R0 58

MILLER BROOKS
Environmental, Inc.

720 Southpoint Blvd. Suite 207
Petaluma, CA 94954
Phone (707) 765-0466, Fax (707) 765-0366

TRANSMITTAL

TO: Mr. Donald Hwang
Alameda County Dept. of Public Health
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502

DATE: October 12, 2004
PROJECT NO. 06-459-6129-03
SUBJECT: 76 Service Station 6129
Oakland, California

From: Jeremy Smith

WE ARE SENDING YOU:

COPIES	DATED	DESCRIPTION
1	10/11/04	Work Plan for Additional Subsurface Site Assessment Activities

THESE ARE TRANSMITTED as checked below:

- ☐ For review and comment
- ☐ As Requested
- ☒ For Approval
- ☐ Approved as submitted
- ☐ Approved as noted
- ☐ Returned for corrections
- ☒ For your files
- ☐ For your use
- ☐ As noted below

COMMENTS:
Attached is a copy of the Work Plan for the above referenced site. Please call with any questions you may have. Thanks.

Signed: _____

COPIES TO: Mr. Thomas Kosel, (electronic copy)

ConocoPhillips

76 Broadway
Sacramento, CA 95818
phone 916.558.7676
fax 916.558.7639

October 11, 2004

Mr. Don Hwang
Alameda County Health Agency
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502

Re: **Document Transmittal**
Fuel Leak Case No. RO0000058
76 Station 6129
3420 35th Avenue
Oakland, California

Dear Mr. Hwang:

Please find attached the *Work Plan for Additional Subsurface Site Assessment Activities, dated 10/11/04* for the above referenced site. I declare, under penalty of perjury, that to the best of my knowledge the information and/or recommendations contained in the attached proposal or report is true and correct.

If you have any questions or need additional information, please call me at (916) 558-7666.

Sincerely,

Thomas H. Kosel
Site Manger, Risk Management and Remediation
ConocoPhillips
76 Broadway, Sacramento, CA 95818

Attachment
cc: Jed Douglas, Miller Brooks

WORK PLAN FOR ADDITIONAL SUBSURFACE SITE ASSESSMENT ACTIVITIES

76 STATION 6129
3420 35th AVENUE
OAKLAND, CALIFORNIA
COP NO. WNO.4583

October 11, 2004

MILLER BROOKS
Environmental, Inc.

WORK PLAN FOR ADDITIONAL SUBSURFACE SITE ASSESSMENT ACTIVITIES

76 STATION 6129
3420 35th AVENUE
OAKLAND, CALIFORNIA
COP NO. WNO.4583

Prepared For:

Mr. Thomas Kosel
ConocoPhillips Company
76 Broadway
Sacramento, CA 95818
(916) 558-7666

By:

MILLER BROOKS ENVIRONMENTAL, INC.
720 Southpoint Boulevard, Suite 207
Petaluma, California 94954
(707) 765-0466

Project Number 06-459-6129-03

October 11, 2004

TABLE OF CONTENTS

1.0 INTRODUCTION

Miller Brooks Environmental, Inc. (Miller Brooks), on behalf of ConocoPhillips Company (ConocoPhillips), submits this work plan for additional subsurface site assessment activities at 76 Service Station No. 6129, located at 3420 35th Avenue in Oakland, California (Figure 1). This work plan was prepared in response to a letter from the Alameda County Environmental Health Services (ACEHS) to ConocoPhillips dated July 23, 2004, requesting further site assessment in order to delineate the lateral and vertical extent of hydrocarbon affected soil and groundwater beneath the site. The subsurface utility survey has been completed, however is being transmitted under separate cover. The requested public well search is in progress, and the results will be transmitted under separate cover. The proposed scope of work includes:

- obtaining the required drilling permits;
- preparing a site specific site safety plan;
- advancing six soil borings and constructing a groundwater monitoring well in two of the borings to delineate the lateral and vertical extent of petroleum hydrocarbon impacted soil and groundwater beneath the site;
- developing the newly installed monitoring wells;
- contracting a licensed land surveyor to survey the vertical elevation and horizontal location of the new wells;
- collecting and submitting select soil and groundwater samples for chemical analysis;
- arranging for disposal of the waste materials;
- preparing a report which presents the findings of the proposed assessment activities.

2.0 SITE DESCRIPTION

The site is currently an operating 76 Service Station that dispenses gasoline stored in two 12,000-gallon underground storage tanks (USTs) from two dispenser islands. An automotive repair building is present at the site, which contains three service bays. Additionally, there is one used-oil UST, three hydraulic lifts, and three groundwater monitoring wells (MW-1 through MW-3) present at the site. There was previously one former used-oil UST, one former clarifier was present beneath the central hydraulic lift, and two floor drains have previously been removed. Pertinent current and former site features are displayed on Figure 2. A former Exxon service station is located to the northeast immediately across Quigley Street.

3.0 ENVIRONMENTAL SETTING

3.1 Geologic Features

The site is located at an elevation of approximately 185 feet above mean sea level (MSL), and slopes gently to the southwest. Soil encountered during previous drilling activities generally consisted of silt and lean clay with varying amounts of sand and gravel to the maximum depth explored (44 feet bgs). Geologic cross sections at the site are presented as Figures 3 and 4, and the surface projection of the cross sections are shown on the Site Plan (Figure 2). The cross sections are interpreted to show that the subsurface stratigraphy is composed of alternating fine- and coarse-grained sediments of varying thickness, which are laterally discontinuous across the site.

3.2 Hydrogeology

Groundwater monitoring of the three existing monitoring wells was conducted on a quarterly basis from May 1990 until May 1991. Groundwater was measured during this period at depths ranging from 30.37 to 33.47 feet below the top of well casing (TOC), and was reported to flow towards the southwest, at an average hydraulic gradient of 0.02 ft/ft. A groundwater rose is presented as Figure 5, which depicts the groundwater flow directions reported during the five quarterly monitoring events conducted in 1990 and 1991. The groundwater rose indicates that the flow direction has been consistently reported as towards the southwest, which is consistent with the surface topography at the site Groundwater at the site was subsequently monitored again on November 13, 2003. During this event, groundwater was encountered at depths between 31.07 and 31.36 feet below TOC, and flowed towards the southwest at a calculated hydraulic gradient of 0.015 ft/ft. The flow direction and gradient are consistent with the historically reported information.

4.0 BACKGROUND

According to Kaprealian Engineering, Inc. (KEI), in 1989, two 10,000-gallon gasoline USTs and one 550-gallon waste oil UST were removed from the site. Analytical results of soil samples collected beneath the former gasoline USTs, used-oil UST and product piping indicated that low concentrations of petroleum hydrocarbons were detected in each of the sampling areas. Three groundwater monitoring wells (MW-1 through MW-3) were installed in 1989 to a depth of approximately 44 feet below ground surface (bgs). In 1990, four soil borings (EB1 through EB4) were drilled at the site in the vicinity of MW-3 in an attempt to define the hydrocarbon impact to soil. Based on the results of the soil sampling from the four borings, approximately 230 cubic yards of soil were excavated from an area between the dispenser islands and around well MW-3 in 1991. Excavation was performed so as to not destroy well MW-3. Analytical results from confirmation soil samples indicated that the majority of the impacted soil had been removed from the subsurface.

On November 12 and 13, 2003, as part of a due diligence investigation, four soil borings (SB-1 and SB-3 through SB-5) were drilled to total depths of approximately 31.5 to 36.5 feet bgs. Proposed boring SB-2 was unable to be installed due to the presence of subsurface utilities and/or structures. Based upon field observations, groundwater was encountered in the borings at a depth of approximately 35 feet bgs. Methyl tertiary butyl ether (MTBE) was reported at concentrations varying from 0.37 to 0.41 milligrams per kilogram (mg/kg) in the soil samples collected between 26 and 31 feet bgs. All other constituents were reported below the laboratory reporting limit for the soil samples analyzed. The three existing groundwater wells were sampled on November 13, 2003, and the analytical results indicated the presence of MTBE at concentrations between 240 and 3,700 micrograms per liter (µg/l), with the most elevated concentrations occurring in wells MW-2 (2,100 µg/l) and MW-3 (3,700 µg/l).

5.0 PROPOSED SITE ASSESSMENT ACTIVITIES

Miller Brooks proposes to conduct additional subsurface site assessment activities to determine the lateral and vertical extent of soil and groundwater impact in the vicinity of the site by advancing six soil borings and constructing two groundwater monitoring wells at the locations shown on Figure 2.

Before commencing field operations, drilling permits will be obtained from the ACEHS. Prior to drilling, Underground Service Alert will be notified as required, and Cruz Brothers Inc., a private utility locating service, will visit the site to clear the proposed drilling locations for underground utilities. In addition, the boring locations will be cleared to approximately 5 feet bgs using a hand auger or air knife to avoid damage to possible underground utilities. The ACEHS will be notified via email a minimum of 48 hours prior to commencing field activities. A description of Miller Brooks general field procedures is included in Appendix A.

5.1 Drilling and Soil/Groundwater Sampling

To assess the extent of hydrocarbon affected soil and groundwater at the site, Miller Brooks proposes to drill six soil borings both upgradient and downgradient of the site (Figure 2). A groundwater monitoring well is proposed to be constructed in two of the borings, at the downgradient property boundary. It is anticipated that the wells will be installed to a depth of approximately 35 feet bgs. The total depth of the well will be determined in the field, and will be based on encountering saturated soils bearing the shallow aquifer.

The soil borings and monitoring wells will be installed using 8-inch diameter hollow-stem augers advanced by a truck mounted drill rig. Soil samples will be collected every 5 feet for soil description, field hydrocarbon vapor screening, and laboratory analyses. Miller Brooks will submit all of the unsaturated soil samples collected from each of the borings for chemical analysis. It is anticipated that groundwater will first be encountered at a depth of approximately 30 feet bgs.

5.2 Monitoring Well Construction

The groundwater monitoring wells are proposed to be constructed of 2-inch diameter schedule 40 PVC well casing and 0.020-inch machine slotted well screen. It is proposed that the wells will be installed to a total depth of 35 feet bgs. The well casing will be installed through the hollow-stem augers. Five feet of well screen is proposed to be installed at the bottom of the well, and the sand pack will extend approximately two feet above the top of screen. Proposed well construction details are presented on Figure 6.

5.3 Well Monitoring, Development, and Sampling

The newly installed wells will be developed by Miller Brooks personnel. An initial "baseline" groundwater sample will be collected immediately after completion of well development activities. The wells will be added to the quarterly monitoring and sampling program performed by TRC Companies, Inc. (TRC).

Depth to groundwater in the wells will be measured and the wells will be checked for the presence of separate phase hydrocarbons (SPH) prior to development. A minimum of 10 well volumes will be removed from each of the wells. After the wells are properly developed, a groundwater sample will

be collected from each well in a disposable bailer and decanted into appropriate pre-cleaned containers supplied by the laboratory. The groundwater samples will be submitted for chemical analysis (see Section 6.6) under chain-of-custody documentation to STL Laboratories in Pleasanton, California.

5.4 Wellhead Survey

Following installation of the wells, the well casing elevations will be surveyed by Morrow Surveying, Inc. of Sacramento, California, Licensed California Land Surveyor No. 5161. The top of casing and vault box elevations will be measured relative to MSL, and the horizontal location of the wells surveyed by global positioning system (GPS). The survey data will be uploaded to the State Water Resources Control Board (SWRCB) database, per the requirements of Assembly Bill (AB) 2886.

5.5 Waste Disposal

Waste materials generated during site investigation activities will be temporarily stored onsite in labeled, Department of Transportation approved, 55-gallon drums. Once the investigation phase has been completed, the drums will be transported by Filter Recycling to their facility in Rialto, California, for treatment and disposal.

5.6 Laboratory Analysis

Select soil and groundwater samples collected during this investigation will be submitted to a state-certified laboratory and analyzed for Total Petroleum Hydrocarbons as gasoline (TPHg), benzene, toluene, ethyl benzene and xylenes (BTEX), MTBE, tert-Butyl alcohol (TBA), di-isopropyl ether, (DIPE), ethyl tert-butyl ether (ETBE), tert-Amyl methyl ether (TAME), and ethanol using EPA Method 8260B. In addition, for waste profiling purposes, one soil sample will be analyzed for total lead using EPA Method 6010. Chain-of-custody (COC) protocol will be followed for all samples collected for laboratory analysis. The COC form accompanies the samples from the sampling locality to the laboratory, providing a continuous record of possession prior to analysis.

5.7 Site Investigation Report

A report will be prepared upon completion of site investigation activities. The report will include a summary of field activities, results of laboratory analyses of soil and groundwater samples, graphic illustrations of the site and subsurface geology, findings, conclusions, and recommendations. The laboratory data and an updated site plan will be uploaded to the SWRCB database, per the requirements of AB 2886.

6.0 PROJECT SCHEDULE

Following the ACEHS review and approval of the proposed scope of work, Miller Brooks will initiate monitoring well permitting activities. Miller Brooks anticipates scheduling of field activities within 30 days of work plan approval, and submittal of the final report within 60 days following completion of assessment activities.

7.0 SITE SAFETY PLAN

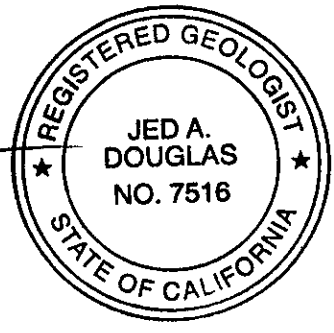
All work activities will be conducted in accordance with requirements of the Miller Brooks Corporate Health and Safety Program and the ACEHS permits and directives. A site safety plan, designed to promote project personnel safety and preparedness during the activities described in this work plan, is included in Appendix B.

If you have any questions regarding this work plan, please call us at (707) 765-0466.

Sincerely,
MILLER BROOKS ENVIRONMENTAL, INC.

Jeremy A. Smith
Senior Staff Scientist

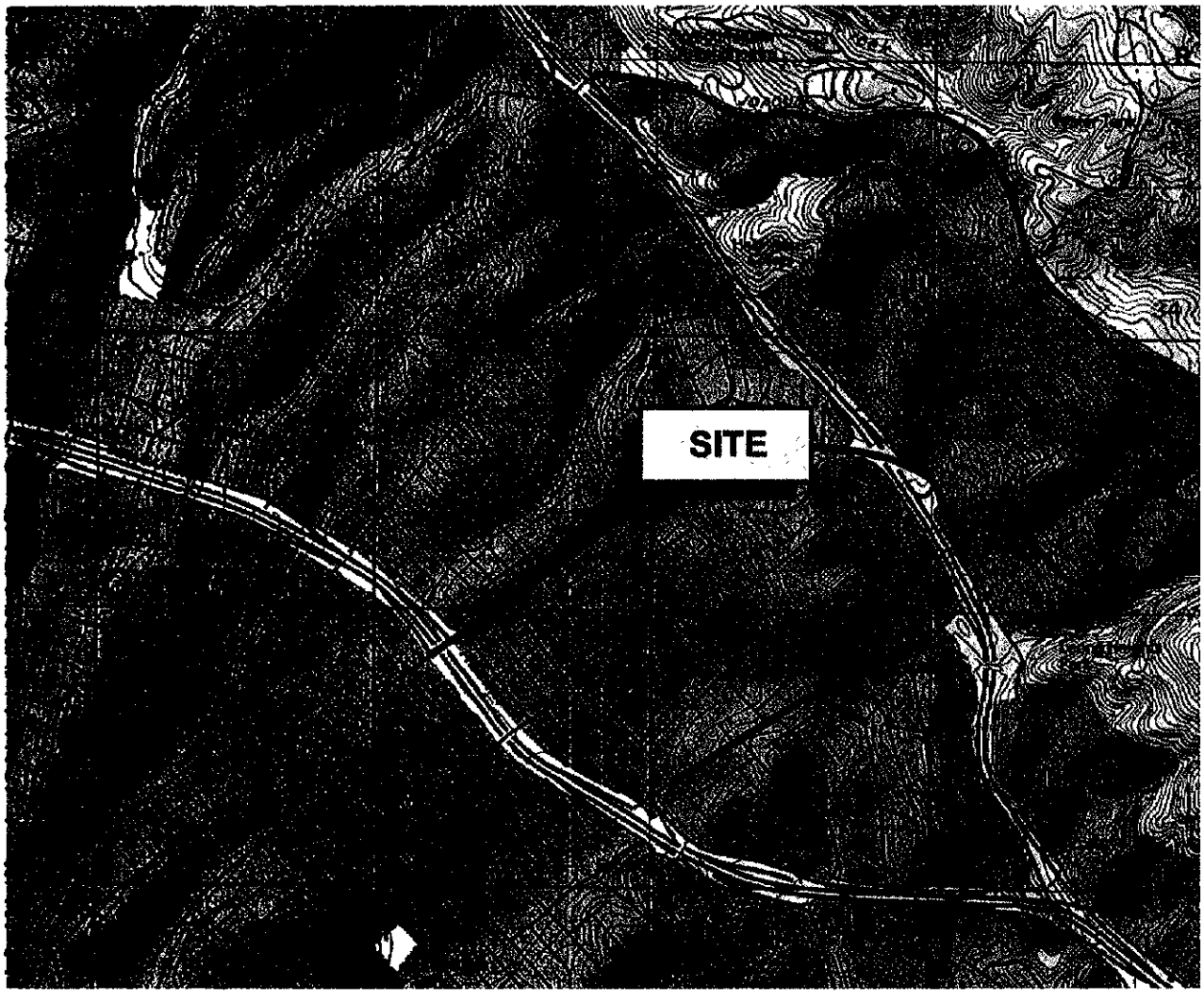
Jed Douglas, R.G. 7516
Senior Geologist



8.0 REFERENCES

Miller Brooks Environmental, Inc., 2003, Limited Phase II Environmental Site Assessment Report, dated November 25, 2003.

