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Consulting • Engineering • Remediation

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July 2, 1999
Project: 6908-050-300

Mr. Barney Chan
Alameda County Department of Environmental Health
1131 Harbor Bay Parkway, 2nd Floor
Alameda, California, 94502

Subject: **Work Plan**
Oakland International Airport
United Airlines Building M-110
1100 Airport Drive, Oakland, California

Dear Mr. Chan:

ENSR Corporation (ENSR) on behalf of United Airlines, is submitting this work plan to install three groundwater monitoring wells at the Oakland International Airport, United Airlines Building M-110, 1100 Airport Drive, Oakland, California. The purpose of the work plan is in response to the Alameda County Environmental Health Services (ACEHS) letter to United Airlines, dated April 8, 1999.

On January 15, 1999, one 10,000-gallon diesel fuel UST, one 10,000-gallon unleaded gasoline UST, a dispenser island and associated piping. Approximately 758 cubic-yards of soil were removed and properly disposed of during over-excavation activities.

This work plan was developed to further define the lateral extent of petroleum hydrocarbons in groundwater at the perimeter of Building M-110, and to determine groundwater flow direction and gradient. In addition, groundwater samples will be submitted for water quality analysis and soil samples will be submitted for geotechnical analysis, to identify subsurface characteristics that may be used in risk-based corrective action, if deemed necessary.

If you have any questions or comments regarding this report, please give Alan Klein a call at (916) 362-7100.

Sincerely,

ENSR

Alan J. Klein, R.E.A.
Senior Environmental Scientist

Alan D. Gibbs, R.G., C.HG.
Department Manager

cc: Mr. Dale Klettke, Port of Oakland Environmental Compliance Department
Mr. Steve Morse, San Francisco Bay RWQCB
Mr. Dennis Moulton, United Airlines
Mr. Steven Sulgit, United Airlines
Mr. Daniel Tisoncik, United Airlines
Mr. Gene Barr, United Airlines
Mr. Ted Wells, United Airlines

WORK PLAN
INSTALLATION OF GROUNDWATER MONITORING WELLS

OAKLAND INT'L AIRPORT
UNITED AIRLINES BLDG. M-110
1100 Airport Drive
Oakland, California

July 1999

Prepared For:
Alameda County
Environmental Health Services

On Behalf Of:
United Airlines

Prepared By:
ENSR Corporation
10324 Placer Lane, Suite 200
Sacramento, California 95827
(916) 362-7100

ENSR Project No: 6908-050-300

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1.0 INTRODUCTION

This work plan consists of installing three groundwater monitoring wells in the vicinity of two former underground storage tanks, located at Oakland International Airport, United Airlines Building M-110, 1100 Airport Drive, Oakland, California (Figures 1 and 2). The purpose of this work plan is in response to the Alameda County Environmental Health Services (ACEHS) letter to United Airlines, dated April 8, 1999 (Appendix A).

This work plan was developed to further define the lateral extent of petroleum hydrocarbons in groundwater at the perimeter of Building M-110, and to determine groundwater flow direction and gradient. In addition, groundwater samples will be submitted for water quality analysis and soil samples will be submitted for geotechnical analysis, to identify subsurface characteristics that may be used in risk-based corrective action, if deemed necessary.

A site specific health and safety plan is presented in Appendix B.

2.0 BACKGROUND

2.1 UST Removal Activities

On January 15, 1999, one 10,000-gallon diesel fuel UST, one 10,000-gallon unleaded gasoline UST, a dispenser island and associated piping. Approximately 758 cubic-yards of soil were removed and properly disposed of during over-excavation activities. The results of the UST removal activities are documented in ENSR's report titled, "*Underground Storage Tanks Closure Report*", dated March 1999.

Upon completion of over-excavation, ENSR collected a total of ten soil samples from the excavation side-walls and one groundwater sample (EXB-1) from within the excavation. The sample identifications and locations are depicted in Figure 3. Soil sample results are summarized in Table 1. Groundwater and excavation purge water sample results are summarized in Table 2.

2.2 Site Description

The subject area is located on the northwest side of United Airlines Building M-110, which is used for airplane maintenance. The surrounding surface area is a graded, relatively flat area, paved with asphalt concrete. The site exists at an approximate elevation of five feet above mean sea level. The nearest body of water is the San Francisco Bay located approximately 0.5 miles south of the Site (U.S.G.S. San Leandro Quadrangle, Photo-revised 1980).

During over-excavation activities, soils encountered to depths of ten feet below ground surface (bgs) consisted of fine sand. Soils encountered greater than 10 feet bgs consisted of Bay Mud. During the USTs excavation activities, groundwater was observed at 6.5 feet bgs.

3.0 SCOPE OF WORK

3.1 Task 1 – Project Setup

Upon approval of this work plan by the Alameda County Environmental Health Services (ACEHS), ENSR will obtain the necessary permits for well installation. ENSR will schedule the subcontractors and coordinate field activities with United Airlines, the Port of Oakland, Alameda County and site personnel.

3.2 Task 2 – Underground Utilities Clearance

ENSR will mark the well locations and notify Underground Service Alert (USA), within 48-hours of implementing field activities. ENSR will review available as-built drawings of underground utilities, provided by United Airlines. In addition, a geophysical survey will be performed using electromagnetic field inductions and ground penetrating radar, to locate underground utilities at the proposed well locations (Figure 2).

3.3 Task 3 – Installation of Groundwater Monitoring Wells

Three soil borings will be advanced approximately 30 feet below ground surface (bgs), using a hollow stem auger drilling rig, at the locations illustrated on Figure 2. Soil samples will be collected in the unsaturated soil zone at five-foot intervals, and geologically logged by an ENSR geologist. Encountered soils will be screened for the presence of volatile organic compounds (VOCs) by visual observation and the use of a photoionization detector (PID). Field activities will be conducted under the oversight of a geologist or engineer registered with the state of California.

Drill cuttings and water generated will be stored separately in 55-gallon Department of Transportation (DOT) drums. Based on analytical soil and/or water results, soil and decontamination water can be disposed of at an appropriate facility. A cost estimate for soil and/or water disposal will be provided at that time.

The soil borings will be completed as four-inch-diameter groundwater monitoring wells. The wells will be completed to a depth of 30 feet bgs, and developed per the guidelines stipulated by the California Code of Regulations, Title 23, Subchapter 16, Article 4, Sections 2647 and 2648. All field sampling activities will be performed in accordance with ENSR's Standard Operating Procedures (SOPs) presented in Appendix C.

3.4 Task 4 – Groundwater Monitoring and Sampling

The groundwater monitoring wells will be surveyed by a California Licensed Surveyor. ENSR will collect depth to groundwater levels in groundwater monitoring wells MW-1, MW-2 and MW-3. Groundwater level data will be used to determine groundwater direction and gradient at the subject site.

One week after the monitoring well installations, groundwater samples will be collected from each groundwater monitoring well (MW-1, MW-2, and MW-3). Prior to sampling, each monitoring well will be purged of a minimum of three well casing volumes using a submersible pump. Physical properties including temperature, pH, and conductivity will be monitored during purging activities.

Groundwater samples collected after these parameters showed relative stability (e.g., - less than 10% change), and the water level in each well has recharged 80% of the depth measured prior to purging. Generated purge water and wash water will be containerized onsite in 55-gallon drums.

Groundwater samples will be collected using a new disposable bailer for each well. The groundwater samples will be transferred to the appropriate sample containers and stored in a cooler containing ice for preservation. The samples will be delivered to a California certified laboratory under chain-of-custody documentation.

3.5 Task 5 – Laboratory Analysis

Three groundwater samples will be submitted for the following chemical analysis:

- Total Extractable Petroleum Hydrocarbons as diesel fuel by DHS Luft;
- Total Purgeable Petroleum Hydrocarbons as gasoline by DHS Luft;
- Benzene, toluene, ethylbenze and total xylenes by EPA Method 8020; and
- Methyl tert-butyl ether (MTBE) by EPA 8260.

Two groundwater samples will be submitted for the following water quality analysis:

- General Mineral by EPA 6000/7000 Series Method;
- Specific Conductivity by EPA Method 120.1;
- pH by EPA Method 150.1;
- Total Dissolved Solids by EPA Method 160.1; and
- Dissolved Oxygen by EPA Method 360.1. ← S/B field tested.

Two soil samples will be submitted for the following geotechnical analysis:

- Particle Size Analysis, by ASTM D422;
- Moisture Content & Density by ASTM D2937;
- Organic Content by ASTM D2974; → for TOC.
- Porosity by Phase Relation; and
- Specific Gravity by ASTM D854.

3.6 Task 6 - Report Preparation

ENSR will prepare a report summarizing our findings, conclusions and recommendations. The report will include boring logs, figures, data tables, field documentation and laboratory reports. ENSR will submit copies of the report to ACEHS and the Port of Oakland.

4.0 SCHEDULE

ENSR estimates that the approved work plan will require approximately ten to 12 weeks to complete and submit a results report. Permitting, scheduling and assessment activities will require approximately five to six weeks. Laboratory analysis will require approximately two weeks. A results report, including review by United Airlines will require approximately three to four weeks to complete. Regulatory delays and inclement weather may delay field activities and therefore possibly delaying the anticipated schedule.

TABLE 1
ANALYTICAL RESULTS - SOIL SAMPLES
Oakland International Airport
United Airlines Building M-110

Sample ID	Date Collected	Total Petroleum Hydrocarbons		MTBE (µg/Kg)	Volatile Organic Compounds			
		Diesel (mg/kg)	Gasoline (mg/kg)		Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)
SW-1-6'	1/15/99	16,000	530	ND<100	1.9	0.71	0.74	1.9
SW-2-10'	1/15/99	ND	ND	49	ND	ND	ND	ND
SW-3-6'	1/15/99	ND	ND	5.5	ND	ND	ND	ND
SW-4-10'	1/15/99	ND	ND	ND	ND	ND	ND	ND
EW-1-8'	1/15/99	ND	2.4	7.8	0.65	0.033	0.12	0.13
EW-2-9.5'	1/18/99	ND	ND	22	ND	ND	ND	ND
WW-1-8'	1/15/99	ND	ND	ND	ND	ND	ND	ND
WW-2-9'	1/18/99	ND	ND	ND	ND	ND	ND	ND
NW-1-9'	1/18/99	ND	ND	ND	ND	ND	ND	ND
NW-2-9.5'	1/18/99	ND	ND	ND	ND	ND	ND	ND
Reporting Limit		1.0	1.0	5.0	0.005	0.005	0.005	0.005

Notes:

MTBE = Methyl tert-Butyl Ether, reported in micrograms per Kilogram (µg/Kg)

ND = Not Detected above laboratory reporting limit

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TABLE 2
ANALYTICAL RESULTS – GROUNDWATER AND PURGE WATER
Oakland International Airport
United Airlines Building M-110

Sample ID	Date Collected	Depth (ft. bgs.)	Total Petroleum Hydrocarbons		MTBE (µg/L)	Volatile Organic Compounds				Lead TTLC (mg/L)	pH	Ignitability
			Diesel (µg/L)	Gasoline (µg/L)		Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)			
EXB-1	1/18/99	10	7,300	14,000	130	1,100	2,200	530	3,000	NA	NA	NA
PW-1	1/18/99	--	5,300	16,000	110	280	1,700	330	3,200	ND	7.6@21°C	ND>100
Reporting Limit		--	50	50	1.0	0.5	0.5	0.5	0.5	0.005	+/- 0.05	+/- 2°C

Notes:

ft. bgs.	Feet below ground surface
TTLC	Total Threshold Limit concentration
MTBE	Methyl tert-Butyl Ether
NA	Not analyzed
ND	Not detected above laboratory reporting limits
µg/L	micrograms per Liter

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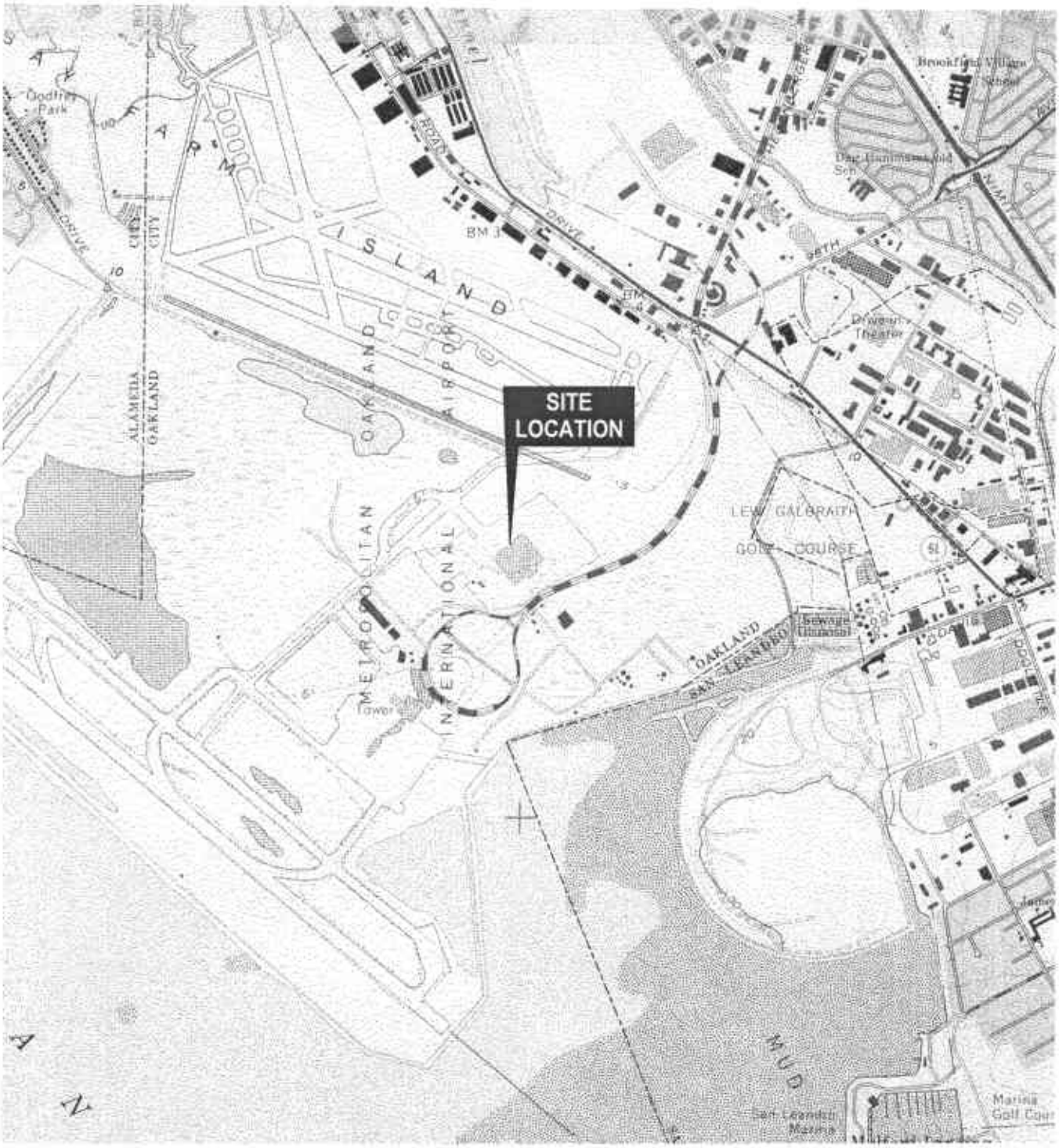


USGS 7.5 MINUTE
SAN LEANDRO, CA QUADRANGLE
1959, PHOTOREVISED 1980

NORTH

0 1000 2000

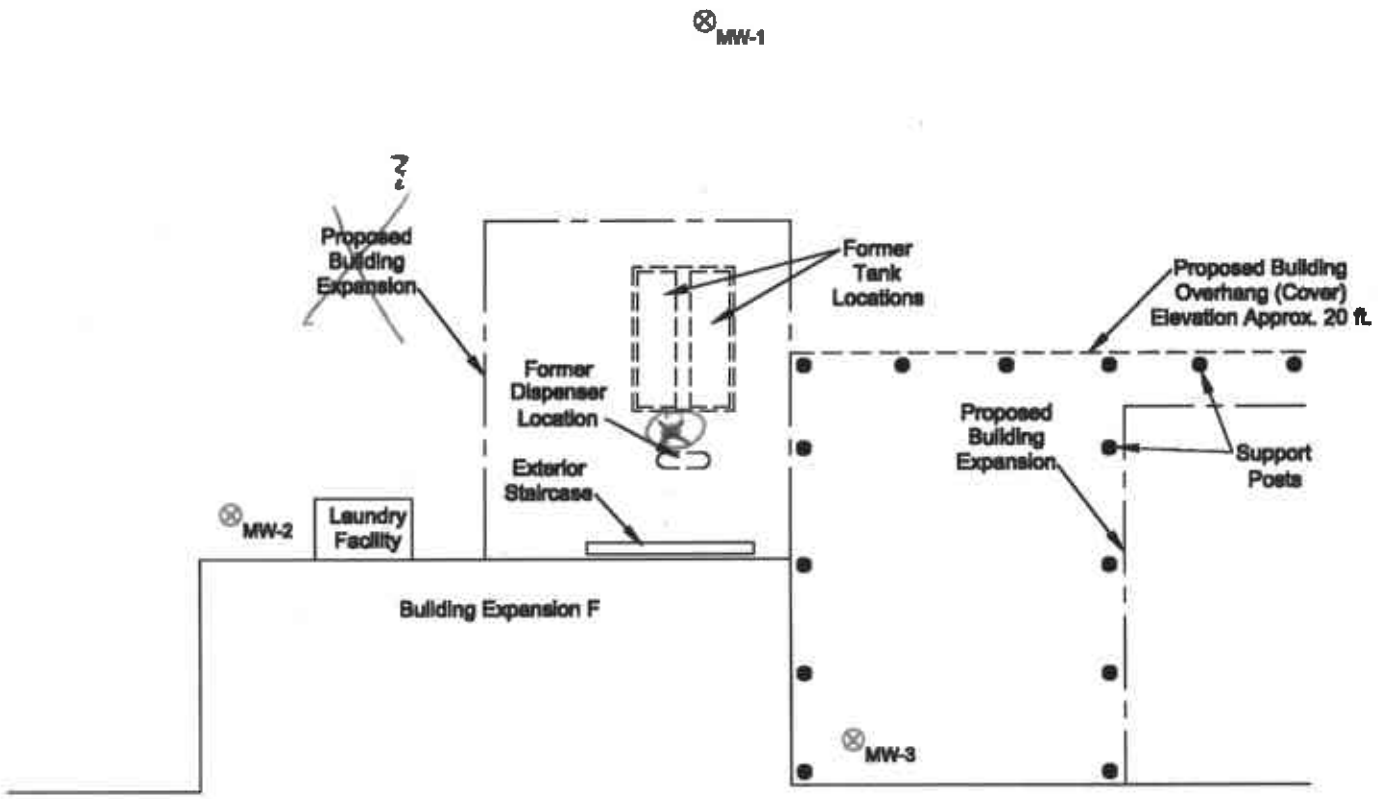
FEET

ENSR

FIGURE 1
SITE LOCATION MAP

United Airlines
Oakland International Airport
Oakland, CA

DRAWN: J. Gierek	DATE: 9/22/98	PROJECT NO. 6908-A92	REV.
FILE: Ens\6908\050\UAL_inf.dsf			



