1R - 146

REPORTS

DATE:

11/92- COST

Brown McCarroll and Oaks Hartline

Austin, Texas

ENSR

RECEIVED

NOV 1 3 1992

OIL CONSERVATION DIV.
SANTA FE

Engineering Evaluation/Cost Analysis Report for Former Exxon Chemical Company Facility West Marland Boulevard Hobbs, New Mexico

ENSR Consulting and Engineering

November 1992

Document Number 1009-001-160

Brown McCarroll and Oaks Hartline
Austin, Texas

Engineering Evaluation/Cost Analysis Report for Former Exxon Chemical Company Facility West Marland Boulevard Hobbs, New Mexico

ENSR Consulting and Engineering

November 1992

Document Number 1009-001-160

CONTENTS

CONTENTS
(Cont'd)

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

The purpose of this report is to compare removal action alternatives for hydrocarbon-contaminated soils at the former Exxon Chemical Company facility at 2607/2609 West Marland in Hobbs, New Mexico.

The following removal alternatives were considered:

1. Excavation of contaminated soils and disposal at a nearby landfill.
2. Excavation, on-site treatment of soils by thermal desorption, and placement of remediated soils as fill material on site.
3. Excavation, on-site treatment of soils using biodegradation of contaminants, and subsequent placement of soils as fill material on site.
4. Concrete capping of the contaminated area.
5. Vapor extraction of contaminated soils.
6. Chemical fixation of contaminants in soils.
7. Excavation, soil washing to extract contaminants from the soil, and placement of remediated soils as fill material on site.
8. Vitrification (fired in a furnace or kiln).
9. No action.

Option number 1 has been selected as the best alternative based on reduction of long term risk to groundwater and surface water, timeliness, feasibility, implementability, compliance with regulations, and cost.

1.0 INTRODUCTION

1.1 General

This report presents an Engineering Evaluation/Cost Analysis (EE/CA) of removal action alternatives for the hydrocarbon-contaminated soil located on the property formerly leased by Exxon Chemical Company and located at 2607/2609 West Marland in Hobbs, New Mexico. ENSR Consulting and Engineering (ENSR) prepared this EE/CA pursuant to 40 CFR 300.415(b)(4)(i).

1.2 Basis of EE/CA

ENSR has conducted a removal action investigation and prepared this Engineering Evaluation/Cost Analysis to:

- Evaluate commonly utilized methods of cleaning up hydrocarbons in soil;
- Provide a detailed review of viable removal action options; and
- Select a removal action plan for the Hobbs, New Mexico site based on:
  - long-term reliability of the applied technology;
  - logistical limitations of conducting removal action on site;
  - ability to implement the selected removal action on a timely schedule;
  - operational and post-removal monitoring and maintenance requirements;
  - protection of the worker and the environment; and
  - costs of removal action.

The goals of this evaluation process are to select the best available technology encompassing acceptable engineering principals and to propose a removal action plan which has both immediate and long-term effectiveness for the subject site.

2.0 SITE CHARACTERIZATION

2.1 Site Description

The site is approximately 2.15 acres in size and consists of two buildings and a caliche covered yard. The site location is shown on Figure 2-1. The site plot plan is shown on Figure 2-2. The two buildings are an office building and a warehouse assembly building. The main building consists of two office suites, 2607 West Marland and 2609 West Marland, and is located in the northern portion of the property. The main building is surrounded on the north and east by an asphalt parking area.

The warehouse assembly building (Bldg. No. 1 on Site Plot Plan) is located along the west side of the property. This building is currently in use by Electro Support Systems, Inc.

2.2 Site Background

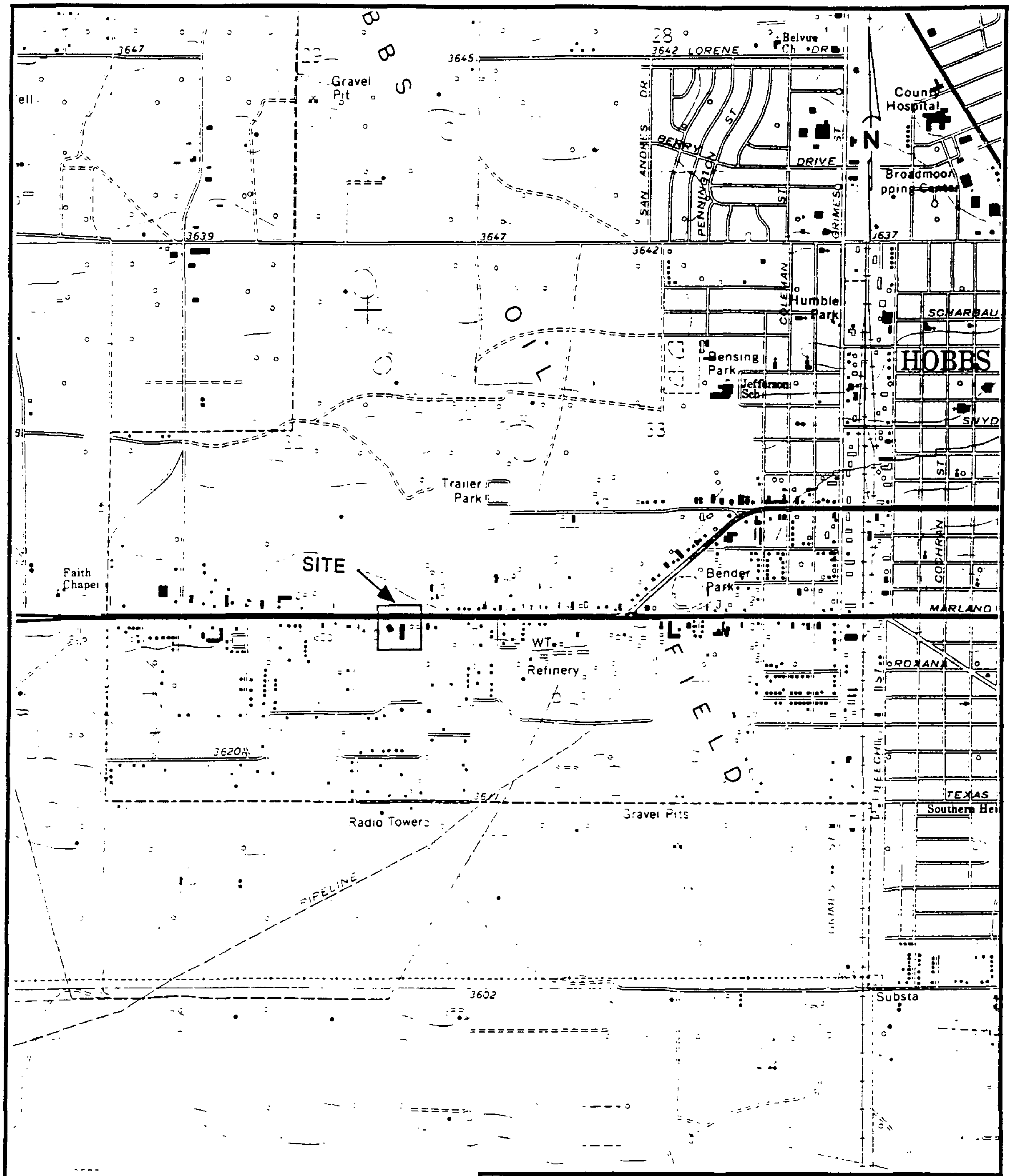
The site is reportedly currently owned and operated by Electro-Support Systems, Inc. (ESS). ESS reportedly purchased the property in early 1991, from Sweatt Construction (Sweatt).