FIGURES



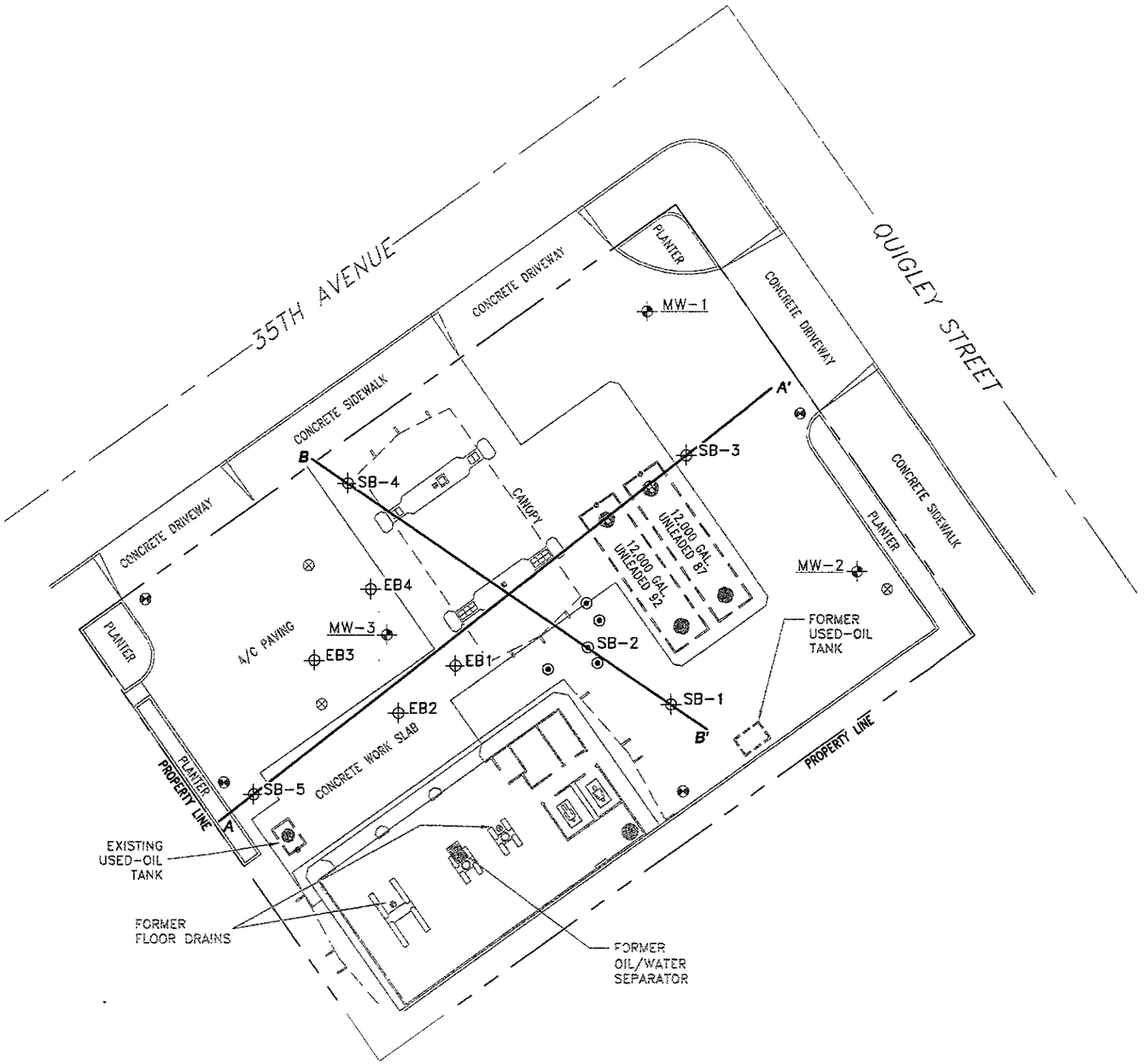
FROM: U.S. GEOLOGICAL SURVEY, 1981
QUADRANGLE: OAKLAND EAST
COUNTY: ALAMEDA
SERIES: 7.5-MINUTE QUAD

NOTE: ALL BOUNDARIES AND LOCATIONS ARE APPROXIMATE

N
W E
S

0 2000 Feet
SCALE

MILLER BROOKS Environmental, Inc.	DRAWN BY: AIL DATE: 11/19/03 REVISED BY: PEL	SITE LOCATION MAP	FIGURE 1
720 SOUTHPOINT BOULEVARD, SUITE 207 PETALUMA, CA. 94954 (707) 765-0466	REVISED: 11/19/03 APPROVED BY: JAD	76 STATION 6129 3420 35TH STREET OAKLAND, CA.	
PROJECT NO. 06-459-6129-01	DATE: 11/20/03	FILE: K:\DWGS\C-P\NO. 6129 (3420 35TH STREET)\VICINITY MAP DATE PLOTTED: 11/20/03	



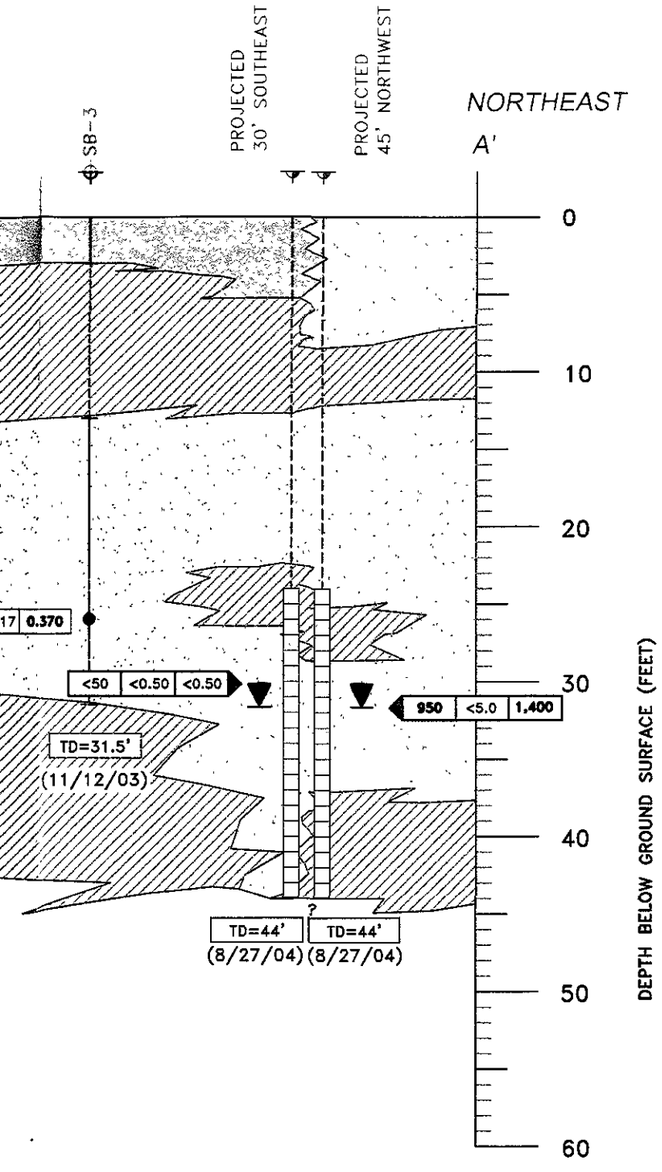
LEGEND

- MW-3 ⊕ GROUNDWATER MONITORING WELL
- EB1 ⊕ SOIL BORING LOCATIONS (1990)
- SB-2 ⊙ ATTEMPTED SOIL BORING
- SB-5 ⊕ SOIL BORING LOCATIONS (2003)
- ⊗ PROPOSED GROUNDWATER MONITORING WELL LOCATION
- ⊗ PROPOSED SOIL BORING LOCATION
- GASOLINE UNDERGROUND STORAGE TANK
- DISPENSER ISLAND
- HOIST

0 30 Feet
SCALE

N
W E
S

	DRAWN BY: AIL	SITE PLAN	FIGURE 2
	DATE: 11/19/03		
	REVISED BY: SLS		
720 SOUTHPOINT BLVD., SUITE 207 PETALUMA, CA. 94954 (707) 765-0466	REVISED: 09/28/04	76 STATION NO. 6129 3420 35TH AVENUE OAKLAND, CA.	
	APPROVED BY: JAD		
PROJECT NO. 06-459-6129-03	DATE: ---	FILE: K:\DWGS\C-P\NO 6129 (3420 35TH ST, OAKLAND)\SITE PLAN DATE PLOTTED: 09/28/04	



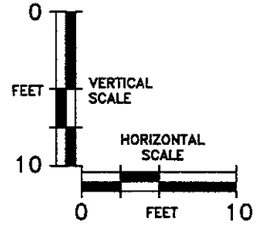
LEGEND

- GROUNDWATER MONITORING WELL
- SCREEN INTERVAL OF WELLS (2" OR 4" DIAMETER WELLS)
- SB-3 — SOIL BORING
- <3.5 | <0.017 | 0.370 — SOIL SAMPLE LOCATION WITH TPH-G/BENZENE/MTBE CONCENTRATIONS IN SOIL (IN mg/kg)
- 950 | <5.0 | 1,400 — TPH-G/BENZENE/MTBE CONCENTRATIONS (IN ug/L) FROM POST-PURGE GROUNDWATER SAMPLES.
- TD=31.5' — TOTAL DEPTH OF BORING OR WELL IN FEET BELOW GROUND SURFACE
- (3/18/03) — SOIL AND GROUNDWATER SAMPLE COLLECTION DATE
- ▼ — APPROXIMATE STATIC GROUNDWATER ON DATE OF WELL INSTALLATION
- ? — UNDEFINED STRATIGRAPHY

- FINE-GRAINED LEAN & FAT CLAY WITH SAND AND GRAVEL
- ARTIFICIAL FILL
- COARSE-GRAINED SAND AND GRAVEL WITH SILT AND CLAY
- APPROXIMATE STRATIGRAPHIC BOUNDARY

NOTES:

1) ND = NOT DETECTED AT OR ABOVE LABORATORY REPORTING LIMIT, mg/Kg = MILLIGRAMS PER KILOGRAM.
2) TPH-G = TOTAL PETROLEUM HYDROCARBONS AS GASOLINE ANALYZED USING DHS LUFT METHOD, BENZENE AND MTBE ANALYZED USING EPA METHOD 8260B.
3) STRATIGRAPHY BETWEEN BORINGS AND WELLS IS INTERPRETED.
4) GROUND SURFACE NOT ADJUSTED TO DEPICT ACTUAL GROUND SURFACE ELEVATION.



MILLER BROOKS Environmental, Inc.
720 SOUTHPOINT BLVD., SUITE 207
PETALUMA, CA. 94954
(707) 765-0466

PROJECT NO. 06-459-6129-03

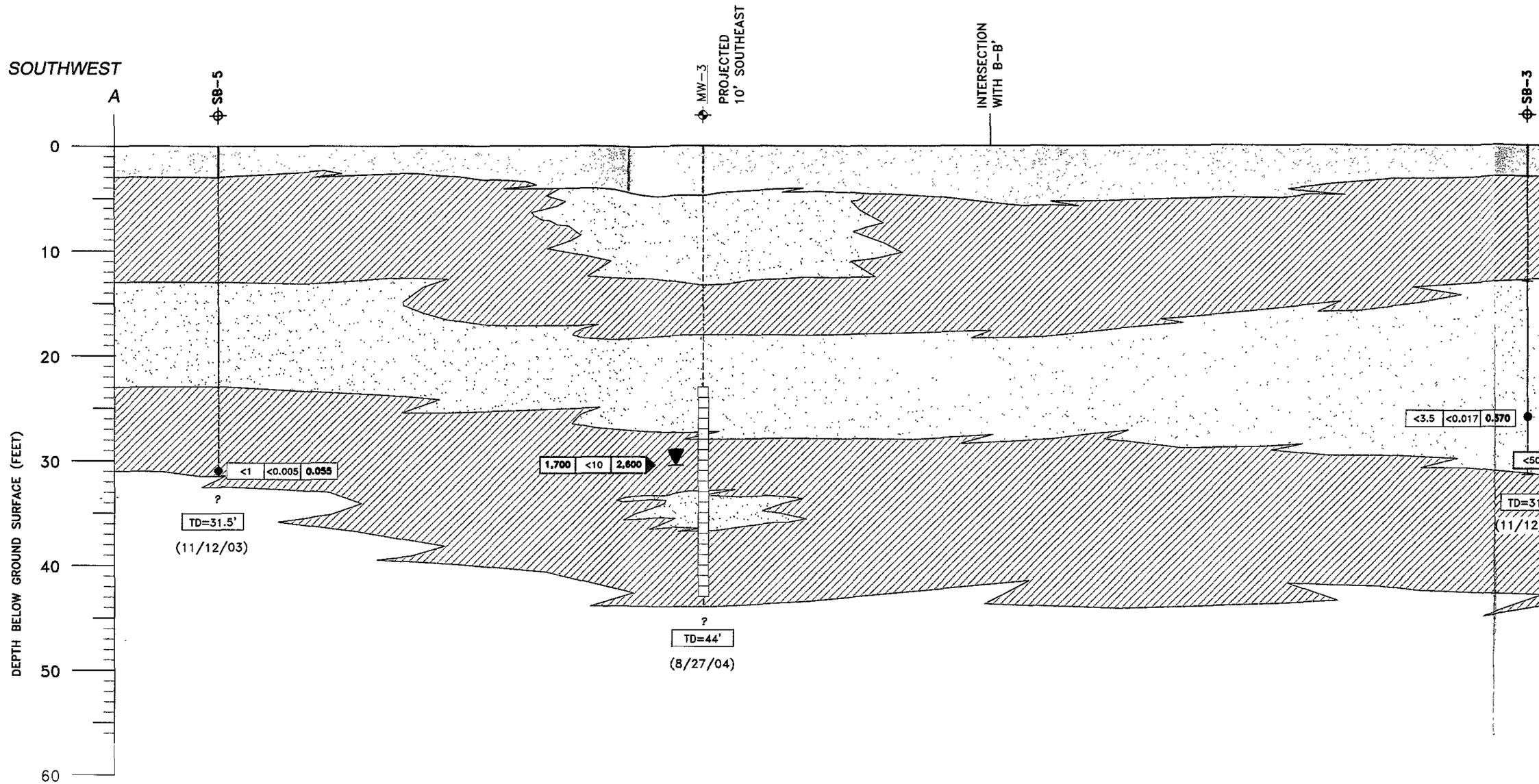
DRAWN BY:	SLS
DATE:	09/21/04
REVISED BY:	SLS
REVISED:	09/28/04
APPROVED BY:	JAD
DATE:	09/28/04

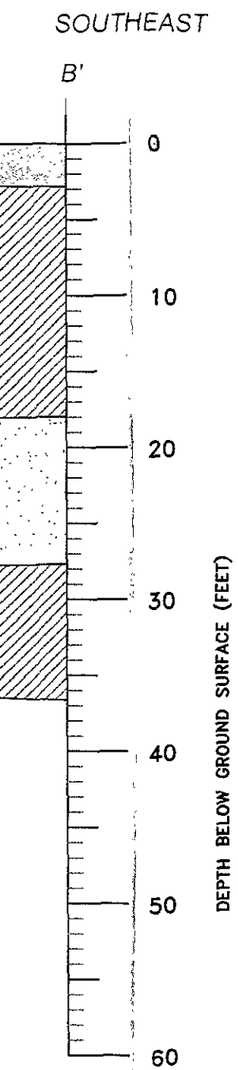
GEOLOGIC CROSS SECTION A-A'

76 STATION NO. 6129
3420 35TH AVENUE
OAKLAND, CA.

FILE: K:\DWGS\OXNARD (2460 VINEYARD AVE.)\SCM\CS 09-21-04
DATE PLOTTED: 09/28/04

FIGURE 3


SOUTHWEST
A
SB-5
MW-3
PROJECTED
10' SOUTHEAST
INTERSECTION
WITH B-B'
SB-3
DEPTH BELOW GROUND SURFACE (FEET)
0
10
20
30
40
50
60
<1
<0.005
0.055
?
TD=31.5'
(11/12/03)
1,700
<10
2,600
?
TD=44'
(8/27/04)
<3.5
<0.017
0.570
TD=31
(11/12



LEGEND

GROUNDWATER MONITORING WELL

SCREEN INTERVAL OF WELLS
(2" OR 4" DIAMETER WELLS)

SB-1 — SOIL BORING

<3.4 | <0.017 | 0.410 — SOIL SAMPLE LOCATION WITH TPH-G/BENZENE/MTBE CONCENTRATIONS IN SOIL (IN mg/kg)

1,700 | <10 | 2,600 — TPH-G/BENZENE/MTBE CONCENTRATIONS (IN ug/L) FROM POST-PURGE GROUNDWATER SAMPLES.