LEGEND

⊗ MW-1 Proposed Well Location

NORTH

0 20 40

APPROX. SCALE IN FEET

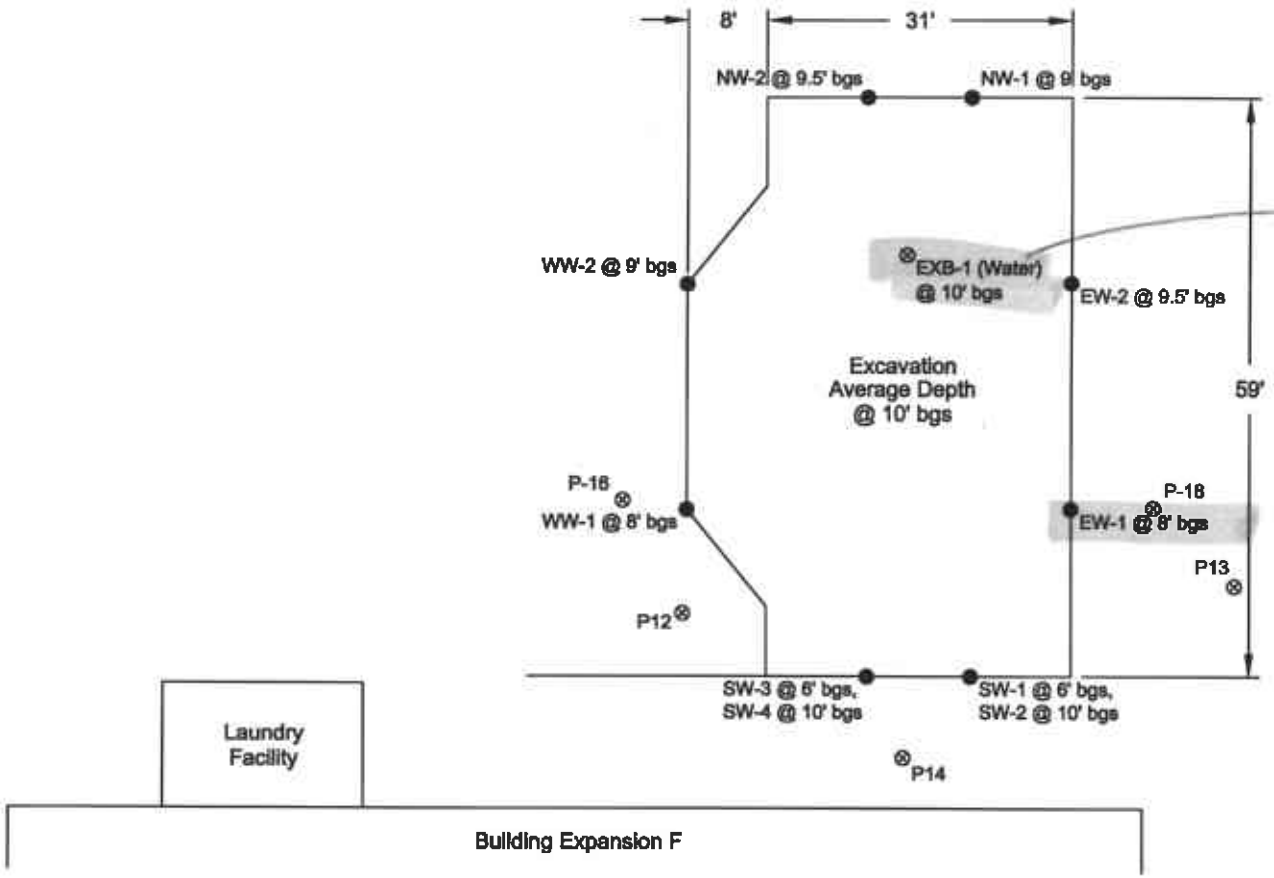
ENSR.

FIGURE 2

PROPOSED MONITORING WELL LOCATIONS

United Airlines
Oakland International Airport
Oakland, CA

DRAWN: J. Gierek	DATE: 5/7/99	PROJECT NO: 6908-050-200	REV.
FILE: Ensr\6906\050\Proposed40.dwg			



14 mg/l gca
7.3 mg/l diesel
1.1 mg/l B

LEGEND

WW-1 @ 8' bgs — Soil Samples Collected by ENSR, January 1999

P13 — Geoprobe Locations by Burns & McDonnell, 1997

NORTH

0 10 20
FEET

ENSR.

FIGURE 3

OVER-EXCAVATION DETAIL

United Airlines
Oakland International Airport
Oakland, CA

DRAWN: J. Glerek	DATE: 2/23/99	PROJECT NO: 6908-050-200	REV.
FILE: Ensr\6908\050\UAL_Plan3.dwg			

APPENDIX A

ALAMEDA COUNTY
ENVIRONMENTAL HEALTH SERVICES LETTER

ALAMEDA COUNTY
HEALTH CARE SERVICES
AGENCY
DAVID J. KEARS, Agency Director

ENVIRONMENTAL HEALTH SERVICES
ENVIRONMENTAL PROTECTION (LOP)
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577
(510) 567-6700
FAX (510) 337-9335

April 8, 1999
StID # 1049

Mr. Dennis Moulton
United Airlines
1100 Airport Drive
Oakland CA 94621

Re: Underground Tank Removals at United Airlines Maintenance Facility, 1100 Airport Drive, Oakland CA 94621

Dear Mr. Moulton:

Thank you for the onsite visit on April 7, 1999 which allowed me to see the location of the recently removed underground storage tanks and the other United Airline underground tank site. I have received and reviewed the **March 1999 ENSR Underground Storage Tanks Closure Report.** The report includes the details of the removal of the 10k diesel and 10k unleaded gasoline tanks, in addition to the closure-in-place of the two 8,500 gallon fire suppression tanks. Also included is the Burns & McDonnell October 22 and 23, 1997 report of soil and groundwater samples taken around both of these tank areas. Based on the absence of the detection of ethylene glycol in the soil and groundwater samples next to the fire suppression tanks, no further action is necessary for these tanks.

However, our office does not agree with the ENSR report, which recommends no further action for the former diesel and gasoline tanks. We agree that no further soil excavation is practical but the impact to groundwater will need further investigation. As you may be aware, the Regional Water Quality Control Board (RWQCB) has requirements for the closure of low risk soil and groundwater cases. Those requirements, which may be questioned for closure of this site are:

- The adequacy of site characterization
- Whether the contaminant plume is migrating and
- Whether water wells, surface water or other sensitive receptors are likely to be impacted

In addition, special concern is given in the presence of the chemical, MTBE, which has unique chemical properties, making it very difficult to remediate. Looking at the requirements in question, it is clear that residual soil and groundwater contamination exists and it likely extends beneath the existing building. Samples collected adjacent to the building indicate the presence of TPH and MTBE in soil and/or groundwater. Since the existing building limited the original investigation, the extent of the contamination was not fully delineated.

Because of the chemical properties of MTBE and the evolving Water Board policy, case closure of residual MTBE cases have additional requirements than that of petroleum. The site must not have any conduits, which could allow lateral or vertical migration. All potential receptors must be protective. Please submit a work plan for additional site characterization. Please submit your work plan **within 45 days or by May 21, 1999.** I recommend that you have your consultant contact me to discuss their recommendations.

Sincerely,

Barney M Chan

Barney M. Chan
Hazardous Materials Specialist

C: B. Chan, files
Mr. D. Klettke, Port of Oakland, 530 Water St., Oakland CA 94607
Mr. A. Klein, ENSR, 10324 Placer Lane, Suite 200, Sacramento, CA 95827
Wprq1100Airport

APPENDIX B

HEALTH & SAFETY PLAN

ENSR

HEALTH AND SAFETY PLAN

for

Groundwater Assessment
United Airlines Bldg. M-110
1100 Airport Drive
Oakland, California

Prepared by: _____ Date: 7-2-99
Alan J. Klein
ENSR Project Manager

Approved by: _____ Date: 6-25-99
Oliver Baptiste
ENSR Regional Health and Safety Manager

Table of Contents

1. Introduction

1.1 HASP Applicability

This site-specific Health and Safety Plan (HASP) has been developed by ENSR Consulting and Engineering (ENSR), to establish the health and safety procedures required to minimize any potential risk to ENSR and contractor personnel involved with subsurface investigation activities at 1100 Airport Drive, Oakland, California.

The provisions of this plan apply to all ENSR personnel and ENSR subcontractor personnel who may potentially be exposed to safety and/or health hazards related to activities described in Section 3.0 of this document.

This HASP has been written to comply with the requirements of the Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120), and California Code of regulation (CCR) Title 8 Section 5192. All activities covered by this HASP must be conducted in complete compliance with this HASP and with all applicable federal, state, and local health and safety regulations. Personnel covered by this HASP who cannot or will not comply will be excluded from site activities.

This plan will be distributed to each employee involved with investigation activity at the Site. Each employee must sign a copy of the attached health and safety plan sign-off sheet (see Attachment A).

This HASP only pertains to the tasks, which are listed in Section 3.0. A task specific HASP or addenda to this HASP will be developed at a later date for any other subsequent investigative/remedial activities at the Site.

1.2 Organization/Responsibilities

The implementation of health and safety at the Site will be the shared responsibility of the ENSR Project Manager (PM), the ENSR Regional Health and Safety Manager (RHSM), the ENSR Project Site Safety Officer (SSO) and all other ENSR and contractor personnel.

1.2.1 ENSR Project Manager

The ENSR PM is, by designation, the individual who has the primary responsibility for ensuring the overall health and safety of this project. The PM therefore has the primary responsibility

for ensuring the implementation of the requirements of this HASP. Some of the PM's specific responsibilities include:

- Providing the RHSM with updated data regarding the types and extent of contamination at the Site;
- Assuring that all personnel to whom this HASP applies have received a copy and have submitted a completed copy of the HASP sign-off form;
- Assuring that all ENSR and subcontractor personnel submit documentation of the medical surveillance and training requirements specified in Sections 9.1 and 9.2 of this HASP;
- Assuring that all personnel to whom this HASP applies have attended a pre-entry briefing prior to entering an exclusion zone;
- Maintaining a high level of health and safety consciousness among employees at the work site; and
- Maintaining regular communications with the SSO and, if necessary, the RHSM.

1.2.2 ENSR Regional Health and Safety Manager (RHSM)

The ENSR RHSM (Oliver G. Baptiste) is the individual responsible for the preparation, interpretation and where appropriate, modification of this HASP. Modifications to this HASP which may result in less stringent precautions cannot be undertaken by the PM or the SSO without the approval of the RHSM. Specific duties of the RHSM include:

- Writing, approving and amending the HASP for this project;
- Advising the PM and SSO on matters relating to health and safety on this site;
- Recommending appropriate personal protective equipment (PPE) and air monitoring instrumentation to protect personnel from potential site hazards;
- Conducting accident investigations; and,
- Maintaining regular contact with the PM and SSO to evaluate site conditions and new information which might require modifications to the HASP.

1.2.3 ENSR Site Safety Officer (SSO)

The ENSR SSO, appointed by the PM, will be on-site during all the activities covered by this HASP. The SSO is responsible for enforcing the requirements of this HASP once on-site work begins. By design, the SSO has the authority, and the responsibility, to immediately correct all situations where noncompliance with this HASP is noted and to immediately stop work in cases where an immediate danger is perceived. Some of the SSO's specific responsibilities include:

- Procuring and distributing the PPE needed for this project for ENSR employees;

- Verifying that all PPE and health and safety equipment is in good working order;
- Procuring the necessary air monitoring equipment for this project and ensuring the required monitoring is conducted in accordance with this plan;
- Setting up and maintaining the contamination reduction zone within the exclusion areas and assuring proper decontamination of all site personnel and equipment;
- Notifying the PM and RHSM of all noncompliance situations and stopping work in the event that an immediate danger situation is perceived;
- Assisting with accident/incident investigations and preparing accident/incident investigation reports;
- Conducting the pre-entry briefing in accordance with Section 9.3; and
- Initiating emergency response procedures in accordance with Section 10.0 of this HASP.

1.2.4 ENSR Field Personnel and Covered Contractor Personnel

All ENSR field personnel and contractor personnel covered by this HASP are responsible for following the health and safety procedures specified in this HASP and for performing their work in a safe and responsible manner. Some of the specific responsibilities of the field personnel are as follows:

- Reading the HASP in its entirety prior to the start of on-site work;
- Submitting a completed HASP Acceptance Form and documentation of medical surveillance and training to the ENSR PM prior to the start of work;
- Attending the required pre-entry briefing prior to beginning on-site work;
- Bringing forth any questions or concerns regarding the content of the HASP to the PM or the RHSM prior to the start of work;
- Reporting all accidents, injuries and illnesses, regardless of their severity, to the ENSR SSO; and
- Complying with the requirements of this HASP and the requests of the SSO.

In addition to other requirements referenced in this HASP, all contractors are required to:

- Provide appropriate PPE for their employees;
- Ensure, via daily inspections, that their equipment is maintained in good working condition;
- Operate their equipment in a safe manner; and
- Appoint an on-site safety coordinator to interface with the ENSR SSO.

1.3 Modification of the HASP

The procedures in this HASP have been developed based on information determined during the Phase II Investigation. Should additional information become available regarding potential on-site hazards, it may be necessary to modify this HASP. All proposed modifications to this HASP must be reviewed and approved by the ENSR RHSM before such modifications are implemented.

Any significant modifications must be incorporated into the written document as addenda and the HASP must be reissued. The ENSR PM will ensure that all personnel covered by this HASP receive copies of all issued addenda. Sign-off forms will accompany each addendum and must be signed by all personnel covered by the addendum. Sign-off forms will be submitted to the ENSR PM. The HASP addenda should be distributed during the daily safety meeting so that they can be reviewed and discussed. Attendance forms will be collected during the meeting.

2. Site Description and History

2.1 Site Description

The Subject Property is located at Oakland International Airport, United Airlines Building M-110, 1100 Airport Drive, Oakland, California (Figure1). The subject area is located on the northwest side of Building M-110, which is used for airplane maintenance.

The surrounding surface area is a graded, relatively flat area, paved with asphalt concrete. The site exists at an approximate elevation of five feet above mean sea level. The nearest body of water is the San Francisco Bay located approximately 0.5 miles south of the Site (U.S.G.S. San Leandro Quadrangle, Photo-revised 1980). Soils encountered to depths of ten feet below ground surface (bgs) consist of fine sand. Soils encountered greater than 10 feet bgs consist of Bay Mud. The depth to first groundwater is approximately 6 t0 10 feet bgs.

2.2 Site History

On January 15, 1999, one 10,000-gallon diesel fuel UST, one 10,000-gallon unleaded gasoline UST, a dispenser island and associated piping. Approximately 758 cubic-yards of soil were removed and properly disposed of during over-excavation activities.

Upon completion of over-excavation, ENSR collected a total of ten soil samples and one groundwater sample from the excavation. Soil and groundwater samples were submitted for the following chemical analysis:

- EPA Method 8015, for total petroleum hydrocarbons (TPH) as diesel fuel;
- EPA Method 8015, for TPH as gasoline;
- EPA Method 8020, for Benzene, Toluene, Xylenes, and Ethylbenzene (BTXE); and
- EPA 8260, for Methyl tertiary butyl ether (MTBE).

The following Constituents of concern were detected in soil samples collected from the excavation sidewalls:

- In soil sample SW-1-6', laboratory results detected the presence of TPH as diesel fuel at 16,000 milligrams per kilogram (mg/kg), gasoline at 530 mg/kg, and benzene at 1.9 mg/kg.

- In soil sample EW-1-8', laboratory results detected the presence of gasoline at 2.4 mg/kg, and benzene at 0.65 mg/kg.

