0	App.	43.00	26	21.00	18	11
Beryllium	N/A	P015	<5.00	<0.5	<5.00	<0.5	<.5
Cadmium	.005	App.	<5.00	<0.5	<5.00	<0.5	<.5
Chromium	.10	App.	18.00	7	5.00	6	3
Cobalt	N/A	App.	<5.00	1	<5.00	1	<1
Copper	1.0	App.	15.00	5	<5.00	2	1
Iron	.30	App.	7850.00	3500	4300	3500	2000
Lead	.05	App.	20.	10	<5.00	<5	<5
Nickel	N/A	App.	13.00	3	4.00	3	<2
Vanadium		App.	19.00	8	8.00	7	4
Zinc	5.0	App.	31.00	13	8.00	8	6
Aluminum			7000.00	3200	4300.00	3400	1700
Boron			22.00	11	12.00	8	<5
Calcium			23600.00	8600	650.00	1800	220
Magnesium			10000.00	2900	870.00	1000	280
Manganese			120.00	51	28.00	30	19
Silicon			570.00	340	480.00	410	290
Strontium			130.00	55	8.00	14	2

[1]Maximum Contaminant Level: Promulgated July, 1992 40 CFR 161.
[2] NMED Sample within mudpit/ [3] Co-located Sample collected by Westinghouse DOE/WIPP
[4] Listed in 40 CFR 261 appendix VIII and/or 40 CFR 264 appendix IX

STATE OF NEW MEXICO DEPARTMENT OF HEALTH

SCIENTIFIC LABORATORY DIVISION

P.O. Box 4700 700 Camino de Salud, NE
Albuquerque, NM 87196-4700 (505)-841-2500
ORGANIC CHEMISTRY SECTION (505)-841-2570

January 26, 1993

Request
ID No. 039280

ANALYTICAL REPORT
SLD Accession No. OR-92-2365

Distribution
(_) User 55802
(■) Submitter 536
(☒) SLD Files

To: P. Sanchez
ED - DOE Project; Carlsbad
NM - Envir. Dept.; WIPP
P.O. Box 3090 MS #180
Carlsbad, NM 88220

From: Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: A soil sample submitted to this laboratory on October 15, 1992

DEMOGRAPHIC DATA

COLLECTION
On: 5-Oct-92 *By:* San . . .
At: 2:15 hrs. *In/Near:* Carlsbad

LOCATION
Waste Isolation Pilot Plant

ANALYTICAL RESULTS: Aromatic & Halogenated Purgeable (EPA-601/2) Screen (754)

Parameter	Value	Note	MDL	Units
EPA 601/2 Volatiles (60)	0.00	N	260.00	ppb

See Laboratory Remarks for Additional Information

Notations & Comments:

MDL = Minimal Detectable Level.

A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified;
T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.

Evidentiary Seals: Not Sealed☒; Intact: No☐, Yes☐ & Broken By: __________ Date: ______

Laboratory Remarks: Cotton Baby 0-5 Shallow

Twenty late eluting compounds in the C3 substituted benzene region at trace-5000 ppb were detected by the photoionization detector, but not identified.

VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: NM SCIENTIFIC LABORATORY DIVISION Contract: N/A
Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: N/A
Matrix: (soil/water) Soil Lab Sample ID: OR-92-2365
Sample wt/vol: 12.55 (g/mL) g SLD Batch No: 310
Level: (low/med) Low Date Received: 10/15/92
% Moisture: not dec. 20.6 dec. N/A Date Extracted: N/A
Extraction: (SepF/Cont/Sonc) N/A Date Analyzed: 10/20/92
GPC Cleanup: (Y/N) No pH: ____ Dilution Factor: 1
CONCENTRATION UNITS:
(ug/L or ug/Kg): ug/Kg

(Continued on page 2.)

This sample was analyzed for the following compounds using EPA Methods 601 & 602

CAS NO.	COMPOUND	CONC.	QUALIFIER
67-64-1	Acetone	1300.0	U
71-43-2	Benzene	260.0	U
108-86-1	Bromobenzene	260.0	U
74-97-5	Bromochloromethane	260.0	U
75-27-4	Bromodichloromethane	260.0	U
75-25-2	Bromoform	260.0	U
78-93-3	2-Butanone (MEK)	1300.0	U
104-51-8	n-Butylbenzene	260.0	U
135-98-8	sec-Butylbenzene	260.0	U
98-06-6	tert-Butylbenzene	260.0	U
1634-04-4	tert-Butyl methyl ether (MTBE)	1300.0	U
56-23-5	Carbon tetrachloride	260.0	U
108-90-7	Chlorobenzene	260.0	U
67-66-3	Chloroform	260.0	U
95-49-8	2-Chlorotoluene	260.0	U
106-43-4	4-Chlorotoluene	260.0	U
96-12-8	1,2-Dibromo-3-chloropropane	260.0	U
124-48-1	Dibromochloromethane	260.0	U
106-93-4	1,2-Dibromoethane	260.0	U
74-95-3	Dibromomethane	260.0	U
95-50-1	1,2-Dichlorobenzene	260.0	U
541-73-1	1,3-Dichlorobenzene	260.0	U
106-46-7	1,4-Dichlorobenzene	260.0	U
75-71-8	Dichlorodifluoromethane	260.0	U
75-34-3	1,1-Dichloroethane	260.0	U
107-06-2	1,2-Dichloroethane	260.0	U
75-35-4	1,1-Dichloroethene	260.0	U
156-59-4	cis-1,2-Dichloroethene	260.0	U
156-60-5	trans-1,2-Dichloroethene	260.0	U
78-87-5	1,2-Dichloropropane	260.0	U
142-28-9	1,3-Dichloropropane	260.0	U
590-20-7	2,2-Dichloropropane	260.0	U
563-58-6	1,1-Dichloropropene	260.0	U
1006-01-5	cis-1,3-Dichloropropene	260.0	U
1006-02-6	trans-1,3-Dichloropropene	260.0	U
100-41-4	Ethylbenzene	260.0	U
87-68-3	Hexachlorobutadiene	260.0	U
98-82-8	Isopropylbenzene	260.0	U

(Continued on page 3.)

99-87-6	4-Isopropyltoluene	260.0	U
75-09-2	Methylene chloride	260.0	U
90-12-0	1-Methylnaphthalene	260.0	U
91-57-6	2-Methylnaphthalene	260.0	U
91-20-3	Naphthalene	260.0	U
103-65-1	n-Propylbenzene	260.0	U
100-42-5	Styrene	260.0	U
630-20-6	1,1,1,2-Tetrachloroethane	260.0	U
79-34-5	1,1,2,2-Tetrachloroethane	260.0	U
127-18-4	Tetrachloroethene	260.0	U
109-99-9	Tetrahydrofuran (THF)	1300.0	U
108-88-3	Toluene	260.0	U
87-61-5	1,2,3-Trichlorobenzene	260.0	U
120-82-1	1,2,4-Trichlorobenzene	260.0	U
71-55-6	1,1,1-Trichloroethane	260.0	U
79-00-5	1,1,2-Trichloroethane	260.0	U
79-01-6	Trichloroethene	260.0	U
75-69-4	Trichlorofluoromethane	260.0	U
96-18-4	1,2,3-Trichloropropane	260.0	U
95-63-6	1,2,4-Trimethylbenzene	260.0	U
108-67-8	1,3,5-Trimethylbenzene	260.0	U
75-01-4	Vinyl chloride	260.0	U
95-47-6	o-Xylene	260.0	U
N/A	p- & m-Xylene	260.0	U

Qualifier Definitions:
B - Indicates compound was detected in the Lab Blank as well as in the sample.
D - Indicates value taken from a secondary (diluted) sample analysis.
E - Indicates compound concentration exceeded the range of the standard curve.
J - Indicates an estimated value for tentatively identified compounds, or for compounds detected and identified but present at a concentration less than the quantitation limit.
N - Indicates that more than one peak was used for quantitation.
U - Indicates compound was analyzed for, but not detected above the concentration listed (Quantitation Limit).

QUALITY CONTROL SUMMARY FOR VOLATILES SCREEN

METHOD BLANK: A laboratory method blank was analyzed along with

(Continued on page 4.)

this sample to assure the absence of interfering contaminants from lab reagents, instruments, or the general laboratory environment. Unless listed below, no contaminants were detected in this blank above the reported detection limit.

COMPOUND DETECTED	CONCENTRATION (PPB)
No Compounds Detected	

SURROGATE RECOVERIES:

SURROGATE	CONCENTRATION	% RECOVERY
Bromofluorobenzene	25.0 ppb	115.9
2-Bromo-1-chloropropane	25.0 ppb	97.2

SPIKE RECOVERY: The % recoveries for compounds in the batch spike were from 80% to 120% with the exception of the compounds listed below:

COMPOUND	CONCENTRATION	% RECOVERY
vinyl chloride	30.0 ppb	79.5
1,1-dichloroethene	24.7 ppb	127.9
acetone	24.3 ppb	157.4
benzene	24.7 ppb	124.5
ethylbenzene	24.7 ppb	122.5
o-xylene	24.3 ppb	121.1
isopropylbenzene	24.9 ppb	125.0
1,2,4-trimethylbenzene	24.8 ppb	120.8
sec-butylbenzene	24.9 ppb	127.3
n-butylbenzene	25.5 ppb	122.7

Analyst: Gary Eden
Gary C. Eden
Analyst, Organic Chemistry

Reviewed By: [signature]
Richard F. Meyerhein 12/21/92
Supervisor, Organic Chemistry Section

STATE OF NEW MEXICO DEPARTMENT OF HEALTH

SCIENTIFIC LABORATORY DIVISION

P.O. Box 4700 700 Camino de Salud, NE
Albuquerque, NM 87196-4700 [505]-841-2500
ORGANIC CHEMISTRY SECTION [505]-841-2570

January 26, 1993

Request
ID No. 039281

ANALYTICAL REPORT
SLD Accession No. OR-92-2364

Distribution
(_) User 55802
(■) Submitter 536
(※) SLD Files

To: P. Sanchez
ED - DOE Project; Carlsbad
NM - Envir. Dept.; WIPP
P.O. Box 3090 MS #180
Carlsbad, NM 88220

From: Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: A soil sample submitted to this laboratory on October 15, 1992

DEMOGRAPHIC DATA

COLLECTION
On: 5-Oct-92 *By:* San . . .
At: 3:15 hrs. *In/Near:* Carlsbad

LOCATION
Waste Isolation Pilot Plant

ANALYTICAL RESULTS: Aromatic & Halogenated Purgeable [EPA-601/2] Screen (754)

Parameter	Value	Note	MDL	Units
EPA 601/2 Volatiles (60)	0.00	N	200.00	ppb

See Laboratory Remarks for Additional Information

Notations & Comments:
MDL = Minimal Detectable Level.
A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified;
T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.
Evidentiary Seals: Not Sealed☒; Intact: No☐, Yes☐ & Broken By: ________ Date: ________

Laboratory Remarks: Cotton Baby 5-10 Deep

Three late eluting compounds in the C3 substituted benzene region at 5000-7000 ppb were detected by the photoionization detector, but not identified.

VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: NM SCIENTIFIC LABORATORY DIVISION Contract: N/A
Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: N/A
Matrix: (soil/water) Soil Lab Sample ID: OR-92-2364
Sample wt/vol: 13.27 (g/mL) g SLD Batch No: 310
Level: (low/med) Low Date Received: 10/15/92
% Moisture: not dec. 3.7 dec. N/A Date Extracted: N/A
Extraction: (SepF/Cont/Sonc) N/A Date Analyzed: 10/20/92
GPC Cleanup: (Y/N) No pH: ____ Dilution Factor: 1
CONCENTRATION UNITS:
(ug/L or ug/Kg): ug/Kg

(Continued on page 2.)

This sample was analyzed for the following compounds using EPA Methods 601 & 602

CAS NO.	COMPOUND	CONC.	QUALIFIER
67-64-1	Acetone	1000.0	U
71-43-2	Benzene	200.0	U
108-86-1	Bromobenzene	200.0	U
74-97-5	Bromochloromethane	200.0	U
75-27-4	Bromodichloromethane	200.0	U
75-25-2	Bromoform	200.0	U
78-93-3	2-Butanone (MEK)	1000.0	U
104-51-8	n-Butylbenzene	200.0	U
135-98-8	sec-Butylbenzene	200.0	U
98-06-6	tert-Butylbenzene	200.0	U
1634-04-4	tert-Butyl methyl ether (MTBE)	1000.0	U
56-23-5	Carbon tetrachloride	200.0	U
108-90-7	Chlorobenzene	200.0	U
67-66-3	Chloroform	200.0	U
95-49-8	2-Chlorotoluene	200.0	U
106-43-4	4-Chlorotoluene	200.0	U
96-12-8	1,2-Dibromo-3-chloropropane	200.0	U
124-48-1	Dibromochloromethane	200.0	U
106-93-4	1,2-Dibromoethane	200.0	U
74-95-3	Dibromomethane	200.0	U
95-50-1	1,2-Dichlorobenzene	200.0	U
541-73-1	1,3-Dichlorobenzene	200.0	U
106-46-7	1,4-Dichlorobenzene	200.0	U
75-71-8	Dichlorodifluoromethane	200.0	U
75-34-3	1,1-Dichloroethane	200.0	U
107-06-2	1,2-Dichloroethane	200.0	U
75-35-4	1,1-Dichloroethene	200.0	U
156-59-4	cis-1,2-Dichloroethene	200.0	U
156-60-5	trans-1,2-Dichloroethene	200.0	U
78-87-5	1,2-Dichloropropane	200.0	U
142-28-9	1,3-Dichloropropane	200.0	U
590-20-7	2,2-Dichloropropane	200.0	U
563-58-6	1,1-Dichloropropene	200.0	U
1006-01-5	cis-1,3-Dichloropropene	200.0	U
1006-02-6	trans-1,3-Dichloropropene	200.0	U
100-41-4	Ethylbenzene	200.0	U
87-68-3	Hexachlorobutadiene	200.0	U
98-82-8	Isopropylbenzene	200.0	U

(Continued on page 3.)

