SDMS Document
92089

NEWARK BAY STUDY AREA

ADDITIONAL SITES AND CANDIDATE PRPS FOR THE NEWARK BAY STUDY AREA

VOLUME II OF IV

EVIDENCE CONCERNING

ALLIED SIGNAL

PREPARED FOR:
TIERRA SOLUTIONS, INC.

SUBMITTED TO:
USEPA REGION II

OCTOBER 6, 2005

920890001

Allied Signal

920890002

920890004

GERAGHTY & MILLER, INC.
Environmental Services

A Heidemij company

February 3, 1995

VIA FEDERAL EXPRESS

Steven Maybury
Section Chief
Bureau of Environmental Evaluation and
Cleanup for Responsibility Assessment
New Jersey Department of
Environmental Protection
401 East State Street
Trenton, NJ 08625-0028

FEB 5 2 09 PM '95
BUREAU OF UNDERGROUND STORAGE TANKS

Re: ISRA Case No. 86103 - AlliedSignal Inc., Elizabeth, New Jersey

Dear Mr. Maybury:

At the request of AlliedSignal Inc., Geraghty & Miller, Inc. has collected sediment samples at AlliedSignal's facility in Elizabeth, New Jersey. The sediment samples were collected on December 1, 1994 in accordance with the Department's July 13, 1994 letter and Geraghty & Miller's September 16, 1994 letter. Sediment samples were analyzed for one or more of the following constituents: volatile organic compounds (VOCs) (see Table 1), semivolatile organic compounds (SVOCs) (see Table 2), priority pollutant metals (PPMs) (see Table 3), total petroleum hydrocarbons (TPH), and total organic carbon (TOC) (see Table 5). Selected sediment samples were also analyzed for grain size distribution and these data are also attached as Appendix A. The sediment sampling locations are shown on Figure 1. The tables and figure include sediment quality results from the December 1994 sampling round (Phase IV) and previous sampling rounds (Phases I and II). A discussion of the sediment quality results follows.

The sediment screening values established by the National Oceanic and Atmospheric Administration (NOAA) (1994) were used for comparison purposes, where applicable. The NOAA values are not action levels but are simply meant to indicate threshold values at which environmental effects may occur.

Figure 1 shows the sediment samples which exceed the NOAA Effects Range-Median (ER-M) sediment screening values. The ER-M represents the maximum value of the range in which biological effects are possible, although infrequent. Concentrations equivalent to or above the ER-M represent a range of values in which biological effects are probable.

The lead, mercury and zinc which were detected in some sediment samples above the NOAA ER-M do not appear to have originated on the AlliedSignal facility because the upgradient concentrations found at locations SS-1 and SS-12 are higher than concentrations found at the downgradient sites and the concentrations appear, in general, to decline with distance from the upgradient sampling locations. These metals are also not indicative of the manufacturing processes at the plant. The sources for these metals are probably upgradient of the AlliedSignal site, originating from locations which drain into the ditch system.

BAA000046

125 East Bethpage Road • Plainview, New York 11803 • (516) 249-7600 • FAX (516) 249-7610

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The one silver value over the NOAA ER-M appears to be an anomaly. Silver was not used in plant processes which indicates that the source of silver maybe the land adjacent (south) of the AlliedSignal site where waste disposal has occurred for many years and from which runoff likely enters the ditch system surrounding the manufacturing area of AlliedSignal's facility.

Arsenic was found at two locations above the NOAA E-RM and above soil background levels. AlliedSignal is in the process of reviewing the risk assessment and determining what other arsenic criteria are available for comparison to determine what, if any, site-specific impacts may be associated with the sediment arsenic values above the ER-M.

The only SVOCs found above the NOAA ER-M values are also not likely to have resulted from waste disposal or release from the AlliedSignal facility. The only two compounds detected, chrysene (7,500 ug/kg) and phenanthrene (2,600 ug/kg), are indicative of runoff from areas paved with asphalt of which there are many in the vicinity of the AlliedSignal's property.

Even though VOC's were found in sediment at some locations, they (the VOC's) are generally not associated with adverse risks in sediment because they generally do not accumulate in sediment and are therefore not bioavailable. For these reasons, there are no NOAA criteria for VOC's.

Total petroleum hydrocarbons (TPHs) in the sediment range from 0.05 to 1200 mg/Kg. There are no NOAA screening values for TPHs in sediment.

Total organic carbon (TOC) in the sediment range from not detected to 2,750 ug/kg. The highest concentration of TOC was reported in upgradient sediment sample SS-16A. There are no NOAA screening values for TOC in sediment.