- MTBE was detected in soil samples SW-2-10' at 49 micrograms per kilogram (µg/kg), SW-3-6' at 5.5 µg/kg, EW-1-8' at 7.8 µg/kg, and in EW-2-9.5' at 22 µg/kg.

The following Constituents of concern were detected in a groundwater sample collected from the excavation bottom:

- In groundwater sample EXB-1, laboratory results detected the presence of TPH as diesel fuel at 7,300 micrograms per liter (µg/L), gasoline at 14,000 µg/L, benzene at 1,100 µg/L and MTBE at 130 µg/L.

3. Scope of Work

The scope of work covered by this HASP includes activities associated with the installation of groundwater monitoring wells and assessment activities at 1100 Airport Drive, Oakland, California.

ENSR will oversee the installation of three groundwater monitoring wells using hollow-stem auger technique. During drilling activities soil samples will be collected and field screened using a photoionization detector (PID). Upon completion of the wells, ENSR will purge three well volumes and collect groundwater samples from each well.

A detailed scope of work is presented in the work plan.

4. Chemical Hazard Assessment and Controls

4.1 Site's Potential Chemical Contaminants

The potential chemical contaminants at this site are:

- Petroleum hydrocarbons
- Methyl tertiary butyl ether

4.1.1 Petroleum Hydrocarbons

Petroleum is a highly complex mixture of aliphatic and aromatic hydrocarbons. Benzene, toluene, xylene and ethylbenzene are some of the more common aromatic hydrocarbons present. On the aliphatic side, common components include pentane, hexane, heptane, and octane.

4.1.1.1 Toxicity Concerns of Petroleum Hydrocarbons

Exposure to the vapors of benzene, ethylbenzene, toluene and xylenes above their respective exposure limits may produce irritation of the mucous membranes of the upper respiratory tract, nose and mouth. Overexposure may also result in the depression of the central nervous system. Symptoms of such exposure include drowsiness, headache, fatigue and drunken-like behaviors. Chronic and prolonged overexposure to the vapors of benzene may cause damage to the blood-forming organs and is known to cause leukemia in humans.

Aliphatic hydrocarbons are asphyxiants and central nervous system depressants. Aliphatic hydrocarbons with lower molecular weights such as pentane, hexane, heptane, and octane cause narcosis. Hexane has neurotoxic properties. Another common from exposure to aliphatic hydrocarbons is irritation of the skin and mucous membranes of the upper respiratory tract. Repeated or prolonged skin contact may result in dermatitis due to defatting of the skin.

Neither an OSHA PEL (permissible exposure limit) nor an ACGIH TLV (threshold limit value) have been established for petroleum hydrocarbons. However, both OSHA and the ACGIH have established exposure limits for all of the common petroleum hydrocarbon components. They are provided in the table in section 4.1.2 of this HASP.

Halogenated aliphatic hydrocarbons are used as commercial solvents, and intermediates in organic synthesis. Examples of these compounds include carbon tetrachloride, tetrachloroethene, trichloroethane, 1,1,1 trichloroethane, methylene chloride, vinyl chloride, and ethylene dibromide. Halogenated aliphatic hydrocarbons cause central nervous system

depression as well as dermatitis. Target organ effects include liver and kidney damage. Vinyl chloride is a known carcinogen and several others in this group are potential carcinogens.

4.1.1.2 Flammability Concerns of Petroleum Hydrocarbons

Petroleum hydrocarbons typically have flash points in excess of 100 °F and are therefore considered to be combustible liquids.

4.1.2 Methyl Tertiary Butyl Ether

MBTE is an additive used to increase the octane ratings of gasoline. Direct contact with the liquid may cause minor skin and eye irritation. Prolonged or repeated inhalation of MBTE vapor may cause irritation of the respiratory tracts as well as depression of the central nervous system.

4.1.3 Summary of Hazardous Properties of Potential Contaminants

Chemical Name	PEL[1]	TLV[2]	VP[3]	VD[4]	SG[5]	SOL[6]	FP[7]	LEL[8]	UEL[9]
Petroleum hydrocarbon	None	None	? < 10	4.5	< 1	Insol.	> 100	0.6	7.5
Benzene	1	0.5	75	2.8	0.9	0.18	12	1.3	7.1
Toluene	200	50	22	3.2	0.9	0.05	40	1.3	7.1
Ethylbenzene	100	100	7.1	3.8	0.9	0.015	59	1	6.7
Xylene	100	100	8	3.8	0.9	0.00003	85	1.1	7
Pentane	1000	600	426	2.6	0.6	0.04	-57	1.5	7.8
Hexane	500	50	124	3.1	0.7	0.014	-7	1.1	7.5
Heptane	500	400	40	3.6	0.7	0.005	25	1.1	6.7
Octane	500	300	11	4.0	0.7	0.04	56	1	6.5

[1] OSHA Permissible Exposure Limit in ppm unless otherwise noted.
[2] ACGIH Threshold Limit Value in ppm unless otherwise noted.
[3] Vapor Pressure in mm Hg
[4] Vapor Density (air = 1)
[5] Specific Gravity (water = 1)
[6] Solubility in Water in %
[7] Flash Point in °F
[8] Lower Explosive Limit in % by volume
[9] Upper Explosive Limit in % by volume
NA = Not Applicable
? = Not known

4.1.4 Chemical Exposure Potential

Groundwater and soil at the site is impacted with moderate concentrations of TPH as gasoline and diesel fuel, MBTE and other constituents. During this investigation the field team will come in contact with soil and groundwater, however, the concentrations of contamination are not expected to be significant. The potential routes of exposure to the contaminants of concern include:

- Dermal contact with contaminated groundwater during soil boring/well installation and sample collection
- Inhalation of vapors if grossly contaminated soils are encountered

4.1.5 Chemical Exposure Controls

ENSR will be conducting air monitoring in the worker's breathing zone to determine exposure to vapors during the subsurface investigations. If exposures exceed the action levels as defined in Section 6.1, respiratory protection as discussed in Section 7.2, will be donned.

To avoid direct dermal contact with contaminated media, protective clothing, as described in Section 7.1, will be required when collecting samples and decontaminating sampling equipment.

Although highly unlikely, exposure to all of the contaminants of concern may occur via ingestion (hand-to-mouth transfer). The decontamination procedures described in Section 8.0 address personal hygiene issues that will limit the potential for contaminant ingestion.

4.2 Hazardous Substances Brought On-Site by ENSR

A material safety data sheet (MSDS) must be available for each hazardous substance that ENSR bring on the property. This includes solutions/chemicals that will be used to decontaminate sampling equipment. All containers of hazardous materials must be properly labeled in accordance with OSHA's Hazard Communication Standard.

For this project, the only chemicals likely to brought on site by ENSR or its subcontractors will be Liquinox® detergent, neutralizing agents and fuels. Material Safety Data Sheets (MSDSs) for these products are included in Attachment C of this HASP.

5. Physical Hazards and Controls

5.1 Underground Utility Hazards

California law requires that a utility clearance survey must be performed before any subsurface activities are performed. This law applies to private property as well as public property and covers all subsurface activities, regardless of depth. The utility clearance survey must be requested from:

Underground Service Alert (USA) North at 1-800-227-2600.

The survey must be requested at least 2 full business days, but no more than 14 business days, prior to conducting the subsurface activities. You will be given a USA request number, which you should record and keep in your records at the site. The USA request number must be updated by requesting a remark every 14 days if subsurface activities continue. Prior to the survey, the law requires that you outline the area in which the subsurface activities will take place in white paint. Remember that digging outside of your originally specified boundaries requires that a new survey be performed.

Be aware that utility companies often can not identify the exact location of their underground services once they cross onto private property. Private property owners may have rerouted these services or installed their own. On private property, a representative of the client should pre-approve the location of all subsurface activities.

5.2 Overhead Utility Hazards

Any vehicle or mechanical equipment that is capable of having parts of its structure elevated near energized overhead lines shall be operated so that a minimum clearance of 10 feet is maintained at all times. Alternatively, the line may be de-energized.

5.3 Drilling Hazards

Use of hollow-stem auger drilling technique install groundwater monitoring wells and to collect soil samples will require all personnel in the vicinity of the operating unit to wear steel-toed boots, hardhats, and hearing protection and safety eyewear. Personnel shall not remain in the vicinity of operating equipment unless it is required for their work responsibilities. Additionally, the following safety requirements must be adhered to:

- A remote vehicle ignition is located on the control panel of the drill rig. This allows the operator to start and stop the vehicle engine from the rear. This device must be tested

prior to job initiation and periodically thereafter. All employees should be aware of how to access and operate the rear ignition.

- Check for overhead obstacles before raising the boom.
- Check for underground utilities before breaking ground.
- The driller must never leave the controls while the auger is being operated.
- Drillers, helpers and geologists must secure all loose clothing when in the vicinity of drilling operations.
- The drill rig shall not be moved any distance in the extended position.
- Be sure the parking brake is set before drilling.
- Never allow the derrick foot to be lifted more than 6" off of the ground surface.
- Deactivate hydraulics when adding or removing augers, anvils or any tool in the hammer.
- Verify that all threaded parts are completely threaded together before drilling.

5.4 Traffic Hazards

In areas where active traffic is close to the work traffic control measures must implemented. Workers will wear orange traffic vests and traffic cones will be placed appropriately (at least 50 feet in front of work area). "Men at Work" signs should also be placed in a conspicuous area to warn others of your presence.

5.5 Noise Exposure

The use of a drilling rig will generate noise levels that will require the use of hearing protection in the immediate vicinity. Appropriate earmuff or earplugs (i.e., with an NRR greater than 25 dB) should be worn to prevent overexposure. The general rule of thumb is that if you have to raise your voice to be understood by someone who is standing 3 to 5 feet away from you, the noise levels are likely to be above 85 dB and therefore require the use of hearing protection.

5.6 Heat Stress

5.6.1 Types of Heat Stress and Their Symptoms

Heat related problems include **heat rash, fainting, heat cramps, heat exhaustion and heatstroke**. **Heat rash** can occur when sweat isn't allowed to evaporate; leaving the skin wet most of the time and making it subject to irritation. **Fainting** may occur when blood pools to lower parts of the body and as a result, does not return to the heart to be pumped to the brain. Heat related fainting often occurs during activities that require standing erect and immobile in the heat for long periods of time. **Heat cramps** are painful spasms of the muscles due to excessive salt loss associated with profuse sweating.

Heat exhaustion results from the loss of large amounts of fluid and excessive loss of salt from profuse sweating. The skin will be clammy and moist and the affected individual may exhibit giddiness, nausea and headache.

Heat stroke occurs when the body's temperature regulatory system has failed. The skin is hot, dry, red and spotted. The affected person may be mentally confused and delirious. Convulsions could occur. EARLY RECOGNITION AND TREATMENT OF HEAT STROKE ARE THE ONLY MEANS OF PREVENTING BRAIN DAMAGE OR DEATH. A person exhibiting signs of heat stroke should be removed from the work area to a shaded area. The person should be soaked with water to promote evaporation. Fan the person's body to increase cooling.

Early symptoms of heat-related health problems include:

- decline in task performance
- incoordination
- decline in alertness
- unsteady walk
- excessive fatigue
- reduced vigilance
- muscle cramps and
- dizziness

Increased body temperature and physical discomfort also promote irritability and a decreased attention to the performance of hazardous tasks.

5.6.2 Susceptibility to Heat Stress

Susceptibility to heat stress increases due to:

- lack of physical fitness
- obesity
- lack of acclimation
- drug or alcohol use
- increased age
- sunburn
- dehydration and
- infection.

People unaccustomed to heat are particularly susceptible to heat fatigue. Individuals who are acclimated need to gradually adjust to the heat.

5.6.3 The Effect of Personal Protective Equipment on Heat Stress

Sweating normally cools the body as moisture is removed from the skin by evaporation. However, the wearing of certain personal protective equipment (PPE), particularly chemical protective coveralls (e.g., Tyvek®), reduces the body's ability to evaporate sweat and thereby regulate heat buildup. The body's efforts to maintain an acceptable temperature can therefore become significantly impaired by the wearing of PPE.

5.6.4 Measures to Avoid Heat Stress:

The following guidelines should be adhered to when working in hot environments:

- Establish work-rest cycles (short and frequent are more beneficial than long and seldom).
- Identify a shaded, cool rest area.
- Rotate personnel, alternative job functions.
- Water intake should be equal to the sweat produced. Most workers exposed to hot conditions drink less fluids than needed because of an insufficient thirst. DO NOT DEPEND ON THIRST TO SIGNAL WHEN AND HOW MUCH TO DRINK. For an 8-hour workday, 50 ounces of fluids should be drunk.
- Eat lightly salted foods or drink salted drinks such as Gatorade to replace lost salt.
- Save most strenuous tasks for non-peak heat hours such as the early morning or at night.
- Avoid alcohol during prolonged periods of heat. Alcohol will cause additional dehydration.
- Avoid double shifts and/or overtime.

The implementation and enforcement of the above mentioned measures will be the joint responsibility of the project manager, on-site field coordinator, and health and safety officer. Potable water and fruit juices should be made available each day for the field team.

5.6.5 Heat Stress Monitoring Techniques

Site personnel should regularly monitor their heart rate as an indicator of heat strain by the following method:

- Radial pulse rates should be checked at the beginning of each rest cycle. Use the fore and middle fingers to apply light pressure to the pulse in the wrist. Count the beats over a one minute period. If the pulse rate exceeds 110 beats/minute, the next work

cycle should be shortened by one-third, while keeping the rest period the same. If, after the next rest period, the pulse rate still exceeds 110 beats/minute, the work cycle should be shortened again by one-third.

6. Air Monitoring

ENSR will conduct the following air monitoring to determine employee exposure to the vapors of the contaminants of concern during all subsurface investigation activities.

6.1 Direct Reading Instruments

6.1.1 Photoionization Detector

A photoionization detector (PID) equipped with a 10.6 eV lamp will be used to monitor the breathing zone of personnel during subsurface investigations and sampling activities at this site. When the PID indicates sustained (15 minute) breathing zone vapor concentrations in excess of 50 units or more above background, in the absence of benzene, respiratory protection, as described in Section 7.2 of this document, will be donned.

6.1.2 Detector Tube

A detector tube kit (such as the Dräger Tube Measurement System) equipped with benzene specific detector tubes (such as the Dräger Benzene 0.5/c tube - part no. 81 01841) will be used to qualify and quantify benzene in atmosphere when PID readings are sustained above 10 units as described above. The detector tube action limit for respiratory protection will be 1 ppm (sustained over a 10 minute period).

6.1.3 Summary of Direct Reading Air Monitoring Procedures

Instrument	Action Limit	Action
PID	10 Units 50 Units	Collect benzene detector tube sample Don respiratory protection as described in 7.2
Benzene Detector Tube	1 Unit	Don respiratory protection as described in 7.2

6.2 Personal Air Sampling

Personal air monitoring at this site will not be conducted by ENSR during the activities covered by this HASP.

6.3 Calibration and Recordkeeping

Equipment used by ENSR will be used and calibrated in accordance with the manufacturer's instructions and with ENSR's standard operating procedures.

The PID should be calibrated against a standard, typically 50 – 100 ppm isobutylene, daily as it is used.

Detailed information on calibration procedures and the results of on-site sampling will be recorded in a project specific field notebook.

7. Personal Protective Equipment

Personal protective equipment (PPE) will be worn during these activities to prevent on-site personnel from being injured by the safety hazards posed by the site and/or the activities being performed. In addition, chemical protective clothing will be worn to prevent direct dermal contact with the site's chemical contaminants. The following table describes the PPE and chemical protective clothing to be worn for general site activities and for certain specific tasks.

7.1 Chemical Protective Clothing

PPE Item	General	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
Hard Hat	✓	✓	✓				
Steel Toed Safety Shoes	✓	✓	✓	✓			
Safety Glasses with Sideshields	✓	✓	✓	✓			
Tyvek® Coveralls			✓*				
Inner PVC/Outer Nitrile Gloves		✓	✓				
Hearing Protection		✓					

General - Site reconnaissance, setup, day to day operations, etc.

Task 1 –Soil borings activities

Task 2 – Soil and groundwater sampling activities (✓* activities involving direct contact with soils potentially contaminated with hydrocarbons)

Task 3 – Backfilled cored drill holes with neat cement

7.2 Respiratory Protection

Respiratory protection will be required if airborne concentrations within a worker's breathing zone are sustained (over a 15 minute period) above the respiratory protection action limits listed in the table below.

Task	Instrument	Action Limit	Respiratory Protection
All tasks involving potential exposure to contaminated soils and/or groundwater.	PID	50 units	Half mask respirator with combination organic vapor/HEPA cartridges.

Respiratory protection should also be donned if odors become objectionable at any time or if respiratory tract irritation is noticed.

All employees who are expected to don respiratory protection must have successfully passed a qualitative or quantitative fit-test within the past year for the brand, model and size respirator they plan to don. Employees with facial hair that comes between that interferes with the sealing surfaces of the respirator will not be allowed to wear respiratory protection and therefore may not perform activities that require its use.

7.3 Other Protective Equipment

The following additional safety items should be available at the site:

- Portable, hand-held eyewash bottles
- First aid kit

8. Site Control/Decontamination

To prevent both exposure of unprotected personnel and migration of contamination due to tracking by personnel or equipment, hazardous work areas will be clearly identified and decontamination procedures will be required for personnel and equipment leaving those areas.