Sweatt used the property for offices, truck maintenance (including oil changes), and construction equipment storage. Sweatt maintained an aboveground diesel tank located south of the main building (see Figure 2-2). Reportedly, a dark stain remained on the soil after Sweatt removed the tank in 1988. Sweatt removed 8 to 12 inches of top soil prior to completion of the sale to ESS.

NL Treating (NL) leased the office suite at 2609 West Marland intermittently from approximately 1980 until 1988. Exxon assumed this lease when it acquired NL in 1987. Sweatt used the majority of the property during this period. Exxon leased the entire property (buildings and yard) from Sweatt from March 1988 to 1989.

No underground storage tanks (USTs) are known to have been located on the property. No PCB-containing equipment is known to have been located on the property.

Exxon maintained seven 750-gallon above-ground storage tanks (ASTs) at the subject property from March 1988 to August 1989. All ASTs were placed in fiberglass secondary containment basins from the time they were originally set up at this property. The seven ASTs were removed



0 2000 4000

SCALE IN FEET

REFERENCE: U.S.G.S. Quadrangle Map for Hobbs West, New Mexico 1979

TOPO

ENSR™

ENSR CONSULTING AND ENGINEERING

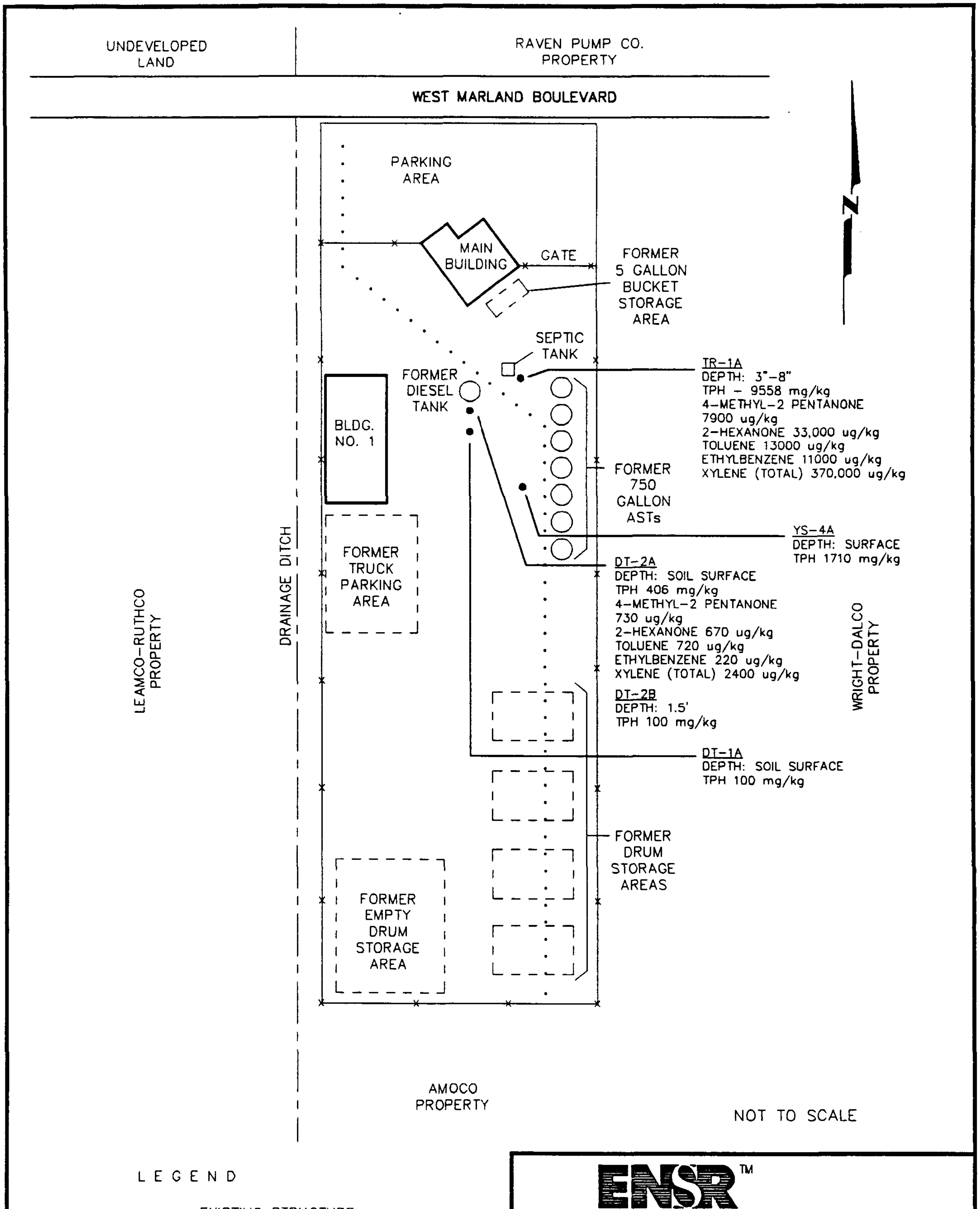
FIGURE 2-1

SITE LOCATION MAP

FORMER CHEMICAL DISTRIBUTION COMPANY

HOBBS, NEW MEXICO

DRAWN BY: S. GHANI	DATE: 10-16-92	PROJECT NUMBER: 1009-001-150
CHK'D.BY:	REVISED:	



ENSR™
ENSR CONSULTING & ENGINEERING

FIGURE 2-2
SITE PLOT PLAN
FORMER CHEMICAL DISTRIBUTION COMPANY
HOBBS, NEW MEXICO

DRAWN: LG/SF/SH	DATE: 11-12-92	PROJECT NUMBER:
APPV'D:	REVISED:	1009-001-150

CE100951

in 1990. Typically, 250 drums of product were stored on the subject property during the same period.