Please call if you require additional information or wish to discuss the data further.

Sincerely,

GERAGHTY & MILLER, INC.

Michael J. Glose by NV

Michael J. Glose
Senior Scientist/Project Manager

Nicholas Valkenburg

Nicholas Valkenburg
Vice President/Project Director

MJG/NV:vk
cc: Leon Mattioli - AlliedSignal
Gordon Quin - AlliedSignal
Jim Cooper (letter only) - AlliedSignal
Stephen Myers - NJDEP
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Table 1. Results of Volatile Organic Compound Analyses of Sediment Samples Collected in Area 6, AlliedSignal Inc., Elizabeth, New Jersey.

Phase:	I	I	I	II	I
Sample Designation:	SS-1	SS-2	SS-3	SS-3	SS-4
Sample Depth* (inches):	6 - 12	6 - 12	6 - 12	0-6	6 - 12
Date Sampled:	5/31/89	5/31/89	5/31/89	10/18/91	5/31/89
Parameter (concentrations in ug/kg)					
Acetone	39	<13	<2,000	<40	<12
Benzene	<7	<6	<1,000	<20	<6
Bromodichloromethane	<7	<6	<1,000	<20	<6
Bromoform	<7	<6	<1,000	<20	<6
Bromomethane	<14	<13	<2,000	<40	<12
2-Butanone	<14	<13	<2,000	<40	<12
Carbon disulfide	<7	<6	<1,000	<20	<6
Carbon tetrachloride	<7	<6	<1,000	<20	<6
Chlorobenzene	<7	<6	<1,000	<20	<6
Chloroethane	<14	<13	<2,000	<40	<12
Chloroform	<7	<6	640 J	110	<6
Chloromethane	<14	<13	<2,000	<40	<12
Dibromochloromethane	<7	<6	<1,000	<20	<6
1,1-Dichloroethane	<7	<6	<1,000	<20	<6
1,2-Dichloroethane	<7	<6	<1,000	200	<6
1,1-Dichloroethene	<7	<6	<1,000	<20	<6
1,2-Dichloroethene (total)	<7	<6	<1,000	1300	<6
1,2-Dichloropropane	<7	<6	<1,000	<20	<6
cis-1,3-Dichloropropene	<7	<6	<1,000	<20	<6
trans-1,3-Dichloropropene	<7	<6	<1,000	<20	<6
Ethylbenzene	<7	3 J	<1,000	<20	2 J
2-Hexanone	<14	<13	<2,000	<40	<12
Methylene chloride	3 J	8 B	<2,000	28	5 BJ
4-Methyl-2-pentanone	<14	<13	<2,000	<40	<12
Styrene	<7	<6	<1,000	<20	<6
1,1,2,2-Tetrachloroethane	<7	<6	10,000	100	<6
Tetrachloroethene	<7	<6	<1,000	4,700	<6
Toluene	<7	<6	<1,000	5.2 J	<6
1,1,1-Trichloroethane	<7	<6	<1,000	<20	<6
1,1,2-Trichloroethane	<7	<6	<1,000	21	<6
Trichloroethene	<7	<6	320 J	120	<6
Vinyl acetate	<14	<13	<2,000	<40	<12
Vinyl chloride	<14	<13	<2,000	<40	<12
Xylene (total)	<7	16 Y	<1,000	<20	8 Y
Total VOCs:	42	27	10,960	6,584.2	15

ug/kg Micrograms per kilogram.
VOCs Volatile organic compounds.
* Depth below land surface.
J Result is detected below the reporting limit or is an estimated concentration.
B Analyte was found in the blank as well as the sample.
Y Compound value has been edited on RTE/MS data system.
NA Not applicable.

There are no National Oceanic and Atmospheric Administration (NOAA) sediment quality screening values for VOCs.

Table 1. Results of Volatile Organic Compound Analyses of Sediment Samples Collected in Area 6, AlliedSignal Inc., Elizabeth, New Jersey.