8.1 Designation of Zones

ENSR designates work areas or zones as suggested in the "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities," NIOSH/OSHA/USCG/EPA, November 1985. They recommend that the areas surrounding each of the work areas to be divided into three zones:

- Exclusion or "hot" Zone
- Contamination Reduction Zone (CRZ)
- Support Zone

8.1.1 Exclusion Zone

The exclusion zone will include the immediate active work areas where soil and groundwater activities take place. All personnel entering the exclusion zone must be trained in accordance with the requirements defined in Section 9.2 of this HASP and must wear the prescribed level of personal protective equipment.

8.1.2 Decontamination Zone

The decontamination zone will be established adjacent to the exclusion zone. If they are worn, personnel will remove contaminated gloves, Tyvek® and other disposable items in this area and place them in a plastic bag until they can be properly disposed of in accordance with the work plan requirements.

8.1.3 Support Zone

At this site the support zone will include the area outside of the exclusion zone.

8.2 Decontamination

8.2.1 Personal Decontamination

Proper decontamination is required of all personnel before leaving the exclusion zone. Decontamination will occur within the contamination reduction zone.

Regardless of the type of decontamination system required, as a minimum, a container of potable water and liquid soap should be made available so employees can wash their hands and face before leaving the site for lunch or for the day. Employees should always wash their face and hands with soap and water before eating, smoking or drinking.

8.2.2 Equipment Decontamination

Equipment decontamination procedures will be accomplished according to ENSR's SOP, entitled "Decontamination of Equipment N0. 7600".

8.3 General Site Safety Practices

The following measures are designed to augment the specific health and safety guidelines provided in this plan.

- Eating, drinking, chewing gum or tobacco, smoking or any practice that increases the probability of hand-to-mouth transfer and ingestion of materials is prohibited in the immediate work area and the decontamination zone.
- Smoking is prohibited in all work areas. Matches and lighters are not allowed in these areas.
- Hands and face must be thoroughly washed upon leaving the work area and before eating, drinking or any other activities.
- Beards or other facial hair that interfere with respirator fit are prohibited.
- The use of alcohol or illicit drugs is prohibited during the conduct of field operations.
- All equipment must be decontaminated or properly discarded before leaving the site in accordance with the project work plan.

9. Medical Monitoring and Training Requirements

9.1 Medical Monitoring

All personnel performing activities covered by this HASP must be active participants in ENSR's Medical Monitoring Program or in a similar program which complies with 29 CFR 1910.120(f). Each individual must have completed an annual surveillance examination and/or an initial baseline examination within the last year prior to performing any work on the site covered by this HASP.

9.2 Health and Safety Training

Additionally, all personnel performing activities covered by this HASP must have completed the appropriate training requirements specified in 29 CFR 1910.120(e). Each individual must have completed an annual 8-hour refresher training course and/or initial 40-hour training course within the last year prior to performing any work on the sites covered by this HASP.

On-site managers and supervisors directly responsible for supervising individuals engaged in hazardous waste operations must have completed the specified 8-hour managers training course. (Note that ENSR corporate policy requires that whenever three or more ENSR employees are performing work on the same site, at least one of these individuals must have completed the manager's training course.)

Although not required under 29 CFR 1910.120, it is recommended that one person qualified in First Aid and CPR be present during all site work.

9.2.1 Pre-Entry Briefing

Prior to the commencement of on-site activities, a pre-entry briefing will be conducted by the ENSR Site Safety Officer or ENSR Project Manager to review the specific requirements of this HASP. Attendance of the pre-entry meeting is mandatory for all personnel covered by this HASP and must be documented on the attendance form provided in Attachment B. Copies should be maintained on site in the project files. HASP sign-off sheets should also be collected and filed at the time of the pre-entry briefing.

The pre-entry briefing must be completed for each new employee before they begin work at the site.
Short safety refresher meetings will be conducted, as needed, throughout the duration of the project

10. Emergency Response

OSHA defines emergency response as any "response effort by employees from outside the immediate release area or by other designated responders (i.e., mutual-aid groups, local fire departments, etc.) to an occurrence which results, or is likely to result in an uncontrolled release of a hazardous substance." According to ENSR policy, ENSR personnel shall not participate in any emergency response where there are potential safety or health hazards (i.e., fire, explosion, or chemical exposure). ENSR response actions will be limited to evacuation and medical/first aid as described within this section below. As such this section is written to comply with the requirements of 29 CFR 1910.38 (a).

10.1 Emergency Response Training

Employees must be instructed in the specific aspects of emergency evacuation applicable to the site.

- The type(s) of potential emergencies that may occur at the facility
- The sound and meaning of the facility's emergency alarms and signals
- The escape routes and procedures for exiting the facility in the event of an emergency
- The designated place of refuge where employees should gather in the event of evacuation

10.2 Employee Accounting Method

The ENSR SSO is responsible for keeping track of all ENSR personnel on-site at all times. A representative from ENSR's subcontractor(s) should be given the same responsibility for their employees. In the event of an emergency that requires evacuation from the facility, the ENSR SSO will organize ENSR and subcontractor personnel at the place of refuge and attempt to account for all personnel that were on-site at the time of the emergency. If one or more employees are missing, the SSO should inform the ESNR PM and the local Fire Department that responds to the emergency.

10.3 Rescue and Medical Duty Assignments

The phone numbers of the police and fire departments, ambulance service, local hospital, and ENSR representatives are provided in the Emergency Reference Sheet that appears at the end of this section. In addition, this sheet also contains the directions to the nearest hospital.

In the event an injury or illness requires more than first aid treatment, the SSO will accompany the injured person to the medical facility and will remain with the person until release or admittance is determined. The escort will relay all appropriate medical information to the on-site project manager and the RHSM.

If the injured employee can be moved from the accident area, he or she will be brought to the CRZ where their PPE will be removed. If the person is suffering from a back or neck injury the person will not be moved and the requirements for decontamination do not apply. The SSO must familiarize the responding emergency personnel about the nature of the site and the injury. If the responder feels that the PPE can be cut away from the injured person's body, this will be done on-site. If this not feasible, decontamination will be performed after the injured person has been stabilized.

10.4 Accident Reporting and Investigation

Any incident (other than minor first aid treatment) resulting in injury, illness or property damage requires an accident investigation and report. The investigation should be conducted as soon as emergency conditions are under control. The purpose of the investigation is not to attribute blame but to determine the pertinent facts so that repeat or similar occurrences can be avoided. An ENSR accident investigation form is presented in Attachment D of this HASP. The injured ENSR employee's supervisor and the RHSM should be notified immediately of the injury. If a subcontractor employee is injured, they are required to notify the ENSR SSO. Once the incident is under control, the subcontractor will submit a copy of their company's accident investigation report to the ENSR SSO.

EMERGENCY REFERENCES

for

Groundwater Assessment
United Airlines Bldg. M-110
1100 Airport Drive
Oakland, California

Ambulance:	911	
Fire:	911	
Police:	911	
Medical Services:	Alameda County Medical Center 1411 East 31st Street Oakland, California	510-437-4800

Directions to Hospital:

The nearest hospital is located in Oakland, California, approximately 8.2 miles northwest of the site. To get to the hospital, proceed South on Airport Drive;
turn right onto Hegenberger Road;
Bear right onto I 880 (North) [Nimitz FWY];
Bear right onto 23rd Avenue exit;
Continue on 23rd Avenue, 23rd Ave becomes unnamed road;
Turn left onto E 12th Street;
Turn right onto 14th Avenue;
Turn slight left onto 15th Ave;
Turn left onto E 31st Street, and the hospital is approximately 0.1 miles at 1411 E 31st Street.

On Site Telephone: Mobile telephone

Underground Utility Location Service:

Underground Service Alert North	800-227-2600

ENSR Project Representatives:

ENSR/SACRAMENTO, CA	916-362-7100
Alan Klein (PM/SSO)	530-731-0180 (pager)
ENSR/IRVINE, CA	949-752-0403
Oliver Baptiste (RHSM)	714-729-2553 (pager)

Client Contact:

United Airlines	
Mr. Dennis Moulton	510-382-8020

Attachment A

Health and Safety Plan Receipt and Acceptance Form

Health and Safety Plan Receipt and Acceptance Form

for

Groundwater Assessment
United Airlines Bldg. M-110
1100 Airport Drive
Oakland, California

I have received a copy of the Health and Safety Plan prepared for the above-referenced site and activities. I have read and understood its contents and I agree that I will abide by its requirements.

Name (Print) _____

Signature _____ Date: _____

Representing (Print) _____
Company Name

Attachment B

Health and Safety Plan Pre-Entry Briefing Attendance Form

Health and Safety Plan Pre-Entry Briefing Attendance Form

for
Groundwater Assessment
United Airlines Bldg. M-110
1100 Airport Drive
Oakland, California

Briefing Conducted By: _____

Date Performed: _____

Printed Name	Signature	Representing

Attachment C

Material Safety Data Sheets

Mobil® The energy to make a difference™

AUTOMOTIVE GASOLINE, UNLEADED (NAM&R)
15024-34

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1. PRODUCT AND COMPANY IDENTIFICATION

APPROVAL DATE: 06/15/98

PRODUCT NAME: AUTOMOTIVE GASOLINE, UNLEADED (NAM&R)

SUPPLIER: MOBIL OIL CORP.
NORTH AMERICA MARKETING AND REFINING
3225 GALLOWS RD.
FAIRFAX, VA 22037

24 - Hour Emergency (call collect): 609-737-4411
Product and MSDS Information: 800-662-4525 609-224-4644
CHEMTREC: 800-424-9300 202-483-7616

2. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAMES AND SYNONYMS: HYDROCARBONS AND ADDITIVES

INGREDIENTS CONSIDERED HAZARDOUS TO HEALTH:

Substance Name	Wt%
GASOLINE (8006-61-9)	100
COMPONENT(S) OF PRODUCT INGREDIENTS INCLUDE:	
METHYL T-BUTYL ETHER (1634-04-4)	15
ETHANOL (64-17-5)	11
XYLENE (1330-20-7)	10
ISOPENTANE (78-78-4)	9
TOLUENE (108-88-3)	5
PSEUDOCUMENE (95-63-6)	5
BUTANE (106-97-8)	4
2-METHYLPENTANE (107-83-5)	4
PENTANE (109-66-0)	4
TRIMETHYL BENZENE (25551-13-7)	3
3-METHYLPENTANE (96-14-0)	2
BENZENE (71-43-2)	2
2,3-DIMETHYLBUTANE (79-29-8)	2
N-HEXANE (110-54-3)	2
ETHYL BENZENE (100-41-4)	2
3- METHYLHEXANE (589-34-4)	2
2- METHYLHEXANE (591-76-4)	1
METHYLCYCLOHEXANE (108-87-2)	1

NOTE: THIS MSDB ALSO COVERS REFORMULATED AND CARB PHASE 2 GASOLINE. The concentration of the components shown above may vary substantially. Because of volatility considerations, gasoline vapor may have concentrations of components very different from those of liquid gasoline. The major components of gasoline vapor are: butane, isobutane, pentane and isopentane. Federal RFG (reformulated) and Carb Phase 2 gasoline will contain oxygenates such as MTBE or ethanol at a

concentration to provide a minimum oxygen content of 1.5 Wt%. The reportable component percentages, shown in the Regulatory Information section, are based on API's evaluation of a typical gasoline mixture.
See Section 15 for European Label Information.
See Section 8 for exposure limits (if applicable).

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3. HAZARDS IDENTIFICATION

US OSHA HAZARD COMMUNICATION STANDARD: Product assessed in accordance with OSHA 29 CFR 1910.1200 and determined to be hazardous.
EFFECTS OF OVEREXPOSURE: Eye irritation, respiratory irritation, dizziness, nausea, loss of consciousness. Skin irritation. Studies (sponsored by API) conducted in the U.S. examining the mortality experience (causes of death) of distribution workers with long-term exposure to gasoline have not found any gasoline-related health effects. Case reports of chronic gasoline abuse (such as gasoline sniffing) and chronic misuse of gasoline as a solvent or as a cleaning agent have reported a range of neurological effects (nervous system effects), sudden deaths from cardiac arrest (heart attacks), hematologic changes (blood effects) and leukemia. These effects are not expected to occur at exposure levels encountered in the distribution and use of gasoline as a motor fuel. Low viscosity material-if swallowed may enter the lungs and cause lung damage.
EMERGENCY RESPONSE DATA: Clear (May Be Dyed) Liquid. Extremely flammable. Vapor accumulation could flash and/or explode if in contact with open flame. DOT ERG No. -128

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4. FIRST AID MEASURES

EYE CONTACT: Flush thoroughly with water. If irritation occurs, call a physician.
SKIN CONTACT: Wash contact areas with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse.
INHALATION: Remove from further exposure. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with bag-valve-mask device or use mouth-to-mouth resuscitation.
INGESTION: Seek immediate medical attention. Do not induce vomiting.
NOTE TO PHYSICIANS: Material if ingested may be aspirated into the lungs and can cause chemical pneumonitis. Treat appropriately.

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5. FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA: Carbon Dioxide, Foam, Dry Chemical, Water Fog.
SPECIAL FIRE FIGHTING PROCEDURES: Evacuate area. For large spills, fire fighting foam is the preferred agent and should be applied in sufficient quantities to blanket the gasoline surface. Water spray may be used to flush spill away from exposures, but good judgement should be practiced to prevent spreading of the gasoline into sewers, streams or drinking water supplies. If a leak or spill has not ignited, apply a foam blanket to suppress the release of vapors. If foam is not available, a water spray curtain can be used to disperse vapors and to protect personnel attempting to stop the leak.
SPECIAL PROTECTIVE EQUIPMENT: For fires in enclosed areas, fire fighters must use self-contained breathing apparatus.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Extremely flammable. Vapor accumulation could flash and/or explode if in contact with open

flame. Flash Point C(F): < -40(-40) (ASTM D-56). Flammable limits - LEL: 1.4%, UEL: 7.6%.

NFPA HAZARD ID: Health: 1, Flammability: 3, Reactivity: 0

HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide.

6. ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES: Report spills as required to appropriate authorities. U. S. Coast Guard regulations require immediate reporting of spills that could reach any waterway including intermittent dry creeks. Report spill to Coast Guard toll free number (800) 424-8802. In case of accident or road spill notify CHEMTREC (800) 424-9300.

PROCEDURES IF MATERIAL IS RELEASED OR SPILLED: Eliminate all ignition sources. Runoff may create fire or explosion hazard in sewer system. Adsorb on fire retardant treated sawdust, diatomaceous earth, etc. Shovel up and dispose of at an appropriate waste disposal facility in accordance with current applicable laws and regulations, and product characteristics at time of disposal.

ENVIRONMENTAL PRECAUTIONS: Prevent spills from entering storm sewers or drains and contact with soil.

PERSONAL PRECAUTIONS: See Section 8

7. HANDLING AND STORAGE

HANDLING: NEVER SIPHON GASOLINE BY MOUTH. GASOLINE SHOULD NOT BE USED AS A SOLVENT OR AS A CLEANING AGENT. Use non-sparking tools and explosion-proof equipment. Avoid contact with skin. Avoid inhalation of vapors or mists. Use in well ventilated area away from all ignition sources. PORTABLE CONTAINERS approved for storing fuel must be placed on the ground and the nozzle must stay in contact with the container when filling to prevent build up and discharge of static electricity.

STORAGE: Drums must be grounded and bonded and equipped with self-closing valves, pressure vacuum bungs and flame arresters. Store away from all ignition sources in a cool area equipped with an automatic sprinkling system. Outside or detached storage preferred. Storage containers should be grounded and bonded.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

VENTILATION: Use in well ventilated area with local exhaust ventilation. Ventilation required and equipment must be explosion proof. Use away from all ignition sources.

RESPIRATORY PROTECTION: Approved respiratory equipment must be used when airborne concentrations are unknown or exceed the TLV.

EYE PROTECTION: If splash with liquid is possible, safety glasses with side shields or chemical goggles should be worn.

SKIN PROTECTION: Impervious gloves should be worn. Good personal hygiene practices should always be followed.

		---TWA---		----STEL---		NOTE
Substance Name (CAS-No.)	Source	ppm	mg/m3	ppm	mg/m3	
GASOLINE (8006-61-9)						
	MOBIL	300	890			
	OSHA	300	900	500	1500	
	ACGIH	300	890	500	1480	
METHYL T-BUTYL ETHER (1634-04-4)						
	MOBIL	40	144			

	ACGIH	40	144		
ETHANOL (64-17-5)					
	MOBIL	1000	1880		
	OSHA	1000	1900		
	ACGIH	1000	1880		
XYLENE (1330-20-7)					
O, M, P, -Isomers	MOBIL	100	434		
O, M, P, -Isomers	OSHA	100	435	150	655
O, M, P, -Isomers	ACGIH	100	434	150	651
ISOPENTANE (78-78-4)					
	MOBIL	600	1770		
All Isomers	ACGIH	600	1770	750	2210
TOLUENE (108-88-3)					
Skin	MOBIL	50	188		
	OSHA	100	375	150	560
Skin	ACGIH	50	188		
PSEUDOCUMENE (95-63-6)					
	OSHA	25	123		
	ACGIH	25	123		
BUTANE (106-97-8)					
	MOBIL	800	1900		
	OSHA	800	1900		
	ACGIH	800	1900		
2-METHYLPENTANE (107-83-5)					
	MOBIL	500	1760		
Isomer of N-Hexane	ACGIH	500	1760	1000	3500
PENTANE (109-66-0)					
	MOBIL	600	1770		
	OSHA	600	1800	750	2250
All Isomers	ACGIH	600	1770	750	2210
TRIMETHYL BENZENE (25551-13-7)					
	MOBIL	25	123		
	OSHA	25	125		
	ACGIH	25	123		
3-METHYLPENTANE (96-14-0)					
	MOBIL	500	1760		
Isomer of N-Hexane	ACGIH	500	1760	1000	3500
BENZENE (71-43-2)					
	OSHA	1		5	
Skin	ACGIH	0.5	1.6	2.5	8
2,3-DIMETHYLBUTANE (79-29-8)					
	MOBIL	500	1760		
Isomer of N-Hexane	ACGIH	500	1760	1000	3500
N-HEXANE (110-54-3)					
N-Hexane	MOBIL	50	176		
Other Isomers	MOBIL	500	1760		
	OSHA	50	180		
N-Hexane	ACGIH	50	176		
Other Isomers	ACGIH	500	1760	1000	3500
ETHYL BENZENE (100-41-4)					
	MOBIL	100	434		
	OSHA	100	435	125	545
	ACGIH	100	434	125	543
3- METHYLHEXANE (589-34-4)					
	MOBIL	400	1640		
2- METHYLHEXANE (591-76-4)					
	MOBIL	400	1640		
METHYLCYCLOHEXANE					

(108-87-2)

MOBIL	400	1610
OSHA	400	1600
ACGIH	400	1610

NOTE: Limits shown for guidance only. Follow applicable regulations.