TD=36.5' — TOTAL DEPTH OF BORING OR WELL IN FEET BELOW GROUND SURFACE

(11/12/03) — SOIL AND GROUNDWATER SAMPLE COLLECTION DATE

▼ — APPROXIMATE STATIC GROUNDWATER ON DATE OF WELL INSTALLATION

? — UNDEFINED STRATIGRAPHY

FINE-GRAINED LEAN & FAT CLAY WITH SAND AND GRAVEL

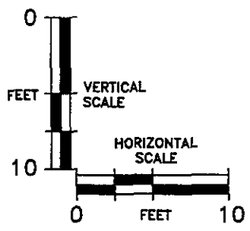
ARTIFICIAL FILL

COARSE-GRAINED SAND AND GRAVEL WITH SILT AND CLAY

APPROXIMATE STRATIGRAPHIC BOUNDARY

NOTES:

1) NA = NOT ANALYZED.
2) ND = NOT DETECTED AT OR ABOVE LABORATORY REPORTING LIMIT, mg/Kg = MILLIGRAMS PER KILOGRAM.
3) TPH-G = TOTAL PETROLEUM HYDROCARBONS AS GASOLINE ANALYZED USING DHS LUFT METHOD, BENZENE AND MTBE ANALYZED USING EPA METHOD 8260B.
4) STRATIGRAPHY BETWEEN BORINGS AND WELLS IS INTERPRETED.
5) GROUND SURFACE NOT ADJUSTED TO DEPICT ACTUAL GROUND SURFACE ELEVATION.



MILLER BROOKS Environmental, Inc.
720 SOUTHPOINT BLVD., SUITE 207
PETALUMA, CA. 94954
(707) 765-0466

PROJECT NO. 06-459-6129-03

DRAWN BY: SLS
DATE: 09/21/04
REVISED BY: SLS
REVISED: 09/28/04
APPROVED BY: JAD
DATE: 09/28/04

GEOLOGIC CROSS SECTION B-B'

76 STATION NO. 6129
3420 35TH AVENUE
OAKLAND, CA.

FIGURE 4

FILE: K:\DWGS\OXNARD (2480 VINEYARD AVE.)\SCM\CS 09-21-04
DATE PLOTTED: 09/28/04

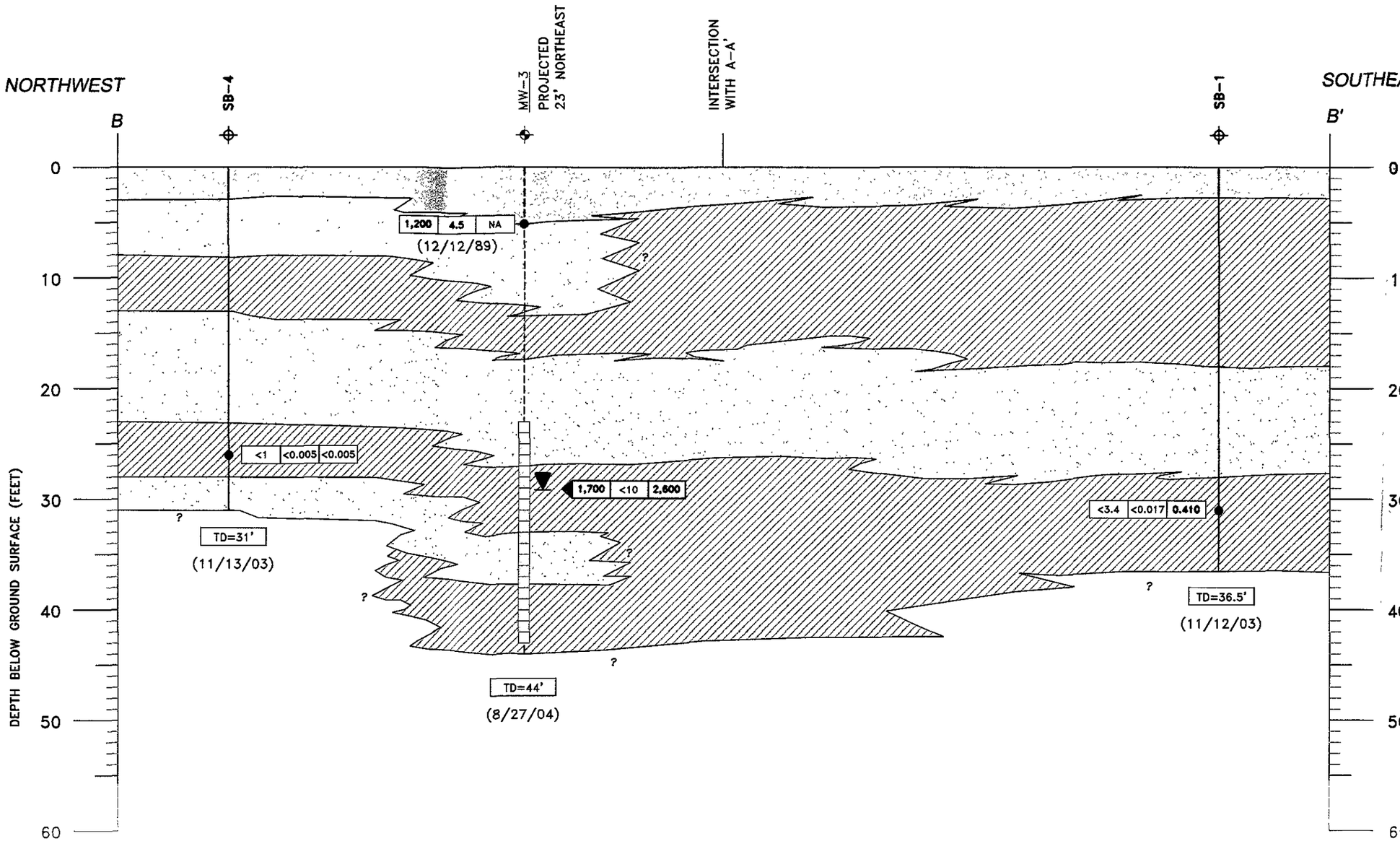
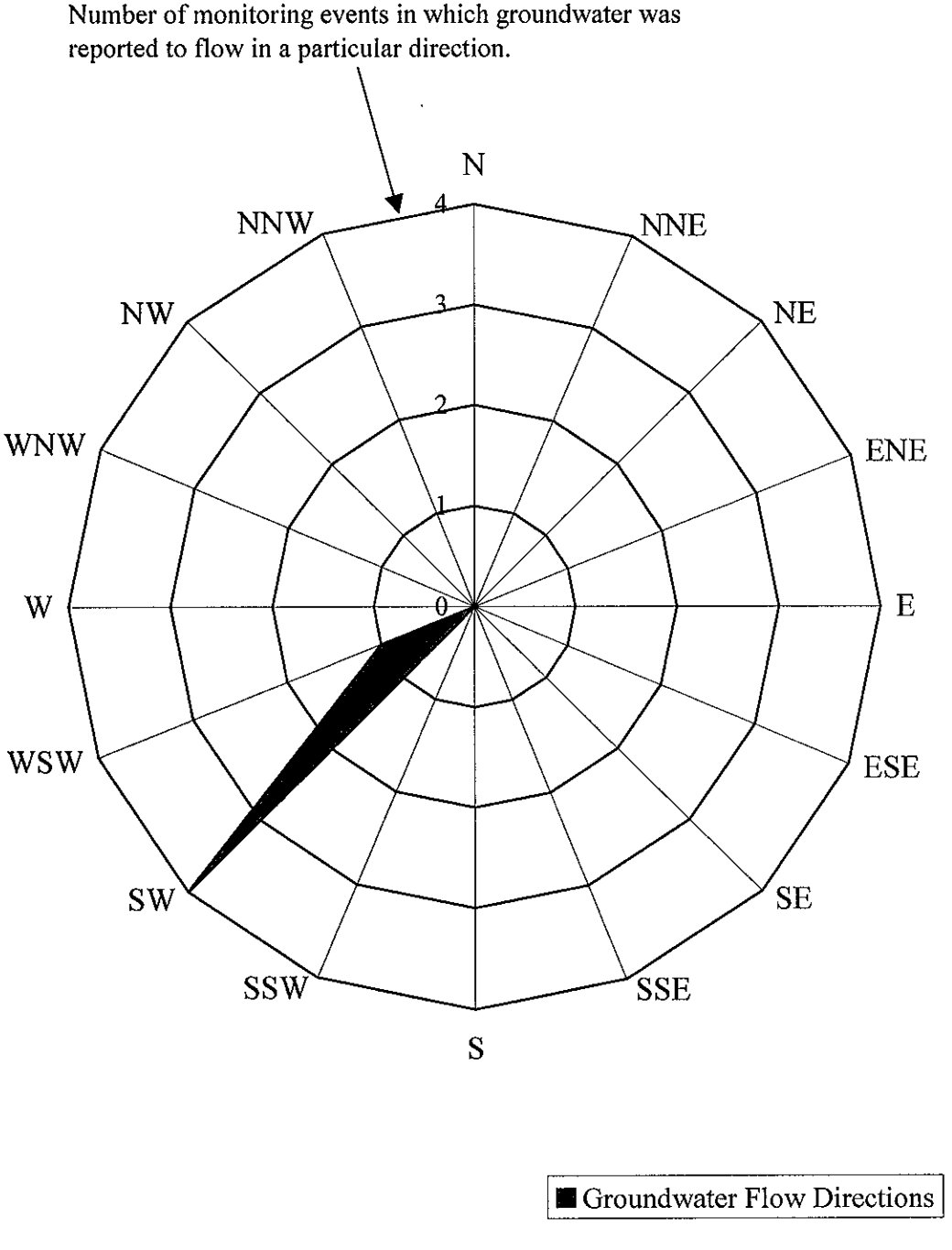
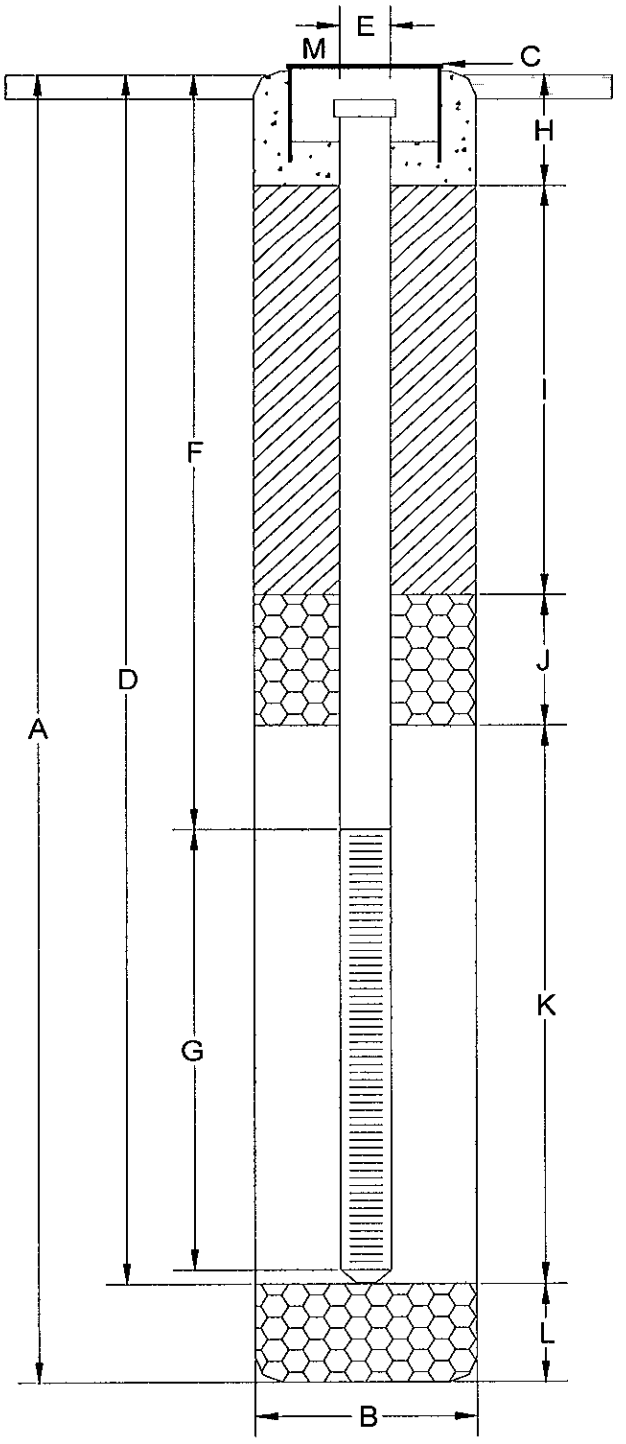

NORTHWEST
B
SB-4
MW-3
PROJECTED
23' NORTHEAST
INTERSECTION
WITH A-A'
SB-1
SOUTHE
B'
DEPTH BELOW GROUND SURFACE (FEET)
0
10
20
30
40
50
60
1,200 | 4.5 | NA
(12/12/89)
<1 | <0.005 | <0.005
TD=31'
(11/13/03)
1,700 | <10 | 2,600
TD=44'
(8/27/04)
<3.4 | <0.017 | 0.410
TD=36.5'
(11/12/03)

FIGURE 5
Historical Groundwater Flow Directions for 76 Service Station No. 6129 (5/11/90 through 5/9/91)



PROPOSED WELL CONSTRUCTION DETAIL



A Total Depth of Boring 35 ft.

B Diameter of Boring 8 in.
Drilling Method hollow stem auger

C Top of Box Elevation to be surveyed ft.
[X] Referenced to Mean Sea Level
[ ] Referenced to Project-Datum

D Casing Length 35 ft.
Material schedule 40 PVC

E Casing Diameter 2 in.

F Depth to Top Perforations 30 ft.

G Perforated Length 5 ft.
Perforated interval from 30 to 35 ft.
Perforation Size 0.02 in.

H Surface Seal from 0 to 1.5 ft.
Seal Material concrete

I Backfill from 1.5 to 26 ft.
Seal Material neat cement

J Seal from 26 to 28 ft.
Seal Material hydrated bentonite

K Sand Pack from 28 to 35 ft.
Pack Material Lonestar #3 sand

L Bottom Seal N/A ft.
Seal Material N/A

M Traffic-rated, water-resistant, steel well box
Locking expandable well plug with lock

Note: Depths measured from initial ground surface.

MILLER BROOKS Environmental, Inc.
720 Southpoint Boulevard, Suite 207
Petaluma, CA 94954 (707) 765-0466

76 Service Station No. 6129
3420 35th Avenue
Oakland, California

FIGURE
6

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE	REVISED DATE
06-459-6129-03		Jan-04	Feb-04	

APPENDIX A
GENERAL FIELD PROCEDURES

GENERAL FIELD PROCEDURES – WELL INSTALLATION

DRILLING AND SOIL SAMPLING

Soil borings are drilled using a continuous-flight, hollow-stem auger drilling rig. Soil excavated from the borings are contained in labeled, Department of Transportation (DOT) approved, 55-gallon drums or sealed roll-off bins and stored onsite pending appropriate disposal. Borings that are not completed as vadose or groundwater monitoring wells are grouted to within 2 feet of the ground surface with neat cement, and finished to the surface with asphalt or concrete to match the existing grade.