Wastes generated by NL at this property were office waste and residual chemicals from oil field customers. Solid waste was picked up by Waste Management of New Mexico for disposal at the City of Hobbs, Lea County Landfill. Residual chemicals were consolidated and shipped periodically (approximately one 55-gallon drum per month) to an NL facility in Odessa, Texas. Reportedly, most of the residual chemicals (quantities of product not used) were left with oil-field clients, instead of bringing it back for consolidation and reuse.

Empty drums (typically 50 to 60) and drums of waste chemicals were stored in the southwest corner of the yard. Drums of product (approximately 250) were stored in rows on pallets along the southeast side of the yard. Five-gallon buckets of product were stored on a few pallets on the south side of the Main Building. The ASTs were located along the middle to north end of the east side of the yard. Trucks were parked along the middle of the west side of the yard, south of the warehouse assembly building.

Truck maintenance activities were reportedly not performed by NL at this site. Trucks were taken to local garages for service and to commercial car/truck washing facilities for cleaning.

NL and Exxon used a small room as a laboratory where emulsion tests were conducted between 1980 to 1987 and 1987 to 1989, respectively. Small volumes of oil were mixed with emulsion breakers. The vials of mixtures were hand-shaken and observed. The facility did not operate as a full-scale laboratory and did not require special staffing. Reportedly, some vials in boxes were shipped to NL, Odessa, Texas, for disposal. The disposition of the wastes generated from these tests is unknown at this time.

2.3 Analytical Data

A sampling program was conducted at the site to delineate the nature and extent of the site's soils contamination and to determine if the contamination was a potential threat to the groundwater.

The soil samples were collected from areas suspected to be impacted from past facility operations and from grid points within a 100' grid system established within the facility yard. The samples were collected from the surface of the soil beneath the caliche pad that covers the yard area to a depth of 6 feet adjacent to the former septic tank. The depth of sampling varied with the depth of physical evidence of contamination or the depth of a source of potential contamination (i.e., septic tank). If no physical evidence of soil contamination was present at a given area a sample was collected at the soil surface only. If physical evidence of soil contamination was present samples were collected from within the contaminated zone and from the visually clean soil below to confirm the depth of contamination.

The samples were primarily analyzed for Total Petroleum Hydrocarbons (TPH), Total RCRA Metals, and pH. The samples were additionally analyzed for Target Compound List (TCL) volatile organics (EPA Method 8240) and TCL semi-volatile organics (EPA Method 8270) in areas displaying physical evidence of contamination and/or from areas otherwise suspected of being contaminated.

Physical and analytical evidence indicates hydrocarbon contamination existing in the following three areas:

- Former location of aboveground diesel tank - the former tank location is approximately 90 feet south of the south corner of the main building. A 6-inch to 8-inch thick layer of hydrocarbon saturated soil was observed just beneath the caliche pad. Analysis of samples DT-1A, DT-2A, and DT-2B indicated TPH and volatile organic contamination to be present. The depth at contamination is approximately 1 ½ feet.

- Septic tank area - This area is approximately 70 feet southeast of the south corner of the main building. While excavating in search of the septic tank, a 3 to 6 inch layer of stained soil was discovered just beneath the caliche ground cover. The soil appeared to be saturated with hydrocarbon substances. This material was very similar to the material noted in the former location of the diesel tank which was approximately 35 feet southwest. This contaminated area was observed to be localized and did not appear to be associated with the septic tank. Sample TR-1A was collected from this area. Analysis revealed TPH, volatile and semi-volatile organic soil contamination.

- Location of yard grid sample YS-4A - This soil sample was collected in the general vicinity of the seven aboveground storage tanks (now removed) that were located along the east property line fence. This sample did not exhibit visual evidence of contamination but did have a petroleum odor. Analysis revealed TPH contamination.

2.4 Site Conditions That Justify a Removal Action

The following conditions at the subject site warrant the proposed removal action (40 CFR 300.415(b)(2)):

- Potential exposure to nearby human populations, animals, or the food chain from pollutants or contaminants.
- Potential contamination of drinking water supplies. (Water supply wells are known to exist on site and in the immediate vicinity.)
- Weather conditions that may cause pollutants or contaminants to migrate or be released. (Stormwater infiltration may cause migration of contaminants.)

The following health effect information is provided for the contaminants of concern at the subject site.

Petroleum Hydrocarbons (TPH) - Volatile components are not likely to be encountered at levels that make vapor inhalation a concern. However, inhalation of contaminated soil dust and contact with contaminated soil may be a concern.

In addition, the following specific volatile and semi-volatile hydrocarbon compounds have been identified at the site:

4-methyl-2-Pentanone over exposure may cause irritated eyes and mucous membranes, headaches, narcosis, and coma. The compound also represents a dermal hazard through skin contact. The target organs are respiratory system, eyes, skin, and central nervous system. The compound is a colorless liquid with a pleasant odor.

2-Hexanone over exposure may cause irritated eyes and nose, peripheral neuropathy, weakness, paresthesia, dermatitis, headaches, and drowsiness. Target organs are central nervous system, skin, and respiratory system. Compound is a colorless liquid with characteristic odor.

Toluene and xylene overexposure has resulted in depression of the central nervous system, damage to the liver and kidneys, eye irritation, respiratory tract irritation, headache and dizziness. They are colorless liquids in their virgin states and have an aromatic odor.

Ethyl benzene overexposure may cause central nervous system depression, eye and respiratory tract irritation, dizziness, and headache. Ethyl benzene also represents a dermal hazard as it permeates unprotected skin.

3.0 IDENTIFICATION OF REMOVAL ACTION OBJECTIVES

3.1 Statutory Limits on Removal Actions

This removal action is wholly funded by a Potentially Responsible Party (PRP). Therefore, no statutory limitations apply.

3.2 Removal Action Scope

Upon discovery of soil contamination at the site, Exxon contacted the State of New Mexico Oil Conservation Division (OCD). On July 31, 1992 detailed site information and analytical data were presented in a meeting with Mr. Roger C. Anderson and other representatives of the OCD. Based upon the information and data submitted, the OCD stated that a removal action was appropriate for contaminated soil that contains contaminants in excess of state cleanup levels or above EPA Regulatory limits. The OCD requested that a workplan be prepared describing the removal action after the Removal Action Alternative has been chosen.

The scope of this project is to address the site conditions that justify a removal action. To that end, the goal of the project is to clean up the site to the contaminant levels set by the New Mexico Oil Conservation Division.

The areas to be addressed at the site are:

- The former location of the aboveground diesel tank,
- The septic tank exploration trench, and
- The location of yard grid sample YS-4A.