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9. PHYSICAL AND CHEMICAL PROPERTIES

Typical physical properties are given below. Consult Product Data Sheet for specific details.

APPEARANCE: Liquid
COLOR: Clear (May Be Dyed)
ODOR: Gasoline
ODOR THRESHOLD-ppm: NE
pH: NA
BOILING POINT C(F): > 35(95)
MELTING POINT C(F): NA
FLASH POINT C(F): < -40(-40) (ASTM D-56)
FLAMMABILITY: NE
AUTO FLAMMABILITY: NE
EXPLOSIVE PROPERTIES: NA
OXIDIZING PROPERTIES: NA
VAPOR PRESSURE-mmHg 20 C: > 400.0
VAPOR DENSITY: 3.0
EVAPORATION RATE: NE
RELATIVE DENSITY, 15/4 C: 0.79
SOLUBILITY IN WATER: Negligible
PARTITION COEFFICIENT: NE
VISCOSITY AT 40 C, cSt: < 1.0
VISCOSITY AT 100 C, cSt: NA
POUR POINT C(F): NA
FREEZING POINT C(F): NE
VOLATILE ORGANIC COMPOUND: NE

NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES

FOR FURTHER TECHNICAL INFORMATION, CONTACT YOUR MARKETING REPRESENTATIVE

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10. STABILITY AND REACTIVITY

STABILITY (THERMAL, LIGHT, ETC.): Stable.
CONDITIONS TO AVOID: Heat, sparks, flame and build up of static electricity.
INCOMPATIBILITY (MATERIALS TO AVOID): Halogens, strong acids, alkalies, and oxidizers.
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide.
HAZARDOUS POLYMERIZATION: Will not occur.

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11. TOXICOLOGICAL DATA

---ACUTE TOXICOLOGY---

ORAL TOXICITY (RATS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
DERMAL TOXICITY (RABBITS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
INHALATION TOXICITY (RATS): Practically non-toxic (LC50: greater than 5 mg/l). ---Based on testing of similar products and/or the components.
EYE IRRITATION (RABBITS): Practically non-irritating. (Draize score: greater than 6 but 15 or less). ---Based on testing of similar

products and/or the components.
SKIN IRRITATION (RABBITS): Irritant. (Primary Irritation Index: 3 or greater but less than 5). ---Based on testing of similar products and/or the components.
OTHER ACUTE TOXICITY DATA: Inhalation of vapors/mists may cause respiratory system irritation. HAZARDS OF COMBUSTION PRODUCTS: Exposure to high concentrations of carbon monoxide can cause loss of consciousness, heart damage, brain damage and death. Exposure to high concentrations of carbon dioxide can cause simple asphyxiation by displacing oxygen. May be harmful or fatal if swallowed due to aspiration pneumonitis.

---SUBCHRONIC TOXICOLOGY (SUMMARY)---

90-day oral gavage studies with rats resulted in kidney effects at 1200 mg/kg MTBE, but these effects are not considered significant to humans. Thirteen week inhalation studies with rats on MTBE resulted in increased organ weights and decreased body weight and anaesthetic effects at levels > 800 ppm.

---NEUROTOXICOLOGY (SUMMARY)---

No significant adverse effects were observed at 8000 ppm MTBE in a 90-day neurotoxicity study with rats.

---REPRODUCTIVE TOXICOLOGY (SUMMARY)---

Inhalation teratology study with mice at 2700 ppm MTBE during gestation resulted in no adverse effects. Another inhalation teratology study in mice at 4000 ppm showed some developmental effects. The NOEL was 1000 ppm. Teratology studies in rats treated by inhalation (less than or equal to 2500 ppm) showed no effects on fetuses. One generation reproductive studies, dosing by inhalation at levels up to 2500 ppm, showed no adverse effects in rats. A two-generation inhalation reproductive study at 8000 ppm showed no reproductive or developmental effects in rats. A teratology inhalation study in rabbits at 8000 ppm during gestation showed no developmental effects.

---CHRONIC TOXICOLOGY (SUMMARY)---

An increased incidence of kidney and liver tumors was observed in laboratory animals exposed to > 3000 ppm MTBE. These effects are not considered significant to humans.

---SENSITIZATION (SUMMARY)---

****Skin sensitization: Negative guinea pig test.

---OTHER TOXICOLOGY DATA---

Gasoline and Refinery Streams: Studies conducted by the American Petroleum Institute examined a reference unleaded gasoline for mutagenic, teratogenic and sensitization potential; no evidence of these hazards was found. However, isolated constituents of gasoline may display these or other potential hazards in laboratory tests. There were no significant adverse effects in three-month subchronic inhalation studies in rats or monkeys, or in a two-year skin cancer study in mice. Studies with laboratory animals have shown that gasoline vapors administered at high concentrations over a prolonged period of time caused kidney damage and kidney cancer in male rats and liver cancer in female mice. The kidney tumors resulted from formation of a compound unique to male rats and is not considered relevant to humans. The relationship of liver cancer in mice to humans is not known. Studies carried out by Mobil's Environmental and Health Sciences Laboratory on some of the major refinery streams from which gasoline is formulated support the results of the API studies. There was no evidence of significant adverse systemic or reproductive effects for light catalytic cracked naphthas and reformed naphthas. Components: Gasoline consists of a complex blend of petroleum/processing derived paraffinic, olefinic,

naphthenic and aromatic hydrocarbons which include up to 5% benzene (with 1-2% typical in the U.S.), n-hexane, mixed xylenes, toluene, ethylbenzene and trimethyl benzene. Repeated exposures to low levels of benzene have been reported to result in blood abnormalities including anemia and, in rare cases, leukemia in both animals and humans. Prolonged exposure to n-hexane may result in nervous system damage, including numbness of the extremities and, in extreme cases, paralysis. The adverse effects associated with these components have not been observed in studies with gasoline or the refinery streams from which it is formulated. Generally, human exposures to gasoline vapors are considerably less than those used in the animal toxicity studies. As far as scientists know, low level or infrequent exposures to gasoline vapor are unlikely to be associated with cancer or other serious diseases in humans.

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12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE AND EFFECTS: Not established.

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13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Product is suitable for burning for fuel value in compliance with applicable laws and regulations.

RCRA INFORMATION: Disposal of unused product may be subject to RCRA regulations (40 CFR 261) due to the characteristic(s)/chemical(s) listed below. Disposal of the used product may also be regulated due to ignitability, corrosivity, reactivity, or toxicity as determined by the Toxicity Characteristic Leaching Procedure (TCLP).

BENZENE: 2.3200 PCT (TCLP)
FLASH: < -40(-40) C(F)

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14. TRANSPORT INFORMATION

USA DOT:

SHIPPING NAME:	Gasoline
HAZARD CLASS & DIV:	3
ID NUMBER:	UN1203
ERG NUMBER:	128
PACKING GROUP:	PG II
STCC:	NE
DANGEROUS WHEN WET:	No
POISON:	No
LABEL(s):	Flammable Liquid
PLACARD(s):	Flammable
PRODUCT RQ:	NA
MARPOL III STATUS:	NA

RID/ADR:

HAZARD CLASS:	3
HAZARD SUB-CLASS:	3(b)
LABEL:	3
DANGER NUMBER:	33
UN NUMBER:	1203
SHIPPING NAME:	Hydrocarbons, liquid having a flash point below 21deg C
REMARKS:	NA

IMO:

HAZARD CLASS & DIV:	3.1
UN NUMBER:	1203

PACKING GROUP: PG II
SHIPPING NAME: Gasoline
LABEL(s): Flammable Liquid
MARPOL III STATUS: NA

ICAO/IATA:
HAZARD CLASS & DIV: 3
ID/UN Number: 1203
PACKING GROUP: PG II
SHIPPING NAME: Gasoline
SUBSIDIARY RISK: NA
LABEL(s): Flammable Liquid

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15. REGULATORY INFORMATION

Governmental Inventory Status: All components comply with TSCA, and EINECS/ELINCS.

EU Labeling:

Symbol: F+ T Extremely flammable, Toxic.

Risk Phrase(s): R12-45-38-65.
Extremely flammable. May cause cancer. Irritating to skin. Harmful: may cause lung damage if swallowed.

Safety Phrase(s): S53-45-2-23-24-29-43-62.
Avoid exposure - obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Keep out of the reach of children. Do not breathe vapor. Avoid contact with skin. Do not empty into drains. In case of fire use carbon dioxide, foam, dry chemical or water fog. If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

Contains: Low Boiling Point Naphtha.

U.S. Superfund Amendments and Reauthorization Act (SARA) Title III:

This product contains no "EXTREMELY HAZARDOUS SUBSTANCES".

SARA (311/312) REPORTABLE HAZARD CATEGORIES:
FIRE CHRONIC ACUTE

This product contains the following SARA (313) Toxic Release Chemicals:

CHEMICAL NAME	CAS NUMBER	CONC.
BENZENE(COMPONENT ANALYSIS)	71-43-2	2.32%
PSEUDOCUMENE(COMPONENT ANALYSIS)	95-63-6	4.55%
ETHYL BENZENE(COMPONENT ANALYSIS)	100-41-4	1.6%
TOLUENE(COMPONENT ANALYSIS)	108-88-3	4.65%
N-HEXANE(COMPONENT ANALYSIS)	110-54-3	1.69%
XYLENES(COMPONENT ANALYSIS)	1330-20-7	9.9%
METHYL-TERT-BUTYL ETHER(COMPONENT ANALYSIS)	1634-04-4	15.1%

The following product ingredients are cited on the lists below:

CHEMICAL NAME	CAS NUMBER	LIST CITATIONS
ETHYL ALCOHOL (COMPONENT ANALYSIS)	64-17-5	1, 6, 10, 18, 19, 20, 21, 23, 25, 26
BENZENE (COMPONENT ANALYSIS) (2.32%)	71-43-2	1, 2, 4, 6, 9, 10, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26
ISOPENTANE (COMPONENT ANALYSIS)	78-78-4	1, 19, 24, 25
2,3-DIMETHYLBUTANE (COMPONENT ANALYSIS)	79-29-8	1, 19, 25
PSEUDOCUMENE (COMPONENT ANALYSIS)	95-63-6	1, 20, 24, 25

PENTANE, 3-METHYL- (COMPONENT ANALYSIS)	96-14-0	1, 19, 25
METHYL CYCLOPENTANE (COMPONENT ANALYSIS)	96-37-7	19, 25, 26
ETHYL BENZENE (COMPONENT ANALYSIS)	100-41-4	1, 10, 18, 19, 20, 21, 23, 24, 25, 26
BUTANE (COMPONENT ANALYSIS)	106-97-8	1, 10, 19, 20, 21, 23, 24, 25, 26
PENTANE, 2-METHYL- (COMPONENT ANALYSIS)	107-83-5	1, 19, 23, 25
METHYLCYCLOHEXANE (COMPONENT ANALYSIS)	108-87-2	1, 10, 18, 19, 20, 21, 23, 25, 26
TOLUENE (COMPONENT ANALYSIS) (4.65%)	108-88-3	1, 10, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26
PENTANE (COMPONENT ANALYSIS)	109-66-0	1, 10, 18, 19, 20, 21, 23, 24, 25, 26
N-HEXANE (COMPONENT ANALYSIS)	110-54-3	1, 10, 18, 19, 20, 21, 23, 24, 25, 26
2-METHYL 2-BUTENE (COMPONENT ANALYSIS)	513-35-9	19, 25
3-METHYLHEXANE (COMPONENT ANALYSIS)	589-34-4	19, 25
HEXANE, 2-METHYL- (COMPONENT ANALYSIS)	591-76-4	19, 25
1-HEXENE (COMPONENT ANALYSIS)	592-41-6	19, 25
XYLENES (COMPONENT ANALYSIS) (9.90%)	1330-20-7	1, 10, 18, 19, 20, 21, 22, 23, 24, 25, 26
METHYL-TERT-BUTYL ETHER (COMPONENT ANALYSIS)	1634-04-4	1, 11, 15, 21, 24, 25
GASOLINE	8006-61-9	1, 8, 10, 18, 19, 20, 21, 23, 26
TRIMETHYL BENZENE (COMPONENT ANALYSIS)	25551-13-7	1, 10, 19, 20, 21, 23, 25, 26

--- REGULATORY LISTS SEARCHED ---

1=ACGIH ALL	6=IARC 1	11=TSCA 4	16=CA P65 CARC	21=LA RTK
2=ACGIH A1	7=IARC 2A	12=TSCA 5a2	17=CA P65 REPRO	22=MI 293
3=ACGIH A2	8=IARC 2B	13=TSCA 5e	18=CA RTK	23=MN RTK
4=NTP CARC	9=OSHA CARC	14=TSCA 6	19=FL RTK	24=NJ RTK
5=NTP SUS	10=OSHA Z	15=TSCA 12b	20=IL RTK	25=PA RTK
				26=RI RTK

Code key: CARC=Carcinogen; SUS=Suspected Carcinogen; REPRO=Reproductive

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16. OTHER INFORMATION

Precautionary Label Text:
CONTAINS GASOLINE
DANGER!
EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. MAY CAUSE SKIN, NOSE, THROAT, AND LUNG IRRITATION, DIZZINESS, NAUSEA, AND LOSS OF CONSCIOUSNESS. LOW VISCOSITY MATERIAL-IF SWALLOWED, MAY BE ASPIRATED AND CAN CAUSE SERIOUS OR FATAL LUNG DAMAGE.
LONG-TERM EXPOSURE TO GASOLINE VAPOR HAS CAUSED KIDNEY AND LIVER CANCER IN LABORATORY ANIMIALS.
Keep away from heat, sparks, and flame. Avoid all personal contact. Avoid prolonged breathing of vapor. Use with adequate ventilation. Keep container closed. Approved portable containers must be properly grounded when transferring fuel. For use as a motor fuel only. Misuse of gasoline may cause serious injury or illness. Never siphon by mouth. Not to be used as a solvent or skin cleaning agent.

FIRST AID: In case of contact, wash skin with soap and water. Remove contaminated clothing. Destroy or wash clothing before reuse. If swallowed, seek immediate medical attention. Do not induce vomiting. Only induce vomiting at the instruction of a physician.
Empty container may contain product residue, including flammable or explosive vapors. Do not cut, puncture, or weld on or near container. All label warnings and precautions must be observed until container has been thoroughly cleaned or destroyed.
This warning is given to comply with California Health and Safety Code 25249.6 and does not constitute an admission or a waiver of rights. This product contains a chemical known to the State of California to cause cancer, birth defects, or other reproductive harm. Chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm are created by the combustion of this product. Refer to product Material Safety Data Bulletin for further safety and health information.

USE: UNLEADED MOTOR FUEL
NOTE: MOBIL PRODUCTS ARE NOT FORMULATED TO CONTAIN PCBS.

INGREDIENT	PERCENT	CAS NUMBER
GASOLINE	100.00	8006-61-9

****
For Internal Use Only: MHC: 1* 1* 1* 1* 2*, MPPEC: CF, REQ: US - MARKETING, SAFE USE: S
****
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Mobil® The energy to make a difference™

REFORMULATED AUTOMOTIVE GASOLINE
15826-30

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1. PRODUCT AND COMPANY IDENTIFICATION

APPROVAL DATE: 06/15/98

PRODUCT NAME: REFORMULATED AUTOMOTIVE GASOLINE

SUPPLIER: MOBIL OIL CORP.
NORTH AMERICA MARKETING AND REFINING
3225 GALLOWS RD.
FAIRFAX, VA 22037

24 - Hour Emergency (call collect): 609-737-4411
Product and MSDS Information: 800-662-4525 609-224-4644
CHEMTREC: 800-424-9300 202-483-7616

2. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAMES AND SYNONYMS: HYDROCARBONS AND ADDITIVES

INGREDIENTS CONSIDERED HAZARDOUS TO HEALTH:

Substance Name	Wt%
GASOLINE (8006-61-9)	100
COMPONENT(S) OF PRODUCT INGREDIENTS INCLUDE:	
METHYL T-BUTYL ETHER (1634-04-4)	15
ETHANOL (64-17-5)	11
XYLENE (1330-20-7)	10
ISOPENTANE (78-78-4)	9
BUTANE (106-97-8)	6
TOLUENE (108-88-3)	5
PSEUDOCUMENE (95-63-6)	5
2-METHYLPENTANE (107-83-5)	4
PENTANE (109-66-0)	4
TRIMETHYL BENZENE (25551-13-7)	3
3-METHYLPENTANE (96-14-0)	2
2,3-DIMETHYLBUTANE (79-29-8)	2
N-HEXANE (110-54-3)	2
ETHYL BENZENE (100-41-4)	2
3- METHYLHEXANE (589-34-4)	2
2- METHYLHEXANE (591-76-4)	1
METHYLCYCLOHEXANE (108-87-2)	1
BENZENE (71-43-2)	< 1

NOTE: The concentration of the components shown above may vary substantially. Because of volatility considerations, gasoline vapor may have concentrations of components very different from those of liquid gasoline. The major components of gasoline vapor are: butane, isobutane, pentane and isopentane. Oxygenates such as MTBE OR ETHANOL will be present at a concentration to provide a minimum oxygen content of 1.5 Wt%. The reportable component percentages, shown in the Regulatory

Information section, are based on API's evaluation of a typical gasoline mixture.
See Section 15 for European Label Information.
See Section 8 for exposure limits (if applicable).