99-87-6	4-Isopropyltoluene	200.0	U
75-09-2	Methylene chloride	200.0	U
90-12-0	1-Methylnaphthalene	200.0	U
91-57-6	2-Methylnaphthalene	200.0	U
91-20-3	Naphthalene	200.0	U
103-65-1	n-Propylbenzene	200.0	U
100-42-5	Styrene	200.0	U
630-20-6	1,1,1,2-Tetrachloroethane	200.0	U
79-34-5	1,1,2,2-Tetrachloroethane	200.0	U
127-18-4	Tetrachloroethene	200.0	U
109-99-9	Tetrahydrofuran (THF)	1000.0	U
108-88-3	Toluene	200.0	U
87-61-5	1,2,3-Trichlorobenzene	200.0	U
120-82-1	1,2,4-Trichlorobenzene	200.0	U
71-55-6	1,1,1-Trichloroethane	200.0	U
79-00-5	1,1,2-Trichloroethane	200.0	U
79-01-6	Trichloroethene	200.0	U
75-69-4	Trichlorofluoromethane	200.0	U
96-18-4	1,2,3-Trichloropropane	200.0	U
95-63-6	1,2,4-Trimethylbenzene	200.0	U
108-67-8	1,3,5-Trimethylbenzene	200.0	U
75-01-4	Vinyl chloride	200.0	U
95-47-6	o-Xylene	200.0	U
N/A	p- & m-Xylene	200.0	U

Qualifier Definitions:
B - Indicates compound was detected in the Lab Blank as well as in the sample.
D - Indicates value taken from a secondary (diluted) sample analysis.
E - Indicates compound concentration exceeded the range of the standard curve.
J - Indicates an estimated value for tentatively identified compounds, or for compounds detected and identified but present at a concentration less than the quantitation limit.
N - Indicates that more than one peak was used for quantitation.
U - Indicates compound was analyzed for, but not detected above the concentration listed (Quantitation Limit).

QUALITY CONTROL SUMMARY FOR VOLATILES SCREEN

METHOD BLANK: A laboratory method blank was analyzed along with

(Continued on page 4.)

SCIENTIFIC LABORATORY DIVISION
P.O. Box 4700
Albuquerque, NM 87196-4700
700 Camino de Salud, NE
[505]-841-2500
ORGANIC CHEMISTRY SECTION [505]-841-2570

February 12, 1993

Request
ID No. 039282

ANALYTICAL REPORT
SLD Accession No. OR-92-2360

Distribution
(※) User 55802
(■) Submitter 536
(※) SLD Files

To: P. Sanchez
ED - DOE Project; Carlsbad
NM - Envir. Dept.; WIPP
P.O. Box 3090
Carlsbad, NM 88221

From: Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: A soil sample submitted to this laboratory on October 15, 1992

User:
ED Har. & Rad. Materials Bur.
ED DOE Project, H&R Materials
P.O. Box 26110
Santa Fe, NM 87502

DEMOGRAPHIC DATA

COLLECTION		LOCATION
On: 5-Oct-92	*By:* Xxx . . .	Cotton Baby 0-5 Shallow
At: 2:45 hrs.	*In/Near:* Carlsbad	

ANALYTICAL RESULTS: Aliphatic Hydrocarbon (>10 Carbons) Screen (751)

Parameter	Value	Note	MDL	Units
See Laboratory Remarks for Additional Information				

Notations & Comments:
MDL = Minimal Detectable Level.
A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified;
T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.
Evidentiary Seals: Not Sealed ☑; Intact: No ☐, Yes ☐ & Broken By: ____________ Date: ________

Laboratory Remarks: COTTON BABY 0-5 Deep

HYDROCARBON FUEL SCREEN ANALYSIS DATA SHEET

Lab Name: NM SCIENTIFIC LABORATORY DIVISION Contract: N/A
Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: N/A
Matrix: (soil/water) Soil Lab Sample ID: OR-92-2360
Sample wt/vol: 12.94 (g/mL) g SLD Batch No: 318
Level: (low/med) Low Date Received: 10/15/92
% Moisture: not dec. ____ dec. 38.9 Date Extracted: 10/19/92
Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/28/92

(Continued on page 2.)

this sample to assure the absence of interfering contaminants from lab reagents, instruments, or the general laboratory environment. Unless listed below, no contaminants were detected in this blank above the reported detection limit.

COMPOUND DETECTED	CONCENTRATION (PPB)
No Compounds Detected	

SURROGATE RECOVERIES:

SURROGATE	CONCENTRATION	% RECOVERY
Bromofluorobenzene	25.0 ppb	120.1
2-Bromo-1-chloropropane	25.0 ppb	94.7

SPIKE RECOVERY: The % recoveries for compounds in the batch spike were from 80% to 120% with the exception of the compounds listed below:

COMPOUND	CONCENTRATION	% RECOVERY
vinyl chloride	30.0 ppb	79.5
1,1-dichloroethene	24.7 ppb	127.9
acetone	24.3 ppb	157.4
benzene	24.7 ppb	124.5
ethylbenzene	24.7 ppb	122.5
o-xylene	24.3 ppb	121.1
isopropylbenzene	24.9 ppb	125.0
1,2,4-trimethylbenzene	24.8 ppb	120.8
sec-butylbenzene	24.9 ppb	127.3
n-butylbenzene	25.5 ppb	122.7

Analyst: Gary Eden
Gary C. Eden
Analyst, Organic Chemistry

Reviewed By: Ken Sherrell
Richard F. Meyerhein 12/21/92
Supervisor, Organic Chemistry Section

STATE OF NEW MEXICO | DEPARTMENT OF HEALTH

SCIENTIFIC LABORATORY DIVISION

P.O. Box 4700 | 700 Camino de Salud, NE
Albuquerque, NM 87196-4700 | [505]-841-2500
ORGANIC CHEMISTRY SECTION [505]-841-2570

February 12, 1993

Request
ID No. 039283

ANALYTICAL REPORT
SLD Accession No. OR-92-2359

Distribution
(※) User 55802
(■) Submitter 536
(※) SLD Files

To: P. Sanchez
ED - DOE Project; Carlsbad
NM - Envir. Dept.; WIPP
P.O. Box 3090
Carlsbad, NM 88221

From: Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: A soil sample submitted to this laboratory on October 15, 1992

User:
ED Har. & Rad. Materials Bur.
ED DOE Project, H&R Materials
P.O. Box 26110
Santa Fe, NM 87502

DEMOGRAPHIC DATA

COLLECTION		*LOCATION*
On: 5-Oct-92	*By:* San . . .	Cotton Baby 5-10 Deep
At: 3:20 hrs.	*In/Near:* Carlsbad	

ANALYTICAL RESULTS: Aliphatic Hydrocarbon (>10 Carbons) Screen (751)

Parameter	Value	Note	MDL	Units

See Laboratory Remarks for Additional Information

Notations & Comments:

MDL = Minimal Detectable Level.

A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified;
T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.

Evidentiary Seals: Not Sealed ☑; Intact: No ☐, Yes ☐ & Broken By: ______ Date: ______

Laboratory Remarks: COTTON BABY 5-10 Deep

HYDROCARBON FUEL SCREEN ANALYSIS DATA SHEET

Lab Name: NM SCIENTIFIC LABORATORY DIVISION Contract: N/A
Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: N/A
Matrix: (soil/water) Soil Lab Sample ID: OR-92-2359
Sample wt/vol: 10.75 (g/mL) g SLD Batch No: 318
Level: (low/med) Low Date Received: 10/15/92
% Moisture: not dec. ______ dec. 4.3 Date Extracted: 10/19/92
Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/28/92

(Continued on page 2.)

GPC Cleanup: (Y/N) No pH:______ Dilution Factor: 1
Extraction Solvent: CS2

CONCENTRATION UNITS:
(mg/L or mg/Kg): mg/kg

This sample was analyzed for hydrocarbons in the C5 to C30 molecular weight range using Gas Chromatography with a Flame Ionization Detector (FID). Since the FID is a nonspecific detector, all compound identifications should be considered as tentative. An attempt has been made below to assign the hydrocarbons found in the sample to an appropriate fuel fraction when the gas chromatograhic fingerprint pattern of the sample closely matches a fuel standard. When the hydrocarbons in the sample do not closely match any known specific fuel, the results will be reported as a hydrocarbon range:

TENTATIVELY IDENTIFIED FUEL FRACTIONS

The following fuel fractions were tentatively identified by FID

FUEL FRACTION	CARBON RANGE	EST. CONC.	% of All H-C's
GASOLINE	C5-C12	ND	0.0
JP-4	C5-C15	ND	0.0
STODDARD SOLVENT	C9-C12	ND	0.0
KEROSENE/JET-A	C9-C19	ND	0.0
DIESEL FUEL	C10-C23	ND	0.0
LUBRICATING OIL	C19-C29	ND	0.0
UNKNOWN PATTERN	C15-C30	*	100

* idicates that the concentration was less than 20 ppm.

Analyst: Robert A. Morris
Robert A. Morris
Analyst, Organic Chemistry

Reviewed By: Richard F. Meyerhein
Richard F. Meyerhein 11/12/92
Supervisor, Organic Chemistry Section

GPC Cleanup: (Y/N) No pH: ____ Dilution Factor: 1

Extraction Solvent: CS2

CONCENTRATION UNITS:
(mg/L or mg/Kg): mg/kg

This sample was analyzed for hydrocarbons in the C5 to C30 molecular weight range using Gas Chromatography with a Flame Ionization Detector (FID). Since the FID is a nonspecific detector, all compound identifications should be considered as tentative. An attempt has been made below to assign the hydrocarbons found in the sample to an appropriate fuel fraction when the gas chromatograhic fingerprint patter of the sample closely matches a fuel standard. When the hydrocarbons in the sample do not closely match any known specific fuel, the results wil be reported as a hydrocarbon range.

TENTATIVELY IDENTIFIED FUEL FRACTIONS

The following fuel fractions were tentatively identified by FID

FUEL FRACTION	CARBON RANGE	EST. CONC.	% of All H-C's
GASOLINE	C5-C12	ND	0.0
JP-4	C5-C15	ND	0.0
STODDARD SOLVENT	C9-C12	ND	0.0
KEROSENE/JET-A	C9-C19	ND	0.0
DIESEL FUEL	C10-C23	ND	0.0
LUBRICATING OIL	C19-C29	ND	0.0
UNKNOWN PATTERN	C13-C30	*	100

* indicates that the concentration was less than 20 ppm.

Analyst: [signature]
Robert A. Morris
Analyst, Organic Chemistry

Reviewed By: [signature]
Richard F. Meyerhein 11/12/92
Supervisor, Organic Chemistry Section

Appendix 4.1.18
DOE-1/RFA Sampling Event

Site Photograph

Site Sketch

Borelog

Analytical Results

Appendix 4.1.18
DOE-1 Site Photograph

View East

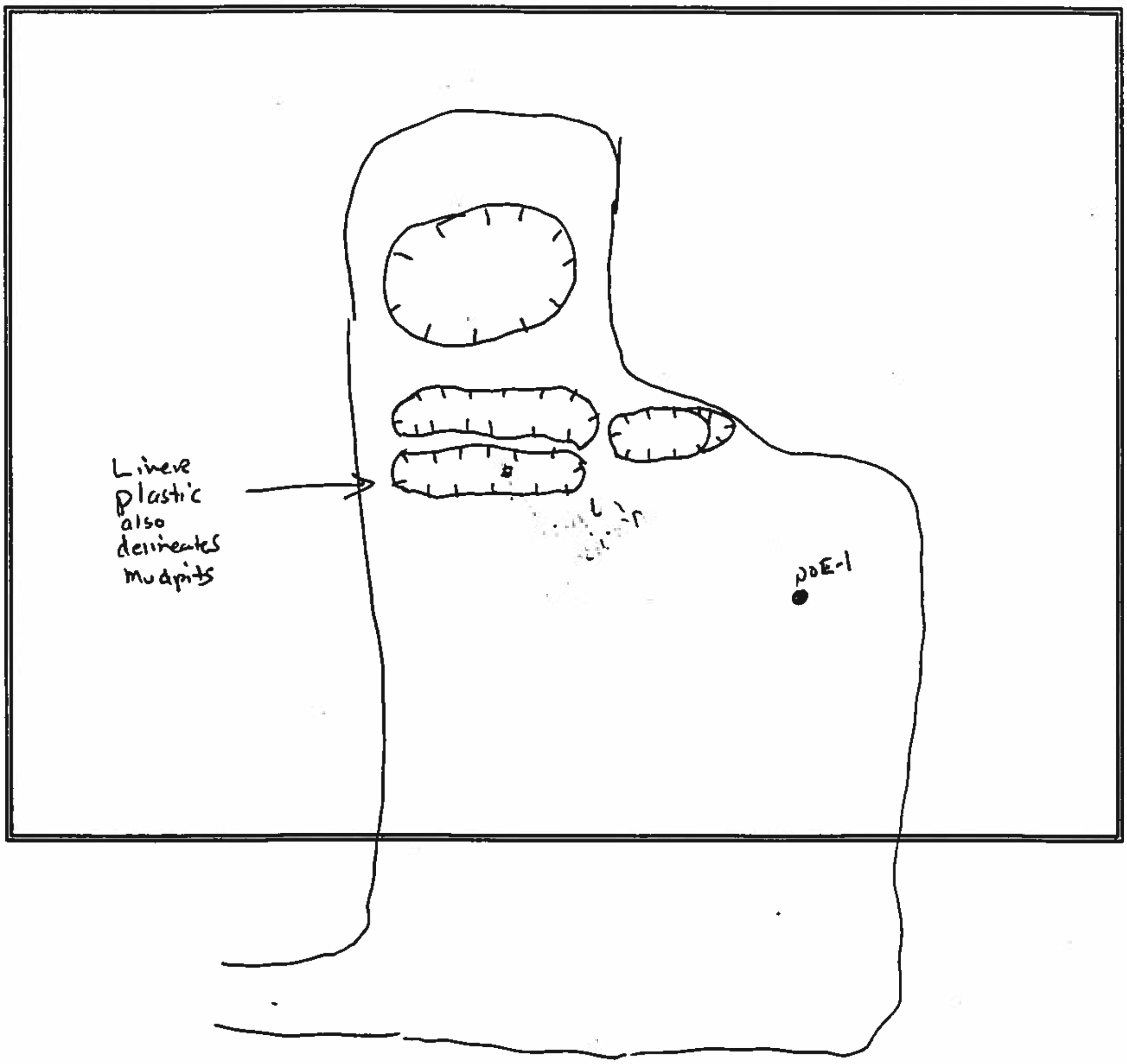
View North

Sampling Location
Site Sketch
Scale: ~~1" = 40'~~ 1" = 60'