The contaminated soils will be removed to a depth of approximately 1 ½ feet to 2 feet below the surface as indicated by previous sample analysis or until verification sampling indicates that all contaminated soil above the cleanup levels has been removed.

3.3 Removal Action Schedule

The threat of contamination appears limited to soil, and therefore is not viewed as requiring immediate removal. However, these soils may pose a threat to groundwater if left in place. The Removal Action Workplan which will be submitted to the OCD will be revised as necessary following the 30-day comment period required for this document. The field work involved in the removal action will take approximately one week to complete. Weather conditions may affect the work schedule. The removal action at the West Marland Street site is scheduled to take place in January 1993.

3.4 Applicable or Relevant and Appropriate Requirements (ARARs)

The Oil Conservation Division has oversight for the Hobbs, New Mexico site.

The following are the clean up levels set by the OCD:

TPH: Maximum TPH concentration set at 100 ppm using EPA analytical Method 8015.

BETX: Maximum Total BETX concentration set at 50 ppm with benzene not to exceed 10 ppm using EPA Method 8020.

These cleanup levels are considered chemical-specific and location specific ARAR's for the site. Based on the cleanup levels approximately 50 cubic yards of soil will require removal.

All applicable or relevant and appropriate federal and state requirements are also considered ARARs for this site. Such ARARs will be attained to the extent practicable considering the requirements of the situation.

4.0 IDENTIFICATION OF REMOVAL ACTION ALTERNATIVES

This section addresses the screening and assessment of removal action alternatives for the clean up of contaminated soils at the former Exxon Chemical Company facility on West Marland Street in Hobbs, New Mexico. The primary objective of this section of the EE/CA is to develop a range of removal action options that will be analyzed more fully in the detailed analysis section of this report. Appropriate removal action alternatives may include complete elimination or destruction of contaminants at the site; reduction of contamination concentrations to acceptable levels; or prevention of exposure to contaminants by engineering or institutional controls; or some combination of the above.

Nine removal action alternatives were assessed on the basis of technical feasibility, cost effectiveness, risk to the environment, timeliness and consistency with agency guidelines. Removal action alternatives for the hydrocarbon-contaminated soils include the following:

1. Excavation of contaminated soils and disposal at a nearby landfill.

2. Excavation, on-site treatment of contaminated soils by thermal desorption, and placement of remediated soils as fill material on site.

3. Excavation, on-site treatment of contaminated soils using biological degradation, and, if excavated, subsequent placement of decontaminated soils as fill material on site.

4. Concrete capping of the contaminated area.

5. Vapor extraction of contaminated soils.

6. Chemical fixation of contaminants in soils.

7. Excavation, soil washing to extract contaminants from the soil, and placement of treated soils as fill material on site.

8. Vitrification (fired in a furnace or kiln).

9. No action.

TABLE 4-1

Screening of Removal Alternatives
Former Exxon Chemical Company Facility
West Marland Facility
Hobbs, New Mexico

Alternative	Remedial Approach (P) Physical (C) Chemical (B) Biological	Need for Additional Studies (Y/N)	Meets or Exceeds Acceptable Clean-up Criteria (Y/N)	Will Contaminant Be Destroyed? (Y/N)	Subcontractor Required? (Y/N)	Evaluation Rating Category					Totals
						A	A	B	B	A	
						Time	Practicality	Long Term Liability Risk	Operating Complexity	Prospect for Achieving Project Goals	
1.Excavation, Landfill	P	N	Y	N	Y	4	4	4	4	3	19
2. Excavation, Thermal Desorption	P	Y	Y	Y	Y	2	3	5	3	3	16
3. Excavation, Biotreatment	B	Y	Y	Y	Y	1	1	5	2	3	12
4. Concrete Capping	P	N	N	N	Y	4	1	1	4	0	10
5. Vapor Extraction	P	Y	N	N	Y	1	0	2	2	2	7
6. Chemical Fixation	C	Y	Y	N	Y	2	2	2	2	2	10
7. Excavation, Soil Washing	C	Y	Y	N	Y	2	2	2	1	2	9
8. Vitrification	P	Y	Y	Y	Y	3	1	1	2	1	8
5. No Action	P	N	N	N	N	5	0	0	5	0	10

Category Rating:

A - 0-unacceptable; 1-poor; 2-fair; 3-average; 4-good; 5-excellent.
B - 1-high; 2-med-high; 3-med; 4-med-low; 5-low

5.0 ANALYSIS OF REMOVAL ACTION ALTERNATIVES

An analysis of the three selected removal action alternatives for the hydrocarbon-contaminated soils has been performed for the former Exxon Chemical Company property located in Hobbs, New Mexico. A summary of each alternative's detailed evaluation criteria is presented in Section 6.0, including Table 6-1, of this report. The detailed analysis of each alternative is presented in parts 5.1 to 5.3 of this section and consists of the following components:

- Effectiveness:
  - protectiveness of the community and workers
  - threat reduction
  - time until protection achieved
  - compliance with ARARS
  - environmental impacts
  - potential exposure to remaining risks
  - long-term reliability
- Implementability:
  - technical feasibility, including ability to construct and operate
  - compliance with ARARs
  - ability to meet processes efficiencies/performance goals
  - demonstrated performance of technology
  - environmental conditions
  - availability of equipment and materials
  - administrative feasibility of obtaining appropriate permits and coordinating actions
- Total Cost of the Alternative

5.1 Alternative 1 - Excavation and Landfilling

Alternative 1 involves excavation of the hydrocarbon-contaminated soils on the subject site and subsequent disposal at a nearby landfill. This alternative provides for an efficient removal action of the estimated 50 cubic yards of soil requiring removal. It is a direct, straight-forward approach to removal action.

5.1.1 Effectiveness

Protection of the community during both the short-term and long-term periods is achieved through this option. Although contaminated soils are removed from the site, precautionary measures will be taken to protect the community. These measures include: limited site access during removal action activities; tarping of transport vehicles during shipment; shipment manifesting; and final disposal in a designated landfill. Potential exposure pathways for workers include ingestion or inhalation of dust particles as soil is removed and transferred to the transport vehicles, or direct contact with contaminated soil. Worker exposure during removal activities can be minimized with appropriate personal protective equipment. Exposure to persons working near or passing by the area will be minimized by control of the removal action to prevent excessive dust. This will be described in detail in the work plan.

Excavation and off-site landfilling provides a timely method of removal action for hydrocarbon-contaminated soils. Implementation of this alternative is anticipated to be one week and therefore does not involve a lengthy process to achieve clean-up goals.