Phase:	IV	I	I	IV	I
Sample Designation:	SS-4A	SS-5	SS-6	SS-6A	SS-7
Sample Depth* (inches):	0 - 6	6 - 12	6 - 12	0 - 6	6 - 12
Date Sampled:	12/1/94	5/31/89	5/31/89	12/1/94	5/31/89
Parameter (concentrations in ug/kg)					
Acetone	<16	62	37	<18	<360
Benzene	<8	<6	<7	<9	<180
Bromodichloromethane	<8	<6	<7	<9	<180
Bromoform	<8	<6	<7	<9	<180
Bromomethane	<16	<13	<13	<18	<360
2-Butanone	<16	<13	<13	<18	<360
Carbon disulfide	<8	6 J	<7	<9	<180
Carbon tetrachloride	<8	<6	<7	<9	<180
Chlorobenzene	<8	<6	<7	<9	<180
Chloroethane	<16	<13	<13	<18	<360
Chloroform	2 J	7	<7	<9	1,700
Chloromethane	<16	<13	<13	<18	<360
Dibromochloromethane	<8	<6	<7	<9	<180
1,1-Dichloroethane	<8	<6	<7	<9	72 J
1,2-Dichloroethane	<8	<6	<7	<9	<180
1,1-Dichloroethene	<8	<6	<7	<9	<180
1,2-Dichloroethene (total)	<8	6 J	<7	<9	<180
1,2-Dichloropropane	<8	<6	<7	<9	<180
cis-1,3-Dichloropropene	<8	<6	<7	<9	<180
trans-1,3-Dichloropropene	<8	<6	<7	<9	<180
Ethylbenzene	<8	<6	<7	<9	<180
2-Hexanone	<16	<13	<13	<18	<360
Methylene chloride	<8	<13	<13	<9	<360
4-Methyl-2-pentanone	<16	14 B	<7	<18	310 B
Styrene	<8	<6	<7	<9	<180
1,1,2,2-Tetrachloroethane	3 J	<6	<7	<9	<180
Tetrachloroethene	<8	17	<7	<9	2,000
Toluene	<8	<6	<7	<9	<180
1,1,1-Trichloroethane	<8	<6	<7	<9	1,500
1,1,2-Trichloroethane	<8	<6	<7	<9	<180
Trichloroethene	<8	57	<7	<9	1,500
Vinyl acetate	<16	<13	<13	<18	<360
Vinyl chloride	<16	<13	<13	<18	<360
Xylene (total)	<8	<6	<7	<9	<180
Total VOCs:	5	169	37	0	7,082

ug/kg Micrograms per kilogram.
VOCs Volatile organic compounds.
* Depth below land surface.
J Result is detected below the reporting limit or is an estimated concentration.
B Analyte was found in the blank as well as the sample.
Y Compound value has been edited on RTE/MS data system.
NA Not applicable.

There are no National Oceanic and Atmospheric Administration (NOAA) sediment quality screening values for VOCs.

Table 1. Results of Volatile Organic Compound Analyses of Sediment Samples Collected in Area 6, AlliedSignal Inc., Elizabeth, New Jersey.

Phase:	II	II	IV	IV	IV
Sample Designation:	SS-10	SS-11	SS-13A	SS-14A	SS-15A
Sample Depth* (inches):	0-6	0-6	0 - 6	0 - 6	0 - 6
Date Sampled:	10/18/91	10/18/91	12/1/94	12/1/94	12/1/94
Parameter (concentrations in ug/kg)					
Acetone	52	<63	<15	<28	<16
Benzene	<8.2	<31	<7	<14	<8
Bromodichloromethane	<8.2	<31	<7	<14	<8
Bromoform	<8.2	<31	<7	<14	<8
Bromomethane	<16	<63	<15	<28	<16
2-Butanone	<16	<63	<15	<28	<16
Carbon disulfide	<8.2	9.1 J	<7	<14	<8
Carbon tetrachloride	<8.2	<31	<7	<14	<8
Chlorobenzene	<8.2	<31	<7	<14	<8
Chloroethane	<16	<63	<15	<28	<16
Chloroform	<8.2	29 J	<7	2 J	<8
Chloromethane	<16	<63	<15	<28	<16
Dibromochloromethane	<8.2	<31	<7	<14	<8
1,1-Dichloroethane	<8.2	<31	<7	<14	<8
1,2-Dichloroethane	<8.2	<31	<7	<14	<8
1,1-Dichloroethene	<8.2	<31	<7	<14	<8
1,2-Dichloroethene (total)	<8.2	89	<7	<14	<8
1,2-Dichloropropane	<8.2	<31	<7	<14	<8
cis-1,3-Dichloropropene	<8.2	<31	<7	<14	<8
trans-1,3-Dichloropropene	<8.2	<31	<7	<14	<8
Ethylbenzene	<8.2	<31	<7	<14	<8
2-Hexanone	<16	<31	<15	<28	<16
Methylene chloride	<16	<31	<7	<14	<8
4-Methyl-2-pentanone	<8.2	13 J	<15	<28	<16
Styrene	<8.2	<31	<7	<14	<8
1,1,2,2-Tetrachloroethane	<8.2	610	4 J	<14	<8
Tetrachloroethene	<8.2	8,800	<7	<14	<8
Toluene	<8.2	<31	<7	<14	<8
1,1,1-Trichloroethane	<8.2	<31	<7	<14	<8
1,1,2-Trichloroethane	<8.2	6.8 J	<7	<14	<8
Trichloroethene	<8.2	12,000	<7	<14	<8
Vinyl acetate	<16	<63	<15	<28	<16
Vinyl chloride	<16	<63	<15	<28	<16
Xylene (total)	<8.2	<31	<7	<14	<8
Total VOCs:	52	21,556.9	4	2	0