120'

New Mexico Environment Department
Location: DOE-1
Date: 10/6/92
Comments:

– signifies depression/mudpit



New Mexico Environment Department
DOE/WIPP Oversight
TEST PIT/AUGERED BORING
LOG AND DATA SHEET

Project No. 550040	Location. DOE-1	Boring No. 1	Sheet 1 of 1

Feature. Mudpit Hydrologic Exp.	Method. Hand Auger
Date (Time) Logged. 10/6/92	Logged By. PES
Area Designation.	Monitoring. MSA Model A/Benzene Tube

Depth and Soil Class	Graphic Log	Sample Taken	Description of Materials Visual Observations	OVA
0 SP-SM Poorly sorted silty sand		Plastic Liners	Sand: Light red brown, fine to medium, loose, dry, porous, occasional angular rock fragments and scattered roots and leaves, black 7 mil liner @ - 2in and white liner @ -.5in below surface. Windblown dune sand over mudpit (0-0.5ft)	
CH/CL Fat clay with lean sandy clay pockets @.8ft			Fat Clay: Grey with brown laminations, highly plastic, very soft, wet to saturated, relatively homogeneous (0.5-.8ft), behaves as liquid (low shear strength), increasingly mixed with small pockets red sandy clay and black and grey (hydrocarbon?) lenses and stringers (0.8-1.5ft), weak reaction with HCL (SO2 generated). Drilling mud/bentonite/hydrocarbon fill (0.5-1.5ft).	
1' CH/Sludge		Aliphatic VOC Sample Heavy Metals (ICAP and As) Sample.	Fat Clay/Sludge: black, very soft/viscous liquid-like shear strength, wet to saturated, locally heavily mottled with brown/red brown sandy clay pockets, strong hydrocarbon smell and measurable voc (benzene). Hydrocarbon/sludge (1.5ft - 2.2ft).	✓
2' SC Clayey Sand		Plastic Liner (White) VOC Aliphatic Heavy Metal Samples	Clayey Sand: Dark red brown, fine to medium, medium dense, moist to wet, faint hydrocarbon smell. Natural undisturbed, slightly contaminated dune sand (to BOH)	
	BOH		Very dense, moist, no recovery from auger bit, bottomed out.	
3'				
4'				

Remarks: Mudpits are topographic depressions.
Measurable organic vapors were measured at the surface of the borehole.

DOE-1 Comparison: Concentrations of Aromatic and Halogenated Puregeables and Aliphatic Hydrocarbons [1]

Analyte	**Shallow[2] 1.0-1.5 ft (µg/kg- ppb)**	**Colocated[3] (µg/kg)**	**Deep[2] 2.5-2.7 ft (µg/kg)**	**Colocated[3] (µg/kg)**
Aromatic and Halogenated Purgeables	No VOC compounds detected above PQL[4] (MDL = 500 ppb) Two late eluting compounds in the C3 substituted benzene region detected 3000-4000 ppb: unidentified.	111-trichloroethane - 1 11-dichloroethane - 4 chloroform - 2 methyl chloride - 2 methylene chloride - 2 o-xylene - 8 m-xylene - 3 p-xylene - 2 benzene - 3	No VOC compounds detected above PQL[4] (MDL = 245 ppb) Three late eluting compounds in the C3 substituted benzene region detected 5000-7000 ppb: unidentified.	111-trichloroethane - 1 12-dichloroethane - 29 methylene chloride - 2 m-xylene - 2 methylbenzene - 7 (Toluene)

Analyte	**Shallow[2] 1.0-1.5 ft (mg/kg- ppm)**	**Colocated[3] (mg/kg)**	**Deep[2] 2.3-2.5 ft (mg/kg)**	**Colocated[3] (mg/kg)**
Aliphatic Hydrocarbons	Gasoline - ND Diesel - ND Lub. Oil - ND Unknown Pattern (C15-C30) - 25	Diesel - 26 ppm	Gasoline - ND Diesel - ND Lub. Oil - ND Unknown Pattern (C15-C30) - <20	Diesel - 13 ppm

1 Concentrations volatiles reported in µg/kg - ppb; aliphatics ppm ----- Not Analyzed

2 NMED Sample. EPA 601/2 for volatiles. Aliphatic hydrocarbon analyses includes all hydrocarbons in the C5-C30 molecular weight range. Note: Gas chromatography and flame ionization detector screening technique results are provisional.

3 Co-located Sample collected by Westinghouse DOE/WIPP

4 Practical Quantitation Limit (PQL) with Minimum Detection Limit (MDL) as indicated.

Methylene chloride, chloroform, Tetrahydrofuran and o-xylene detected in equipment rinsate blank.

DOE-1: Comparison of Concentrations

Heavy Metal	MCL[1] (mg/L)	Other (mg/L)	Mudpit[2] 1.8-2.1 ft (μg/g)	Colocated[3] (mg/kg)	Below Mudpit[2] 2.3-2.7 ft (μg/g)	Colocated[3] (mg/kg)	Background[3] (mg/kg)
Arsenic	.05	App.[4]	1.1000	<10	2.8000	<10	<10
Barium	1.0	App.	90.00	120	65.00	69	11
Beryllium	N/A	P015	<5.00	<0.5	<5.00	<0.5	<.5
Cadmium	.005	App.	<5.00	<0.5	<5.00	<0.5	<.5
Chromium	.10	App.	27.00	43	53.00	Illegible	3
Cobalt	N/A	App.	<5.00	2	<2.50	3	<1
Copper	1.0	App.	5.00	4	8.00	4	1
Iron	.30	App.	7800.00	5800	12700.	9200	2000
Lead	.05	App.	20.	12	<5.	6	<5
Nickel	N/A	App.	6.00	7	10.00	10	<2
Vanadium		App.	14.00	13	21.00	20	4
Zinc	5.0	App.	16.00	20	26.00	22	6
Aluminum			7400.00	6000	12700.	8600	1700
Boron			17.00	13	11.00	20	<5
Calcium			72000.00	70000	15800.	Illegible	220
Magnesium			14600.00	9800	2700.00	2200	280
Manganese			170.00	140	66.00	100	19
Silicon			570.00	250	500.00	530	290
Strontium			300.00	160	32.00	28	2

[1] Maximum Contaminant Level: Promulgated July, 1992 40 CFR 161.
[2] NMED Sample within mudpit/ [3] Co-located Sample collected by Westinghouse DOE/WIPP
[4] Listed in 40 CFR 261 appendix VIII and/or 40 CFR 264 appendix IX

STATE OF NEW MEXICO DEPARTMENT OF HEALTH

SCIENTIFIC LABORATORY DIVISION

P.O. Box 4700
Albuquerque, NM 87196-4700

700 Camino de Salud, NE
[505]-841-2500

ORGANIC CHEMISTRY SECTION [505]-841-2570

January 26, 1993

Request
ID No. 039305

ANALYTICAL REPORT
SLD Accession No. OR-92-2363

Distribution
(__) User 55802
(■) Submitter 536
(※) SLD Files

To: P. Sanchez
ED - DOE Project; Carlsbad
NM - Envir. Dept.; WIPP
P.O. Box 3090 MS #180
Carlsbad, NM 88220

From: Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: A soil sample submitted to this laboratory on October 15, 1992

DEMOGRAPHIC DATA

COLLECTION		*LOCATION*
On: 6-Oct-92	*By:* San . . .	Waste Isolation Pilot Plant
At: 3:00 hrs.	*In/Near:* Carlsbad	

ANALYTICAL RESULTS: Aromatic & Halogenated Purgeable [EPA-601/2] Screen (754)

Parameter	Value	Note	MDL	Units
EPA 601/2 Volatiles (60)	0.00	N	245.00	ppb

See Laboratory Remarks for Additional Information

Notations & Comments:

MDL = Minimal Detectable Level.
A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified;
T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.
Evidentiary Seals: Not Sealed☒; Intact: No☐, Yes☐ & Broken By: ______________ Date: ________

Laboratory Remarks: DQE1 5-10 Deep

Three late eluting compounds in the C3 substituted benzene region at 5000-7000 ppb were detected by the photoionization detector, but not identified.

VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: NM SCIENTIFIC LABORATORY DIVISION Contract: N/A
Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: N/A
Matrix: (soil/water) Soil Lab Sample ID: OR-92-2363
Sample wt/vol: 11.66 (g/mL) g SLD Batch No: 310
Level: (low/med) Low Date Received: 10/15/92
% Moisture: not dec. 11.0 dec. N/A Date Extracted: N/A
Extraction: (SepF/Cont/Sonc) N/A Date Analyzed: 10/20/92
GPC Cleanup: (Y/N) No pH: _____ Dilution Factor: 1
CONCENTRATION UNITS:
(ug/L or ug/Kg): ug/Kg

(Continued on page 2.)

This sample was analyzed for the following compounds using EPA Methods 601 & 602

CAS NO.	COMPOUND	CONC.	QUALIFIER
67-64-1	Acetone	1225.0	U
71-43-2	Benzene	245.0	U
108-86-1	Bromobenzene	245.0	U
74-97-5	Bromochloromethane	245.0	U
75-27-4	Bromodichloromethane	245.0	U
75-25-2	Bromoform	245.0	U
78-93-3	2-Butanone (MEK)	1225.0	U
104-51-8	n-Butylbenzene	245.0	U
135-98-8	sec-Butylbenzene	245.0	U
98-06-6	tert-Butylbenzene	245.0	U
1634-04-4	tert-Butyl methyl ether (MTBE)	1225.0	U
56-23-5	Carbon tetrachloride	245.0	U
108-90-7	Chlorobenzene	245.0	U
67-66-3	Chloroform	245.0	U
95-49-8	2-Chlorotoluene	245.0	U
106-43-4	4-Chlorotoluene	245.0	U
96-12-8	1,2-Dibromo-3-chloropropane	245.0	U
124-48-1	Dibromochloromethane	245.0	U
106-93-4	1,2-Dibromoethane	245.0	U
74-95-3	Dibromomethane	245.0	U
95-50-1	1,2-Dichlorobenzene	245.0	U
541-73-1	1,3-Dichlorobenzene	245.0	U
106-46-7	1,4-Dichlorobenzene	245.0	U
75-71-8	Dichlorodifluoromethane	245.0	U
75-34-3	1,1-Dichloroethane	245.0	U
107-06-2	1,2-Dichloroethane	245.0	U
75-35-4	1,1-Dichloroethene	245.0	U
156-59-4	cis-1,2-Dichloroethene	245.0	U
156-60-5	trans-1,2-Dichloroethene	245.0	U
78-87-5	1,2-Dichloropropane	245.0	U
142-28-9	1,3-Dichloropropane	245.0	U
590-20-7	2,2-Dichloropropane	245.0	U
563-58-6	1,1-Dichloropropene	245.0	U
1006-01-5	cis-1,3-Dichloropropene	245.0	U
1006-02-6	trans-1,3-Dichloropropene	245.0	U
100-41-4	Ethylbenzene	245.0	U
87-68-3	Hexachlorobutadiene	245.0	U
98-82-8	Isopropylbenzene	245.0	U

(Continued on page 3.)

99-87-6	4-Isopropyltoluene	245.0	U
75-09-2	Methylene chloride	245.0	U
90-12-0	1-Methylnaphthalene	245.0	U
91-57-6	2-Methylnaphthalene	245.0	U
91-20-3	Naphthalene	245.0	U
103-65-1	n-Propylbenzene	245.0	U
100-42-5	Styrene	245.0	U
630-20-6	1,1,1,2-Tetrachloroethane	245.0	U
79-34-5	1,1,2,2-Tetrachloroethane	245.0	U
127-18-4	Tetrachloroethene	245.0	U
109-99-9	Tetrahydrofuran (THF)	1225.0	U
108-88-3	Toluene	245.0	U
87-61-5	1,2,3-Trichlorobenzene	245.0	U
120-82-1	1,2,4-Trichlorobenzene	245.0	U
71-55-6	1,1,1-Trichloroethane	245.0	U
79-00-5	1,1,2-Trichloroethane	245.0	U
79-01-6	Trichloroethene	245.0	U
75-69-4	Trichlorofluoromethane	245.0	U
96-18-4	1,2,3-Trichloropropane	245.0	U
95-63-6	1,2,4-Trimethylbenzene	245.0	U
108-67-8	1,3,5-Trimethylbenzene	245.0	U
75-01-4	Vinyl chloride	245.0	U
95-47-6	o-Xylene	245.0	U
N/A	p- & m-Xylene	245.0	U

Qualifier Definitions:

B - Indicates compound was detected in the Lab Blank as well as in the sample.
D - Indicates value taken from a secondary (diluted) sample analysis.
E - Indicates compound concentration exceeded the range of the standard curve.
J - Indicates an estimated value for tentatively identified compounds, or for compounds detected and identified but present at a concentration less than the quantitation limit.
N - Indicates that more than one peak was used for quantitation.
U - Indicates compound was analyzed for, but not detected above the concentration listed (Quantitation Limit).

QUALITY CONTROL SUMMARY FOR VOLATILES SCREEN

METHOD BLANK: A laboratory method blank was analyzed along with

(Continued on page 4.)

this sample to assure the absence of interfering contaminants from lab reagents, instruments, or the general laboratory environment. Unless listed below, no contaminants were detected in this blank above the reported detection limit.