3. HAZARDS IDENTIFICATION

US OSHA HAZARD COMMUNICATION STANDARD: Product assessed in accordance with OSHA 29 CFR 1910.1200 and determined to be hazardous.
EFFECTS OF OVEREXPOSURE: Eye irritation, respiratory irritation, dizziness, nausea, loss of consciousness. Skin irritation. Studies (sponsored by API) conducted in the U.S. examining the mortality experience (causes of death) of distribution workers with long-term exposure to gasoline have not found any gasoline-related health effects. Case reports of chronic gasoline abuse (such as gasoline sniffing) and chronic misuse of gasoline as a solvent or as a cleaning agent have reported a range of neurological effects (nervous system effects), sudden deaths from cardiac arrest (heart attacks), hematologic changes (blood effects) and leukemia. These effects are not expected to occur at exposure levels encountered in the distribution and use of gasoline as a motor fuel.
EMERGENCY RESPONSE DATA: Clear (May Be Dyed) Liquid. Extremely flammable. Vapor accumulation could flash and/or explode if in contact with open flame. DOT ERG No. -128

4. FIRST AID MEASURES

EYE CONTACT: Flush thoroughly with water. If irritation occurs, call a physician.
SKIN CONTACT: Wash contact areas with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse.
INHALATION: Remove from further exposure. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with bag-valve-mask device or use mouth-to-mouth resuscitation.
INGESTION: Seek immediate medical attention. Do not induce vomiting.
NOTE TO PHYSICIANS: Material if ingested may be aspirated into the lungs and can cause chemical pneumonitis. Treat appropriately.

5. FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA: Carbon Dioxide, Foam, Dry Chemical, Water Fog.
SPECIAL FIRE FIGHTING PROCEDURES: Evacuate area. For large spills, fire fighting foam is the preferred agent and should be applied in sufficient quantities to blanket the gasoline surface. Water spray may be used to flush spill away from exposures, but good judgement should be practiced to prevent spreading of the gasoline into sewers, streams or drinking water supplies. If a leak or spill has not ignited, apply a foam blanket to suppress the release of vapors. If foam is not available, a water spray curtain can be used to disperse vapors and to protect personnel attempting to stop the leak.
SPECIAL PROTECTIVE EQUIPMENT: For fires in enclosed areas, fire fighters must use self-contained breathing apparatus.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Extremely flammable. Vapor accumulation could flash and/or explode if in contact with open flame. Flash Point C(F): < -40(-40) (ASTM D-56). Flammable limits - LEL: 1.4%, UEL: 7.6%.

NFPA HAZARD ID: Health: 1, Flammability: 3, Reactivity: 0
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide.

6. ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES: Report spills as required to appropriate authorities. U. S. Coast Guard regulations require immediate reporting of spills that could reach any waterway including intermittent dry creeks. Report spill to Coast Guard toll free number (800) 424-8802. In case of accident or road spill notify CHEMTREC (800) 424-9300.

PROCEDURES IF MATERIAL IS RELEASED OR SPILLED: Eliminate all ignition sources. Runoff may create fire or explosion hazard in sewer system. Adsorb on fire retardant treated sawdust, diatomaceous earth, etc. Shovel up and dispose of at an appropriate waste disposal facility in accordance with current applicable laws and regulations, and product characteristics at time of disposal.

ENVIRONMENTAL PRECAUTIONS: Prevent spills from entering storm sewers or drains and contact with soil.

PERSONAL PRECAUTIONS: See Section 8

7. HANDLING AND STORAGE

HANDLING: NEVER SIPHON GASOLINE BY MOUTH. GASOLINE SHOULD NOT BE USED AS A SOLVENT OR AS A CLEANING AGENT. Use non-sparking tools and explosion-proof equipment. Avoid contact with skin. Avoid inhalation of vapors or mists. Use in well ventilated area away from all ignition sources. PORTABLE CONTAINERS approved for storing fuel must be placed on the ground and the nozzle must stay in contact with the container when filling to prevent build up and discharge of static electricity.

STORAGE: Drums must be grounded and bonded and equipped with self-closing valves, pressure vacuum bungs and flame arresters. Store away from all ignition sources in a cool area equipped with an automatic sprinkling system. Outside or detached storage preferred. Storage containers should be grounded and bonded.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

VENTILATION: Use in well ventilated area with local exhaust ventilation. Ventilation required and equipment must be explosion proof. Use away from all ignition sources.

RESPIRATORY PROTECTION: Approved respiratory equipment must be used when airborne concentrations are unknown or exceed the TLV.

EYE PROTECTION: If splash with liquid is possible, chemical type goggles should be worn.

SKIN PROTECTION: Impervious gloves should be worn. Good personal hygiene practices should always be followed.

		---TWA---		----STEL---		NOTE
Substance Name (CAS-No.)	Source	ppm	mg/m3	ppm	mg/m3	
GASOLINE (8006-61-9)						
	MOBIL	300	890			
	OSHA	300	900	500	1500	
	ACGIH	300	890	500	1480	
METHYL T-BUTYL ETHER (1634-04-4)						
	MOBIL	40	144			
	ACGIH	40	144			
ETHANOL (64-17-5)						

	MOBIL	1000	1880		
	OSHA	1000	1900		
	ACGIH	1000	1880		
XYLENE (1330-20-7)					
O, M, P, -Isomers	MOBIL	100	434		
O, M, P, -Isomers	OSHA	100	435	150	655
O, M, P, -Isomers	ACGIH	100	434	150	651
ISOPENTANE (78-78-4)					
	MOBIL	600	1770		
All Isomers	ACGIH	600	1770	750	2210
BUTANE (106-97-8)					
	MOBIL	800	1900		
	OSHA	800	1900		
	ACGIH	800	1900		
TOLUENE (108-88-3)					
Skin	MOBIL	50	188		
	OSHA	100	375	150	560
Skin	ACGIH	50	188		
PSEUDOCUMENE (95-63-6)					
	OSHA	25	123		
	ACGIH	25	123		
2-METHYLPENTANE (107-83-5)					
	MOBIL	500	1760		
Isomer of N-Hexane	ACGIH	500	1760	1000	3500
PENTANE (109-66-0)					
	MOBIL	600	1770		
	OSHA	600	1800	750	2250
All Isomers	ACGIH	600	1770	750	2210
TRIMETHYL BENZENE (25551-13-7)					
	MOBIL	25	123		
	OSHA	25	125		
	ACGIH	25	123		
3-METHYLPENTANE (96-14-0)					
	MOBIL	500	1760		
Isomer of N-Hexane	ACGIH	500	1760	1000	3500
2,3-DIMETHYLBUTANE (79-29-8)					
	MOBIL	500	1760		
Isomer of N-Hexane	ACGIH	500	1760	1000	3500
N-HEXANE (110-54-3)					
N-Hexane	MOBIL	50	176		
Other Isomers	MOBIL	500	1760		
	OSHA	50	180		
N-Hexane	ACGIH	50	176		
Other Isomers	ACGIH	500	1760	1000	3500
ETHYL BENZENE (100-41-4)					
	MOBIL	100	434		
	OSHA	100	435	125	545
	ACGIH	100	434	125	543
3- METHYLHEXANE (589-34-4)					
	MOBIL	400	1640		
2- METHYLHEXANE (591-76-4)					
	MOBIL	400	1640		
METHYLCYCLOHEXANE (108-87-2)					
	MOBIL	400	1610		
	OSHA	400	1600		
	ACGIH	400	1610		
BENZENE (71-43-2)					

	OSHA	1		5		
Skin	ACGIH	0.5	1.6	2.5	8	

NOTE: Limits shown for guidance only. Follow applicable regulations.

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9. PHYSICAL AND CHEMICAL PROPERTIES

Typical physical properties are given below. Consult Product Data Sheet for specific details.
APPEARANCE: Liquid
COLOR: Clear (May Be Dyed)
ODOR: Gasoline
ODOR THRESHOLD-ppm: NE
pH: NA
BOILING POINT C(F): > 23(73)
MELTING POINT C(F): NA
FLASH POINT C(F): < -40(-40) (ASTM D-56)
FLAMMABILITY: NE
AUTO FLAMMABILITY: NE
EXPLOSIVE PROPERTIES: NA
OXIDIZING PROPERTIES: NA
VAPOR PRESSURE-mmHg 20 C: < 775.0
VAPOR DENSITY: 3.0
EVAPORATION RATE: NE
RELATIVE DENSITY, 15/4 C: 0.67-0.75
SOLUBILITY IN WATER: Negligible
PARTITION COEFFICIENT: NE
VISCOSITY AT 40 C, cSt: < 1.0
VISCOSITY AT 100 C, cSt: NA
POUR POINT C(F): NA
FREEZING POINT C(F): NE
VOLATILE ORGANIC COMPOUND: NE
NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES
FOR FURTHER TECHNICAL INFORMATION, CONTACT YOUR MARKETING REPRESENTATIVE

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10. STABILITY AND REACTIVITY

STABILITY (THERMAL, LIGHT, ETC.): Stable.
CONDITIONS TO AVOID: Heat, sparks, flame and build up of static electricity.
INCOMPATIBILITY (MATERIALS TO AVOID): Halogens, strong acids, alkalies, and oxidizers.
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide.
HAZARDOUS POLYMERIZATION: Will not occur.

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11. TOXICOLOGICAL DATA

---ACUTE TOXICOLOGY---

ORAL TOXICITY (RATS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
DERMAL TOXICITY (RABBITS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
INHALATION TOXICITY (RATS): Practically non-toxic (LC50: greater than 5 mg/l). ---Based on testing of similar products and/or the components.
EYE IRRITATION (RABBITS): Practically non-irritating. (Draize score: greater than 6 but 15 or less). ---Based on testing of similar products and/or the components.
SKIN IRRITATION (RABBITS): Irritant. (Primary Irritation Index: 3

or greater but less than 5). ---Based on testing of similar products and/or the components.
OTHER ACUTE TOXICITY DATA: Inhalation of vapors/mists may cause respiratory system irritation. HAZARDS OF COMBUSTION PRODUCTS: Exposure to high concentrations of carbon monoxide can cause loss of consciousness, heart damage, brain damage and death. Exposure to high concentrations of carbon dioxide can cause simple asphyxiation by displacing oxygen.

---SUBCHRONIC TOXICOLOGY (SUMMARY)---

90-day oral gavage studies with rats resulted in kidney effects at 1200 mg/kg MTBE, but these effects are not considered significant to humans. Thirteen week inhalation studies with rats on MTBE resulted in increased organ weights and decreased body weight and anaesthetic effects at levels > 800 ppm.

---NEUROTOXICOLOGY (SUMMARY)---

No significant adverse effects were observed at 8000 ppm MTBE in a 90-day neurotoxicity study with rats.

---REPRODUCTIVE TOXICOLOGY (SUMMARY)---

Inhalation teratology study with mice at 2700 ppm MTBE during gestation resulted in no adverse effects. Another inhalation teratology study in mice at 4000 ppm showed some developmental effects. The NOEL was 1000 ppm. Teratology studies in rats treated by inhalation (less than or equal to 2500 ppm) showed no effects on fetuses. One generation reproductive studies, dosing by inhalation at levels up to 2500 ppm, showed no adverse effects in rats. A two-generation inhalation reproductive study at 8000 ppm showed no reproductive or developmental effects in rats. A teratology inhalation study in rabbits at 8000 ppm during gestation showed no developmental effects.

---CHRONIC TOXICOLOGY (SUMMARY)---

An increased incidence of kidney and liver tumors was observed in laboratory animals exposed to > 3000 ppm MTBE. These effects are not considered significant to humans.

---SENSITIZATION (SUMMARY)---

****Skin sensitization: Negative guinea pig test.

---OTHER TOXICOLOGY DATA---

Gasoline and Refinery Streams: Studies conducted by the American Petroleum Institute examined a reference unleaded gasoline for mutagenic, teratogenic and sensitization potential; no evidence of these hazards was found. However, isolated constituents of gasoline may display these or other potential hazards in laboratory tests. There were no significant adverse effects in three-month subchronic inhalation studies in rats or monkeys, or in a two-year skin cancer study in mice. Studies with laboratory animals have shown that gasoline vapors administered at high concentrations over a prolonged period of time caused kidney damage and kidney cancer in male rats and liver cancer in female mice. The kidney tumors resulted from formation of a compound unique to male rats and is not considered relevant to humans. The relationship of liver cancer in mice to humans is not known. Studies carried out by Mobil's Environmental and Health Sciences Laboratory on some of the major refinery streams from which gasoline is formulated support the results of the API studies. There was no evidence of significant adverse systemic or reproductive effects for light catalytic cracked naphthas and reformed naphthas. Components: Gasoline consists of a complex blend of petroleum/processing derived paraffinic, olefinic, naphthenic and aromatic hydrocarbons which include up to 5% benzene (with 1-2% typical in the U.S.), n-hexane, mixed xylenes, toluene, ethylbenzene and trimethyl benzene. Repeated exposures

to low levels of benzene have been reported to result in blood abnormalities including anemia and, in rare cases, leukemia in both animals and humans. Prolonged exposure to n-hexane may result in nervous system damage, including numbness of the extremities and, in extreme cases, paralysis. The adverse effects associated with these components have not been observed in studies with gasoline or the refinery streams from which it is formulated. Generally, human exposures to gasoline vapors are considerably less than those used in the animal toxicity studies. As far as scientists know, low level or infrequent exposures to gasoline vapor are unlikely to be associated with cancer or other serious diseases in humans.

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12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE AND EFFECTS: Not established.

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13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Product is suitable for burning for fuel value in compliance with applicable laws and regulations.

RCRA INFORMATION: Disposal of unused product may be subject to RCRA regulations (40 CFR 261) due to the characteristic(s)/chemical(s) listed below. Disposal of the used product may also be regulated due to ignitability, corrosivity, reactivity, or toxicity as determined by the Toxicity Characteristic Leaching Procedure (TCLP).