The actions described in this option mitigate the threats identified in Sections 2.4 and 3.0 of this report. It is anticipated that soils would be removed in layers, in each of the specified areas, to a depth where TPH and BETX levels meet the required clean-up criteria. Confirmation sampling would be performed prior to backfilling the excavated area. The actions of this alternative allow compliance with the chemical-specific ARARs identified in section 3.4 of this report. Environmental impacts are minimized in regard to implementing this removal action. Clean backfill soils are to be placed on site in the excavated areas. Off-site disposal eliminates the potential for future on-site exposure to contaminants and affords an effective solution in terms of long-term reliability.

Off-site landfilling the hydrocarbon contaminated soils is easily facilitated for this site, and is considered by OCD as an appropriate, effective removal action.

5.1.2 Implementability

The area of concern contains approximately 50 cubic yards of hydrocarbon-contaminated soil. This proposed alternative allows the soils to be excavated, removed from the site, with tentative disposal in the nearby CRI Landfill west of Hobbs, New Mexico. The soils would be excavated from the area of concern. A staging area would be designated for stockpiling excavated soils. Additional sampling and analysis, if required, could be performed at this stage. All soils designated for disposal would be properly manifested for transport to the landfill. The CRI Landfill is a permitted facility. Triassic age shales which are virtually impermeable underlie the site preventing vertical seepage of waters from the site into underlying non potable freshwater sands. Flooding is a minimal problem as the area receives sparse rainfall and has a high evaporation rate. The landfill, therefore, has a very low potential for adversely impacting groundwater.

Implementation of this removal action alternative does not require engineering design or construction of remediation equipment. Excavation with off-site landfill disposal is a direct, straight forward approach for removal action.

Schedule delays are not anticipated, however unanticipated interruptions to the proposed schedule can occur. Potential schedule delays include inclement weather; or mechanical failure of removal or transport equipment. Other difficulties, specific to this alternative, which could be encountered include inability to reach targeted clean-up levels through excavation of contaminated soils.

It is anticipated that excavation will enable clean up according to the ARARs discussed in Section 3.4 of this report. Off-site landfilling provides physical removal of contaminated soils to a specified, contained location. The removal action is designed to prevent the need for removal restarts to address the same contamination threats. Landfilling non-hazardous soils is commonly approved by regulatory agencies. Permits would not be required for soil removal at the site. All soil shipments would be manifested so that each shipment is tracked from the site to its final destination.

Equipment, materials, and personnel would be readily available locally, and during the anticipated project time schedule. The landfill is within a reasonable distance (approximately 1.5 hours from the site). Upon disposal of soils in the landfill, clean backfill soil from soil pits in the Hobbs area would be transported to the site. The excavation area would then be backfilled and compacted with the clean soil.

This alternative should be publicly acceptable as it allows contaminated soils to be permanently removed from the site and placed in the CRI Landfill or a similar landfill. This is a good long-term solution for the site since there would be no future environmental endangerment at the site; the work can be accomplished in a timely manner; no operational maintenance of a treatment system is required; and post-removal site control measures should not be required.

5.1.3 Total Cost

The following table indicates approximate costs for implementing Alternative 1. These include excavation of contaminated soil, transport of contaminated soil and backfill material, backfill operations, purchase of backfill material, associated labor costs, project management and other miscellaneous costs associated with implementing this alternative.

ALTERNATIVE 1 - ESTIMATED COSTS

Task	Approximate Cost ($ per cubic yard)	Total Cost ($)
Excavate, Backfill and Compact Hole with Clean Soil	14.30	715
Verification Sampling		6210
Backfill Material	5.75	345
Transport	20.60	1375
Disposal Fees	27.00	1890
Project Management and Oversight		16610
ESTIMATED TOTAL		27145

5.2 Alternative 2 - Excavation and Thermal Desorption

Alternative 2 involves thermal desorption, a low-temperature treatment for excavated soils. Incineration would be used in conjunction with the soil treatment to destroy volatile contaminants released from the heated soils.

5.2.1 Effectiveness

Short-term and long-term protection of the community is achieved through this option. Precautionary measures, for protection of the community, can be taken during on-site soil removal and treatment activities. These measures include: limited site access during removal activities; soil wetting for dust control of processed soils; and noise and nuisance control procedures. Potential exposure pathways for workers include ingestion or inhalation of dust particles as soil is removed and transferred to the treatment unit, or direct contact with contaminated soil. Worker exposure during removal action activities can be minimized by using appropriate personal protective equipment.

Thermal desorption does not provide the most timely method of removal action for the hydrocarbon-contaminated soils at this site. Permitting, for construction and/or operation of the thermal desorption unit, can delay start up. The thermal unit can process soils on a 24-hour basis and up to 20 tons per hour. Field work involved with implementing this alternative is anticipated to be approximately 1 week.

The actions described in this option mitigate the threats identified in Sections 2.4 and 3.0 of this report. It is anticipated that soils would be removed in layers, in each of the specified areas, to a depth where TPH and BTEX concentration levels meet the required clean-up criteria. Confirmation sampling of the excavation areas would be performed as operations progress and prior to backfilling. In addition, confirmation sampling would be performed as operations progress on the processed soils. The actions of this alternative allow compliance with the chemical-specific ARARs identified in section 3.4 of this report. Environmental impacts are minimized in regard to implementing this removal action. Contaminants are destroyed, therefore remediated soils can be used as backfill for the excavated areas. In addition, destruction of contaminants eliminates the potential for future on-site exposure. This appears to be an effective solution in terms of long-term reliability.

The use of this alternative provides an alternate to consumptive use of landfills and provides for the final destruction of contaminants.

5.2.2 Implementability

The first phase of this alternative requires excavation of the estimated 50 cubic yards of contaminated soil. Following permitting and set up of the thermal desorption unit, contaminated soils are fed into the system at a pre-determined rate. A typical system works by loading soil into a feed bin which is equipped with a sizer/crusher. The soil temperature is then raised to 600°F - 800°F in a rotary dryer. The feed rate can be varied to accommodate site-specific soils and contaminant concentrations. Hydrocarbon-based compounds are driven from the soil into the dryer chamber and the treated soil is discharged, cooled, moistened, and stockpiled. Soil fines and dust particles are removed from the exhaust gases. The gases are then forced through a thermal after-burner to combust the volatile compounds. The treated air is exhausted to the atmosphere. Treated soil will be sampled and analyzed prior to placement as backfill into the excavated area. Air emissions are monitored for compliance with regulatory requirements.

Space is limited on site which could be a logistical problem for this option. Operation and maintenance of the system could be significant when considering the requirements of fuel, materials handling, monitoring (sampling and lab analysis), and on-site project management.

Implementation of this removal action requires moderate design, engineering and construction. Additional preliminary analytical data required include moisture content, soil typing, pyrolysis and bench scale testing. The thermal processing unit is self-contained, therefore on-site set-up time is minimized. Safety controls and automatic monitors help to reduce the complexity of the operation.