COMPOUND DETECTED	CONCENTRATION (PPB)
No Compounds Detected	

SURROGATE RECOVERIES:

SURROGATE	CONCENTRATION	% RECOVERY
Bromofluorobenzene	25.0 ppb	118.2
2-Bromo-1-chloropropane	25.0 ppb	96.4

SPIKE RECOVERY: The % recoveries for compounds in the batch spike were from 80% to 120% with the exception of the compounds listed below:

COMPOUND	CONCENTRATION	% RECOVERY
vinyl chloride	30.0 ppb	79.5
1,1-dichloroethene	24.7 ppb	127.9
acetone	24.3 ppb	157.4
benzene	24.7 ppb	124.5
ethylbenzene	24.7 ppb	122.5
o-xylene	24.3 ppb	121.1
isopropylbenzene	24.9 ppb	125.0
1,2,4-trimethylbenzene	24.8 ppb	120.8
sec-butylbenzene	24.9 ppb	127.3
n-butylbenzene	25.5 ppb	122.7

Analyst: Gary Eden
Gary C. Eden
Analyst, Organic Chemistry

Reviewed By: [signature]
Richard F. Meyerhein 12/21/92
Supervisor, Organic Chemistry Section

SCIENTIFIC LABORATORY DIVISION

P.O. Box 4700 700 Camino de Salud, NE
Albuquerque, NM 87196-4700 [505]-841-2500
ORGANIC CHEMISTRY SECTION [505]-841-2570

January 26, 1993

Request
ID No. 039304

ANALYTICAL REPORT
SLD Accession No. OR-92-2362

Distribution
(_) User 55802
(■) Submitter 536
(☒) SLD Files

To: P. Sanchez
ED - DOE Project; Carlsbad
NM - Envir. Dept.; WIPP
P.O. Box 3090 MS #180
Carlsbad, NM 88220

From: Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: A soil sample submitted to this laboratory on October 15, 1992

DEMOGRAPHIC DATA

COLLECTION
On: 6-Oct-92 *By:* San . . .
At: 1:45 hrs. *In/Near:* Carlsbad

LOCATION
Waste Isolation Pilot Plant
DOE-1 Shallow (0-5)

ANALYTICAL RESULTS: Aromatic & Halogenated Purgeable [EPA-601/2] Screen (754)

Parameter	Value	Note	MDL	Units
EPA 601/2 Volatiles (60)	0.00	N	500.00	ppb

· See Laboratory Remarks for Additional Information

Notations & Comments:
MDL = Minimal Detectable Level.
A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified;
T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.
Evidentiary Seals: Not Sealed ☒; Intact: No ☐, Yes ☐ & Broken By: ________ Date: ________

Laboratory Remarks: DOE1 0-5 Shallow

Two late eluting compounds in the C3 substituted benzene region at 3000-4000 ppb were detected by the photoionization detector, but not identified.

VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: NM SCIENTIFIC LABORATORY DIVISION Contract: N/A
Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: N/A
Matrix: (soil/water) Soil Lab Sample ID: OR-92-2362
Sample wt/vol: 6.71 (g/mL) g SLD Batch No: 310
Level: (low/med) Low Date Received: 10/15/92
% Moisture: not dec. 33.9 dec. N/A Date Extracted: N/A
Extraction: (SepF/Cont/Sonc) N/A Date Analyzed: 10/21/92
GPC Cleanup: (Y/N) No pH: ____ Dilution Factor: 1
CONCENTRATION UNITS:
(ug/L or ug/Kg): ug/Kg

(Continued on page 2.)

This sample was analyzed for the following compounds using EPA Methods 601 & 602

CAS NO.	COMPOUND	CONC.	QUALIFIER
67-64-1	Acetone	2500.0	U
71-43-2	Benzene	500.0	U
108-86-1	Bromobenzene	500.0	U
74-97-5	Bromochloromethane	500.0	U
75-27-4	Bromodichloromethane	500.0	U
75-25-2	Bromoform	500.0	U
78-93-3	2-Butanone (MEK)	2500.0	U
104-51-8	n-Butylbenzene	500.0	U
135-98-8	sec-Butylbenzene	500.0	U
98-06-6	tert-Butylbenzene	500.0	U
1634-04-4	tert-Butyl methyl ether (MTBE)	2500.0	U
56-23-5	Carbon tetrachloride	500.0	U
108-90-7	Chlorobenzene	500.0	U
67-66-3	Chloroform	500.0	U
95-49-8	2-Chlorotoluene	500.0	U
106-43-4	4-Chlorotoluene	500.0	U
96-12-8	1,2-Dibromo-3-chloropropane	500.0	U
124-48-1	Dibromochloromethane	500.0	U
106-93-4	1,2-Dibromoethane	500.0	U
74-95-3	Dibromomethane	500.0	U
95-50-1	1,2-Dichlorobenzene	500.0	U
541-73-1	1,3-Dichlorobenzene	500.0	U
106-46-7	1,4-Dichlorobenzene	500.0	U
75-71-8	Dichlorodifluoromethane	500.0	U
75-34-3	1,1-Dichloroethane	500.0	U
107-06-2	1,2-Dichloroethane	500.0	U
75-35-4	1,1-Dichloroethene	500.0	U
156-59-4	cis-1,2-Dichloroethene	500.0	U
156-60-5	trans-1,2-Dichloroethene	500.0	U
78-87-5	1,2-Dichloropropane	500.0	U
142-28-9	1,3-Dichloropropane	500.0	U
590-20-7	2,2-Dichloropropane	500.0	U
563-58-6	1,1-Dichloropropene	500.0	U
1006-01-5	cis-1,3-Dichloropropene	500.0	U
1006-02-6	trans-1,3-Dichloropropene	500.0	U
100-41-4	Ethylbenzene	500.0	U
87-68-3	Hexachlorobutadiene	500.0	U
98-82-8	Isopropylbenzene	500.0	U

(Continued on page 3.)

99-87-6	4-Isopropyltoluene	500.0	U
75-09-2	Methylene chloride	500.0	U
90-12-0	1-Methylnaphthalene	500.0	U
91-57-6	2-Methylnaphthalene	500.0	U
91-20-3	Naphthalene	500.0	U
103-65-1	n-Propylbenzene	500.0	U
100-42-5	Styrene	500.0	U
630-20-6	1,1,1,2-Tetrachloroethane	500.0	U
79-34-5	1,1,2,2-Tetrachloroethane	500.0	U
127-18-4	Tetrachloroethene	500.0	U
109-99-9	Tetrahydrofuran (THF)	2500.0	U
108-88-3	Toluene	500.0	U
87-61-5	1,2,3-Trichlorobenzene	500.0	U
120-82-1	1,2,4-Trichlorobenzene	500.0	U
71-55-6	1,1,1-Trichloroethane	500.0	U
79-00-5	1,1,2-Trichloroethane	500.0	U
79-01-6	Trichloroethene	500.0	U
75-69-4	Trichlorofluoromethane	500.0	U
96-18-4	1,2,3-Trichloropropane	500.0	U
95-63-6	1,2,4-Trimethylbenzene	500.0	U
108-67-8	1,3,5-Trimethylbenzene	500.0	U
75-01-4	Vinyl chloride	500.0	U
95-47-6	o-Xylene	500.0	U
N/A	p- & m-Xylene	500.0	U

Qualifier Definitions:

B - Indicates compound was detected in the Lab Blank as well as in the sample.
D - Indicates value taken from a secondary (diluted) sample analysis.
E - Indicates compound concentration exceeded the range of the standard curve.
J - Indicates an estimated value for tentatively identified compounds, or for compounds detected and identified but present at a concentration less than the quantitation limit.
N - Indicates that more than one peak was used for quantitation.
U - Indicates compound was analyzed for, but not detected above the concentration listed (Quantitation Limit).

QUALITY CONTROL SUMMARY FOR VOLATILES SCREEN

METHOD BLANK: A laboratory method blank was analyzed along with

(Continued on page 4.)

this sample to assure the absence of interfering contaminants from lab reagents, instruments, or the general laboratory environment. Unless listed below, no contaminants were detected in this blank above the reported detection limit.

COMPOUND DETECTED	CONCENTRATION (PPB)
No Compounds Detected	

SURROGATE RECOVERIES:

SURROGATE	CONCENTRATION	% RECOVERY
Bromofluorobenzene	25.0 ppb	119.5
2-Bromo-1-chloropropane	25.0 ppb	93.8

SPIKE RECOVERY: The % recoveries for compounds in the batch spike were from 80% to 120% with the exception of the compounds listed below:

COMPOUND	CONCENTRATION	% RECOVERY
vinyl chloride	30.0 ppb	79.5
1,1-dichloroethene	24.7 ppb	127.9
acetone	24.3 ppb	157.4
benzene	24.7 ppb	124.5
ethylbenzene	24.7 ppb	122.5
o-xylene	24.3 ppb	121.1
isopropylbenzene	24.9 ppb	125.0
1,2,4-trimethylbenzene	24.8 ppb	120.8
sec-butylbenzene	24.9 ppb	127.3
n-butylbenzene	25.5 ppb	122.7

Analyst: Gary Eden
Gary C. Eden
Analyst, Organic Chemistry

Reviewed By: Ken Sherrill
Richard F. Meyerhein 12/21/92
Supervisor, Organic Chemistry Section

STATE OF NEW MEXICO DEPARTMENT OF HEALTH

SCIENTIFIC LABORATORY DIVISION

P.O. Box 4700 700 Camino de Salud, NE
Albuquerque, NM 87196-4700 [505]-841-2500
ORGANIC CHEMISTRY SECTION [505]-841-2570

February 12, 1993

Request
ID No. 039306

ANALYTICAL REPORT
SLD Accession No. OR-92-2357

Distribution
(※) User 55802
(■) Submitter 536
(※) SLD Files

To: P. Sanchez
ED - DOE Project; Carlsbad
NM - Envir. Dept.; WIPP
P.O. Box 3090
Carlsbad, NM 88221

From: Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: A soil sample submitted to this laboratory on October 15, 1992

User:
ED Har. & Rad. Materials Bur.
ED DOE Project, H&R Materials
P.O. Box 26110
Santa Fe, NM 87502

DEMOGRAPHIC DATA

COLLECTION		*LOCATION*
On: 6-Oct-92	*By:* San . . .	Doel 0-5 Shallow
At: 2:00 hrs.	*In/Near:* Carlsbad	

ANALYTICAL RESULTS: Aliphatic Hydrocarbon (>10 Carbons) Screen (751)

Parameter	Value	Note	MDL	Units

See Laboratory Remarks for Additional Information

Notations & Comments:
MDL = Minimal Detectable Level.
A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified;
T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.
Evidentiary Seals: Not Sealed ☑; Intact: No ☐, Yes ☐ & Broken By: ______ Date: ______

Laboratory Remarks: DOEL 0-5 SHALLOW

HYDROCARBON FUEL SCREEN ANALYSIS DATA SHEET

Lab Name: NM SCIENTIFIC LABORATORY DIVISION Contract: N/A
Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: N/A
Matrix: (soil/water) Soil Lab Sample ID: OR-92-2357
Sample wt/vol: < 11.3 (g/mL) g SLD Batch No: 318
Level: (low/med) Low Date Received: 10/15/92
% Moisture: not dec. ______ dec. 38.6 Date Extracted: 10/19/92
Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/28/92

(Continued on page 2.)

GPC Cleanup: (Y/N) No pH: ____ Dilution Factor: 1
Extraction Solvent: CS2

CONCENTRATION UNITS:
(mg/L or mg/Kg): mg/kg

This sample was analyzed for hydrocarbons in the C5 to C30 molecular weight range using Gas Chromatography with a Flame Ionization Detector (FID). Since the FID is a nonspecific detector, all compound identifications should be considered as tentative. An attempt has been made below to assign the hydrocarbons found in the sample to an appropriate fuel fraction when the gas chromatograhic fingerprint patter of the sample closely matches a fuel standard. When the hydrocarbons in the sample do not closely match any known specific fuel, the results wil be reported as a hydrocarbon range.

TENTATIVELY IDENTIFIED FUEL FRACTIONS

The following fuel fractions were tentatively identified by FID

FUEL FRACTION	CARBON RANGE	EST. CONC.	% of All H-C's
GASOLINE	C5-C12	ND	0.0
JP-4	C5-C15	ND	0.0
STODDARD SOLVENT	C9-C12	ND	0.0
KEROSENE/JET-A	C9-C19	ND	0.0
DIESEL FUEL	C10-C23	ND	0.0
LUBRICATING OIL	C19-C29	ND	0.0
UNKNOWN PATTERN	C15-C30	25 ppm	100

Analyst: [signature]
Robert A. Morris
Analyst, Organic Chemistry

Reviewed By: [signature]
Richard F. Meyerhein 11/12/92
Supervisor, Organic Chemistry Section

S ATE OF NEW MEXICO

DEPARTMENT OF HEALTH

SCIENTIFIC LABORATORY DIVISION

P.O. Box 4700
Albuquerque, NM 87196-4700

700 Camino de Salud, NE
(505)-841-2500

ORGANIC CHEMISTRY SECTION (505)-841-2570

February 12, 1993

Request
ID No. 039307

ANALYTICAL REPORT
SLD Accession No. OR-92-2358

Distribution
(■) User 55802
(■) Submitter 536
(■) SLD Files

To: P. Sanchez
ED - DOE Project; Carlsbad
NM - Envir. Dept.; WIPP
P.O. Box 3090
Carlsbad, NM 88221

From: Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: **A soil sample submitted to this laboratory on October 15, 1992**

User:
ED Har. & Rad. Materials Bur.
ED DOE Project, H&R Materials
P.O. Box 26110
Santa Fe, NM 87502

DEMOGRAPHIC DATA

COLLECTION		LOCATION
On: 6-Oct-92	*By:* San . . .	Doel 5-10 Deep
At: 2:55 hrs.	*In/Near:* Carlsbad	

ANALYTICAL RESULTS: Aliphatic Hydrocarbon (>10 Carbons) Screen (751)

Parameter	Value	Note	MDL	Units
See Laboratory Remarks for Additional Information				

Notations & Comments:

MDL = Minimal Detectable Level.