Soil samples are obtained from each boring for soil description, field hydrocarbon vapor screening, and possible laboratory analysis. Soil samples are generally retrieved from the borings at 5-foot depth intervals using a standard penetration or California-modified split-spoon sampler lined with three 2-inch diameter brass sample inserts. The sampler is driven approximately 18 inches beyond the lead auger with a 140-pound hammer dropped from a height of 30 inches.

Upon retrieval, soil samples are immediately removed from the sampler and sealed with Teflon sheeting and polyurethane caps. Each sample is labeled with the project number, boring number, sample depth, geologist's initials, and date of collection. After the samples have been labeled and documented in the chain of custody record, they are placed in a cooler with ice at approximately 4 degrees Celsius for transport to an offsite state-certified laboratory. Samples not selected for immediate analysis may be transported in a cooler with ice and archived in a frostless refrigerator at approximately 4 degrees Celsius for possible future testing.

During sampling activities, soil adjacent to the laboratory sample is screened for organic vapors using a photoionization detector (PID). For each vapor screening event, a sandwich size Ziploc bag is filled approximately 1/3 full with the soil sample. The PID probe is then inserted into the bag, and a reading is taken after approximately 15 seconds and recorded on the boring log. The remaining soil recovered is removed from the sample tube and described in accordance with the Unified Soil Classification System. For each sampling interval, field estimates of soil type, color, density/consistency, moisture, and grading are recorded on the boring logs.

MONITORING WELL INSTALLATION

Groundwater monitoring wells are constructed of 2-inch diameter, flush-threaded, Schedule 40, polyvinyl chloride (PVC) blank and screened casing (0.020-inch screen slot size). Groundwater monitoring wells typically extend up to 10 feet above and at up to 15 feet below the groundwater surface, provided that no competent clay layer is penetrated. The annular space surrounding the screened casing intervals is backfilled with Number 3 Monterey sand (filter pack) to approximately 2 feet above the top of the screened section.

A 2-foot thick hydrated bentonite annular seal is placed above the well filter pack. The remaining annular space is sealed with a neat cement grout to the surface. Utility access boxes are installed slightly above grade at the surface, and locking, watertight caps are installed to prevent unauthorized access to the well and limit infiltration of surface fluids.

CHAIN OF CUSTODY PROTOCOL

Chain of custody protocol is followed for all soil and groundwater samples selected for laboratory analysis. The chain of custody form accompanies the samples from the sampling locality to the laboratory, providing a continuous record of possession prior to analysis.

DECONTAMINATION

Drilling equipment is decontaminated by steam cleaning before being brought onsite. Prior to use, the sampler and sampling tubes are brush-scrubbed in a Liqui-nox and potable water solution, and rinsed twice in clean potable water. Sampling equipment and tubes are also decontaminated before each sample is collected to avoid cross-contamination between borings.

Groundwater purging and sampling equipment that could come into contact with well fluids is either dedicated to a well or cleaned prior to each use in a Liqui-nox solution followed by two tap water rinses.

APPENDIX B

SITE SAFETY PLAN

SITE SAFETY PLAN SUMMARY

PROJECT-SPECIFIC INFORMATION

Project Site:

76 Station 6129, 3420 35th Avenue, Oakland, California

Field Activity/Duration:

- Install six soil borings and construct monitoring wells in two of the borings.
- Develop two onsite wells, and collect groundwater samples from each of the two new wells.
- All work activities will be conducted onsite in accordance with Alameda Counts Environmental Health Services permits and directives.

Summary of Potential Chemical Hazards:

- Petroleum hydrocarbons (gasoline and/or diesel fuel)
- Benzene, toluene, ethylbenzene, xylenes (BTEX), methyl tertiary butyl ether (MTBE), & other oxygenates.

Chemical and physical characteristics of these compounds are presented in Table 1, Material Safety Data Sheets (MSDS) for these compounds are provided in Appendix A.

Summary of Physical Hazards:

- Explosion and fire
  Petroleum products are highly flammable. Liquid petroleum product readily vaporizes from standing pools or saturated soil. Ignition sources of any kind (e.g., engines, impact sparking, and heat or arc from inappropriate equipment or instrumentation) pose a major explosion and fire hazard.
- Injury from operation of heavy equipment
- Electrocution from buried or overhead power lines
- Noise exposure from the operation of heavy equipment
- Heat stress/Cold Exposure
- Vehicular Traffic
- Biologic hazards
- Confined space entry is NOT part of the scope of work for this project and shall not be attempted.

Further information on hazard assessment and hazard control are presented in the Site Safety Plan.

Personal Protective Equipment (PPE) Required Onsite:

- Hard hats (optional for this task only)
- Air purifying respirators with organic vapor cartridges and dust/mist filters
- Safety glasses with side-shields, or splash goggles
- Suitable work clothing (long pants)
- Appropriate chemical-resistant gloves
- Steel-toed boots
- Ear plugs or other suitable hearing protection
- Traffic safety vests with reflective striping

Air Monitoring Plan and Action Levels:

Site work will be initiated in Level D protection (no respiratory protection). A PID will be used to monitor airborne contamination in the breathing zone. Positive breathing zone readings are not expected, but if sustained gasoline-range hydrocarbon readings at 1 minute of 300 parts per million (ppm) are obtained, work will cease until engineering controls are instituted to prevent vapors from reaching the breathing zone. This can be accomplished by increasing air speed (mechanical fans), improving ventilation, or changing work activities (move personnel farther away). If engineering controls cannot reduce breathing zone readings to below 300 ppm, the level of protection will be upgraded to Level C. Continuous air monitoring will be conducted in the breathing zone of the workers. If a sustained PID reading of greater than 300 ppm is measured in the breathing zone, work will recess for 15 minutes in an attempt to let the air circulate. Concentrations measured at 300 ppm or greater in the breathing zone will require personnel to upgrade to Level C PPE. If Level C is required, the project will be stopped and the current operating procedures will be assessed by the Site Safety Officer and the Project Manager.

The PID used for air monitoring will be calibrated daily prior to the start of field activities by the site safety officer. The PID type and model number, and documentation of daily calibration will be recorded on the attached daily attendance sheet.

List Of Key Personnel

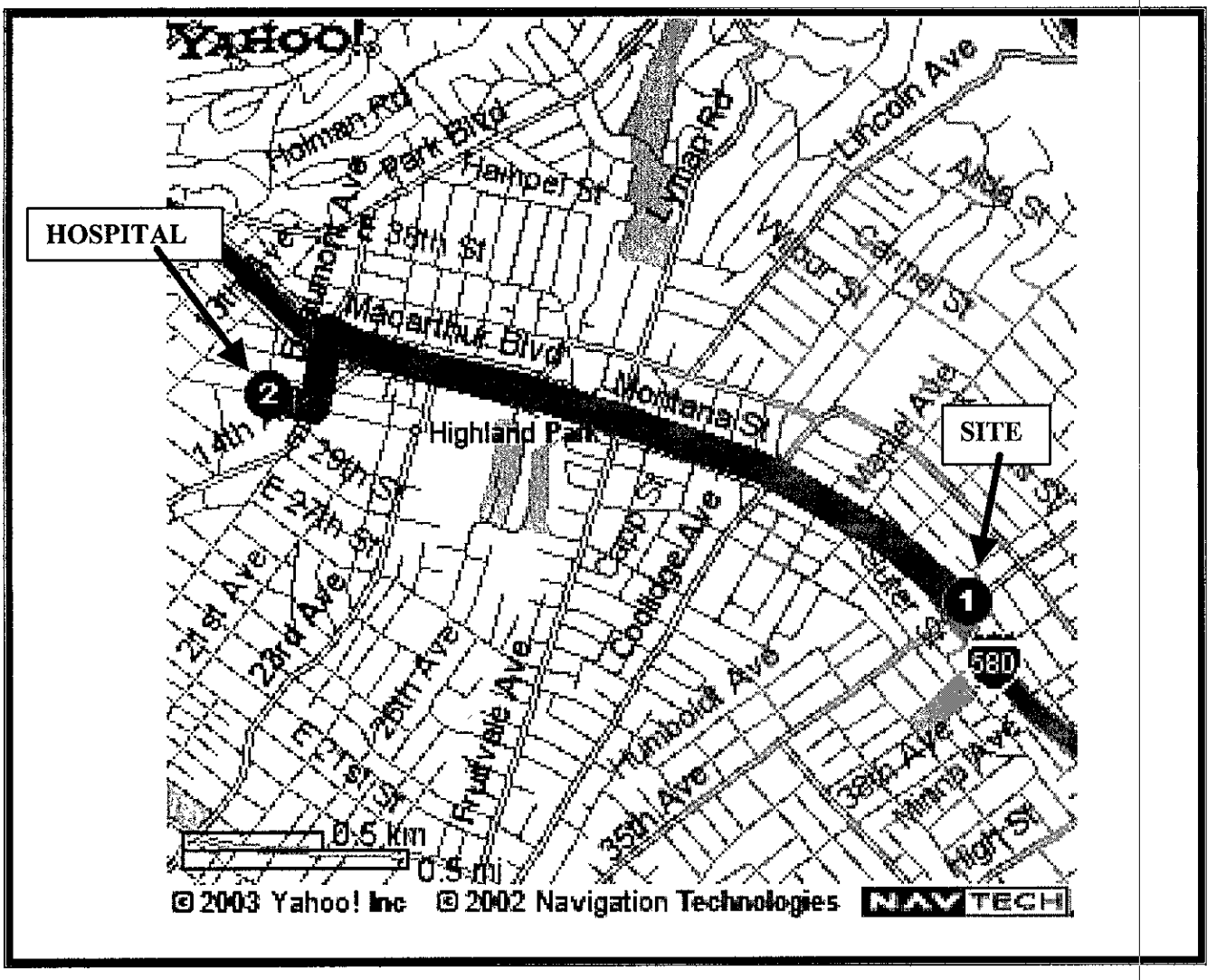
Project Manager: CELL (415) 798-0647	Jed Douglas Miller Brooks
Authorized Site Safety Officers:	Jeremy Smith/Jed Douglas Miller Brooks
Corporate Health and Safety Officer: (714) 960-4088	Dan Ramsay Miller Brooks
Client Contact: (714) 428-7720 CELL (916) 346-8111	Thomas Kosel ConocoPhillips Company

Emergency Contacts

Police Department:	911
Fire Department:	911
Ambulance:	911
Poison Control Center:	(800) 777-6476
Chemical Transportation Emergency Center (CHEMTREC):	(800) 424-9300
Office of Emergency Services (OES):	(800) 852-7550
National Response Center (NRC):	(800) 424-8802

Figure 1

Hospital Route Map



Directions to Hospital:

Alameda County Medical Center
1411 East 31st Street
Oakland, California
510-437-4800

Directions: Turn out of site left onto 35th Ave and enter Hwy 580 westbound. Proceed 1.3 miles and take exit at Park Blvd. Turn left (south) on Beaumont Avenue and proceed for 0.2 miles. Turn right on 31st Street and follow signs to emergency room on left. The distance from the site to the hospital is approximately 1.8 miles.

Certification

This HASP has been reviewed and approved by the Health and Safety Officer. The plan satisfies the requirements of the Occupational Safety and Health Act 1910.120 as implemented by the Health and Safety Committee for hazardous waste site activities. No changes may be made to this plan without the written approval of the Health and Safety Officer.

Jed A. Douglas, Senior Geologist
Health and Safety Officer

Statement of Qualifications for Health and Safety Officer and Site Safety Officers

The Health and Safety Officer, and the Site Safety Officer have completed a 40-hour hazardous materials training course, as required by the Code of Federal Regulations (CFR) 1910.120, and the 8-hour Site Supervisor training course. Thereafter, these personnel annually complete an 8-hour refresher course.

ATTACHMENTS:

Tailgate Safety Meeting Form & Air Monitoring Equipment Calibration

Table 1 – Occupational Health Guidelines & Toxicological Information

Site Safety Plan

MSDS Sheets: Gasoline, Diesel, Benzene, Toluene, Ethylbenzene, Xylenes, MTBE, Ethanol

ConocoPhillips Incident/Near Miss Report Form and Definitions

TAILGATE SAFETY MEETING FORM

Date: Time: Project No.: 06-459-6129-03

Site: 76 Station 6129, 3420 35TH avenue, Oakland, California

On Site Contact:

Alarm System: Sustained horn blast from designated onsite vehicle/ Verbal

In Case of Site Emergency or Evacuation, meet at: offsite in the upwind direction

Review and Location of Emergency Equipment:

First Aid Kit: Inside onsite vehicle Fire Extinguisher (Type ABC): in or near onsite vehicle

Emergency Shut Off Switch for Dispensers (Service Station)_____

Presented by:_____ Signature:_____

Air Monitoring Equipment: _____

Calibrated on: _____ by_____ to 100ppm isobutylene

Topics Covered:

- ☐ Chemical Hazards
- ☐ Physical Hazards
- ☐ Equipment Hazards
- ☐ Other_____
- ☐ Personal Protective Equipment
- ☐ Emergency Procedures
- ☐ Secure Storm Drain from Spills

ATTENDANCE

The undersigned have read the Site Safety Plan and are familiar with its provisions:

NAME (print)	SIGNATURE	DATE

TABLE 1

Table 1

Occupational Health Guidelines and Toxicological Information

Chemical	OSHA PEL (ppm)	STEL (ppm)	NIOSH REL (ppm)	IDLH (ppm)	Ionization Potential (eV)	Routes of Exposure	Known or Suspected Carcinogen	Symptoms	1997 NIOSH Page Reference
Benzene	1	1	0.1	500	9.24	Inhalation, Ingestion, Absorption, Contact	Yes	Irritation to eyes, skin, nose, and resp system; giddiness; headache; nausea; staggered gait; fatigue; anorexia; weakness/exhaustion; dermatitis	26
Toluene	200	150	100	500	8.82	Inhalation, Ingestion, Absorption, Contact	No	Irritation to eyes & nose; dilated pupils; insomnia; fatigue; weakness; dizziness; headache; tears; confusion, euphoria; muscle fatigue; dermatitis; nervousness; parethesia; liver & kidney damage	310
Ethylbenzene	100	125	100	800	8.76	Inhalation, Ingestion, Contact	No	Irritation to eyes, skin, and mucous membrane; headache; dermatitis; narcosis; coma	132
Xylenes (o,m,p)	100	150	100	900	Range of 8.44 - 8.56	Inhalation, Ingestion, Absorption, Contact	No	Irritation to eyes, skin, nose, & throat; vomiting; dizziness, excitement; drowsiness; abdominal pain; uncoordination; staggering gait; dermatitis; nausea	334-336
Methyl Tertiary Butyl Ether	not available	not available	not available	not available	not available	Inhalation, Ingestion	Yes	Cough, dizziness, unconsciousness, weakness; dry skin; eye redness & pain, abdominal pain, nausea, vomiting.	not applicable
Ethanol (Ethyl alcohol)	1000	Not available	1000	3300	10.47	Inhalation, Ingestion, Contact	No	Irritation to eyes, skin, nose; headache, drowsiness, fatigue, narcosis; cough; liver damage; anemia; reproductive & teratogenic effects	132

SITE SAFETY PLAN

SITE SAFETY PLAN

1.0 INTRODUCTION

This plan has been prepared in conformity with the Miller Brooks Environmental, Inc. (Miller Brooks) Corporate Health and Safety Program. It addresses those activities associated with site assessment and will be implemented during the site investigations and related field work. Compliance with this site safety plan (SSP) is required of all Miller Brooks personnel and subcontractors who enter the site. The subcontractors may elect to modify these provisions, but only to upgrade or increase the safety requirements, and only with the concurrence of Miller Brooks. The requirements and parameters identified in this SSP will be subject to modification as warranted by existing site conditions or as work progresses. However, no changes will be made without the prior approval of the Site Safety Officer.

2.0 AUTHORITY FOR SITE SAFETY

The Miller Brooks Project Manager, as site safety officer, has overall responsibility for the development, coordination, and implementation of the SSP and its conformity with the Miller Brooks Corporate Health and Safety Plan. The Project Manager is also responsible for field implementation of the SSP. This will include communicating the site-specific requirements to the project personnel and subcontractors working at the site, and assuring compliance with the Corporate Health and Safety Plan. In the event that the Project Manager is unable to perform these duties, site safety responsibilities may be delegated to a designated alternate safety officer. The Project Manager and/or alternate safety officer may suspend or modify work practices or dismiss subcontractors whose conduct does not meet the requirements specified in this SSP. The site safety officer will be responsible for initiating emergency response procedures, if necessary.