Schedule delays are not anticipated, however unanticipated interruptions to the proposed schedule can occur. Potential schedule delays include inclement weather; time to locate, set up and start equipment on site; or mechanical failure of removal or processing equipment. Other difficulties, specific to this alternative, which could be encountered include inability to reach targeted clean-up levels by excavation or by thermal treatment. If thermal treatment does not completely eliminate contaminants in the processed soils, early detection would provide for an opportunity to reprocess the soils at a slower feed rate. This action would create additional residence time within the thermal unit causing a rise in the soil temperature and additional destruction of contaminants.

It is anticipated that excavation and thermal desorption could enable clean up according to the ARARs discussed in Section 3.4 of this report. The thermal desorption process provides destruction/elimination of contaminants in the soil. The removal action is designed to prevent the need for removal restarts to address the same contamination threats.

Thermal desorption/incineration has been approved by regulatory agencies on other occasions for other facilities. Permits would be required for operation of the thermal unit and would be obtained prior to beginning on-site activities.

Adequate lead time is available to arrange for the necessary equipment, materials, and personnel to perform the required work activities within the anticipated schedule. On-site treatment/remediation of soils eliminates the need for purchasing clean backfill material. It is expected that post-removal site control measures would not be required at completion of the stated action alternative.

This alternative should be publicly acceptable as it provides for elimination of contaminants from the soils. This is a good long-term solution for the site removal action since there would be no future environmental endangerment at the site.

5.2.3 Total Cost

The following table indicates approximate costs for implementing Alternative 2. These include excavation of contaminated soil, mobilization/demobilization of equipment; soil remediation by thermal desorption/incineration system, and backfill operations; project management, engineering and design and other miscellaneous costs associated with implementing this alternative.

ALTERNATIVE 2 - ESTIMATED COSTS

Task	Approximate Cost ($ per cubic yard)	Total Cost ($)
Preliminary Soil Testing		10,000
Excavate, Backfill, and Compact Hole with Clean Soil	13.00	650
Mobilization/Demobilization of Treatment System		5,000
Soil Treatment by Low Temp Desorption System	65.00	3,250
Verification Sampling		5,400
Project Management, Engineering and Design		18,000
ESTIMATED TOTAL		42,300

5.3 Alternative 3 - Excavation and Biological Treatment

Biological treatment technologies, which use naturally occurring microbes to destroy contaminants in the soil, can be applied ex-situ (soils are excavated and treated on site). This alternative would incorporate a bioremediation system to treat excavated soils on site. Above-ground treatment of the soils allows better control of materials and treatment agents, and therefore residual concentrations of contaminants are generally lower than if the soils are treated in place.

5.3.1 Effectiveness

Protection of the community during both the short-term and long-term periods is achieved through this option. Precautionary measures are taken throughout the treatment period to protect the community. These measures include limited site access during removal action activities, plastic sheeting over stockpiled soils, and noise and nuisance control procedures. Potential exposure pathways for workers include ingestion or inhalation of dust particles as soil is removed and transferred to the treatment area, or direct contact with contaminated soil. Worker exposure during removal action activities can be minimized by using appropriate personal protective equipment.

Biological treatment does not provide a timely method of removal action in comparison to the other removal action alternatives investigated for this site. Considerable time may be involved in performing a treatability study prior to beginning removal activities and achieving a steady optimum operation following start up. Permitting for the system could delay start up by as long as 3 to 6 months. Biological treatment of the soils in the area of concern could be expected to last in excess of 1 year.

The actions described in this option mitigate the threats identified in sections 2.4 and 3.0 of this report. Contaminated soils would be removed in layers, in each of the specified areas, to a depth where TPH and BETX concentration levels meet the required clean-up criteria. Confirmation sampling of the excavated areas would be performed as operations progress. Excavated soils would be placed in windrows for on-site treatment. Confirmation sampling would be performed on the treated soils prior to their use as backfill. The actions of this alternative allow compliance with the chemical-specific ARARs identified in section 3.4 of this report. Environmental impacts are minimized in regard to implementing this removal action. Contaminants are destroyed, therefore treated soils can be used as backfill for the excavated areas. Additionally, the potential for future on-site exposure is eliminated. This appears to be an effective solution in terms of long-term reliability.

If feasible, biological degradation provides an alternate solution to consumption of landfill capacity.

5.3.2 Implementability

Two methods of biotreatment are spread and windrow biotreatment. Due to the limited amount of space available to accommodate equipment/facilities on site, the windrow biotreatment method would be recommended. The windrow method requires a smaller surface area, however, due to the increased thickness of the soils, an engineered aeration system would be required to provide oxygen to the bacteria. In addition, an engineered leachate collection system and an air emission control system would be required. The amount of space required to treat the soil may present a logistical problem. Treated soils could be backfilled into the excavated area eliminating the need for purchasing clean backfill material. Note that the excavated area would remain open while the soils were being treated. This may not be practical.

Implementation of this removal action requires extensive design, engineering and construction. A treatability study would be necessary prior to beginning removal activities. The operation and maintenance costs and considerations of the biotreatment system could be considerable when including the requirements of fuel, material handling, monitoring (sampling and lab analysis), and on-site project management.

Schedule delays are not anticipated, however the longer the project, the more opportunity exists for delays to occur. Potential schedule delays include lengthy permitting process; start up delays; insufficient nutrients or inappropriate microbes; inclement weather; or mechanical failure of removal equipment. Other difficulties, specific to this alternative, which could be encountered include inability to reach targeted clean-up levels by excavation or by biological treatment. In addition, the adhesive nature of certain clay containing soils, as found at this site, may prevent nutrients and oxygen from penetrating the soils thus increasing the time and cost for this option.

It is anticipated that excavation and biodegradation could enable clean up according to the ARARs discussed in Section 3.4 of this report. The biodegradation process provides destruction/elimination of contaminants in the soil. The removal action is designed to prevent the need for removal restarts to address the same contamination threats. If biological treatment is ineffective, other means such as landfill or thermal treatment would still be applicable. Soils would already be stockpiled in an accessible manner for either application.

Biological degradation has proven to be effective for treating a wide variety of materials in soils. Therefore, it should be viewed by regulatory agencies as an acceptable removal action. Permits would be required for operation of the technology on site and would be obtained prior to beginning on-site activities. It is expected that post-removal site control measures would not be required at completion of the stated action alternative.

Adequate lead time is available to arrange for the necessary equipment, materials, and personnel to perform the required work activities. However, the time necessary to achieve clean up levels could be lengthy.

This alternative involves a process whereby organic contaminants are destroyed rather than transferred to a different media. Application of the technology should be publicly acceptable since the process destroys the contaminants, thus eliminating potential future exposure to contaminants.