BENZENE: 1.2999 PCT (TCLP)
FLASH: < -40(-40) C(F)

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14. TRANSPORT INFORMATION

USA DOT:

SHIPPING NAME:	Gasoline
HAZARD CLASS & DIV:	3
ID NUMBER:	UN1203
ERG NUMBER:	128
PACKING GROUP:	PG II
STCC:	NE
DANGEROUS WHEN WET:	No
POISON:	No
LABEL(s):	Flammable Liquid
PLACARD(s):	Flammable
PRODUCT RQ:	NA
MARPOL III STATUS:	NA

RID/ADR:

HAZARD CLASS:	3
HAZARD SUB-CLASS:	3(b)
LABEL:	3
DANGER NUMBER:	33
UN NUMBER:	1203
SHIPPING NAME:	Hydrocarbons, liquid having a flash point below 21deg C
REMARKS:	NA

IMO:

HAZARD CLASS & DIV:	3.1
UN NUMBER:	1203
PACKING GROUP:	PG II
SHIPPING NAME:	Gasoline
LABEL(s):	Flammable Liquid

MARPOL III STATUS: NA
ICAO/IATA:
HAZARD CLASS & DIV: 3
ID/UN Number: 1203
PACKING GROUP: PG II
SHIPPING NAME: Gasoline
SUBSIDIARY RISK: NA
LABEL(s): Flammable Liquid

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15. REGULATORY INFORMATION

Governmental Inventory Status: All components comply with TSCA, and EINECS/ELINCS.
EU Labeling:
Symbol: F+ T Extremely flammable, Toxic.
Risk Phrase(s): R12-45-38-65.
Extremely flammable. May cause cancer. Irritating to skin. Harmful: may cause lung damage if swallowed.
Safety Phrase(s): S53-45-2-23-24-29-43-62.
Avoid exposure - obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Keep out of the reach of children. Do not breathe vapor. Avoid contact with skin. Do not empty into drains. In case of fire use foam/drypowder/CO2/Halon. If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.
Contains: Low Boiling Point Naphtha.
U.S. Superfund Amendments and Reauthorization Act (SARA) Title III:
This product contains no "EXTREMELY HAZARDOUS SUBSTANCES".
SARA (311/312) REPORTABLE HAZARD CATEGORIES:
FIRE CHRONIC ACUTE
This product contains the following SARA (313) Toxic Release Chemicals:

CHEMICAL NAME	CAS NUMBER	CONC.
BENZENE(COMPONENT ANALYSIS)	71-43-2	< 1.3%
PSEUDOCUMENE(COMPONENT ANALYSIS)	95-63-6	4.55%
ETHYL BENZENE(COMPONENT ANALYSIS)	100-41-4	1.6%
TOLUENE(COMPONENT ANALYSIS)	108-88-3	4.65%
N-HEXANE(COMPONENT ANALYSIS)	110-54-3	1.69%
XYLENES(COMPONENT ANALYSIS)	1330-20-7	9.9%
METHYL-TERT-BUTYL ETHER(COMPONENT ANALYSIS)	1634-04-4	15.1%

The following product ingredients are cited on the lists below:

CHEMICAL NAME	CAS NUMBER	LIST CITATIONS
ETHYL ALCOHOL (COMPONENT ANALYSIS)	64-17-5	1, 6, 10, 18, 19, 20, 21, 23, 25, 26
BENZENE (COMPONENT ANALYSIS) (< 1.30%)	71-43-2	1, 2, 4, 6, 9, 10, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26
ISOPENTANE (COMPONENT ANALYSIS)	78-78-4	1, 19, 24, 25
2,3-DIMETHYLBUTANE (COMPONENT ANALYSIS)	79-29-8	1, 19, 25
PSEUDOCUMENE (COMPONENT ANALYSIS)	95-63-6	1, 20, 24, 25
PENTANE, 3-METHYL- (COMPONENT ANALYSIS)	96-14-0	1, 19, 25
METHYL CYCLOPENTANE (COMPONENT	96-37-7	19, 25, 26

ANALYSIS)		
ETHYL BENZENE (COMPONENT ANALYSIS)	100-41-4	1, 10, 18, 19, 20, 21, 23, 24, 25, 26
BUTANE (COMPONENT ANALYSIS)	106-97-8	1, 10, 19, 20, 21, 23, 24, 25, 26
PENTANE, 2-METHYL- (COMPONENT ANALYSIS)	107-83-5	1, 19, 23, 25
METHYLCYCLOHEXANE (COMPONENT ANALYSIS)	108-87-2	1, 10, 18, 19, 20, 21, 23, 25, 26
TOLUENE (COMPONENT ANALYSIS) (4.65%)	108-88-3	1, 10, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26
PENTANE (COMPONENT ANALYSIS)	109-66-0	1, 10, 18, 19, 20, 21, 23, 24, 25, 26
N-HEXANE (COMPONENT ANALYSIS)	110-54-3	1, 10, 18, 19, 20, 21, 23, 24, 25, 26
2-METHYL 2-BUTENE (COMPONENT ANALYSIS)	513-35-9	19, 25
3-METHYLHEXANE (COMPONENT ANALYSIS)	589-34-4	19, 25
HEXANE, 2-METHYL- (COMPONENT ANALYSIS)	591-76-4	19, 25
1-HEXENE (COMPONENT ANALYSIS)	592-41-6	19, 25
XYLENES (COMPONENT ANALYSIS) (9.90%)	1330-20-7	1, 10, 18, 19, 20, 21, 22, 23, 24, 25, 26
METHYL-TERT-BUTYL ETHER (COMPONENT ANALYSIS)	1634-04-4	1, 11, 15, 21, 24, 25
GASOLINE	8006-61-9	1, 8, 10, 18, 19, 20, 21, 23, 26
TRIMETHYL BENZENE (COMPONENT ANALYSIS)	25551-13-7	1, 10, 19, 20, 21, 23, 25, 26

--- REGULATORY LISTS SEARCHED ---

1=ACGIH ALL	6=IARC 1	11=TSCA 4	16=CA P65 CARC	21=LA RTK
2=ACGIH A1	7=IARC 2A	12=TSCA 5a2	17=CA P65 REPRO	22=MI 293
3=ACGIH A2	8=IARC 2B	13=TSCA 5e	18=CA RTK	23=MN RTK
4=NTP CARC	9=OSHA CARC	14=TSCA 6	19=FL RTK	24=NJ RTK
5=NTP SUS	10=OSHA Z	15=TSCA 12b	20=IL RTK	25=PA RTK
				26=RI RTK

Code key: CARC=Carcinogen; SUS=Suspected Carcinogen; REPRO=Reproductive

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16. OTHER INFORMATION

Precautionary Label Text:
CONTAINS GASOLINE
DANGER!
EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. MAY CAUSE SKIN, NOSE, THROAT, AND LUNG IRRITATION, DIZZINESS, NAUSEA, AND LOSS OF CONSCIOUSNESS. LOW VISCOSITY MATERIAL-IF SWALLOWED, MAY BE ASPIRATED AND CAN CAUSE SERIOUS OR FATAL LUNG DAMAGE.
LONG-TERM EXPOSURE TO GASOLINE VAPOR HAS CAUSED KIDNEY AND LIVER CANCER IN LABORATORY ANIMIALS.
Keep away from heat, sparks, and flame. Avoid all personal contact. Avoid prolonged breathing of vapor. Use with adequate ventilation. Keep container closed. Approved portable containers must be properly grounded when transferring fuel. For use as a motor fuel only. Misuse of gasoline may cause serious injury or illness. Never siphon by mouth. Not to be used as a solvent or skin cleaning agent.
FIRST AID: In case of contact, wash skin with soap and water. Remove contaminated clothing. Destroy or wash clothing before reuse. If swallowed, seek immediate medical attention. Do not induce vomiting.

Only induce vomiting at the instruction of a physician.
Empty container may contain product residue, including flammable or explosive vapors. Do not cut, puncture, or weld on or near container. All label warnings and precautions must be observed until container has been thoroughly cleaned or destroyed.
This warning is given to comply with California Health and Safety Code 25249.6 and does not constitute an admission or a waiver of rights. This product contains a chemical known to the State of California to cause cancer, birth defects, or other reproductive harm. Chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm are created by the combustion of this product. Refer to product Material Safety Data Bulletin for further safety and health information.

USE: UNLEADED MOTOR FUEL
NOTE: MOBIL PRODUCTS ARE NOT FORMULATED TO CONTAIN PCBS.

INGREDIENT		CAS NUMBER
GASOLINE	100.00	8006-61-9

****
For Internal Use Only: MHC: 1* 1* 1* 1* 2*, MPPEC: CF, REQ: US - MARKETING, SAFE USE: S
****

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Mobil® The energy to make a difference™

DIESEL FUEL (MRDUS)
170019-31

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1. PRODUCT AND COMPANY IDENTIFICATION

APPROVAL DATE: 12/18/97

PRODUCT NAME: DIESEL FUEL (MRDUS)

SUPPLIER: MOBIL OIL CORP.
NORTH AMERICA MARKETING AND REFINING
3225 GALLOWS RD.
FAIRFAX, VA 22037

24 - Hour Emergency (call collect):	609-737-4411	
Product and MSDS Information:	800-662-4525	609-224-4644
CHEMTREC:	800-424-9300	202-483-7616

2. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAMES AND SYNONYMS: HYDROCARBONS AND ADDITIVES

INGREDIENTS CONSIDERED HAZARDOUS TO HEALTH:

Substance Name	Wt%
DIESEL FUEL (68334-30-5)	100

See Section 15 for European Label Information.
See Section 8 for exposure limits (if applicable).

3. HAZARDS IDENTIFICATION

US OSHA HAZARD COMMUNICATION STANDARD: Product assessed in accordance with OSHA 29 CFR 1910.1200 and determined to be hazardous.

EFFECTS OF OVEREXPOSURE: Respiratory irritation, dizziness, nausea, loss of consciousness. Prolonged, repeated skin contact may result in skin irritation or more serious skin disorders. Note: This product contains polycyclic aromatic hydrocarbons, some of which have been reported to cause skin cancer in humans under conditions of poor personal hygiene, prolonged repeated contact, and exposure to sunlight. Toxic effects are unlikely to occur if good personal hygiene is practiced.

EMERGENCY RESPONSE DATA: Clear (May Be Dyed) Liquid. Material is combustible. DOT ERG No. -128

4. FIRST AID MEASURES

EYE CONTACT: Flush thoroughly with water. If irritation occurs, call a physician.

SKIN CONTACT: Remove contaminated clothing. Dry wipe exposed skin and cleanse yourself with waterless hand cleaner and follow by washing thoroughly with soap and water. For those providing assistance, avoid further contact to yourself or others. Wear impervious gloves. Launder contaminated clothing separately

before reuse. Discard contaminated articles that cannot be laundered.
INHALATION: Remove from further exposure. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with bag-valve-mask device or use mouth-to-mouth resuscitation.
INGESTION: Seek immediate medical attention. Do not induce vomiting.
NOTE TO PHYSICIANS: Material if aspirated into the lungs may cause chemical pneumonitis. Treat appropriately.

5. FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA: Carbon dioxide, foam, dry chemical and water fog.
SPECIAL FIRE FIGHTING PROCEDURES: Use water to keep fire exposed containers cool. If a leak or spill has not ignited, use water spray to disperse the vapors and to protect personnel attempting to stop leak. Water spray may be used to flush spills away from exposures. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply.
SPECIAL PROTECTIVE EQUIPMENT: For fires in enclosed areas, fire fighters must use self-contained breathing apparatus.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Material is combustible. Flash Point C(F): > 52(125) (ASTM D-93). Flammable limits - LEL: 0.6%, UEL: 7.0%.
NFPA HAZARD ID: Health: 1, Flammability: 2, Reactivity: 0
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide.

6. ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES: Report spills as required to appropriate authorities. U. S. Coast Guard regulations require immediate reporting of spills that could reach any waterway including intermittent dry creeks. Report spill to Coast Guard toll free number (800) 424-8802. In case of accident or road spill notify CHEMTREC (800) 424-9300.
PROCEDURES IF MATERIAL IS RELEASED OR SPILLED: Adsorb on fire retardant treated sawdust, diatomaceous earth, etc. Shovel up and dispose of at an appropriate waste disposal facility in accordance with current applicable laws and regulations, and product characteristics at time of disposal.
ENVIRONMENTAL PRECAUTIONS: Prevent spills from entering storm sewers or drains and contact with soil.
PERSONAL PRECAUTIONS: See Section 8

7. HANDLING AND STORAGE

HANDLING: Harmful in contact with or if absorbed through the skin. Avoid inhalation of vapors or mists. PORTABLE CONTAINERS approved for storing fuel must be placed on the ground and the nozzle must stay in contact with the container when filling to prevent build up and discharge of static electricity.
STORAGE: Store in a cool area. A flammable atmosphere can be produced in storage tank headspaces even when stored at a temperature below the flashpoint. Monitor and maintain headspace gas concentrations below flammable limits. Ensure that there are no ignition sources in the area immediately surrounding filling and venting operations. Avoid sparking conditions. Ground and bond all transfer equipment. Store in a cool area.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

VENTILATION: Use in well ventilated area. Ventilation desirable and equipment should be explosion proof.
RESPIRATORY PROTECTION: No special requirements under ordinary conditions of use and with adequate ventilation.
EYE PROTECTION: If splash with liquid is possible, chemical type goggles should be worn.
SKIN PROTECTION: Impervious gloves must be worn. If contact is likely oil impervious clothing must be worn.
EXPOSURE LIMITS: This product does not contain any components which have recognized exposure limits.

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9. PHYSICAL AND CHEMICAL PROPERTIES

Typical physical properties are given below. Consult Product Data Sheet for specific details.
APPEARANCE: Liquid
COLOR: Clear (May Be Dyed)
ODOR: Hydrocarbon
ODOR THRESHOLD-ppm: NE
pH: NA
BOILING POINT C(F): > 149(300)
MELTING POINT C(F): NA
FLASH POINT C(F): > 52(125) (ASTM D-93)
FLAMMABILITY: NE
AUTO FLAMMABILITY: NE
EXPLOSIVE PROPERTIES: NA
OXIDIZING PROPERTIES: NA
VAPOR PRESSURE-mmHg 20 C: 0.5
VAPOR DENSITY: > 2.0
EVAPORATION RATE: NE
RELATIVE DENSITY, 15/4 C: 0.82-0.87
SOLUBILITY IN WATER: Negligible
PARTITION COEFFICIENT: NE
VISCOSITY AT 40 C, cSt: > 1.0
VISCOSITY AT 100 C, cSt: NE
POUR POINT C(F): < -7(20)
FREEZING POINT C(F): NE
VOLATILE ORGANIC COMPOUND: NE
NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES
FOR FURTHER TECHNICAL INFORMATION, CONTACT YOUR MARKETING REPRESENTATIVE

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10. STABILITY AND REACTIVITY

STABILITY (THERMAL, LIGHT, ETC.): Stable.
CONDITIONS TO AVOID: Heat, sparks, flame and build up of static electricity.
INCOMPATIBILITY (MATERIALS TO AVOID): Halogens, strong acids, alkalies, and oxidizers.
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide.
HAZARDOUS POLYMERIZATION: Will not occur.

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11. TOXICOLOGICAL DATA

---ACUTE TOXICOLOGY---
ORAL TOXICITY (RATS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
DERMAL TOXICITY (RABBITS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the

components.
INHALATION TOXICITY (RATS): Practically non-toxic (LC50: greater than 5 mg/l). ---Based on testing of similar products and/or the components.
EYE IRRITATION (RABBITS): Practically non-irritating. (Draize score: greater than 6 but 15 or less). ---Based on testing of similar products and/or the components.
SKIN IRRITATION (RABBITS): Practically non-irritating. (Primary Irritation Index: greater than 0.5 but less than 3). ---Based on testing of similar products and/or the components.

---SUBCHRONIC TOXICOLOGY (SUMMARY)---

Repeated dermal application to rats for 13 weeks was carried out with aromatic oils similar to some of the components of this product. Resulting effects included increased mortality and decreased body and thymus weights. Severe skin irritation was also observed at the site of application.

---REPRODUCTIVE TOXICOLOGY (SUMMARY)---

Repeated dermal application to pregnant rats was carried out using aromatic oils similar to some of the components used in this product. Results included maternal toxicity, decreased fetal body weights and decreased fetal survival in some cases. No fetal malformations were observed.

---CHRONIC TOXICOLOGY (SUMMARY)---

Expected to be carcinogenic in lifetime mouse skin painting bioassays.

---OTHER TOXICOLOGY DATA---

Skin cleansing studies with aromatic oils show that toxic effects are not likely to occur in humans if good personal hygiene practices are used. Overexposure to diesel exhaust fumes may result in eye irritation, headaches, nausea, and respiratory irritation. Animal studies involving lifetime exposure to high levels of diesel exhaust have produced variable results, with some studies indicating a potential for lung cancer. Limited evidence from epidemiological studies suggest an association between long-term occupational exposure to diesel engine emissions and lung cancer. Diesel engine exhaust typically consists of gases and particulates, including carbon dioxide, carbon monoxide, nitrogen compounds, oxides of sulfur, and hydrocarbons. Diesel exhaust composition will vary with fuel, engine type, load cycle, engine maintenance, tuning and exhaust gas treatment. Use of adequate ventilation and/or respiratory protection in the presence of diesel exhaust is recommended to minimize exposures.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE AND EFFECTS: Not established.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Product is suitable for burning for fuel value in compliance with applicable laws and regulations.
RCRA INFORMATION: Disposal of unused product may be subject to RCRA regulations (40 CFR 261) due to the characteristic(s)/chemical(s) listed below. Disposal of the used product may also be regulated due to ignitability, corrosivity, reactivity, or toxicity as determined by the Toxicity Characteristic Leaching Procedure (TCLP).

FLASH: > 52(125) C(F)

14. TRANSPORT INFORMATION

NOTE:The flash point of this material is > 125F. Regulatory classifications vary as follows:
DOT: Flammable Liquid OR Combustible Liquid - (49CFR 173.120(b)(2))
OSHA: Combustible Liquid
IATA/IMO: Flammable Liquid
USA DOT:

SHIPPING NAME:	Diesel Fuel
HAZARD CLASS & DIV:	COMBUSTIBLE LIQUID
ID NUMBER:	NA1993
ERG NUMBER:	128
PACKING GROUP:	PG III
STCC:	NE
DANGEROUS WHEN WET:	No
POISON:	No
LABEL(s):	NA
PLACARD(s):	Combustible
PRODUCT RQ:	NA
MARPOL III STATUS:	NA

In accordance with 49 CFR 173.150(f)(2), non-bulk quantities of this material (< 119 gallons per container) may be shipped as non regulated for USA domestic shipments.
RID/ADR:

HAZARD CLASS:	3
HAZARD SUB-CLASS:	31(c)
LABEL:	3
DANGER NUMBER:	30
UN NUMBER:	1202
SHIPPING NAME:	Gas Oil
REMARKS:	NA

IMO:

HAZARD CLASS & DIV:	3.3
UN NUMBER:	1202
PACKING GROUP:	PG III
SHIPPING NAME:	Gas Oil
LABEL(s):	Flammable Liquid
MARPOL III STATUS:	NA

ICAO/IATA:

HAZARD CLASS & DIV:	3
ID/UN Number:	1202
PACKING GROUP:	PG III
SHIPPING NAME:	Gas Oil
SUBSIDIARY RISK:	NA
LABEL(s):	Flammable Liquid

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15. REGULATORY INFORMATION

Governmental Inventory Status: All components comply with TSCA, and EINECS/ELINCS.
EU Labeling:
Symbol: Xn Harmful.
Risk Phrase(s): R40.
Possible risks of irreversible effects.
Safety Phrase(s): S24-2-36/37-62.
Avoid contact with skin. Keep out of the reach of children. Wear suitable protective clothing and gloves. If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.
Contains: Fuels, diesel.
U.S. Superfund Amendments and Reauthorization Act (SARA) Title III:
This product contains no "EXTREMELY HAZARDOUS SUBSTANCES".