3.0 SITE PERSONNEL

Onsite personnel must initially complete a 40-hour hazardous materials training course, as required by the Code of Federal Regulations (CFR) 1910.120. Thereafter, personnel are required to annually complete an 8-hour refresher course. Additionally, personnel will be required to document their full understanding of this SSP before admission to the site, by signing the compliance log at the end of this SSP. Appropriate personal protective equipment will be available and used, as necessary, by onsite project personnel.

4.0 SAFETY AND ORIENTATION MEETING

Prior to commencement of work, the designated site safety officer will conduct a site-specific training session (tailgate meeting) to review project tasks before beginning work, and to make personnel aware of potential physical hazards, chemical hazards, and safe work practices. Material Safety Data Sheets (MSDS) will be made available, as appropriate.

5.0 POTENTIAL SITE HAZARDS

Specific site investigation activities to be performed are listed at the beginning of this SSP. In general, physical and chemical hazards that may be encountered include those associated with operating mechanical equipment and dealing with potentially hazardous chemicals. The most immediate hazard is likely that of physical injury to onsite personnel from machinery. Petroleum hydrocarbons (gasoline) may be present in soil and groundwater beneath the site. The hazard potential associated with the presence of hydrocarbons includes vapor build-up in, and/or escaping from, bore holes, excavations, and/or contaminated soil stockpiled and moved around the site.

Petroleum hydrocarbons (e.g. gasoline) may be encountered in the subsurface during this investigation. These chemicals are volatile, flammable, and moderately to extremely toxic. Potential hazards associated with petroleum hydrocarbons include inhalation, ingestion, and skin absorption of toxic vapors, liquids, or dusts.

Gasoline vapors in high concentrations (greater than 300 parts per million [ppm]) can cause eye, nose, and throat irritation, headaches, dizziness, and anesthesia. Skin contact with liquid gasoline may result in irritation and dermatitis, and absorption of specific toxic petroleum fractions. Typical toxic petroleum hydrocarbon substances include the following volatile organic compounds (VOCs): benzene, toluene, ethylbenzene, and total xylenes (BTEX), and methyl tertiary butyl ether (MBTE). Benzene is a suspected human carcinogen and, along with toluene and xylenes, can cause damage to an unprotected individual's liver, kidneys, and central nervous system. Ethylbenzene is a skin irritant in vapor and liquid form.

6.0 HAZARD ASSESSMENT

Consistent efforts will be made throughout the project to evaluate the chemical and physical hazards identified for the specific scope of work. Fire, explosion, and VOC exposure hazards will be evaluated in the field using a Photoionization Detector (PID). Periodic measurements will be obtained at the top of each borehole and in any confined areas that may contain and accumulate combustible vapors. The calibration and maintenance of all monitoring equipment will be conducted in accordance with the manufacturer recommendations.

7.0 HAZARD REDUCTION

7.1 SAFETY INSPECTIONS

Walk-through safety inspections of the work area will be conducted daily before the start of work and as conditions warrant. The results of these surveys will be communicated to the work crews during regularly scheduled "tailgate" safety meetings. The safety procedures and the day's planned operations will be discussed at these meetings.

7.2 ENVIRONMENTAL CONTROLS

In the event that PID readings anywhere on the site exceed 300 ppm, work will be suspended, monitoring will be continued as necessary to isolate the area of concern, and any or all of the following environmental controls will be implemented as appropriate:

1. Borings emitting excessive VOC concentrations will be ventilated, capped, or shut in as necessary.

2. Contaminated soil will be covered with clean soil and/or sprayed with water or deodorizing chemicals in order to reduce vaporization of VOCs.

3. Drilling equipment will be bonded and grounded during the operations to control ignition sources.

7.3 GENERAL PROCEDURES AND ENGINEERING CONTROLS

Access to work areas will be limited by the site safety officer to essential personnel. Underground utilities will be located and identified prior to any operation; power lines and pipelines will be shut down, locked and tagged out as appropriate. Work areas will be cordoned off with delineators, barriers, and/or taping, as appropriate.

During onsite work activities, unpaved work areas will be watered down (if necessary) until the surface is moist, and maintained in a moist condition to minimize dust. In addition, workers shall not be permitted underneath loads handled by excavation or loading equipment.

Stockpiled soil will be temporarily stored onsite in sealed, roll-off bins or labeled, Department of Transportation (DOT) approved, 55-gallon drums pending transport to an appropriate soil disposal facility. Decontamination rinse water will be stored in labeled, DOT approved, 55-gallon drums. Drums containing soil or water will be clearly labeled. Hydrocarbon-affected soil or water will be stored in an onsite location approved by the station owner/operator, and will be removed from the site at the earliest opportunity.

7.4 PERSONAL PROTECTIVE EQUIPMENT

Field personnel involved in site assessment activities are required to be prepared with the following personal protective equipment:

- Hard hats
- Air purifying respirators with organic vapor cartridges and dust/mist filters
- Safety glasses with side-shields, or splash goggles
- Suitable work clothing
- Chemical-resistant gloves [Nitrile disposable gloves]
- Steel-toe boots or boot covers
- Ear plugs or other suitable hearing protection
- Traffic safety vests with reflective striping

Personnel involved in onsite work activities, as described in Section 5.0 above, will be required to wear personal protective equipment for safety Level D (no respiratory protection). Based upon the results of hydrocarbon vapor monitoring conducted during work activities, the level of safety protection may be upgraded to include respiratory protection (Level C).

7.5 PROTECTION FROM AIRBORNE TOXIC CHEMICALS

Workers will be required to wear air purifying respirators with organic vapor cartridges under the following circumstances:

1. If the worker is continuously exposed throughout the day to VOC vapors that exceed the permissible exposure level - time-weighted average (PEL-TWA) for gasoline (300 ppm).

2. If the worker is exposed at any time to VOC vapors that exceed the permissible exposure level - short-term exposure limit (PEL-STEL) for gasoline (500 ppm).

Similar precautions will be taken with regard to other toxic chemicals, such as benzene, toluene, ethylbenzene, and total xylenes. If VOC vapors exceed 1,000 ppm, full-face air purifying respirators with organic vapor canisters will be worn.

7.6 OTHER PHYSICAL HAZARDS

In general, accidents will be prevented by personal protective equipment, environmental controls, engineering controls, and the exercise of reasonable caution during work activities. Other potential hazards and corresponding precautions include the following:

Physical Contact with Contaminated Soil

Workers who must come in direct contact with VOC-affected soil or groundwater for sampling purposes will be required to wear protective gloves and/or necessary protective clothing to prevent skin contact.

Noise Exposure
Project personnel entering high-noise areas will be required to wear hearing protection (ear plugs or muffs).

Heat Stress
Heat stress can impair worker coordination and judgement, and directly impact health and safety. Heat stress is more likely to occur when personal protective equipment is in use. Project personnel will be provided with beverages, shaded rest areas, and breaks, as needed, to prevent heat stress.

Cold Exposure
To guard against cold injury (frostbite and hypothermia), which is a danger when the temperature and wind-chill factor are low, employees will wear appropriate clothing, have warm shelter readily available, and maintain carefully scheduled work and rest periods.

Vehicular Traffic
Cones, delineators, and caution tape will be used to define the work area, and the work area will be set up such that vehicular traffic directly adjacent to the work area is minimized. If work equipment blocks the line of sight of vehicular traffic, access to such areas will be cordoned off to prevent entry of vehicles and possible accidents resulting from reduced visibility.

Biological Hazards
The only biological factors anticipated during operations would be those posed by poisonous plants, insects, animals, and indigenous pathogens. Protective clothing and respiratory equipment can help reduce the chances of exposure. Thorough washing of any exposed body parts and equipment will help protect against infection.

8.0 EMERGENCY RESPONSE

The site safety officer will have controlling authority during an emergency. In the event that this person is not available, the alternate safety officer will be in charge. Emergency response organizations, locations, and contacts are listed in the site-specific portion of this SSP.

9.0 GENERAL SAFETY REQUIREMENTS

The following requirements will also be observed:

- The designated site safety officer has the authority to correct unsafe site conditions. Accidents, injuries, and potentially unsafe working conditions shall be reported to the site safety officer immediately.
- Eating, smoking, and drinking will be allowed only in designated offsite areas. Site personnel will wash their hands and faces thoroughly prior to eating or drinking.
- Respirators will be cleaned, sanitized, inspected, and maintained by employees after each use.
- Fire extinguishers will be onsite for use on equipment or small fires only.
- An adequately stocked first aid kit will be onsite during work activities.

Practical engineering and geological information, experience, and accepted practices will be employed, as necessary, to control site safety while carrying out the proposed site assessment/remediation work.

ConocoPhillips

Incident Report Data

Name of Person Involved:	**Type:** **Date Occurred:**	☐ **Injury** ☐ **Prop Damage** ☐ **Environmental** ☐ **Near Miss**
Company Name:	**Time Occurred:** **Time Reported:**	_____ a.m. _____ a.m.
Employee Address: **City, State, ZIP:** **Phone #:**	**Location:** **Name:** **City, State, ZIP:**	**Site #** **(if applicable)**
Description of Incident:		
Actions Taken: **Seen by Physician:** ☐ **Hospitalized:** ☐ **Doctor's Name:** **Lost Work Days:** ☐ **From** _____ **to** _____	**Treatment/Medication:**	
Preventive Steps Taken:		
Report Submitted By: **Title:** **Company:**	**Date:**	

MATERIAL SAFETY DATA SHEET

Conoco Gasoline, Unleaded, with 10% Ethanol (All Grades)

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: Conoco Gasoline, Unleaded, with 10% Ethanol (All Grades)

Synonyms: Conoco - MSDS #GASC0115
Conoco Gasoline, Mid-Grade, with 10% Ethanol
Conoco Gasoline, Regular, with 10% Ethanol
Conoco Gasoline, Super with 10% Ethanol

Intended Use: Fuel

Chemical Family: Petroleum Hydrocarbon

Responsible Party: ConocoPhillips
P.O. Box 2197
Houston, TX
77252

For Additional MSDSs 800-762-0942

Technical Information: 918-661-8327

The intended use of this product is indicated above. If any additional use is known, please contact us at the Technical Information number listed.

EMERGENCY OVERVIEW

24 Hour Emergency Telephone Numbers:

Spill, Leak, Fire or Accident
Call CHEMTREC
North America: (800)424-9300
Others: (703)527-3887 (collect)

California Poison Control System: (800) 356-3129

Health Hazards/Precautionary Measures: May be harmful or fatal if swallowed. Aspiration hazard. Possible cancer hazard based on animal data. Vapor harmful. Causes eye and skin irritation. A component is a birth defect hazard. Use ventilation adequate to keep exposure below recommended limits, if any. Avoid exposure during pregnancy. Avoid breathing vapor or mist. Avoid contact with eyes, skin and clothing. Do not taste or swallow. Wash thoroughly after handling.

Physical Hazards/Precautionary Measures: Extremely flammable liquid and vapor. Vapor can cause flash fire. Keep away from heat, sparks, flames, static electricity or other sources of ignition.

Appearance: Clear to amber

Physical form: Liquid

Odor: Gasoline

NFPA Hazard Class:

```
Health:       1 (Slight)
Flammability: 3 (High)
Reactivity:   0 (Least)
```

HMIS Hazard Class

```
Health:           2* (Moderate)
Flammability:     3 (High)
Physical Hazard:  0 (Least)
```

*Indicates possible chronic health effects.

2. COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS	% WEIGHT	EXPOSURE GUIDELINE		
		Limits	Agency	Type
Gasoline CAS# None	87-100	300 ppm 500 ppm	ACGIH ACGIH	TWA STEL
Toluene CAS# 108-88-3	<15	50 ppm 200 ppm 300 ppm 500 ppm 500 ppm	ACGIH OSHA OSHA NIOSH OSHA. 10 min. peak; once per 8-hr shift	TWA-SKIN TWA CEIL IDLH
Xylenes CAS# 1330-20-7	<15	100 ppm 150 ppm 100 ppm 900 ppm	ACGIH ACGIH OSHA NIOSH	TWA STEL TWA IDLH
Ethanol CAS# 64-17-5	<10	1000 ppm 1000 ppm	ACGIH OSHA	TWA TWA
1,2,4-Trimethyl Benzene CAS# 95-63-6	1-5	25 ppm (Mixed Isomers)	ACGIH	TWA
Ethyl Benzene CAS# 100-41-4	1-5	100 ppm 125 ppm 100 ppm 800 ppm	ACGIH ACGIH OSHA NIOSH	TWA STEL TWA IDLH
Benzene CAS# 71-43-2	<4.9	0.5 ppm 2.5 ppm 1 ppm 5 ppm 500 ppm	ACGIH ACGIH OSHA OSHA NIOSH	TWA-SKIN STEL-SKIN TWA STEL IDLH
n-Hexane CAS# 110-54-3	<4	50 ppm 500 ppm 1100 ppm	ACGIH OSHA NIOSH	TWA-SKIN TWA IDLH
Cyclohexane CAS# 110-82-7	<2	100 ppm 300 ppm 1300 ppm	ACGIH OSHA NIOSH	TWA TWA IDLH

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

1%=10,000 PPM.

Contains benzene. If exposure concentrations exceed the 0.5 ppm action level, OSHA requirements for personal protective equipment, exposure monitoring, and training may apply (29CFR1910.1028). Also see Section 4.

All components are listed on the TSCA inventory.

3. HAZARDS IDENTIFICATION

Potential Health Effects:

Eye: Eye irritant. Contact may cause stinging, watering, redness, and swelling.

Skin: Skin irritant. Contact may cause redness, itching, burning, and skin damage. Prolonged or repeated contact can worsen irritation by causing drying and cracking of the skin, leading to dermatitis (inflammation). Not acutely toxic by skin absorption, but prolonged or repeated skin contact may be harmful (see Section 11).

Inhalation (Breathing): Low to moderate degree of toxicity by inhalation.

Ingestion (Swallowing): Low degree of toxicity by ingestion. ASPIRATION HAZARD - This material can enter lungs during swallowing or vomiting and cause lung inflammation and damage.

Signs and Symptoms: Effects of overexposure may include irritation of the nose and throat, irritation of the digestive tract, nausea, vomiting, flushing, transient excitation followed by signs of nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue), blurred vision, drunkenness, stupor, tremors, respiratory failure, unconsciousness, convulsions and death.

Cancer: A component is a known cancer hazard (see Sections 11 and 14).

Target Organs: Overexposure to a component may cause injury to the central nervous system, stomach, liver, male reproductive system and heart (see Section 11). Animal studies have shown that overexposure to gasoline with ethanol may cause injury to the immune system (see Section 11).

Developmental: No data available for this material. A component is a potential hazard to the fetus (see Section 11).

Other Comments: Most adverse health effects associated with ethanol, a component of this material, are related to the chronic ingestion of alcoholic beverages. Alcoholism has been associated with liver, stomach, heart, and nervous system damage, cancer, adverse reproductive effects, and effects on the developing fetus. Many of these effects may be related to metabolic changes that result from constantly high blood levels of alcohol. This exposure pattern is significantly different from that of persons handling industrial ethanol in the workplace or from refueling cars with gasoline containing ethanol.

Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage (sometimes referred to as Solvent or Painters' Syndrome). Intentional misuse by deliberately concentrating and inhaling this material may be harmful or fatal.

Pre-Existing Medical Conditions: Conditions aggravated by exposure may include skin disorders, respiratory (asthma-like) disorders and liver disorders.

Exposure to high concentrations of this material may increase the sensitivity of the heart to certain drugs. Persons with pre-existing heart disorders may be more susceptible to this effect (see Section 4 - Note to Physicians).

4. FIRST AID MEASURES

Eye: Move victim away from exposure and into fresh air. If irritation or redness develops, flush eyes with clean water and seek medical attention. For direct contact, hold eyelids apart and flush the affected eye(s) with clean water for at least 15 minutes. Seek medical attention.

Skin: Remove contaminated shoes and clothing, and flush affected area(s) with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. If skin surface is not damaged, cleanse affected area(s) thoroughly by washing with mild soap and water. If irritation or redness develops, seek medical attention.

Inhalation (Breathing): If respiratory symptoms or other symptoms of exposure develop, move victim away from source of exposure and into fresh air. If symptoms persist, seek immediate medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen

should be administered by qualified personnel. Seek immediate medical attention.

Ingestion (Swallowing): Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is drowsy or unconscious and vomiting, place on the left side with the head down. If possible, do not leave victim unattended and observe closely for adequacy of breathing. Seek medical attention.

Note To Physicians: Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of hydrocarbon solvents (e.g., in enclosed spaces or with deliberate abuse). The use of other drugs with less arrhythmogenic potential should be considered. If sympathomimetic drugs are administered, observe for the development of cardiac arrhythmias.