A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified;
T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.

Evidentiary Seals: Not Sealed[✓]; Intact: No[ ], Yes[ ] & Broken By: ______________ Date: ________

Laboratory Remarks: DOEL 5-10 Deep

HYDROCARBON FUEL SCREEN ANALYSIS DATA SHEET

Lab Name: NM SCIENTIFIC LABORATORY DIVISION   Contract: N/A
Lab Code: N/A   Case No.: N/A   SAS No.: N/A   SDG No.: N/A
Matrix: (soil/water) Soil   Lab Sample ID: OR-92-2358
Sample wt/vol: 6.81 (g/mL) g   SLD Batch No: 318
Level: (low/med) Low   Date Received: 10/15/92
% Moisture: not dec. ______ dec. 17.2   Date Extracted: 10/19/92
Extraction: (SepF/Cont/Sonc) Sonc   Date Analyzed: 10/28/92

(Continued on page 2.)

GPC Cleanup: (Y/N) No pH: ____
Extraction Solvent: CS2

Dilution Factor: 1

CONCENTRATION UNITS:
(mg/L or mg/Kg): mg/kg

This sample was analyzed for hydrocarbons in the C5 to C30 molecular weight range using Gas Chromatography with a Flame Ionization Detector (FID). Since the FID is a nonspecific detector, all compound identifications should be considered as tentative. An attempt has been made below to assign the hydrocarbons found in the sample to an appropriate fuel fraction when the gas chromatograhic fingerprint pattern of the sample closely matches a fuel standard. When the hydrocarbons in the sample do not closely match any known specific fuel, the results will be reported as a hydrocarbon range.

TENTATIVELY IDENTIFIED FUEL FRACTIONS

The following fuel fractions were tentatively identified by FID

FUEL FRACTION	CARBON RANGE	EST. CONC.	% of All H-C's
GASOLINE	C5-C12	ND	0.0
JP-4	C5-C15	ND	0.0
STODDARD SOLVENT	C9-C12	ND	0.0
KEROSENE/JET-A	C9-C19	ND	0.0
DIESEL FUEL	C10-C23	ND	0.0
LUBRICATING OIL	C19-C29	ND	0.0
UNKNOWN PATTERN	C15-C30	*	100

* indicates that the concentration was less than 20 ppm.

Analyst: Robert A. Morris
Analyst, Organic Chemistry

Reviewed By: Richard F. Meyerhein 11/12/92
Supervisor, Organic Chemistry Section

Appendix 4.1.19
D-123 Site Photograph

View North

Appendix 4.1.20
ERDA-9 Site Photograph

Appendix 4.1.21
IMC-374 Site Photograph

View West

Appendix 4.1.22
IMC-376 Site Photograph

View North

Appendix 4.1.23
IMC-456 Site Photograph

View S20W

Appendix 4.1.24
IMC-457 Site Photograph

View S20W

Appendix 4.1.25
WIPP-13 Site Photograph

View N70E

Appendix 4.1.26
WIPP-18 Site Photograph

View North

Appendix 4.1.27
WIPP-19 Site Photograph

View North

View South

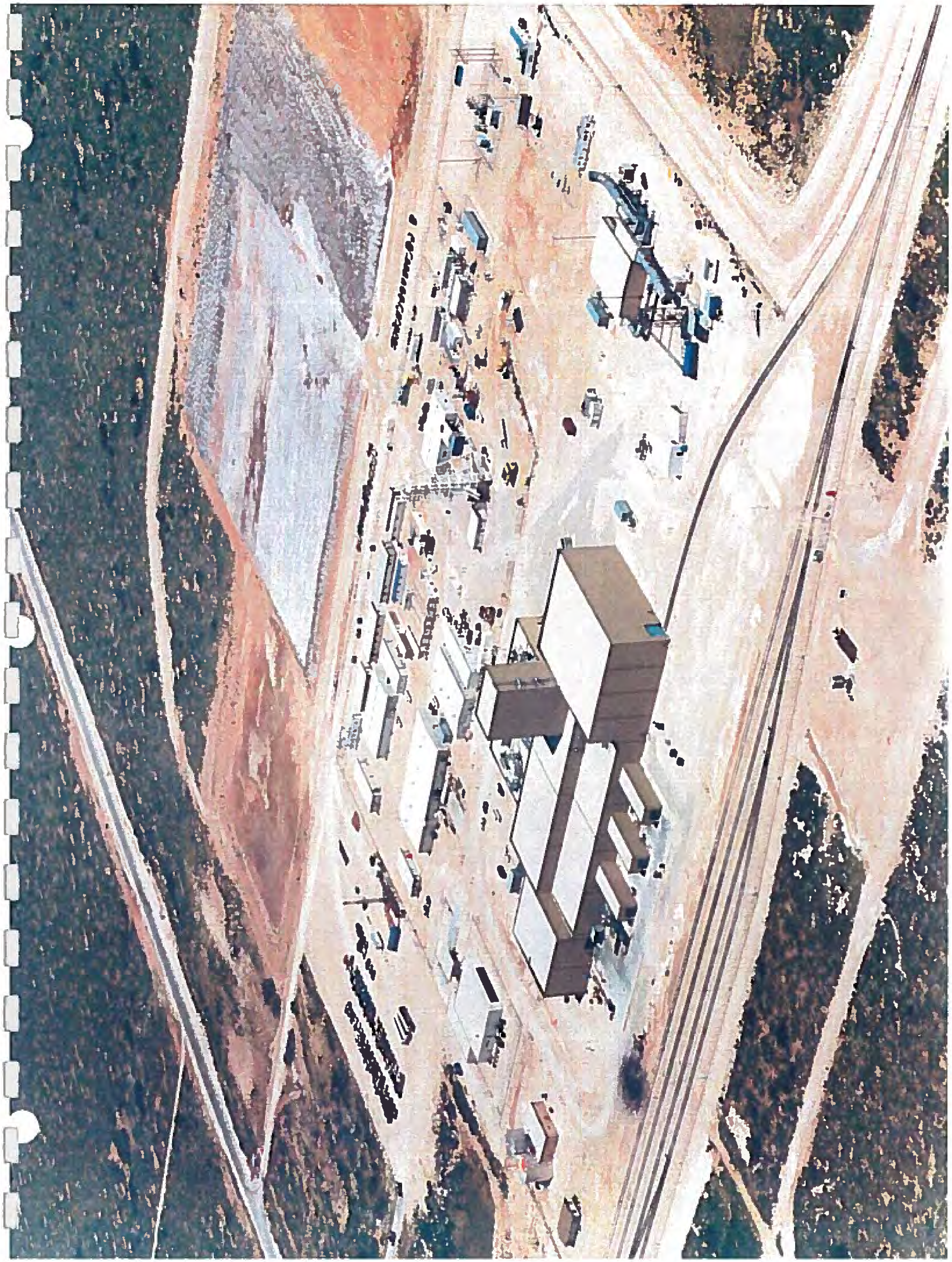
Appendix 4.1.28
WIPP-21 Site Photograph

View East

Appendix 4.1.29
WIPP-22 Site Photograph

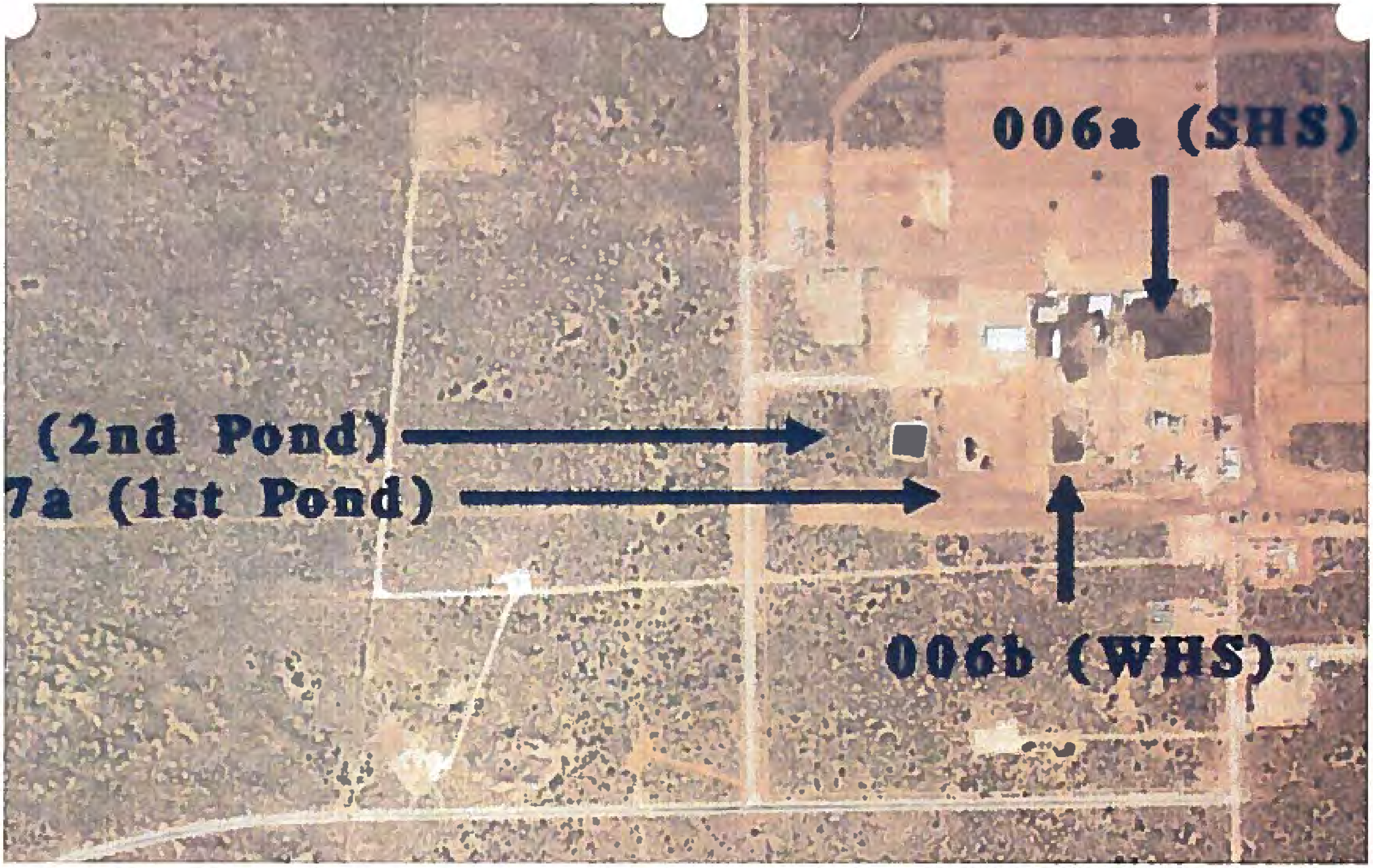
View North

View East

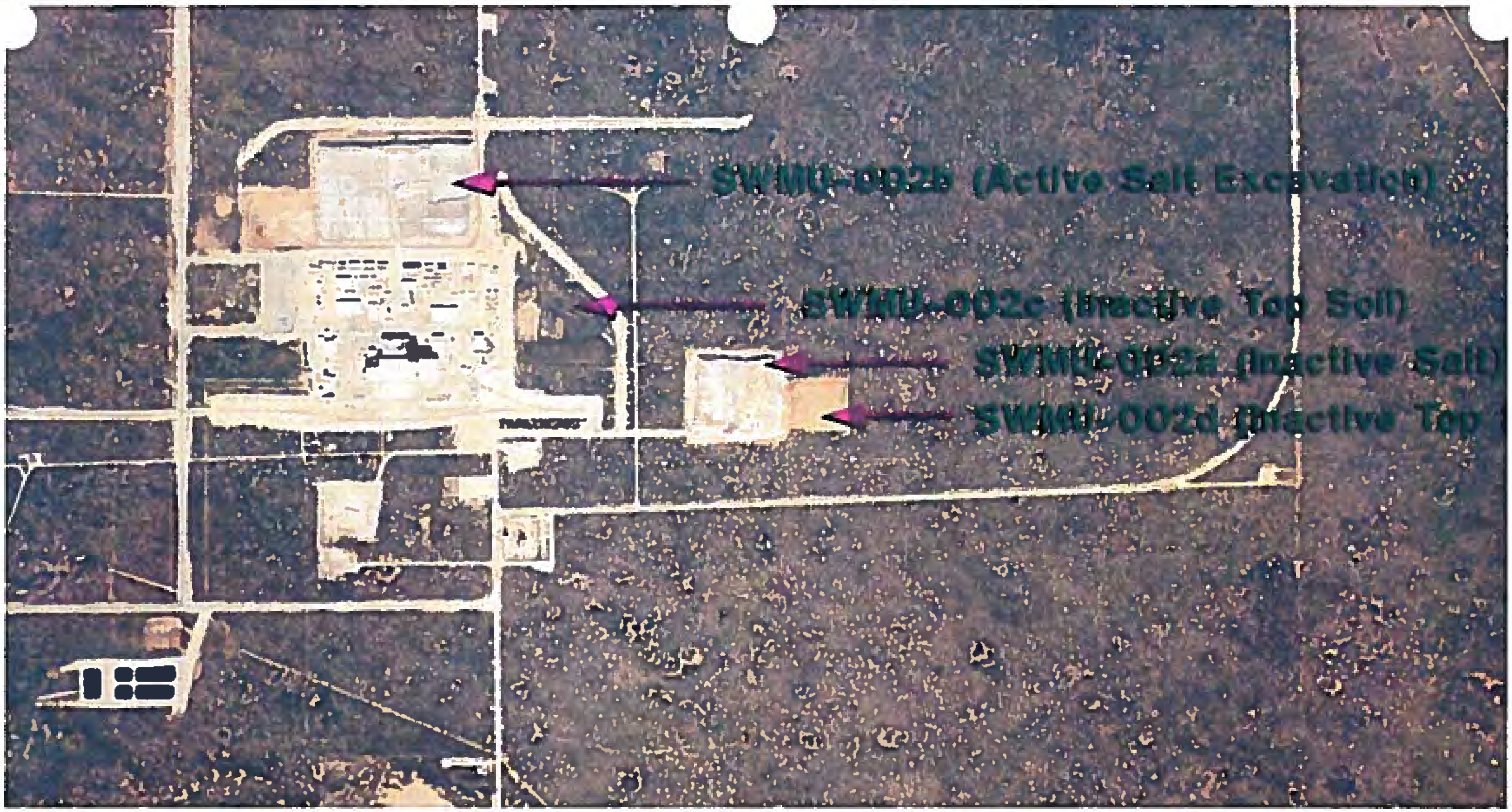


Appendix 4.2

Salt and Top Soil
Storage Piles



006a (SHS)
(2nd Pond)
7a (1st Pond)
006b (WHS)