ug/kg Micrograms per kilogram.
VOCs Volatile organic compounds.
* Depth below land surface.
J Result is detected below the reporting limit or is an estimated concentration.
B Analyte was found in the blank as well as the sample.
Y Compound value has been edited on RTE/MS data system.
NA Not applicable.

There are no National Oceanic and Atmospheric Administration (NOAA) sediment quality screening values for VOCs.

Table 1. Results of Volatile Organic Compound Analyses of Sediment Samples Collected in Area 6, AlliedSignal Inc., Elizabeth, New Jersey.

Parameter (concentrations in ug/kg)	Phase: IV Sample Designation: SS-15B Sample Depth* (inches): 18 - 24 Date Sampled: 12/1/94	IV SS-16A 0 - 6 12/1/94	IV SS-16B 18 - 24 12/1/94
Acetone	<13	<13	<13
Benzene	<7	<7	<6
Bromodichloromethane	<7	<7	<6
Bromoform	<7	<7	<6
Bromomethane	<13	<13	<13
2-Butanone	<13	<13	<13
Carbon disulfide	<7	<7	<6
Carbon tetrachloride	<7	<7	<6
Chlorobenzene	<7	<7	<6
Chloroethane	<13	<13	<13
Chloroform	<7	<7	<6
Chloromethane	<13	<13	<13
Dibromochloromethane	<7	<7	<6
1,1-Dichloroethane	<7	<7	<6
1,2-Dichloroethane	<7	<7	<6
1,1-Dichloroethene	<7	<7	<6
1,2-Dichloroethene (total)	<7	<7	<6
1,2-Dichloropropane	<7	<7	<6
cis-1,3-Dichloropropene	<7	<7	<6
trans-1,3-Dichloropropene	<7	<7	<6
Ethylbenzene	<7	<7	<6
2-Hexanone	<13	<13	<13
Methylene chloride	<7	<7	<6
4-Methyl-2-pentanone	<13	<13	<13
Styrene	<7	<7	<6
1,1,2,2-Tetrachloroethane	<7	<7	<6
Tetrachloroethene	<7	<7	<6
Toluene	<7	<7	<6
1,1,1-Trichloroethane	<7	<7	<6
1,1,2-Trichloroethane	<7	<7	<6
Trichloroethene	<7	<7	<6
Vinyl acetate	<13	<13	<13
Vinyl chloride	<13	<13	<13
Xylene (total)	<7	<7	<6
Total VOCs:	0	0	0

ug/kg	Micrograms per kilogram.
VOCs	Volatile organic compounds.
*	Depth below land surface.
J	Result is detected below the reporting limit or is an estimated concentration.
B	Analyte was found in the blank as well as the sample.
Y	Compound value has been edited on RTE/MS data system.
NA	Not applicable.

There are no National Oceanic and Atmospheric Administration (NOAA) sediment quality screening values for VOCs.

Table 2. Results of Semivolatile Organic Compound Analyses of Sediment Samples Collected in Area 6, ...ied Signal Inc., Elizabeth, New Jersey.