Federal regulations (29 CFR 1910.1028) specify medical surveillance programs for certain exposures to benzene above the action level or PEL (specified in Section (i)(1)(i) of the Standard). In addition, employees exposed in an emergency situation shall, as described in Section (i)(4)(i), provide a urine sample at the end of the shift for measurement of urine phenol.

5. FIRE FIGHTING MEASURES

Flammable Properties:
Flash Point: -49°F/-45°C
OSHA Flammability Class: Flammable Liquid
LEL%: 1.4 / UEL%: 7.6
Autoignition Temperature: 833°F/444°C

Unusual Fire & Explosion Hazards: This material is extremely flammable and can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor/air explosion hazard indoors, in confined spaces, outdoors, or in sewers. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire.

Extinguishing Media: Dry chemical, carbon dioxide, or alcohol-resistant foam is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

Fire Fighting Instructions: For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear. When the potential chemical hazard is unknown, in enclosed or confined spaces, or when explicitly required by DOT, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area, keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. *Move undamaged containers from immediate hazard area if it can be done with minimal risk.*

Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done with minimal risk. Avoid spreading burning liquid with water used for cooling purposes.

6. ACCIDENTAL RELEASE MEASURES

Extremely flammable. Keep all sources of ignition and hot metal surfaces away from spill/release. The use of explosion-proof equipment is recommended.

Stay upwind and away from spill/release. Notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Wear appropriate protective equipment including respiratory protection as conditions warrant (see Section 8).

Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Dike far ahead of spill for later recovery or disposal. Use foam on spills to minimize vapors (see Section 5). Use water sparingly to reduce disposal requirements. Spilled material may be absorbed into an appropriate absorbent material.

Notify fire authorities and appropriate federal, state, and local agencies. Immediate cleanup of any spill is recommended. If spill of any amount is made into or upon navigable waters, the contiguous zone, or adjoining shorelines, notify the National Response Center (phone number 800-424-8802).

7. HANDLING AND STORAGE

Handling: Open container slowly to relieve any pressure. Bond and ground all equipment when transferring from one vessel to another. Can accumulate static charge by flow or agitation. Can be ignited by static discharge. The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). Refer to NFPA-704 and/or API RP 2003 for specific bonding/grounding requirements.

Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits (see Sections 2 and 8).

Wash thoroughly after handling. Do not wear contaminated clothing or shoes. Keep contaminated clothing away from sources of ignition such as sparks or open flames. Use good personal hygiene practices.

High pressure injection of hydrocarbon fuels, hydraulic oils or greases under the skin may have serious consequences even though no symptoms or injury may be apparent. This can happen accidentally when using high pressure equipment such as high pressure grease guns, fuel injection apparatus or from pinhole leaks in tubing of high pressure hydraulic oil equipment.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1 and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

Storage: Keep container(s) tightly closed. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Post area "No Smoking or Open Flame." Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

Portable Containers:
Static electricity may ignite gasoline vapors when filling portable containers. To avoid static buildup do not use a nozzle lock open device. Use only approved containers for the storage of gasoline. Place the container on the ground before filling. Keep the nozzle in contact with the container during filling.

Do not fill any portable container in or on a vehicle or marine craft.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits (see Section 2), additional engineering controls may be required. Where explosive mixtures may be present, electrical systems safe for such locations must be used (see appropriate electrical codes).

Personal Protective Equipment (PPE):

Respiratory: A NIOSH certified air purifying respirator with an organic vapor cartridge may be used under conditions where airborne concentrations are expected to exceed exposure limits (see Section 2).

Protection provided by air purifying respirators is limited (see manufacturer's respirator selection guide). Use a NIOSH approved self-contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or other positive pressure mode if there is potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air purifying respirators may not provide adequate protection.

A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use.

Skin: The use of gloves impervious to the specific material handled is advised to prevent skin contact, possible irritation, absorption, and skin damage. Examples of approved materials are nitrile, or Viton® (see glove manufacturer literature for information on permeability). Depending on conditions of use, apron and/or arm covers may be necessary.

Eye/Face: Approved eye protection to safeguard against potential eye contact, irritation, or injury is recommended. Depending on conditions of use, a face shield may be necessary.

Other Protective Equipment: A source of clean water should be available in the work area for flushing eyes and skin. Impervious clothing should be worn as needed.

Suggestions for the use of specific protective materials are based on readily available published data. Users should check with specific manufacturers to confirm the performance of their products.

9. PHYSICAL AND CHEMICAL PROPERTIES

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm).
Appearance: Clear to amber
Physical State: Liquid
Odor: Gasoline
pH: Not applicable
Vapor Pressure (mm Hg): 330-775 @ 100°F
Vapor Density (air=1): >1
Boiling Point/Range: 80-437°F / 26-225°C
Freezing/Melting Point: No Data
Solubility in Water: Approx 10%
Specific Gravity: 0.68-0.78 @ 60°F
Percent Volatile: 100 vol.%
Evaporation Rate (nBuAc=1): >1
Bulk Density: 5.66-6.50 lbs/gal
Flash Point: -49°F / -45°C
Flammable/Explosive Limits (%): LEL: 1.4 / UEL: 7.6

10. STABILITY AND REACTIVITY

Stability: Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure. Extremely flammable liquid and vapor. Vapor can cause flash fire.

Conditions To Avoid: Avoid all possible sources of ignition (see Sections 5 and 7).

Materials to Avoid (Incompatible Materials): Contact with strong oxidizing agents such as chlorine, dichromates, or permanganates can cause fire or explosion.

Hazardous Decomposition Products: The use of hydrocarbon fuel in an area without adequate ventilation may result in hazardous levels of combustion products (e.g., oxides of carbon, sulfur and

nitrogen, benzene and other hydrocarbons) and/or dangerously low oxygen levels. See Section 11 for additional information on hazards of engine exhaust, if any.

Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Conoco Gasoline, Unleaded, with 10% Ethanol (All Grades) (CAS#)

Target Organ(s): Laboratory animals exposed to vapors of gasoline blended with 10% ethanol at concentrations of 2000, 10,000, and 20,000 mg/m3, 6hr/day, 5 days/week for four weeks showed a reduction in antibody forming cells. This immune suppressant effect was not seen in animals exposed to vapors of conventional gasoline.

Gasoline (CAS# None)

Carcinogenicity: Two year inhalation studies of wholly vaporized unleaded gasoline produced increased incidences of kidney tumors in male rats and liver tumors in female mice. Follow-up studies suggest that occurrence of the kidney tumors may be linked to alpha-2-u-globulin nephropathy, and most likely unique to the male rat. Epidemiology data collected from a study of more than 18,000 petroleum marketing and distribution workers showed no increased risk of leukemia, multiple myeloma, or kidney cancer from gasoline exposure. Unleaded gasoline has been identified as a possible carcinogen by IARC.

Because solvent extracts of gasoline exhaust particulates caused skin cancer in laboratory animals, IARC has categorized gasoline engine exhaust as a possible human cancer hazard.

Target Organ(s): A two year inhalation study of wholly vaporized unleaded gasoline produced nephropathy in male rats, characterized by the accumulation of alpha-2-u- globulin in epithelial cells of the proximal tubules, and necrosis and hyperplasia of surrounding cells. Follow-up studies have demonstrated that these changes are unique to the male rat.
Although prolonged exposure to n-hexane, a component of gasoline, has resulted in adverse male reproductive effects in experimental animal studies, no adverse male reproductive effects were found in studies conducted with gasoline.

Developmental: No evidence of developmental toxicity was found in pregnant laboratory animals (rats and mice) exposed to up to 9,000 ppm vapor of unleaded gasoline via inhalation.

Toluene (CAS# 108-88-3)

Target Organ(s): Epidemiology studies suggest that chronic occupational overexposure to toluene may damage color vision. Subchronic and chronic inhalation studies with toluene produced kidney and liver damage, hearing loss and central nervous system (brain) damage in laboratory animals. Intentional misuse by deliberate inhalation of high concentrations of toluene has been shown to cause liver, kidney, and central nervous system damage, including hearing loss and visual disturbances.

Developmental: Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. The effects seen include decreased fetal body weight and increased skeletal variations in both inhalation and oral studies.

Xylenes (CAS# 1330-20-7)

Target Organ(s): A six week inhalation study with xylene produced hearing loss in rats.

Developmental: Both mixed xylenes and the individual isomers produced limited evidence of developmental toxicity in laboratory animals. Inhalation and oral administration of xylene resulted in decreased fetal weight, increased incidences of delayed ossification, skeletal variations and resorptions.

Ethanol (CAS# 64-17-5)

Carcinogenicity: Ingestion of alcoholic beverages has been classified by IARC as "carcinogenic

to humans" (Group 1). Occupational exposures to ethanol and exposures other than by ingestion (i.e., dermal and inhalation) have not been associated with cancer in humans.

Target Organ(s): Chronic alcoholism has been associated with damage to the liver in humans (e.g., cirrhosis of the liver). Excessive consumption of alcoholic beverages has also been associated with adverse effects on the central nervous system, digestive system, cardiovascular system, and the reproductive system including reduced sperm count and motility and loss of libido in men, abnormal menstrual function, and decreased plasma estradiol and progesterone levels in women.

Developmental: Excessive consumption of alcoholic beverages during pregnancy has been associated with effects on the developing fetus referred to collectively as the fetal alcohol syndrome. The effects most frequently manifested include psychomotor dysfunction, growth retardation and a characteristic cluster of facial anomalies.

Mutagenicity: Excessive consumption of alcoholic beverages has been associated with chromosomal aberrations in white blood cells. Depending on the animal species being tested, ethanol may produce chromosomal damage, DNA damage and mutation in both somatic and germ cells.

Ethyl Benzene (CAS# 100-41-4)

Carcinogenicity: Rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study demonstrated limited evidence of kidney, liver, and lung cancer. Ethyl benzene has been listed as a possible human carcinogen by IARC. Ethyl benzene has not been listed as a carcinogen by NTP, or OSHA.

Target Organ(s): In rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study there was mild damage to the kidney (tubular hyperplasia), liver (eosinophilic foci, hypertrophy, necrosis), thyroid (hyperplasia) and pituitary (hyperplasia).

Benzene (CAS# 71-43-2)

Carcinogenicity: Benzene is an animal carcinogen and is known to produce acute myelogenous leukemia (a form of cancer) in humans. Benzene has been identified as a human carcinogen by NTP, IARC and OSHA.

Target Organ(s): Prolonged or repeated exposures to benzene vapors has been linked to bone marrow toxicity which can result in blood disorders such as leukopenia, thrombocytopenia, and aplastic anemia. All of these diseases can be fatal.

Developmental: Exposure to benzene during pregnancy demonstrated limited evidence of developmental toxicity in laboratory animals. The effects seen include decreased body weight and increased skeletal variations in rodents. Alterations in hematopoiesis have been observed in the fetuses and offspring of pregnant mice.

Mutagenicity: Benzene exposure has resulted in chromosomal aberrations in human lymphocytes and animal bone marrow cells, and DNA damage in mammalian cells in vitro.

n-Hexane (CAS# 110-54-3)

Target Organ(s): Excessive exposure to n-hexane can result in peripheral neuropathies. The initial symptoms are symmetrical sensory numbness and paresthesias of distal portions of the extremities. Motor weakness is typically observed in muscles of the toes and fingers but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. The neurotoxic properties of n-hexane are potentiated by exposure to methyl ethyl ketone and methyl isobutyl ketone.

Prolonged exposure to high concentrations of n-hexane (>1,000 ppm) has resulted in decreased sperm count and degenerative changes in the testes of rats but not those of mice.

Acute Data:
Gasoline:
Dermal LD50>5 ml/kg (Rabbit)
LC50> 4500 ppm (Rat)
Oral LD50= 18.75 ml/kg. (Rat)

1, 2, 4-Trimethyl Benzene:
Dermal LD50 = No data available
LC50 = 18 gm/m3/4hr (Rat)
Oral LD50 = 3-6 g/kg (Rat)

Benzene:
Dermal LD50> 9400 mg/kg (Rabbit), (Guinea Pig)
LC50= 9980 ppm (Mouse); 10000 ppm/7hr. (Rat)
Oral LD50= 4700 mg/kg (Mouse); 930 mg/kg (Rat); 5700 mg/kg (Mammal)

Cyclohexane:
Dermal LD50=>2g/kg (Rabbit)
LC50>4,044 ppm (4-hr., Rat)
Oral LD50> 2g/kg (Rat)

Ethanol:
Dermal LD50 = 9.4 ml/kg (Rabbit)
LC50 = 20,000 ppm/10 hr. (Rat)
Oral LD50 = 6.2-13.7 g/kg (Rat); LD50 = 6300 mg/kg (Rabbit)

Ethyl Benzene:
Dermal LD50= 17800 mg/kg (Rabbit)
LC50=4000 ppm/4 hr.; 13367 ppm (Rat)
Oral LD50=3500 mg/kg (Rat)

n-Hexane:
Dermal LD50 = >2,000 mg/kg (Rabbit)
LC50>3,367 ppm (4-hr., Rat)
Oral LD50>5,000 mg/kg (Rat)

Toluene:
Dermal LD50 = 14 g/kg (Rabbit)
LC50 = 8,000 ppm (4-hr., Rat)
Oral LD50 = 2.5 - 7.9 g/kg (Rat)

Xylene:
Dermal LD50 >3.16 ml/kg (Rabbit)
LC50= 5000 ppm/4 hr. (Rat)
Oral LD50 = 4300 mg/kg (Rat)

12. ECOLOGICAL INFORMATION

Spilling of gasoline can result in environmental damage.

Gasoline floats on water and evaporates rapidly from water or soil surfaces. However, spilled gasoline may penetrate soil and could contaminate groundwater.

Gasoline is biodegradable but in situations of low oxygen, such as in soil below grade or in groundwater, may persist for many years.

Gasoline does not readily dissolve in water but will be adsorbed to soils. Gasoline in the environment can be toxic to plants and animals.

13. DISPOSAL CONSIDERATIONS

This material, if discarded as produced, would be a RCRA "characteristic" hazardous waste due to the characteristic(s) of ignitability (D001) and benzene (D018). If the spilled or released material impacts soil, water, or other media, characteristic testing of the contaminated materials may be required prior to their disposal. Further, this material, once it becomes a waste, is subject to the land disposal restrictions in 40 CFR 268.40 and may require treatment prior to disposal to meet specific standards. Consult state and local regulations to determine whether they are more stringent than the federal requirements.

Container contents should be completely used and containers should be emptied prior to discard. Container rinsate could be considered a RCRA hazardous waste and must be disposed of with care and in full compliance with federal, state and local regulations. Larger empty containers, such as drums, should be returned to the distributor or to a drum reconditioner. To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

14. TRANSPORT INFORMATION

DOT Shipping Description:	Gasoline,3,UN1203,II
Non-Bulk Package Label:	Flammable
Bulk Package Placard/Marking:	Flammable/1203
Hazardous Substance/RQ	None
Packaging References	49 CFR 173.150, 173.202, 173.242
Emergency Response Guide:	128

15. REGULATORY INFORMATION

EPA SARA 311/312 (Title III Hazard Categories):

Acute Health:	Yes
Chronic Health:	Yes
Fire Hazard:	*Yes*
Pressure Hazard:	No
Reactive Hazard:	No

SARA 313 and 40 CFR 372:
This material contains the following chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372:

Component	CAS Number	Weight %
Toluene	108-88-3	<15
Xylenes	1330-20-7	<15
1,2,4-Trimethyl Benzene	95-63-6	1-5
Ethyl Benzene	100-41-4	1-5
Benzene	71-43-2	<4.9
n-Hexane	110-54-3	<4
Cyclohexane	110-82-7	<2

California Proposition 65:

Warning: This material contains the following chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm, and are subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):

Component	Effect
Benzene	Cancer, Developmental and Reproductive Toxicant
Toluene	Developmental Toxicant
Unleaded Gasoline (wholly vaporized)	Cancer

Carcinogen Identification:

Unleaded gasoline has been identified as a carcinogen by IARC. For carcinogenicity information on individual components, see Section 11.