SWMU-002b (Active Salt Excavation)
SWMU-002c (Inactive Top Soil)
SWMU-002a (Inactive Salt)
SWMU-002d (Inactive Top

Appendix 4.2.1
SWMU-002a: SPVD Salt Storage Pile

Appendix 4.2.1 (Continued)
SWMU-002a: SPVD Salt Storage Pile

Appendix 4.2.2
SWMU-002b: Salt Storage Pile (North)

Appendix 4.2.2 (Continued)

Appendix 4.2.3
SWMU 002c: Top Soil Storage Area

Appendix 4.2.4
SWMU 002d: Top Soil Storage "SPVD" Area

Appendix 4.3

Landfills

Appendix 4.3.1
SWMU 003a: Brinderson Landfill

Appendix 4.3.2
SWMU 003b: New Landfill (Inactive Unit)

Appendix 4.3.2
SWMU 003b: Inactive Unit (Continued)

Appendix 4.3.2
SWMU 003b: New Landfill (Active Unit)

Appendix 4.3.2
SWMU 003b: Active Unit (Continued)

Appendix 4.4

Storage Yards

Appendix 4.4.1

SWMU No. 004-a, Storage Yard, Portacamp

Westinghouse - West side

Appendix 4.4.1

SWMU No. 004-a, Storage Yard, Portacamp

Westinghouse - West side

Appendix 4.4.1

SWMU No. 004-a, Storage Yard, Portacamp

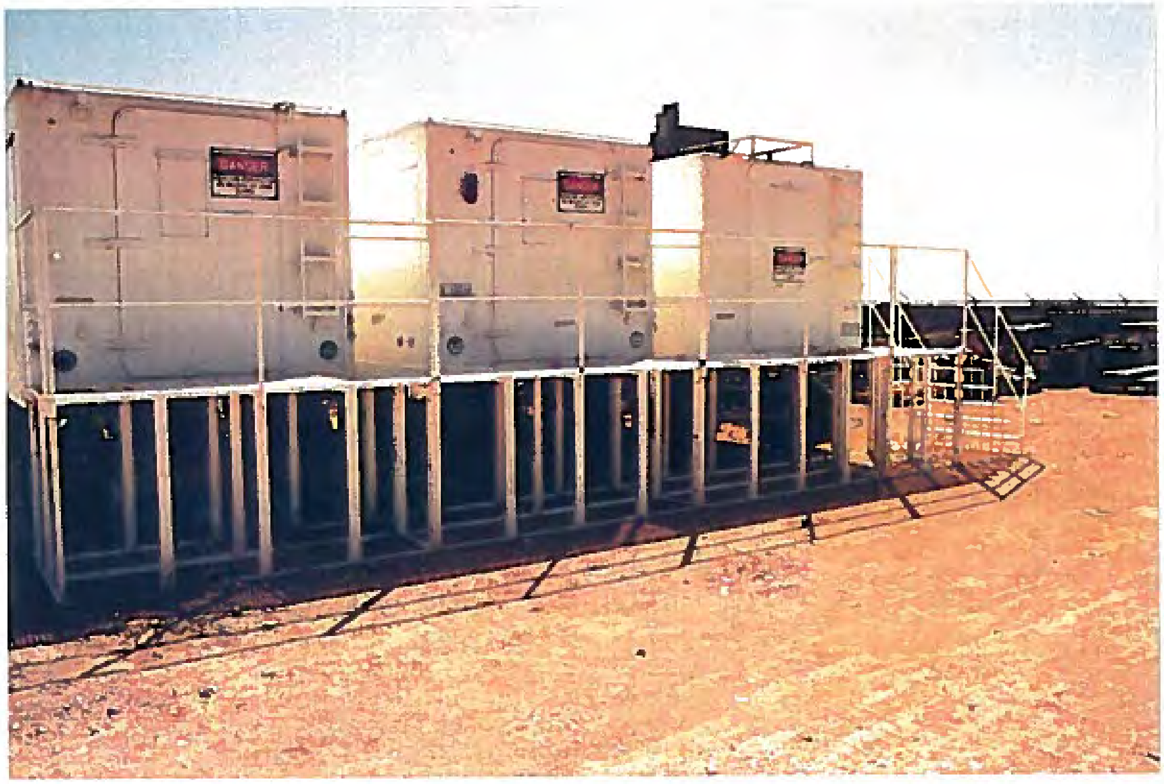
Sandia National Laboratory - East side

Stored Acids

Appendix 4.4.1

SWMU No. 004-a, Storage Yard, Portacamp

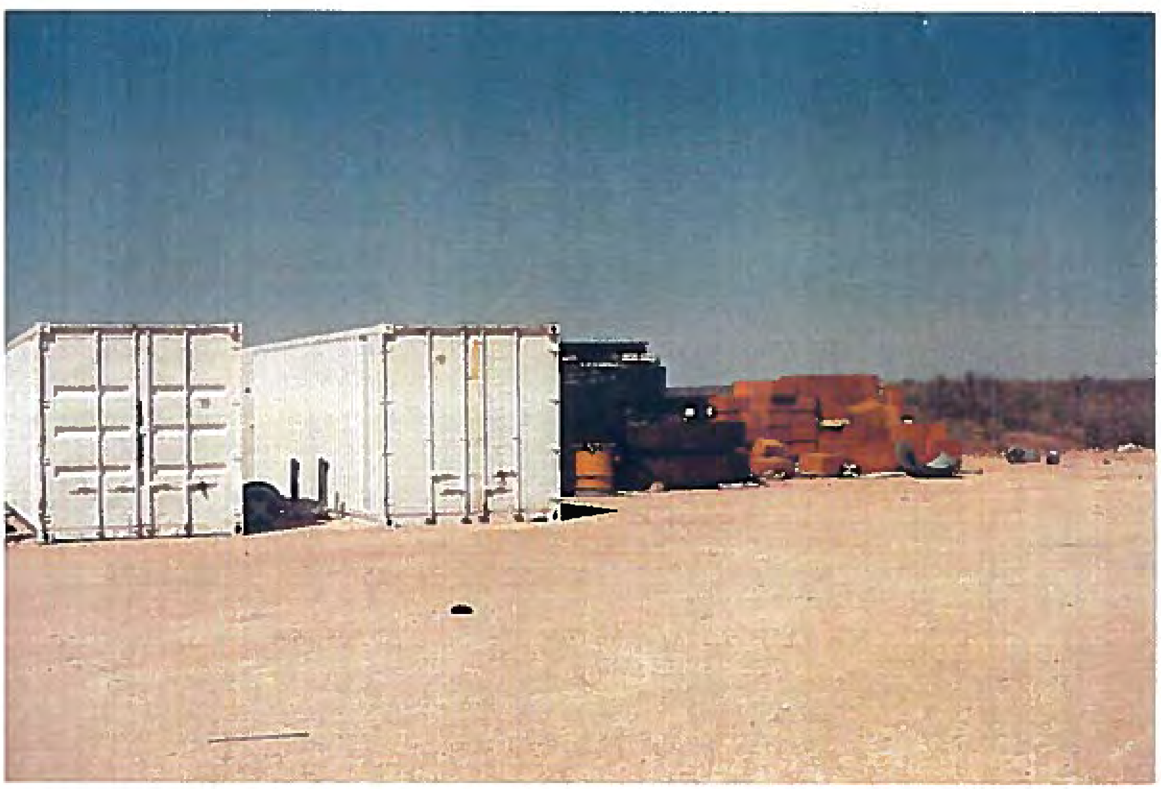
Sandia National Laboratory - East side



SWMU No. 004-b, Storage Yard, Reclaimables

Appendix 4.4.2

SWMU No. 004-b, Storage Yard, Reclaimables



Appendix 4.4.3

SWMU No. 004-c, Storage Yard, Zone One

Appendix 4.4.3

SWMU No. 004-c, Storage Yard, Zone One

Appendix 4.4.3

SWMU No. 004-c, Storage Yard, Zone One, Grout Storage

Appendix 4.5

Concrete Batch Plants

Appendix 4.5.2

SWMU No. 005-b, Concrete Batch Plant. Inactive and Reclaimed. West of Main Salt Storage Pile Evaporation Pond 007-c.

Appendix 4.5.3

SWMU No. 005-c, Concrete Batch Plant. Inactive.
South of Zone One next to well H-1 (SWMU 001-a).
Site used to store aggregate.

Appendix 4.5.3

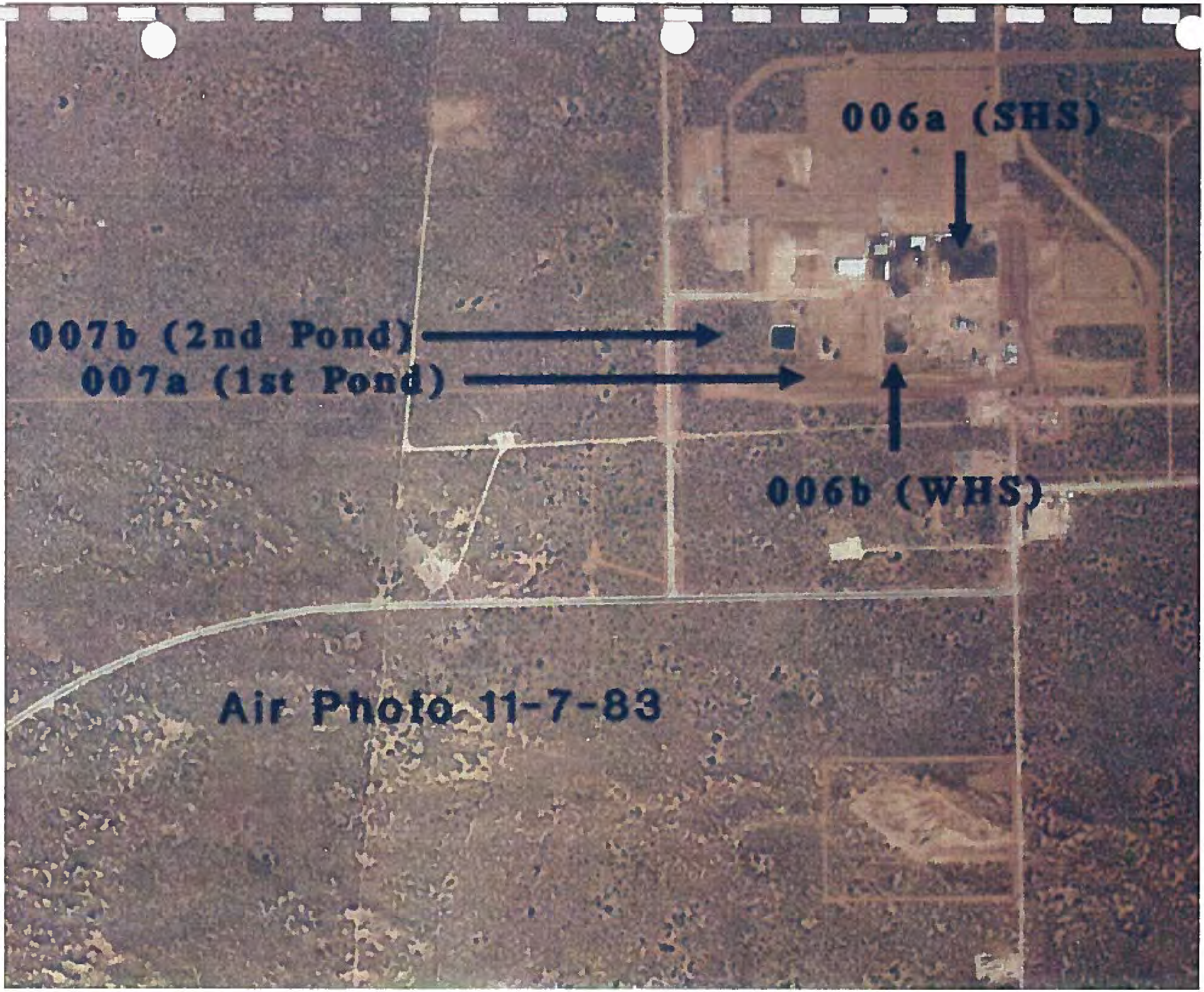
SWMU No. 005-c, Concrete Batch Plant. Inactive.
South of Zone One next to well H-1 (SWMU 001-a).
Site used to store aggregate.