5.3.3 Total Cost

Costs could vary depending on the efficiency/effectiveness of the on-site system. Materials handling costs are minimized when bioremediation is performed on site. However, the overall cost, relative to the other alternatives presented in this report, makes this a less attractive alternative.

The following table indicates approximate costs for implementing Alternative 3. These include excavation of contaminated soil; mobilization/demobilization of equipment; remediation of soils by biological treatment, backfill operations; project management, engineering and design and other miscellaneous costs associated with implementing this alternative.

ALTERNATIVE 3 - ESTIMATED COSTS

Task	Approximate Cost ($ per cubic yard)	Total Cost ($)
Perform Treatability Study		15,000
Excavate, Backfill, and Compact Hole with Clean Soil	13.00	650
Mobilization/Demobilization of Treatment Equipment		5,000
Soil Treatment by Bioremediation	120.00	6,000
Verification Sampling		54,000
Project Management, Engineering and Design		100,000
ESTIMATED TOTAL		132,050

6.0 COMPARATIVE ANALYSIS

The purpose of the comparative analysis is to present a qualitative assessment of strengths and weaknesses of each alternative relative to the others. Table 6-1, following Section 6.0, presents a summary of the alternatives and evaluation criteria.

Alternative 1 - Excavation and Off-Site Landfilling

The following points summarize the technical, environmental, health risk, and institutional aspects of performing the excavation and off-site landfilling removal action alternative.

Strengths

- No engineering design or construction of remedial system.
- No post-removal monitoring.
- Low cost.
- Reduces/eliminates stormwater erosion of contaminated soil.
- Timely resolution.
- Ability to achieve chemical-specific ARARs.

Weaknesses

- Contaminants are not destroyed.
- Maintain a level of liability for contaminated soil at landfill.
- Purchase backfill.

Alternative 2 - Excavation and On-Site Thermal Treatment

The following points summarize the technical, environmental, health risk, and institutional aspects of performing the excavation and on-site thermal treatment removal action alternative.

Strength

- No post-removal monitoring.
- Reduces/eliminates future contact with contaminated soil.
- Contaminants are destroyed.

Weaknesses

- Requires additional analytical data.
- Considerable operating and maintenance required.

Strengths	Weaknesses
• Reduces/eliminates stormwater erosion of contaminated soil.	• High cost.
• Treated soil available as backfill.	
• Ability to achieve chemical-specific ARARs.	

Alternative 3 - Excavation and On-Site Biological Treatment

The following points summarize the technical, environmental, health risk, and institutional aspects of performing the excavation and on-site biological treatment removal action alternative.

Strengths	Weaknesses
• Contaminants are destroyed.	• Treatability study required.
• Backfill with treated soil.	• High cost.
• Ability to achieve chemical-specific ARARs.	• Extensive permitting.
	• Extensive design, engineering and construction.
	• Lengthy start-up period prior to stabilization.
	• Extensive operating and maintenance required.

TABLE 6-1

Summary of Detailed Removal Alternatives
Former Exxon Chemical Company Facility
West Marland Facility
Hobbs, New Mexico

Removal Action Alternative	Technical Considerations	Environmental Considerations	Human Health	Institutional	Time-Frame/ Schedule	Cost Estimate (x $1000)	
						Construction and Materials	PM/E&D
1. Excavation of Soil Transport - Landfill Disposal - Backfill with Clean Soil	-no post removal monitoring, -reduces/eliminates on-site and off-site environmental liabilities, -cost effective, -no engineering design or construction required, -does not destroy contamination.	-protective of the environment, -potential exposure to hydrocarbon contaminated dust during implementation, -reduces the potential for contaminants to leach into groundwater,	-reduces and/or eliminates future contact with contaminated soil. -as soil is removed and treated, dust may be generated that may be inhaled on ingested. -reduces and/or eliminates amount of infiltration to the groundwater.	-approved by regulatory agencies for previous sites.	1 week	10.5	16.6

TABLE 6-1 (Cont'd)

Summary of Detailed Removal Alternatives
Former Exxon Chemical Company Facility
West Marland Facility
Hobbs, New Mexico

Removal Action Alternative	Technical Considerations	Environmental Considerations	Human Health	Institutional	Time-Frame/ Schedule	Cost Estimate (x $1000)	
						Construction and Materials	PM/E&D
2. Excavation of soil - On-site thermal desorption - Backfill with treated soil	-moderate design, engineering and construction required, -extensive operating and maintenance required as well as additional laboratory analysis.	-protective of environment, -potential exposure to hydrocarbon contaminated air emissions during implementation, -reduces the potential for contaminants to leach into groundwater, -contaminants are destroyed and treated soil is used as backfill material, thereby eliminating consumption of landfill capacity.	-reduces and/or eliminates future contact with contaminated soil. -as soil is removed dust may be generated that may be inhaled or ingested. -reduces the amount of infiltration to groundwater.	-approved by regulatory agencies on other occasions for other facilities.	1 week	24.3	18

TABLE 6-1 (Cont'd)

Summary of Detailed Removal Alternatives
Former Exxon Chemical Company
West Marland Facility
Hobbs, Mexico

Removal Action Alternative	Technical Considerations	Environmental Considerations	Human Health	Institutional	Time-Frame/ Schedule	Cost Estimate (x $1000) Construction and Materials	PM/E&D
3. Excavation of soil - On-site Bioremediation - Backfill with treated soil.	-moderate design, engineering and construction required, -treatability study required, -cost prohibitive, -considerable start-up time required to stabilize system, -extensive operating and maintenance required as well as periodic laboratory analysis of samples.	-protective of the environment, -potential exposure to hydrocarbon contaminated dust during implementation, -contaminants are destroyed and treated soil is used as backfill material, thereby eliminating consumption of landfill capacity.	-as soil is removed and treated, dust may be generated that may be inhaled or ingested. -reduces the amount of infiltration to groundwater.	-approved by regulatory agencies, -extensive permitting requirements	1 + year	32.05	100

7.0 PROPOSED REMOVAL ACTION

Excavation and landfilling (Alternative 1, Section 3) is recommended for the Hobbs, New Mexico. This alternative adequately meets the removal action goals set for the site.

Excavation with landfill disposal is the most feasible alternative for soils at this site. This alternative:

- requires no engineering design, construction or permitting of a treatment system;
- reduces/eliminates on-site and off-site environmental liabilities;
- reduces/eliminates potential stormwater erosion of hydrocarbon-contaminated materials;
- reduces/eliminates potential for future exposure to contaminants on site;
- reduces/eliminates the potential for contaminants to leach into groundwater; and
- provides a cost effective removal action.