EPA (CERCLA) Reportable Quantity:

--None--

Canada - Domestic Substances List: Listed

WHMIS Class:

B2-Flammable Liquid
D2B-Materials causing other toxic effects - Toxic Material

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

16. OTHER INFORMATION

Issue Date: 02/13/03
Previous Issue Date: 01/01/03
Revised Sections: 1, 5, 16
MSDS Number: 732433
Status: Final

Disclaimer of Expressed and Implied Warranties:

The information presented in this Material Safety Data Sheet is based on data believed to be accurate as of the date this Material Safety Data Sheet was prepared. **HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE.** No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

MATERIAL SAFETY DATA SHEET
Conoco No. 2 Diesel Fuel

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: *Conoco No. 2 Diesel Fuel*

Synonyms: Conoco - MSDS# GASC0220
Conoco No. 2 Diesel Fuel High Sulfur
Conoco No. 2 Diesel Fuel Low Sulfur

Intended Use: Fuel

Chemical Family: Petroleum Hydrocarbons

Responsible Party: ConocoPhillips
P.O. Box 2197
Houston, TX
77252

For Additional MSDSs 800-762-0942

Technical Information: 918-661-8327

The intended use of this product is indicated above. If any additional use is known, please contact us at the Technical Information number listed.

EMERGENCY OVERVIEW

24 Hour Emergency Telephone Numbers:

Spill, Leak, Fire or Accident
Call CHEMTREC
North America: (800)424-9300
Others: (703)527-3887 (collect)

California Poison Control System: (800) 356-3129

Health Hazards/Precautionary Measures: Causes severe skin irritation. Aspiration hazard if swallowed. Can enter lungs and cause damage. Use with adequate ventilation. Avoid contact with eyes, skin and clothing. Do not taste or swallow. Wash thoroughly after handling.

Physical Hazards/Precautionary Measures: Flammable liquid and vapor. Keep away from heat, sparks, flames, static electricity or other sources of ignition.

Appearance: Straw-colored to dyed red
Physical form: Liquid
Odor: *Characteristic petroleum*

NFPA Hazard Class:

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Health:       1 (Slight)
Flammability: 2 (Moderate)
Reactivity:   0 (Least)
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HMIS Hazard Class

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Health:           3* (High)
Flammability:     2 (Moderate)
Physical Hazard:  0 (Least)
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*Indicates possible chronic health effects.

2. COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS	% VOLUME	EXPOSURE GUIDELINE		
		Limits	Agency	Type

Diesel Fuel No. 2 CAS# 68476-34-6	100	100 mg/m3	ACGIH	TWA-SKIN
Naphthalene CAS# 91-20-3	<1	10 ppm 15 ppm 10 ppm 250 ppm	ACGIH ACGIH OSHA NIOSH	TWA STEL TWA IDLH

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

1%=10,000 PPM.

All components are listed on the TSCA inventory.

3. HAZARDS IDENTIFICATION

Potential Health Effects:

Eye: Contact may cause mild eye irritation including stinging, watering, and redness.

Skin: Severe skin irritant. Contact may cause redness, itching, burning, and severe skin damage. Prolonged or repeated contact can worsen irritation by causing drying and cracking of the skin, leading to dermatitis (inflammation). Not acutely toxic by skin absorption, but prolonged or repeated skin contact may be harmful (see Section 11).

Inhalation (Breathing): No information available. Studies by other exposure routes suggest a low degree of toxicity by inhalation.

Ingestion (Swallowing): Low degree of toxicity by ingestion. ASPIRATION HAZARD - This material can enter lungs during swallowing or vomiting and cause lung inflammation and damage.

Signs and Symptoms: Effects of overexposure may include irritation of the nose and throat, irritation of the digestive tract, nausea, diarrhea and transient excitation followed by signs of nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue).

Cancer: Possible skin cancer hazard (see Sections 11 and 15).

Target Organs: There is limited evidence from animal studies that overexposure may cause injury to the kidney (see Section 11).

Developmental: Inadequate data available for this material.

Other Comments: This material may contain polynuclear aromatic hydrocarbons (PNAs) which have been known to produce a phototoxic reaction when contaminated skin is exposed to sunlight. Th effect is similar in appearance to an exaggerated sunburn, and is temporary in duration if exposure is discontinued. Continued exposure to sunlight can result in more serious skin problems including pigmentation (discoloration), skin eruptions (pimples), and possible skin cancers.

Pre-Existing Medical Conditions: Conditions aggravated by exposure may include skin disorders and kidney disorders.

4. FIRST AID MEASURES

Eye: If irritation or redness develops, move victim away from exposure and into fresh air. Flush eyes with clean water. If symptoms persist, seek medical attention.

Skin: Immediately remove contaminated shoes, clothing, and constrictive jewelry and flush affected area(s) with large amounts of water. If skin surface is damaged, apply a clean dressing and seek immediate medical attention. If skin surface is not damaged, cleanse affected area(s) thoroughly by washing with mild soap and water. If irritation or redness develops, seek immediate medical attention.

Inhalation (Breathing): If respiratory symptoms develop, move victim away from source of exposure and into fresh air. If symptoms persist, seek medical attention. If victim is not breathing, clear airway and immediately *begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified* personnel. Seek immediate medical attention.

Ingestion (Swallowing): Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is drowsy or unconscious and vomiting, place on the left side with the head down. If possible, do not leave victim unattended and observe closely for adequacy of breathing. Seek medical attention.

Note To Physicians: High-pressure hydrocarbon injection injuries may produce substantial necrosis of underlying tissue despite an innocuous appearing external wound. Often these injuries require extensive emergency surgical debridement and all injuries should be evaluated by a specialist in order to assess the extent of injury.

5. FIRE FIGHTING MEASURES

Flammable Properties:

Flash Point: 125-180°F/52-82°C PMCC, ASTM D-93
OSHA Flammability Class: Combustible liquid
LEL%: 0.3 / UEL%: 10.0
Autoignition Temperature: 500°F/260°C

Unusual Fire & Explosion Hazards: This material is flammable and can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, or mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor/air explosion hazard indoors, in confined spaces, outdoors, or in sewers. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire.

Extinguishing Media: Dry chemical, carbon dioxide, or foam is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

Fire Fighting Instructions: For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear. When the potential chemical hazard is unknown, in enclosed or confined spaces, or when explicitly required by DOT, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area, keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Move undamaged containers from immediate hazard area if it can be done with minimal risk.

Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done with minimal risk. Avoid spreading burning liquid with water used for cooling purposes.

6. ACCIDENTAL RELEASE MEASURES

Flammable. Keep all sources of ignition and hot metal surfaces away from spill/release. The use of explosion-proof equipment is recommended.

Stay upwind and away from spill/release. Notify persons down wind of the spill/release, isolate immediate hazard

area and keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Wear appropriate protective equipment including respiratory protection as conditions warrant (see Section 8).

Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Dike far ahead of spill for later recovery or disposal. Use foam on spills to minimize vapors (see Section 5). Spilled material may be absorbed into an appropriate absorbent material.

Notify fire authorities and appropriate federal, state, and local agencies. Immediate cleanup of any spill is recommended. If spill of any amount is made into or upon navigable waters, the contiguous zone, or adjoining shorelines, notify the National Response Center (phone number 800-424-8802).

7. HANDLING AND STORAGE

Handling: Open container slowly to relieve any pressure. Bond and ground all equipment when transferring from one vessel to another. Can accumulate static charge by flow or agitation. Can be ignited by static discharge. The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). Refer to NFPA-704 and/or API RP 2003 for specific bonding/grounding requirements.

Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits (see Sections 2 and 8).

Do not wear contaminated clothing or shoes. Keep contaminated clothing away from sources of ignition such as sparks or open flames. Use good personal hygiene practices.

High pressure injection of hydrocarbon fuels, hydraulic oils or greases under the skin may have serious consequences even though no symptoms or injury may be apparent. This can happen accidentally when using high pressure equipment such as high pressure grease guns, fuel injection apparatus or from pinhole leaks in tubing of high pressure hydraulic oil equipment.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1 and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

Storage: Keep container(s) tightly closed. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Post area "No Smoking or Open Flame." Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits (see Section 2), additional engineering controls may be required. Where explosive mixtures may be present, electrical systems safe for such locations must be used (see appropriate electrical codes).

Personal Protective Equipment (PPE):

Respiratory: A NIOSH certified air purifying respirator with an organic vapor cartridge may be used under conditions where airborne concentrations are expected to exceed exposure limits (see Section 2).

Protection provided by air purifying respirators is limited (see manufacturer's respirator

selection guide). Use a NIOSH approved self-contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or other positive pressure mode if there is potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air purifying respirators may not provide adequate protection.

A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use.

Skin: The use of gloves impervious to the specific material handled is advised to prevent skin contact, possible irritation, and skin damage. Examples of approved materials are nitrile, or Viton® (see glove manufacturer literature for information on permeability). Depending on conditions of use, apron and/or arm covers may be necessary.

Eye/Face: Approved eye protection to safeguard against potential eye contact, irritation, or injury is recommended. Depending on conditions of use, a face shield may be necessary.

Other Protective Equipment: Eye wash and quick-drench shower facilities should be available in the work area. Thoroughly clean shoes and wash contaminated clothing before reuse. It is recommended that impervious clothing be worn when skin contact is possible.

Suggestions for the use of specific protective materials are based on readily available published data. Users should check with specific manufacturers to confirm the performance of their products.

9. PHYSICAL AND CHEMICAL PROPERTIES

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm).
Appearance: Straw-colored to dyed red
Physical State: Liquid
Odor: Characteristic petroleum
pH: Not applicable
Vapor Pressure (mm Hg): 0.40
Vapor Density (air=1): >3
Boiling Point/Range: 300-690°F / 366
Freezing/Melting Point: No Data
Solubility in Water: Negligible
Specific Gravity: 0.81-0.88 @60°F
Percent Volatile: Negligible
Evaporation Rate (nBuAc=1): <1
Viscosity: 1.7-4.1 cSt @40°F
Bulk Density: 7.08 lbs/gal
Flash Point: 125-180°F / 52-82°C PMCC, ASTM D-93
Flammable/Explosive Limits (%): LEL: 0.3 / UEL: 10.0

10. STABILITY AND REACTIVITY

Stability: Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure. Flammable liquid and vapor. Vapor can cause flash fire.

Conditions To Avoid: Avoid all possible sources of ignition (see Sections 5 and 7).

Materials to Avoid (Incompatible Materials): Avoid contact with strong oxidants such as liquid chlorine, concentrated oxygen, sodium hypochlorite, calcium hypochlorite, etc.

Hazardous Decomposition Products: The use of hydrocarbon fuels in an area without adequate ventilation may result in hazardous levels of combustion products (e.g., oxides of carbon, sulfur and nitrogen, benzene and other hydrocarbons) and/or dangerously low oxygen levels. ACGIH has included a TLV of 0.02 mg/m3 TWA for diesel exhaust particulate on its 2002 Notice of Intended Changes. See Section 11 for additional information on hazards of engine exhaust.

Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Diesel Fuel No. 2 (CAS# 68476-34-6)

Carcinogenicity: Chronic dermal application of certain middle distillate streams contained in diesel fuel No. 2 resulted in an increased incidence of skin tumors in mice. This material has not been identified as a carcinogen by NTP, IARC, or OSHA. IARC has classified Diesel exhaust as probably carcinogenic in humans.

Target Organ(s): Limited evidence of renal impairment has been noted from a few case reports involving excessive exposure to diesel fuel No. 2.

Naphthalene (CAS# 91-20-3)

Carcinogenicity: Naphthalene has been evaluated in two year inhalation studies in both rats and mice. The National Toxicology Program (NTP) concluded that there is clear evidence of carcinogenicity in male and female rats based on increased incidences of respiratory epithelial adenomas and olfactory epithelial neuroblastomas of the nose. NTP found some evidence of carcinogenicity in female mice (alveolar adenomas) and no evidence of carcinogenicity in male mice. Naphthalene has been identified as a carcinogen by IARC.

Acute Data:
Diesel Fuel No. 2
Dermal LD50>5ml/kg (Rabbit)
LC50=No data available
Oral LD50=9 ml/kg (Rat)

12. ECOLOGICAL INFORMATION

Not evaluated at this time

13. DISPOSAL CONSIDERATIONS

This material, if discarded as produced, would be a RCRA "characteristic" hazardous waste due to the characteristic(s) of ignitability (D001) and benzene (D018). If the spilled or released material impacts soil, water, or other media, characteristic testing of the contaminated materials may be required prior to their disposal. Further, this material, once it becomes a waste, is subject to the land disposal restrictions in 40 CFR 268.40 and may require treatment prior to disposal to meet specific standards. Consult state and local regulations to determine whether they are more stringent than the federal requirements.

Container contents should be completely used and containers should be emptied prior to discard. Container rinsate could be considered a RCRA hazardous waste and must be disposed of with care and in full compliance with federal, state and local regulations. Larger empty containers, such as drums, should be returned to the distributor or to a drum reconditioner. To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

14. TRANSPORT INFORMATION

DOT Shipping Description:	Diesel fuel,3 or Combustible liquid*,UN1202**,III
Non-Bulk Package Label:	Flammable or None
Bulk Package Placard/Marking:	Flammable/1202

Hazardous Substance/RQ	None
Packaging References	49 CFR 173.150, 173.203, 173.241
Emergency Response Guide:	128

Note: *This product may be reclassed as a combustible liquid when shipped domestically or by rail or highway. If reclassed as a combustible liquid, this product is not regulated by DOT when shipped in non-bulk packages.

**NA1993 may be used instead of UN1202 for land transportation.

15. REGULATORY INFORMATION

EPA SARA 311/312 (Title III Hazard Categories):

Acute Health:	Yes
Chronic Health:	Yes
Fire Hazard:	Yes
Pressure Hazard:	No
Reactive Hazard:	No

SARA 313 and 40 CFR 372:
This material contains the following chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372:

Component	CAS Number	Weight %
Naphthalene	91-20-3	<1

California Proposition 65:

Warning: *This material contains the following chemicals which are known to the State of California to cause cancer,* birth defects or other reproductive harm, and are subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):

Component	Effect
Benzene	Cancer, Developmental and Reproductive Toxicant
Toluene	Developmental Toxicant

Diesel engine exhaust, while not a component of this material, is on the Proposition 65 list of chemicals known to the State of California to cause cancer.

Carcinogen Identification:
This material has not been identified as a carcinogen by NTP, IARC, or OSHA. See Section 11 for carcinogenicity information of individual components, if any. Diesel exhaust is a probable cancer hazard based on tests in laboratory animals. It has been identified as a carcinogen by IARC.

EPA (CERCLA) Reportable Quantity:
--None--

Canada - Domestic Substances List: Listed

WHMIS Class:
B2-Flammable Liquid
D2B-Materials causing other toxic effects - Toxic Material

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

16. OTHER INFORMATION

Issue Date: 02/13/03

Previous Issue Date: 01/01/03
Revised Sections: 1, 3, 5, 16
MSDS Number: 041760
Status: Final

Disclaimer of Expressed and Implied Warranties:

The information presented in this Material Safety Data Sheet is based on data believed to be accurate as of the date this Material Safety Data Sheet was prepared. **HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE.** No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

BENZENE

0015
April 1993

CAS No: 71-43-2
RTECS No: CY1400000
UN No: 1114
EC No: 601-020-00-8

Cyclohexatriene
Benzol
C_6H_6
Molecular mass: 78.1

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive. Risk of fire and explosion: see chemical dangers.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		**AVOID ALL CONTACT!**	
Inhalation	Dizziness. Drowsiness. Headache. Nausea. Shortness of breath. Convulsions. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! Dry skin (further see Inhalation).	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
Eyes		face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion	Abdominal pain. Sore throat. Vomiting (further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	PACKAGING & LABELLING	
Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer (extra personal protection: complete protective clothing including self-contained breathing apparatus).	F Symbol T Symbol R: 45-11-48/23/24/25 S: 53-45 UN Hazard Class: 3 UN Pack Group: II	Do not transport with food and feedstuffs.

EMERGENCY RESPONSE	STORAGE
Transport Emergency Card: TEC (R)-7 NFPA Code: H2; F3; R0;	Fireproof. Separated from food and feedstuffs, oxidants and halogens.

IPCS
International Programme on Chemical Safety

Prepared in the context of cooperation between the International Programme on Chemical Safety and the European Commission

SEE IMPORTANT INFORMATION ON THE BACK.

IMPORTANT DATA

Physical State; Appearance
COLOURLESS LIQUID, WITH CHARACTERISTIC ODOUR.

Physical Dangers
The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical Dangers
Reacts violently with oxidants and halogens causing fire and explosion hazard.

Occupational Exposure Limits
TLV: 10 ppm; 32 mg/m^3 (as TWA) A2 (ACGIH 1991-1992).

Routes of Exposure
The substance can be absorbed into the body by inhalation and through the skin.

Inhalation Risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C; on spraying or dispersion, however, much faster.

Effects of Short-term Exposure
The substance irritates the skin and the respiratory tract. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system. Exposure far above the occupational exposure limit may result in unconsciousness.