Appendix 4.5.3

**SWMU No. 005-c, Concrete Batch Plant. Inactive.
South of Zone One next to well H-1 (SWMU 001-a).
Site used to store aggregate.**

Appendix 4.6

Salt and Waste Shaft Holding Ponds


006a (SHS)
007b (2nd Pond)
007a (1st Pond)
006b (WHS)
Air Photo 11-7-83

Appendix 4.7

Evaporation Ponds

Appendix 4.7.2

SWMU No. 007-b, Evaporation Pond

Appendix 4.7.3

SWMU No. 007-c, Evaporation Pond

Appendix 4.8

Satellite Accumulation Areas
Surface

Appendix 4.8.1

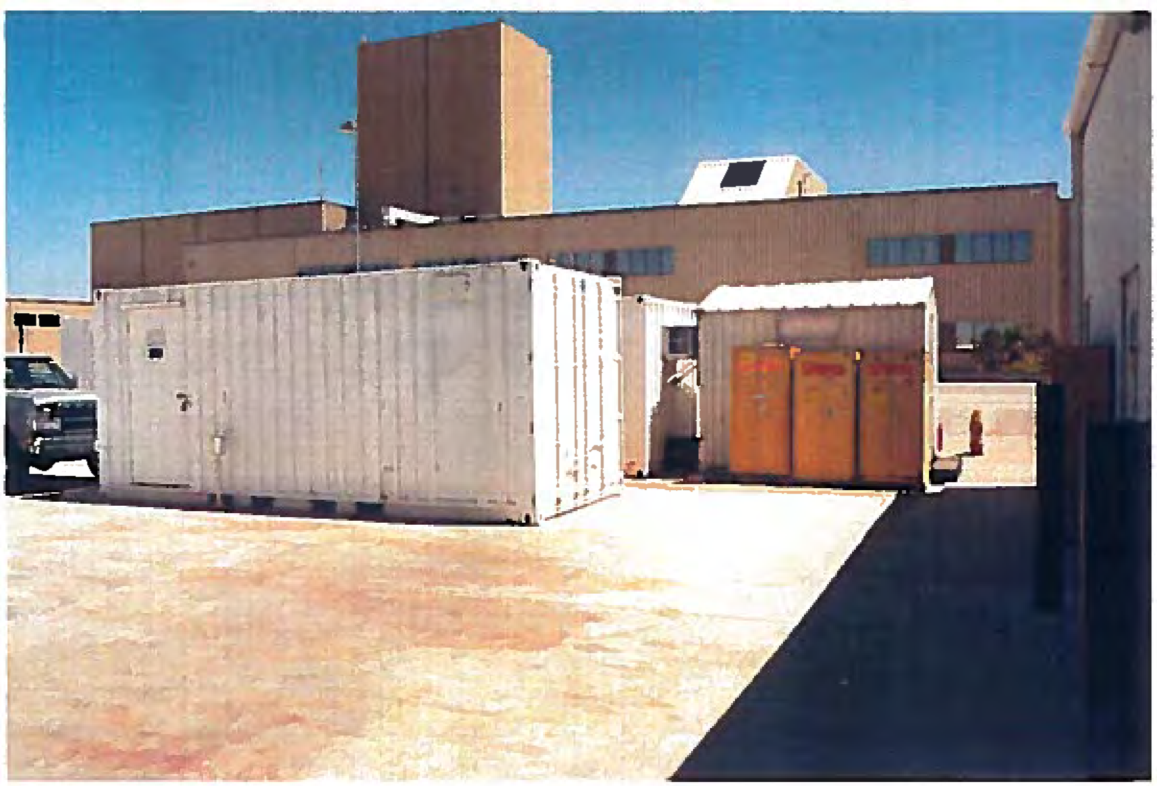
SWMU No. 008-a, Satellite Accumulation Area (SAA) Maintenance Warehouse Blg.#455

Appendix 4.8.2

SWMU No. 008-b, SAA Blg.#454

Appendix 4.8.2

SWMU No. 008-b, Inactive SAA, on Eastside of Blg.#454



Appendix 4.8.3

SWMU No. 008-c, SAA #5, Blg.#993 Sandia Cal.Lab

Appendix 4.8.5

SWMU No. 008-e, SAA #2, Security Armory Blg.#473

Appendix 4.8.7

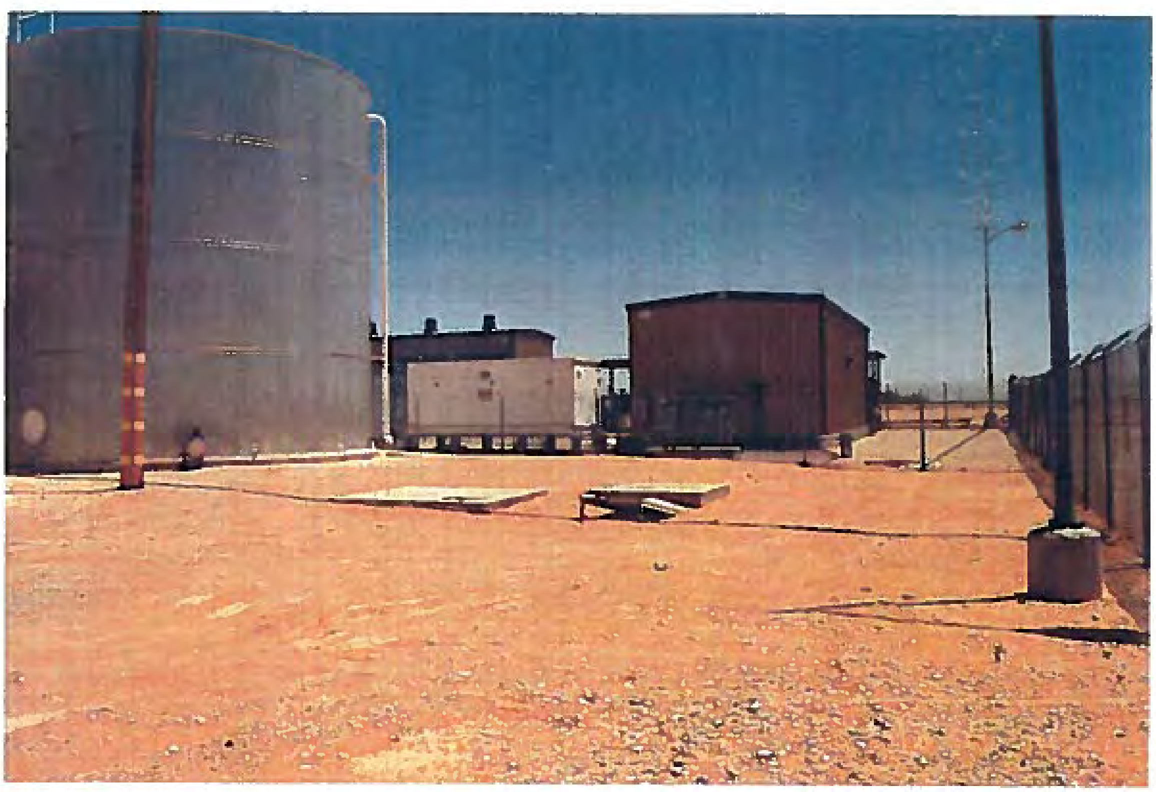
SWMU No. 008-g, SAA #6, Emergency Services Blg. Vehicle wash bay

Appendix 4.8.8

SWMU No. 008-h, SAA #15, Hazardous Materials/Waste Staging Area

Appendix 4.8.8

SWMU No. 008-h, Inactive Hazardous Materials/Waste Staging Area



Appendix 4.8.9

SWMU No. 008-i, SAA #3, AIS Hoist House

Appendix 4.8.10

SWMU No. 008-j, SAA #12, Electric Shop West Side, Blg.#482

Appendix 4.8.11

SWMU No. 008-k, Inactive SAA, North outside of Blg. #454
Waste oil and Waste antifreeze accumulation area and product dispensary

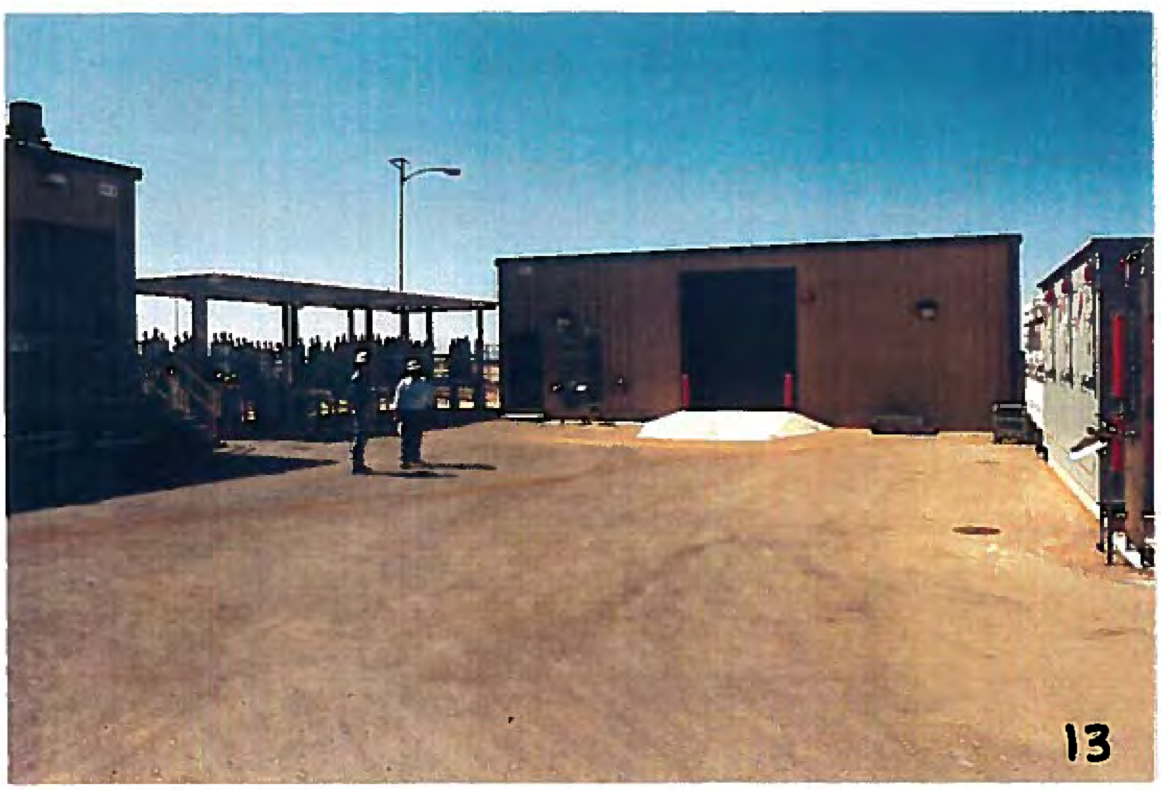
Appendix 4.8.12

SWMU No. 008-1, Hazardous Waste Staging Area, Blg. #474

Appendix 4.8.12

SWMU No. 008-1, Hazardous Waste Staging Area, Blg. #474-B

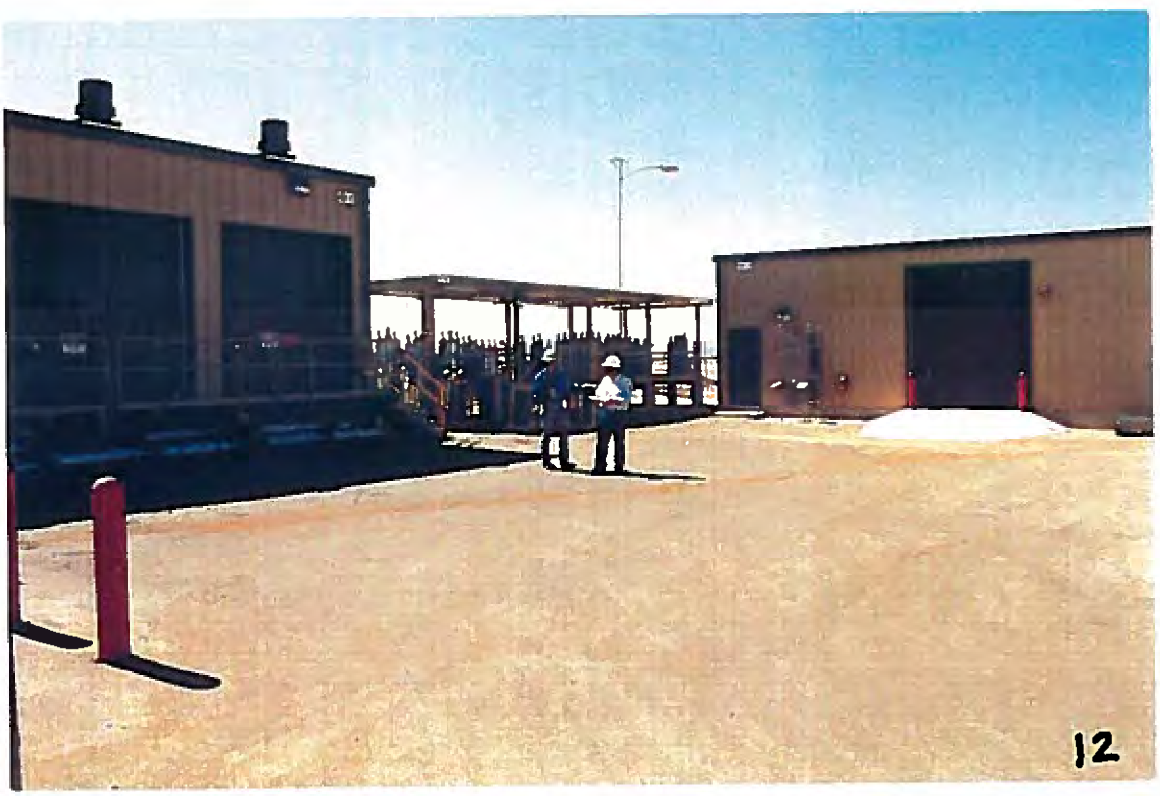
Building B (white), Building A future use (gray), Water storage Tanks on right