SARA (311/312) REPORTABLE HAZARD CATEGORIES:
FIRE CHRONIC
This product contains no chemicals reportable under SARA (313) toxic release program.

The following product ingredients are cited on the lists below:

CHEMICAL NAME	CAS NUMBER	LIST CITATIONS
DIESEL OIL..C9-20	68334-30-5	21, 26

--- REGULATORY LISTS SEARCHED ---

1=ACGIH ALL	6=IARC 1	11=TSCA 4	16=CA P65 CARC	21=LA RTK
2=ACGIH A1	7=IARC 2A	12=TSCA 5a2	17=CA P65 REPRO	22=MI 293
3=ACGIH A2	8=IARC 2B	13=TSCA 5e	18=CA RTK	23=MN RTK
4=NTP CARC	9=OSHA CARC	14=TSCA 6	19=FL RTK	24=NJ RTK
5=NTP SUS	10=OSHA Z	15=TSCA 12b	20=IL RTK	25=PA RTK
				26=RI RTK

Code key: CARC=Carcinogen; SUS=Suspected Carcinogen; REPRO=Reproductive

16. OTHER INFORMATION

Precautionary Label Text:
CONTAINS DIESEL OIL.. C9-20
WARNING!
COMBUSTIBLE LIQUID AND VAPOR. MAY CAUSE NOSE, THROAT AND LUNG IRRITATION, DIZZINESS, NAUSEA, LOSS OF CONSCIOUSNESS. LOW VISCOSITY MATERIAL-IF SWALLOWED, MAY BE ASPIRATED AND CAN CAUSE SERIOUS OR FATAL LUNG DAMAGE.
MAY CAUSE SKIN CANCER ON PROLONGED, REPEATED SKIN CONTACT. ANIMAL SKIN ABSORPTION STUDIES RESULTED IN INCREASED MORTALITY, EFFECTS ON BODY WEIGHT, THE IMMUNE SYSTEM AND THE UNBORN CHILD. PROLONGED, REPEATED SKIN CONTACT MAY CAUSE IRRITATION. DIESEL EXHAUST IS SUSPECT OF CAUSING LUNG CANCER.
Keep away from heat and flame. Avoid prolonged or repeated overexposure by skin contact or inhalation. Use with adequate ventilation. Keep container closed. Keep out of reach of children. Approved portable containers must be properly grounded when transferring fuel.
FIRST AID: If inhaled, remove from further exposure. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a bag-valve-mask device or use mouth-to-mouth resuscitation. In case of contact, remove contaminated clothing. Dry wipe the exposed skin and cleanse with waterless hand cleaner and follow by washing thoroughly with soap and water. For those providing assistance, avoid further skin contact to yourself and others. Wear impervious gloves. If swallowed, seek immediate medical attention. Do not induce vomiting. Only induce vomiting at the instruction of a physician.
Empty container may contain product residue, including flammable or explosive vapors. Do not cut, puncture, or weld on or near container. All label warnings and precautions must be observed until container has been thoroughly cleaned or destroyed.
Chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm are created by the combustion of this product. Refer to product Material Safety Data Bulletin for further safety and health information.

USE: DIESEL FUEL
NOTE: MOBIL PRODUCTS ARE NOT FORMULATED TO CONTAIN PCBS.

INGREDIENT DESCRIPTION	PERCENT	CAS NUMBER
DIESEL OIL..C9-20	100	68334-30-5

****
For Internal Use Only: MHC: 1* 1* 1* 1* 1*, MPPEC: C, REQ: US - MARKETING, SAFE USE: C
****
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Attachment D

Supervisor's Accident Investigation Report Form

SUPERVISOR'S ACCIDENT INVESTIGATION REPORT

Injured Employee Job Title _____

Home Office _____ Division/Department _____

Date/Time of Accident _____

Location of Accident _____

Witnesses to the Accident _____

Injury Incurred? _____ Nature of Injury _____

_____

Engaged in What Task When Injured? _____

_____

Will Lost Time Occur? _____ How Long? _____ Date Lost Time Began _____

Were Other Persons Involved/Injured? _____

_____

How Did the Accident Occur? _____

_____

_____

_____

_____

What Could Be Done to Prevent Recurrence of the Accident? _____

_____

_____

What Actions Have You Taken Thus Far to Prevent Recurrence? _____

_____

_____

Supervisor's Signature _____ Title _____ Date _____

Reviewer's Signature _____ Title _____ Date _____

Note: If the space provided on this form is insufficient, provide additional information on a separate page and attach. The completed accident investigation report must submitted to the Regional Health and Safety Manager within two days of the occurrence of the accident.

Revision 0: March 15, 1991

TABLE 1

PETROLEUM HYDROCARBON ANALYTICAL RESULTS

Arden Post Office

(mg/kg)

Sample Number	Sample Date	Sample Location	TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes (Total)
E/14	8/31/98	14 feet bgs, east end of tank	ND	ND	ND	ND	ND
W/14	8/31/98	14 feet bgs, west end of tank	ND	ND	ND	ND	ND
		Method Detection Limit	1.0	0.005	0.005	0.005	0.005

Notes: ND = Not Detected above method detection limit
TPH-G = Total Petroleum Hydrocarbons for Gasoline
bgs = below ground surface

APPENDIX C

ENSR STANDARD OPERATING PROCEDURES (SOPs)

STANDARD OPERATING PROCEDURE LIST

SOP-1	SOIL BORING SAMPLING
SOP-3	SOIL CLASSIFICATION
SOP-4	SAMPLE IDENTIFICATION AND CHAIN-OF-CUSTODY PROCEDURES
SOP-5	LABORATORY ANALYTICAL QUALITY ASSURANCE AND CONTROL
SOP-6	HOLLOW-STEM AUGER MONITORING WELL INSTALLATION AND DEVELOPMENT
SOP-7	GROUNDWATER PURGING AND SAMPLING
SOP-12	MEASURING LIQUID LEVELS USING A WATER LEVEL INDICATOR OR INTERFACE PROBE

STANDARD OPERATING PROCEDURES
RE: SOIL BORING SAMPLING
SOP-1

During drilling with a hollow-stem auger or air-rotary rig, soil samples are typically collected in thin-walled brass or stainless steel tubes 6 inches long by 2 inches outside diameter. Three of the tubes are set, typically, in an 18-inch-long split-barrel sampler. The sampler is usually lowered into the open borehole attached either to the end of drilling pipe or on a wire-line hammer device.

When possible, the split-barrel sampler is driven its entire length, either hydraulically or by repeatedly pounding a 140-pound hammer using a 30-inch drop. The number of drops (blows) used to drive the sampler is recorded on the boring log. The sampler is extracted from the borehole and the tubes containing the soil samples are removed. Upon removal from the sampler, the ends of the lowermost tube are typically covered with aluminum foil or "Teflon" sheets and plastic caps. The sample may be extruded from the tube and sealed within another appropriate cleaned sample container (e.g., glass jar). The sealed sample is labeled and refrigerated for delivery, under strict chain-of-custody, to the analytical laboratory. These procedures minimize the potential for cross-contamination and volatilization of volatile organic compounds (VOC) prior to chemical analysis.

Material from one of the other tubes is analyzed in the field, when required, using either a portable photoionization detector (PID) or equivalent analytical instrument. The purpose of this field analysis is to qualitatively determine the presence or absence of hydrocarbons. The soil sample is enclosed in a container (eg., plastic bag) to allow for some volatilization of VOC. The PID is then used to measure the concentrations of hydrocarbons within the container headspace. The data is recorded on the boring logs at the depth corresponding to the sampling point.

Any remaining soil collected from the sampler at that interval is described geologically using the USCS or other appropriate classification system) on a boring log. All drilling and sampling equipment are either steam-cleaned or washed prior to use at each site and between boreholes to minimize the potential for cross-contamination. Sampling equipment is also cleaned between samples.

STANDARD OPERATING PROCEDURES
RE: SOIL CLASSIFICATION
SOP-3

Soil samples are classified according to the Unified Soil Classification System. Representative portions of the samples may be submitted under strict chain-of-custody to an analytical laboratory for further examination and verification of the in-field classification, and analysis of soil mechanical and/or petrophysical properties. The soil types are indicated on logs of either excavations or borings together with depths corresponding to the sampling points, and other pertinent information.

STANDARD OPERATING PROCEDURES
RE: SAMPLE IDENTIFICATION AND CHAIN-OF-CUSTODY PROCEDURES
SOP-4

Sample identification and chain-of-custody procedures ensure sample integrity, and document sample possession from the time of collection to its ultimate disposal. Each sample container submitted for analysis is labeled to identify the job number, date, time of sample collection, a sample number unique to the sample, any name(s) of on-site personnel and any other pertinent field observations also recorded on the field excavation or boring log.

Chain-of-custody forms are used to record possession of the sample from time of collection to its arrival at the laboratory. During shipment, the person with custody of the samples will relinquish them to the next person by signing the chain-of-custody form(s) and noting the date and time. The sample-control officer at the laboratory will verify sample integrity, correct preservation, confirm collection in the proper container(s), and ensure adequate volume for analysis.

If these conditions are met, the samples will be assigned unique laboratory log numbers for identification throughout analysis and reporting. The log numbers will be recorded on the chain-of-custody forms and in the legally-required log book maintained in the laboratory. The sample description, date received, client's name, and any other relevant information will also be recorded.

STANDARD OPERATING PROCEDURES
RE: LABORATORY ANALYTICAL QUALITY ASSURANCE AND CONTROL
SOP-5

In addition to routine instrument calibration, replicates, spikes, blanks, spiked blanks, and certified reference materials are routinely analyzed at method-specific frequencies to monitor precision and bias. Additional components of the laboratory Quality Assurance/Quality Control program include:

1. Participation in state and federal laboratory accreditation/certification programs;
2. Participation in both U.S. EPA Performance Evaluation studies (WS and WP studies) and inter-laboratory performance evaluation programs;
3. Standard operating procedures describing routine and periodic instrument maintenance;
4. "Out-of-Control"/Corrective Action documentation procedures; and,
5. Multi-level review of raw data and client reports.

STANDARD OPERATING PROCEDURES
RE: HOLLOW-STEM AUGER MONITORING WELL INSTALLATION AND DEVELOPMENT
SOP-6

Boreholes for monitoring wells are drilled using a truck-mounted, hollow-stem auger drill rig. The borehole diameter will be a minimum of 4 inches larger than the outside diameter of the casing when installing well screen. The hollow-stem auger provides minimal interruption of drilling while permitting soil sampling at desired intervals. Soil samples are collected by either hammering or hydraulically pushing a conventional split-barrel sampler containing pre-cleaned 2-inch-diameter brass tubes. A geologist or engineer from ENSR, continuously logs each borehole during drilling and constantly checks drill cuttings for indications of both the first recognizable occurrence of groundwater and volatile hydrocarbons, using either a portable photoionization detector, flame ionization detector, or an explosimeter. The sampler is rinsed between samples and either steam cleaned or washed with all other drilling equipment between borings to minimize the potential for cross-contamination.

Monitoring wells are cased with threaded, factory-perforated and blank Schedule 40 PVC. The perforated interval consists of slotted casing, generally with 0.020-inch-wide by 1.5-inch-long slots, with 42 slots per foot. A PVC cap may be secured to the bottom of the casing with stainless steel screws; no solvents or cements are used. Centering devices may be fastened to the casing to ensure even distribution of filter material and grout within the borehole annulus. The well casing is thoroughly washed and/or steam cleaned, or may be purchased as pre-cleaned, prior to installation.

After setting the casing inside the hollow-stem auger, sand or gravel filter material is poured into the annular space to fill from boring bottom to generally 1 foot above the perforated interval. A 1- to 2-foot thick bentonite plug is set above this filter material to prevent grout from infiltrating into the filter pack. Either neat cement, containing about 5 percent bentonite, or sand-cement grout is then tremmied into the annular space from the top of the bentonite plug to near surface. A traffic-rated vault is installed around each wellhead for wells located in parking lots or driveways, while steel "stovepipes" are usually set over wellheads in landscaped areas.

After installation, the wells are thoroughly developed to remove residual drilling materials from the wellbore, and to improve well performance by removing fine material from the filter pack that may pass into the well. Well development techniques used may include pumping, surging, bailing, swabbing, jetting, flushing, and air-lifting. All development water is collected either in drums or tanks for temporary storage, and properly disposed of depending on laboratory analytical results. To minimize the potential for cross-contamination between wells, all development equipment is either steam cleaned or properly washed prior to use.

STANDARD OPERATING PROCEDURES
RE: GROUNDWATER PURGING AND SAMPLING
SOP-7

Prior to water sampling, each well is purged by evacuating a minimum of three wetted well-casing volumes of groundwater. When required, purging will continue until either the discharge water temperature, conductivity, or pH stabilize to within 10% of previously measured values; and a maximum of ten wetted casing volumes of groundwater have been recovered, or the well is bailed dry. When practical, the groundwater sample should be collected when the water level in the well recovers to at least 80 percent of its static level. Field measurements, observations and procedures are noted.

The sampling equipment consists of a clean bailer, or stainless steel bladder pump with a "Teflon" bladder. If the sampling system is dedicated to the well, then the bailer is usually "Teflon," but the bladder pump may be PVC with a polypropylene bladder. Sample container type, preservation, and volume depends on the intended analyses.

The groundwater sample is decanted into each VOA vial in such a manner that there is no meniscus at the top of the vial. A cap is quickly secured to the top of the vial. The vial is then inverted and gently tapped to see if air bubbles are present. If none are present, the vial is labeled and refrigerated for delivery, under strict chain-of-custody, to the analytical laboratory. Label information should include a unique sample identification number, job identification number, date, time, and the sampler's initials.

For quality control purposes, a duplicate water sample may be collected from a well. When required, a trip blank is prepared at the laboratory and placed in the transport cooler. It is labeled similar to the well samples, remains in the cooler during transport, and is analyzed by the laboratory along with the groundwater samples. In addition, a field blank may be prepared in the field when sampling equipment is not dedicated. The field blank is prepared after a pump or bailer has been either steam cleaned or properly washed, prior to use in the next well, and is analyzed along with the other samples. The field blank analysis demonstrates the effectiveness of in-field cleaning procedures to prevent cross-contamination.

To minimize the potential for cross-contamination between wells, all well development and water sampling equipment not dedicated to a well is either steam cleaned or properly washed between use. As a second precautionary measure, wells are sampled in order of lowest to highest concentrations as established by available previous analytical data.

In the event the water samples cannot be submitted to the analytical laboratory on the same day they are collected (e.g., due to weekends or holidays), the samples are temporarily stored until the first opportunity for submittal either on ice in a cooler, such as when in the field, or in a refrigerator.

STANDARD OPERATING PROCEDURES
RE: MEASURED LIQUID LEVELS USING A WATER LEVEL INDICATOR OR INTERFACE PROBE
SOP-12

Field equipment used for liquid-level gauging typically includes the measuring probe (water level or interface) and a clean product bailer(s). The field kit also includes cleaning supplies (buckets, TSP, spray bottles, and deionized water) to be used in cleaning the equipment between wells.

Prior to measurement, the probe tip is lowered into the well until it touches bottom. Using the previously established top-of-casing or top-of-box (i.e., wellhead vault) point, the probe cord (or halyard) is marked and a measuring tape (graduated in hundredths of a foot) is used to determine the distance between the probe end and the marking on the cord. This measurement is then recorded on the liquid-level data sheet as the "Measured Total Depth" of the well.

When necessary in using the interface probe to measure liquid levels, the probe is first electrically grounded to either the metal stove pipe or another metal object nearby. When no ground is available, reproducible measurements can be obtained by clipping the ground lead to the handle of the interface probe case.

The probe tip is then lowered into the well and submerged in the groundwater. An oscillating (beeping) tone indicates the probe is in water. The probe is slowly raised until either the oscillating tone ceases or becomes a steady tone. In either case, this is the depth-to-water (DTW) indicator and the DTW measurement is made accordingly. The steady tone indicates floating hydrocarbons. In this case, the probe is slowly raised until the steady tone ceases. This is the depth-to-product (DTP) indicator and the measurement of DTP is recorded. A corrected depth to groundwater to account for floating hydrocarbons can be calculated by using the following formula:

CDTW = DTW - (SP.G x LHT).
CDTW = Corrected depth to groundwater.
DTW = Measured depth to groundwater.
SP.G = Specific gravity: unweathered gasoline = 0.75; diesel = 0.80
LHT = Measured liquid hydrocarbon thickness.

The corresponding groundwater elevation is the difference between a previously determined well reference elevation and either the depth to groundwater or the corrected depth to groundwater.

The process of lowering and raising the probe must be repeated several times to ensure accurate measurements. The DTW and DTP measurements are recorded on the liquid-level data sheet. When floating product is indicated by the probe's response, a product bailer is lowered partially through the product-water interface to confirm the product on the water surface, and as further indication of product thickness, particularly in cases where the product layer is quite thin. Either this measurement or the difference between DTW and DTP is recorded on the data sheet as "product thickness".

STANDARD OPERATING PROCEDURES
RE: MEASURED LIQUID LEVELS USING A WATER LEVEL INDICATOR OR INTERFACE PROBE
SOP-12 (cont.)

In order to avoid cross-contamination of wells during the liquid-level measurement process, wells are measured in the order of "clean" to "dirty" (where such information is available). In addition, all measurement equipment is cleaned with TSP or similar solution and thoroughly rinsed with deionized water before use, between measurements in respective wells, and at the completion of the day's activities.