Effects of Long-term or Repeated Exposure
The liquid defats the skin. The substance may have effects on the blood forming organs, liver and immune system. This substance is carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 80°C
Melting point: 6°C
Relative density (water = 1): 0.9
Solubility in water, g/100 ml at 25°C: 0.18
Vapour pressure, kPa at 20°C: 10
Relative vapour density (air = 1): 2.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2
Flash point: (c.c.) -11°C
Auto-ignition temperature: about 500°C
Explosive limits, vol% in air: 1.2-8.0
Octanol/water partition coefficient as log Pow: 2.13

ENVIRONMENTAL DATA

NOTES

Use of alcoholic beverages enhances the harmful effect. Depending on the degree of exposure, periodic medical examination is indicated. The odour warning when the exposure limit value is exceeded is insufficient.

ADDITIONAL INFORMATION

TOLUENE

0078
October 2002

CAS No: 108-88-3
RTECS No: XS5250000
UN No: 1294
EC No: 601-021-00-3

Methylbenzene
Toluol
Phenylmethane
$C_6H_5CH_3$ / C_7H_8
Molecular mass: 92.1

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		**STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!**	
Inhalation	Cough. Sore throat. Dizziness. Drowsiness. Headache. Nausea. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
Eyes	Redness. Pain.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	PACKAGING & LABELLING
Evacuate danger area in large spill! Consult an expert in large spill! Remove all ignition sources. Ventilation. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. (Extra personal protection: self-contained breathing apparatus) in large spill.	F Symbol Xn Symbol R: 11-20 S: (2-)16-25-29-33 UN Hazard Class: 3 UN Pack Group: II

EMERGENCY RESPONSE	STORAGE
Transport Emergency Card: TEC (R)-30S1294 NFPA Code: H 2; F 3; R 0	Fireproof. Separated from strong oxidants.

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IMPORTANT DATA

Physical State; Appearance
COLOURLESS LIQUID, WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour mixes well with air, explosive mixtures are formed easily. As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers
Reacts violently with strong oxidants causing fire and explosion hazard.

Occupational exposure limits
TLV: 50 ppm as TWA; (skin); A4; (ACGIH 2002).

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of short-term exposure
The substance is irritating to the eyes and the respiratory tract. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. Exposure at high levels may result in cardiac dysrhythmia and unconsciousness.

Effects of long-term or repeated exposure
The liquid defats the skin. The substance may have effects on the central nervous system. Exposure to the substance may enhance hearing damage caused by exposure to noise. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Boiling point: 111°C
Melting point: -95°C
Relative density (water = 1): 0.87
Solubility in water: none
Vapour pressure, kPa at 25°C: 3.8
Relative vapour density (air = 1): 3.1
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01
Flash point: 4°C c.c.
Auto-ignition temperature: 480°C
Explosive limits, vol% in air: 1.1-7.1
Octanol/water partition coefficient as log Pow: 2.69

ENVIRONMENTAL DATA

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is indicated.
Use of alcoholic beverages enhances the harmful effect.

ADDITIONAL INFORMATION

ETHYLBENZENE

0268
March 1995

CAS No: 100-41-4
RTECS No: DA0700000
UN No: 1175
EC No: 601-023-00-4

Ethylbenzol
Phenylethane
EB
C_8H_{10} / C_6H_5-C_2H_5
Molecular mass: 106.2

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		**PREVENT GENERATION OF MISTS!**	
Inhalation	Cough. Dizziness. Drowsiness. Headache.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain. Blurred vision.	Face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion	(further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	PACKAGING & LABELLING
Ventilation. Collect leaking liquid in covered containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer (extra personal protection: A filter respirator for organic vapour).	F Symbol Xn Symbol R: 11-20 S: (2-)16-24/25-29 UN Hazard Class: 3 UN Pack Group: II

EMERGENCY RESPONSE	STORAGE
Transport Emergency Card: TEC (R)-522 NFPA Code: H2; F3; R0	Fireproof. Separated from strong oxidants.

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IMPORTANT DATA

Physical State; Appearance
COLOURLESS LIQUID, WITH AROMATIC ODOUR.

Physical Dangers
The vapour mixes well with air, explosive mixtures are easily formed.

Chemical Dangers
Reacts with strong oxidants. Attacks plastic and rubber.

Occupational Exposure Limits
TLV (as TWA): 100 ppm; 434 mg/m^3;
as STEL: 125 ppm; 543 mg/m3 (ACGIH 1994-1995).
MAK: 100 ppm; 440 mg/m^3 (1994).

Routes of Exposure
The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Inhalation Risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of Short-term Exposure
The substance irritates the eyes, the skin and the respiratory tract. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system. Exposure far above OEL could cause lowering of consciousness.

Effects of Long-term or Repeated Exposure
Repeated or prolonged contact with skin may cause dermatitis.

PHYSICAL PROPERTIES

Boiling point: 136°C
Melting point: -95°C
Relative density (water = 1): 0.9
Solubility in water, g/100 ml at 20°C: 0.015
Vapour pressure, kPa at 20°C: 0.9
Relative vapour density (air = 1): 3.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02
Flash point: 18°C c.c.
Auto-ignition temperature: 432°C
Explosive limits, vol% in air: 1.0-6.7
Octanol/water partition coefficient as log Pow: 3.2

ENVIRONMENTAL DATA

The substance is harmful to aquatic organisms.

NOTES

The odour warning when the exposure limit value is exceeded is insufficient.

ADDITIONAL INFORMATION

m-XYLENE

0085
March 2002

CAS No: 108-38-3
RTECS No: ZE2275000
UN No: 1307
EC No: 601-022-00-9

meta-Xylene
1,3-Dimethylbenzene
m-Xylol
$C_6H_4(CH_3)_2$ / C_8H_{10}
Molecular mass: 106.2

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Above 27°C explosive vapour/air mixtures may be formed.	Above 27°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		**STRICT HYGIENE!**	
Inhalation	Dizziness. Drowsiness. Headache. Nausea.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	PACKAGING & LABELLING
Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.)	Xn Symbol R: 10-20/21-38 S: (2-)25 Note: C UN Hazard Class: 3 UN Pack Group: III

EMERGENCY RESPONSE	STORAGE
NFPA Code: H 2; F 3; R 0; Transport Emergency Card: TEC (R)-30S1307-III	Fireproof. Separated from strong oxidants and strong acids.

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UNEP

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IMPORTANT DATA

Physical State; Appearance
COLOURLESS LIQUID, WITH CHARACTERISTIC ODOUR.

Physical dangers
As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers
Reacts with strong acids and strong oxidants.

Occupational exposure limits
TLV: 100 ppm as TWA; 150 ppm as STEL A4 (ACGIH 2001).
BEI specified by (ACGIH 2001).
EU OEL: 50 ppm as TWA; 100 ppm as STEL (skin) (EU 2000).

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of short-term exposure
The substance is irritating to the eyes and the skin. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.

Effects of long-term or repeated exposure
The liquid defats the skin. The substance may have effects on the central nervous system. Exposure to the substance may enhance hearing damage caused by exposure to noise. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Boiling point: 139°C
Melting point: -48°C
Relative density (water = 1): 0.86
Solubility in water: none
Vapour pressure, kPa at 20°C: 0.8
Relative vapour density (air = 1): 3.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02
Flash point: 27°C c.c.
Auto-ignition temperature: 527°C
Explosive limits, vol% in air: 1.1-7.0
Octanol/water partition coefficient as log Pow: 3.20

ENVIRONMENTAL DATA

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is indicated.
The recommendations on this Card also apply to technical xylene.
See ICSC 0084 o-Xylene and 0086 p-Xylene.

ADDITIONAL INFORMATION

o-XYLENE

0084
March 2002

CAS No: 95-47-6
RTECS No: ZE2450000
UN No: 1307
EC No: 601-022-00-9

ortho-Xylene
1,2-Dimethylbenzene
o-Xylol
$C_6H_4(CH_3)_2$ / C_8H_{10}
Molecular mass: 106.2

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Above 32°C explosive vapour/air mixtures may be formed.	Above 32°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		**STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!**	
Inhalation	Dizziness. Drowsiness. Headache. Nausea.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	PACKAGING & LABELLING
Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.)	Xn Symbol R: 10-20/21-38 S: (2-)25 Note: C UN Hazard Class: 3 UN Pack Group: III

EMERGENCY RESPONSE	STORAGE
Transport Emergency Card: TEC (R)-30S1307-III NFPA Code: H 2; F 3; R 0	Fireproof. Separated from strong oxidants and strong acids.

IPCS
International Programme on Chemical Safety

UNEP

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SEE IMPORTANT INFORMATION ON THE BACK.

IMPORTANT DATA

Physical State; Appearance
COLOURLESS LIQUID, WITH CHARACTERISTIC ODOUR.

Physical dangers
As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers
Reacts with strong acids and strong oxidants.

Occupational exposure limits
TLV: 100 ppm as TWA; 150 ppm as STEL A4 (ACGIH 2001).
BEI specified by (ACGIH 2001).
EU OEL: 50 ppm as TWA; 100 ppm as STEL (skin) (EU 2000).

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of short-term exposure
The substance is irritating to the eyes and the skin. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.

Effects of long-term or repeated exposure
The liquid defats the skin. The substance may have effects on the central nervous system. Exposure to the substance may enhance hearing damage caused by exposure to noise. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Boiling point: 144°C
Melting point: -25°C
Relative density (water = 1): 0.88
Solubility in water: none
Vapour pressure, kPa at 20°C: 0.7
Relative vapour density (air = 1): 3.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02
Flash point: 32°C c.c.
Auto-ignition temperature: 463°C
Explosive limits, vol% in air: 0.9-6.7
Octanol/water partition coefficient as log Pow: 3.12

ENVIRONMENTAL DATA

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is indicated.
The recommendations on this Card also apply to technical xylene.
See ICSC 0086 p-Xylene and 0085 m-Xylene.

ADDITIONAL INFORMATION

p-XYLENE

0086
March 2002

CAS No: 106-42-3
RTECS No: ZE2625000
UN No: 1307
EC No: 601-022-00-9

para-Xylene
1,4-Dimethylbenzene
p-Xylol
$C_6H_4(CH_3)_2$ / C_8H_{10}
Molecular mass: 106.2

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Above 27°C explosive vapour/air mixtures may be formed.	Above 27°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		**STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!**	
Inhalation	Dizziness. Drowsiness. Headache. Nausea.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	PACKAGING & LABELLING
Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.)	Xn Symbol R: 10-20/21-38 S: (2-)25 Note: C UN Hazard Class: 3 UN Pack Group: III

EMERGENCY RESPONSE	STORAGE
Transport Emergency Card: TEC (R)-30S1307-III NFPA Code: H 2; F 3; R 0	Fireproof. Separated from strong oxidants, and strong acids.

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SEE IMPORTANT INFORMATION ON THE BACK.

IMPORTANT DATA

Physical State; Appearance
COLOURLESS LIQUID, WITH CHARACTERISTIC ODOUR.

Physical dangers
As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers
Reacts with strong acids and strong oxidants.

Occupational exposure limits
TLV: 100 ppm as TWA; 150 ppm as STEL A4 (ACGIH 2001).
BEI specified by (ACGIH 2001).
EU OEL: 50 ppm as TWA; 100 ppm as STEL (skin) (EU 2000).

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of short-term exposure
The substance is irritating to the eyes and the skin. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.

Effects of long-term or repeated exposure
The liquid defats the skin. The substance may have effects on the central nervous system. Exposure to the substance may enhance hearing damage caused by exposure to noise. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Boiling point: 138°C
Melting point: 13°C
Relative density (water = 1): 0.86
Solubility in water: none
Vapour pressure, kPa at 20°C: 0.9
Relative vapour density (air = 1): 3.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02
Flash point: 27°C c.c.
Auto-ignition temperature: 528°C
Explosive limits, vol% in air: 1.1-7.0
Octanol/water partition coefficient as log Pow: 3.15

ENVIRONMENTAL DATA

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is indicated.
The recommendations on this Card also apply to technical xylene.
See ICSC 0084 o-Xylene and 0085 m-Xylene.

ADDITIONAL INFORMATION

METHYL TERT-BUTYL ETHER

1164
April 2000

CAS No: 1634-04-4
RTECS No: KN5250000
UN No: 2398

tert-Butyl methyl ether
MTBE
Methyl-1,1-dimethylethyl ether
2-Methoxy-2-methyl propane
$(CH_3)_3COCH_3$ / $C_5H_{12}O$
Molecular mass: 88.2

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking. NO contact with oxidants.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE			
Inhalation	Drowsiness. Dizziness. Headache. Weakness. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Safety goggles or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion	Abdominal pain. Nausea. Vomiting. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	PACKAGING & LABELLING
Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. (Extra personal protection: filter respirator for organic gases and vapours).	UN Hazard Class: 3 UN Pack Group: II

EMERGENCY RESPONSE	STORAGE
Transport Emergency Card: TEC (R)-30G30	Fireproof. Separated from strong oxidants, strong acids.

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IMPORTANT DATA

Physical State; Appearance
COLOURLESS LIQUID, WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers
Reacts violently with strong oxidants causing fire hazard. The substance decomposes on contact with acids.

Occupational exposure limits
TLV: 40 ppm; 144 mg/m^3 (as TWA) A3 (ACGIH 1999).

Routes of exposure
The substance can be absorbed into the body by inhalation and by ingestion.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of short-term exposure
The substance irritates the skin. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. Exposure far above the OEL could cause lowering of consciousness.

PHYSICAL PROPERTIES

Boiling point: 55°C
Melting point: -109°C
Relative density (water = 1): 0.7
Solubility in water, g/100 ml at 20°C: 4.2
Vapour pressure, kPa at 20°C: 27
Relative vapour density (air = 1): 3.0
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.5
Flash point: -28°C c.c.
Auto-ignition temperature: 375°C
Explosive limits, vol% in air: 1.6-15.1
Octanol/water partition coefficient as log Pow: 1.06

ENVIRONMENTAL DATA

It is strongly advised not to let the chemical enter into the environment because it persists in the environment.

NOTES

Much less likely to form peroxides than other ethers.

ADDITIONAL INFORMATION

ETHANOL (ANHYDROUS)

0044
October 2000

CAS No: 64-17-5
RTECS No: KQ6300000
UN No: 1170
EC No: 603-002-00-5

Ethyl alcohol
CH_3CH_2OH / C_2H_6O
Molecular mass: 46.1

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking. NO contact with strong oxidants.	Powder, alcohol-resistant foam, water in large amounts, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE			
Inhalation	Cough. Headache. Fatigue. Drowsiness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest.
Skin	Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain. Burning.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion	Burning sensation. Headache. Confusion. Dizziness. Unconsciousness.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	PACKAGING & LABELLING
Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Wash away remainder with plenty of water.	F Symbol R: 11 S: (2-)7-16 UN Hazard Class: 3

EMERGENCY RESPONSE	STORAGE
Transport Emergency Card: TEC (R)-32 NFPA Code: H 0; F 3; R 0	Fireproof. Separated from strong oxidants.

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IMPORTANT DATA

Physical State; Appearance
COLOURLESS LIQUID, WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour mixes well with air, explosive mixtures are easily formed.

Chemical dangers
Reacts slowly with calcium hypochlorite, silver oxide and ammonia, causing fire and explosion hazard. Reacts violently with strong oxidants such as nitric acid, silver nitrate, mercuric nitrate or magnesium perchlorate, causing fire and explosion hazard.

Occupational exposure limits
TLV: 1000 ppm; (as TWA) A4 (ACGIH 2000).
MAK: 500 ppm; 960 mg/m^3; II,1 (1999).
MAK: class C,2 (1999).

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of short-term exposure
The substance irritates the eyes. Inhalation of high concentration of vapour may cause irritation of the eyes and respiratory tract. The substance may cause effects on the central nervous system.

Effects of long-term or repeated exposure
The liquid defats the skin. The substance may have effects on the upper respiratory tract and central nervous system, resulting in irritation, headache, fatigue and lack of concentration. See Notes.

PHYSICAL PROPERTIES

Boiling point: 79°C
Melting point: -117°C
Relative density (water = 1): 0.8
Solubility in water: miscible
Vapour pressure, kPa at 20°C: 5.8
Relative vapour density (air = 1): 1.6
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.03
Flash point: 13°C c.c.
Auto-ignition temperature: 363°C
Explosive limits, vol% in air: 3.3-19
Octanol/water partition coefficient as log Pow: -0.32

ENVIRONMENTAL DATA

NOTES

Ethanol consumption during pregnancy may adversely affect the unborn child.
Chronic ingestion of ethanol may cause liver cirrhosis.
The flash point of 50% water solution is 24°C.

ADDITIONAL INFORMATION