Appendix 4.8.12

Blg. #474-C, Lubricant Storage

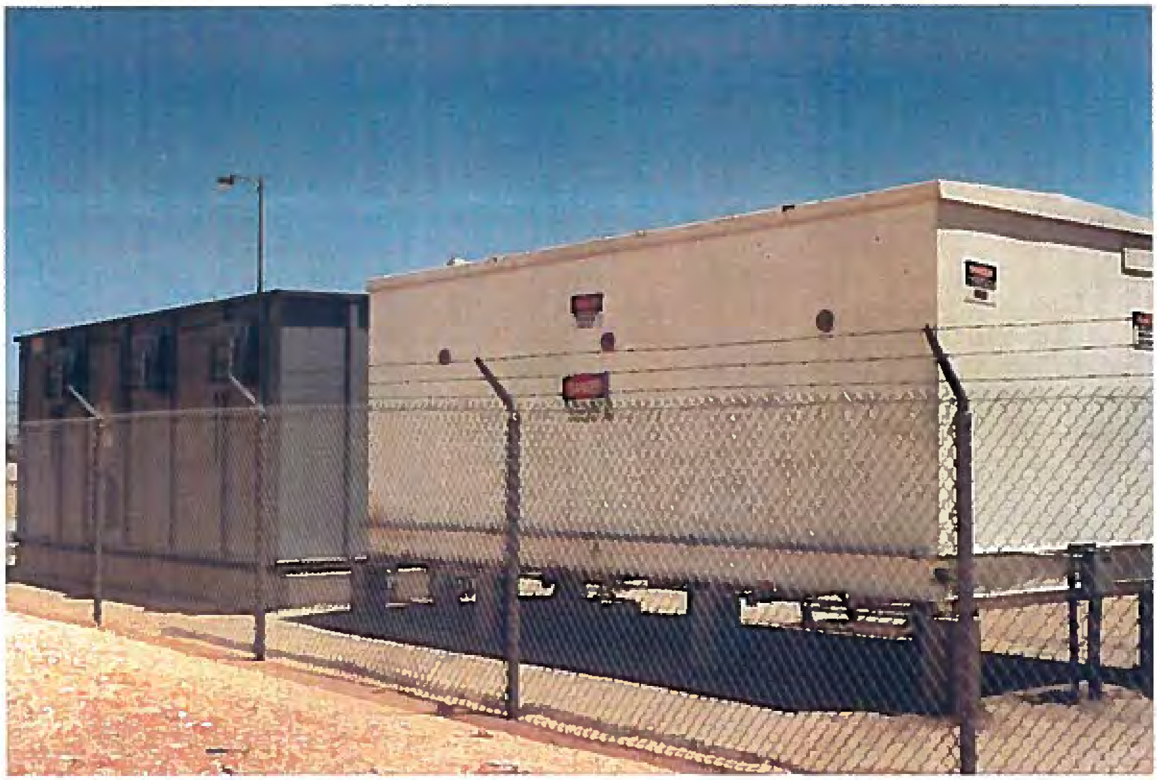
Building 474-D, Compressed Gas Cylinder Storage



Appendix 4.8.1 3
SWMU-008m: Blg. #454 Fluorescent Tube Crusher

Appendix 4.8.14

SWMU No. 008-n, Hazardous Waste Staging Area, Blg. #474-A (FUTURE)



Building B (white building) is currently used as the staging area and building A (gray) is for future use.

Appendix 4.8.15

SWMU No. 008-o, Satellite Accumulation and Hazardous Materials Storage Area Bldg. 474-E

Middle Bay - Hazardous Materials Storage

East Bay - SAA #15

Appendix 4.8.15

SWMU No. 008-o, SAA and Hazardous Materials Storage Area
Bldg. 474-E

West Bay - Hazardous Materials Storage

Appendix 4.9

Satellite Accumulation Areas Underground

Appendix 4.9.1

SWMU No. 009-a, UG, Maintenance Shop

Appendix 4.9.2

SWMU No. 009-b, UG, Experimental Programs Shop

Appendix 4.9.3

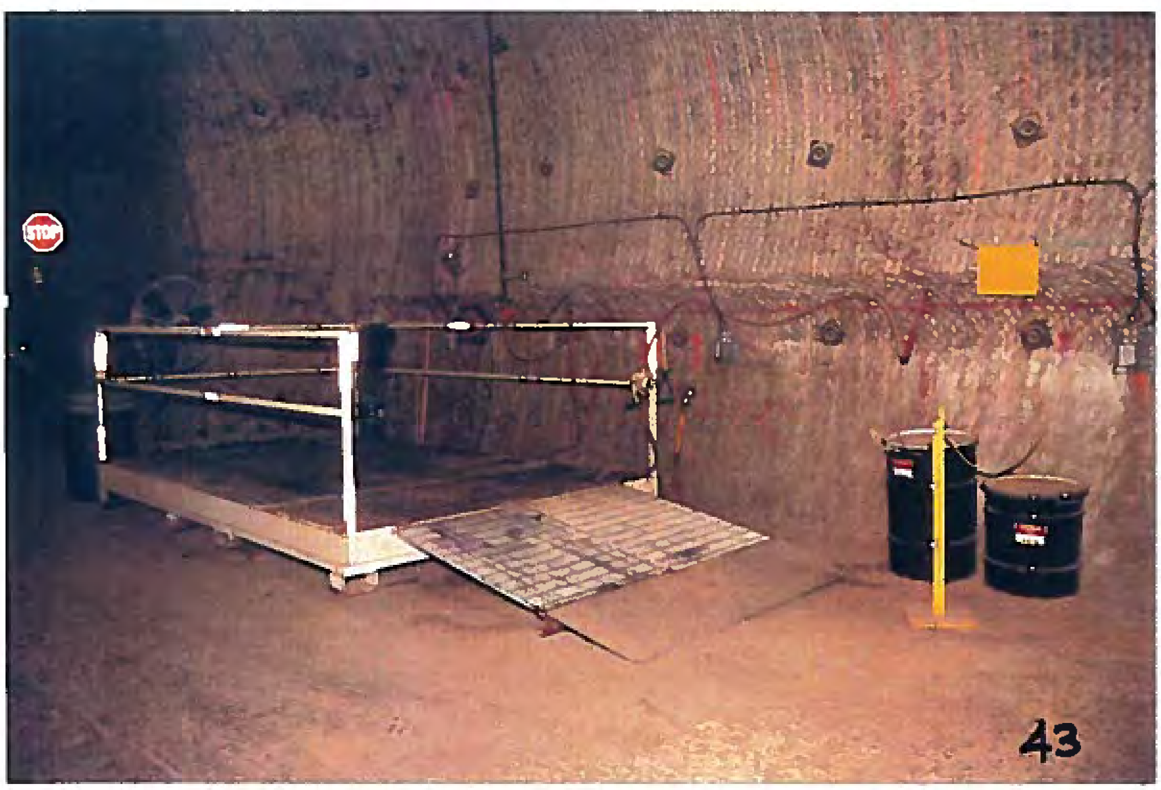
SWMU No. 009-c, UG, S1300/W170 Intersection

Appendix 4.9.4

SWMU No. 009-d, UG, West end of S1300

Appendix 4.9.5

SWMU No. 009-e, UG, E140/S700, Cart Maintenance



Appendix 4.9.6

SWMU No. 009-f, UG, S1600/W30 Vehicle Wash Rack

Appendix 4.9.7

SWMU No. 009-g, UG, S1300/E140

Appendix 4.9.8

SWMU No. 009-h, UG, N780 Welding Shop

Appendix 4.9.9

SWMU No. 009-i, UG, SPVD Room 1

Appendix 4.9.10

SWMU No. 009-j, UG, West end of N1420

Appendix 4.10

Shaft Sump

Appendix 4.10.1

SWMU No. 010-a, UG, Salt Handling Shaft Sump

Appendix 4.10.2

SWMU No. 010-b, UG, Waste Handling Shaft Sump

Appendix 4.10.2

SWMU No. 010-b, UG, Waste Handling Shaft Sump

Appendix 4.10.2

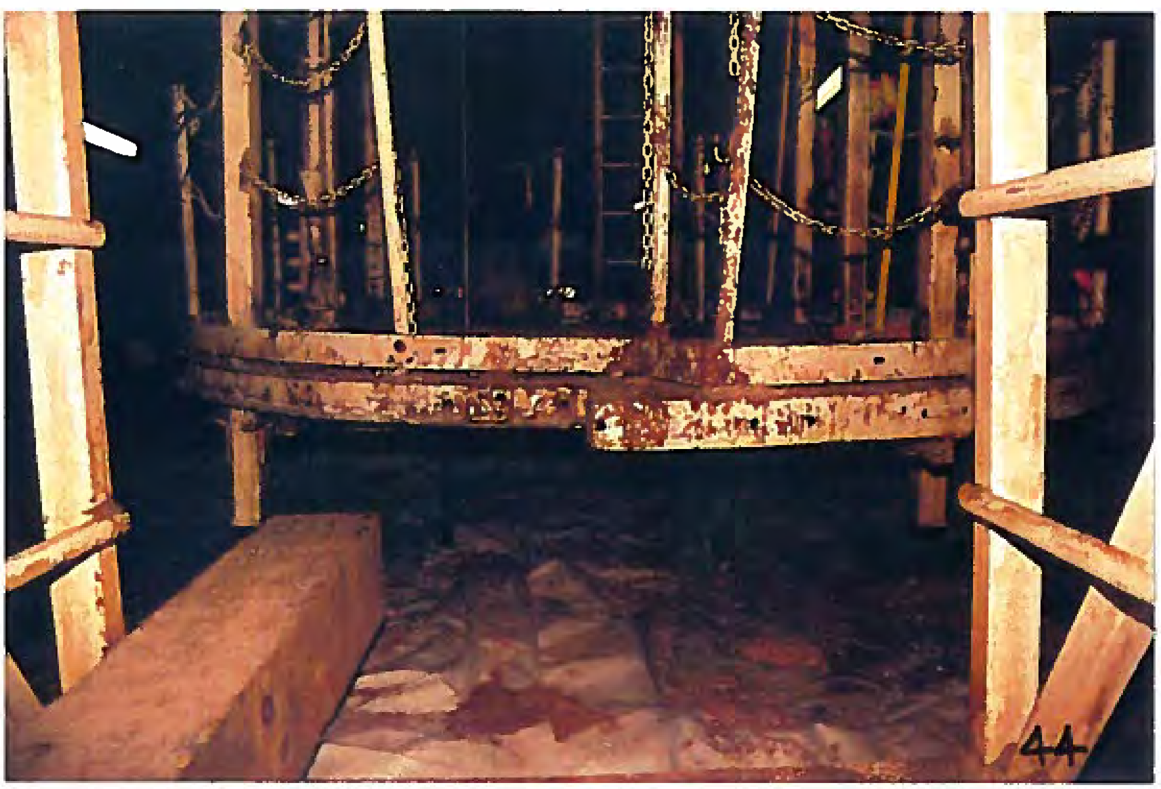
SWMU No. 010-b, UG, Waste Handling Shaft Sump

Appendix 4.10.3

SWMU No. 010-c, UG, Exhaust Shaft Sump

Appendix 4.10.4

SWMU No. 010-d, UG, Air Intake Shaft Sump

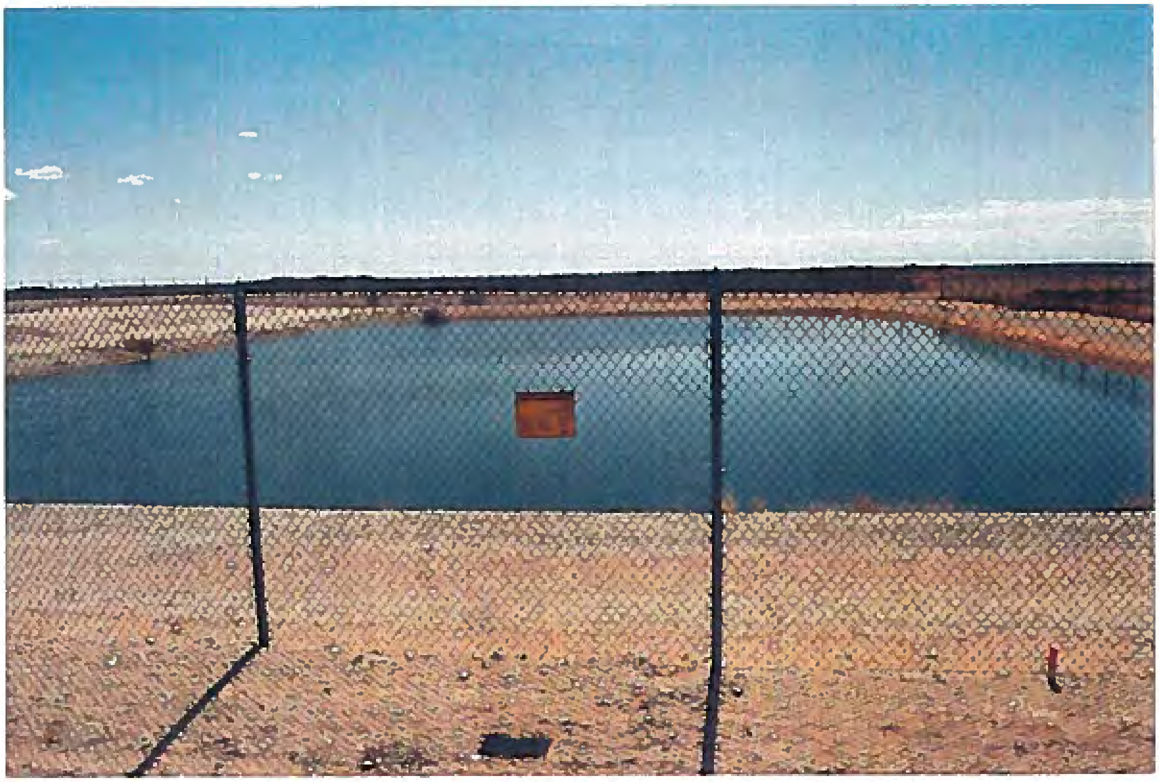


Appendix 4.11

Sewage Lagoon

Appendix 4.11.1

SWMU No. 011, Sewage Treatment Facility



Unlined final evaporation cell

Parallel Primary Treatment Lagoons

Appendix 4.11.1

SWMU No. 011, Sewage Treatment Facility

March 1993 Construction of Lined Parallel Evaporation Cells to replace the existing Evaporation Cell

Appendix 4.12

Solid Waste Collection Bins

Appendix 4.12.2

SWMU No. 012-b, Nonhazardous Solid Waste Bins (Underground)