The selection of the excavation and landfilling option incurs minimal costs as compared to other alternatives. This alternative provides the best combination of positive corrective actions with the minimal number of adverse impacts and is considered to be the most cost-effective method of addressing the site.

APPENDIX A

ANALYTICAL RESULTS

Analytical Test Results
Site Inspection
Exxon Chemical Company
Hobbs, NM
West Marland Site

Sample ID	Location	Depth	TPH 8015 (M) (mg/kg)	Total Metals (mg/kg)								pH	Detected Total Volatiles Code (ug/kg)	Detected Total Semi Volatiles Code (ug/kg)
				Ag	As	Ba	Cd	Cr	Hg	Pb	Se			
YS-1A	Yard Grid Sample	Surface	BDL	BDL	5.4	470	BDL	12	0.1	150	BDL	8.62		
YS-2A	Yard Grid Sample	Surface	BDL	BDL	2.8	250	BDL	3.6	BDL	12	BDL	7.94		
YS-3A	Yard Grid Sample	Surface	BDL	BDL	2.5	230	BDL	10	BDL	11	BDL	7.87		
YS-4A	Yard Grid Sample	Surface	1710	BDL	3.1	220	BDL	6.8	BDL	18	BDL	8.06		
YS-5A	Yard Grid Sample	Surface	BDL	BDL	3.6	210	BDL	5.6	BDL	17	BDL	8.45	1(14)(B)	None Detected
YS-6A	Yard Grid Sample	Surface	BDL	BDL	5.6	540	BDL	16	0.2	170	BDL	8.05		
YS-7A	Yard Grid Sample	Surface	BDL	BDL	2.8	280	BDL	8.5	BDL	12	BDL	9.44		
YS-8A	Yard Grid Sample	Surface	BDL	BDL	2.6	120	BDL	14	BDL	14	BDL	8.22		
YS-9A	Duplicate of YS-6a	Surface	BDL	BDL	5.2	470	BDL	14	0.2	160	BDL	7.97		
YS-10A	Yard Grid Sample	Surface	BDL	BDL	3.6	300	BDL	4.6	BDL	49	BDL	8.12		
LA-1A	Loading Area	Surface	BDL	BDL	2.9	180	BDL	7.3	0.2	16	BDL	8.03		
DT-1A	Former Diesel Tank Area	Surface	100	BDL	3.5	250	BDL	2.8	BDL	6.8	BDL	8.51		
DT-2A	Former Diesel Tank Area	Surface	406	BDL	3.5	200	BDL	5.2	BDL	13	BDL	8.24	1(75, 2(730), 3(670), 4(720), 5(220), 6(2,400)	None Detected
DT-2B	Former Diesel Tank Area	1.5 ft.	100	BDL	4.6	300	BDL	2.4	BDL	9.2	BDL	8.29		
TR-1A	Septic Tank Area (trench)	3" - 8"	9558	BDL	3.1	210	BDL	4.8	BDL	70	BDL	7.49	2(7,900), 3(33,000), 4(13,000), 5(11,000), 6(370,000)	1(100,000)
SPT-1B	Septic Tank Area	6'	BDL	BDL	1.5	100	3.2	6.2	0.3	40	BDL	7.35	1,(7)	
SPT-2B	Septic Tank Area	6'	BDL	BDL	1.6	140	BDL	11	0.1	14	BDL	7.37		
Trip Blank	QA/QC Sample												None Detected	
Equipment Blank	QA/QC Sample		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL		7(12)	2(13)(B)

LEGEND
BDL = Below Detection Limit
Blank cells indicate that the sample was not analyzed for that parameter

COMPOUND CODE FOR VOLATILES
1) Acetone
2) 4-Methyl-2-Pentanone
3) 2-Hexanone
4) Toluene
5) Ethylbenzene
6) Xylene (total)
7) Bromoform

COMPOUND CODE FOR SEMIVOLATILES
1) Naphthalene
2) Di-n-Butylphthalate

Exxon-WM.wq1

Summary of Analytical Results
In-Situ Waste Classification Sample
Former Exxon Chemical Company Facility
2607/2609 West Marland Facility
Hobbs, New Mexico
Date Sampled: 9-3-92

Analytical Parameters	Regulatory Threshold Limit	Sample ID: MR-1 Depth: 0'-3'	
TCLP Metals (mg/l)		**Level Detected**	**Detection Limit**
Arsenic	5.0	<0.2	0.2
Barium	100.0	1.2	0.5
Cadmium	1.0	<0.010	0.010
Chromium	5.0	<0.05	0.05
Lead	5.0	<0.02	0.02
Mercury	0.2	<0.001	0.001
Selenium	1.0	<0.2	0.2
Silver	5.0	<0.01	0.01
TCLP Volatiles (μg/l)			
Pyridine	5,000	<11	11
Vinyl Chloride	200	<10	10
1,1-Dichloroethene	700	<5	5
Chloroform	6,000	<5	5
1,2-Dichloroethane	500	<5	5
Methyl Ethyl Ketone	200,000	<10	10
Carbon Tetrachloride	500	<5	5
Trichloroethene	500	<5	5
Benzene	500	<5	5
Tetrachloroethene	700	<5	5
Chlorobenzene	100,000	<5	5

Summary of Analytical Results
In-Situ Waste Classification Sample
Former Exxon Chemical Company Facility
2607/2609 West Marland Facility
Hobbs, New Mexico
Date Sampled: 9-3-92

Analytical Parameters	Regulatory Threshold Limit	Sample ID: MR-1 Depth: 0'-3'	
TCLP Semivolatiles ($\mu g/l$)		**Level Detected**	**Detection Limit**
1,4-Dichlorobenzene	7,500	<11	11
2-Methylphenol	200,000	<11	11
4-Methylphenol	200,000	<11	11
3-Methylphenol	200,000	<11	11
Hexachloroethane	3,000	<11	11
Nitrobenzene	2,000	<11	11
Hexachlorobuta-diene	500	<11	11
2,4,6-Trichlorophenol	2,000	<11	11
2,4,5-Trichlorophenol	400,000	<54	54
2,4-Dinitrotoluene	130	<11	11
Hexachlorobenzene	130	<11	11
Pentachlorophenol	100,000	<54	54
RCRA Characteristics			
pH	2<pH<12.5	8.06 units	0.01 units
Corrosivity	>6.35 MMPY	Unable to analyze due to matrix	Unable to analyze due to matrix
Ignitability	<140°F	Unable to analyze due to matrix	Unable to analyze due to matrix
Reactivity - HCN - H_2S	 250 mg/kg 500 mg/kg	 <0.40 mg/kg 241 mg/kg	 0.40 mg/kg 20 mg/kg

B - Below Method Detection Limit