Parameter (concentrations in ug/kg)	1994 NOAA Sediment Quality Screening Values ER-L Concentrations (ug/kg)	ER-M Concentrations (ug/kg)		
		Phase:	I	I
		Sample Designation:	SS-1	SS-2
		Sample Depth* (inches):	6 - 12	6 - 12
		Sample Date:	5/31/89	5/31/89
Acenaphthene	16	500	74 J	<520
Acenaphthylene	44	640	70 J	<520
Anthracene	85.3	1,100	220 J	54 J
Benzo(a)anthracene	261	1,600	840	320 J
Benzo(b)fluoranthene	NS	NS	1100	750
Benzo(k)fluoranthene	NS	NS	1100	750
Benzo(g,h,i)perylene	NS	NS	520 J	260 J
Benzo(a)pyrene	430	1,600	480 J	240 J
Benzoic acid	NS	NS	NA	NA
Benzyl alcohol	NS	NS	<560	<520
bis(2-Chloroethoxy)methane	NS	NS	<560	<520
bis(2-Chloroethyl)ether	NS	NS	<560	<520
bis(2-Chloroisopropyl)ether	NS	NS	<560	<520
bis(2-Ethylhexyl)phthalate	NS	NS	1700 B	790 B
4-Bromophenyl-phenylether	NS	NS	<560	<520
Butylbenzylphthalate	NS	NS	230 J	89 J
4-Chloroaniline	NS	NS	<560	<520
4-Chloro-3-methylphenol	NS	NS	<560	<520
2-Chloronaphthalene	NS	NS	<560	<520
2-Chlorophenol	NS	NS	NA	NA
4-Chlorophenyl-phenylether	NS	NS	<560	<520
Chrysene	384	2,800	770	410 J
Dibenz(a,h)anthracene	63.4	260	<560	<520
Dibenzofuran	NS	NS	<560	<520
Di-n-butylphthalate	NS	NS	300 BJ	180 BJ
1,2-Dichlorobenzene	NS	NS	<560	<520
1,3-Dichlorobenzene	NS	NS	<560	<520
1,4-Dichlorobenzene	NS	NS	<560	<520
3,3'-Dichlorobenzidine	NS	NS	<1100	<1000
2,4-Dichlorophenol	NS	NS	NA	NA
Diethylphthalate	NS	NS	<560	<520
2,4-Dimethylphenol	NS	NS	NA	NA
Dimethyl phthalate	NS	NS	<560	<520
4,6-Dinitro-2-methylphenol	NS	NS	NA	NA
2,4-Dinitrophenol	NS	NS	NA	NA
2,4-Dinitrotoluene	NS	NS	<560	<520
2,6-Dinitrotoluene	NS	NS	<560	<520
Di-n-octyl phthalate	NS	NS	<560	<520
Fluoranthene	600	5,100	1800	530
Fluorene	19	540	76 J	<520
Hexachlorobenzene	NS	NS	<560	<520
Hexachlorobutadiene	NS	NS	<560	<520
Hexachlorocyclopentadiene	NS	NS	<560	<520
Hexachloroethane	NS	NS	<560	<520
Indeno(1,2,3-cd)pyrene	NS	NS	360 J	270 J
Isophorone	NS	NS	61 J	<520
2-Methylnaphthalene	70	670	NA	NA
2-Methylphenol	NS	NS	<560	<520
4-Methylphenol	NS	NS	<560	<520
Naphthalene	160	2,100	59 J	<520
2-Nitroaniline	NS	NS	<2700	<2500
3-Nitroaniline	NS	NS	<2700	<2500
4-Nitroaniline	NS	NS	<2700	<2500
Nitrobenzene	NS	NS	<560	<520
2-Nitrophenol	NS	NS	NA	NA
4-Nitrophenol	NS	NS	NA	NA
N-Nitrosodiphenylamine	NS	NS	<560	<520
N-Nitroso-di-n-propylamine	NS	NS	<560	<520
Pentachlorophenol	NS	NS	NA	NA
Phenanthrene	240	1,500	850	240 J
Phenol	NS	NS	NA	NA
Pyrene	665	2,600	940	370 J
1,2,4-Trichlorobenzene	NS	NS	<560	<520
2,4,5-Trichlorophenol	NS	NS	NA	NA
2,4,6-Trichlorophenol	NS	NS	NA	NA
Total SVOCs:	NS	NS	11550	5253
Total PAHs:	4,022	44,792	9,259	4,194

See last page for footnotes.

Table 2. Results of Semivolatile Organic Compound Analyses of Sediment Samples Collected in Area C, Allied Signal Inc., Elizabeth, New Jersey.

Parameter (concentrations in ug/kg)	1994 NOAA Sediment Quality Screening Values ER-L Concentrations (ug/kg)	ER-M Concentrations (ug/kg)	Phase: I	Phase: II
		Sample Designation:	SS-3	SS-3
		Sample Depth*(inches):	6 - 12	0-6
		Sample Date:	5/31/89	10/18/91
Acenaphthene	16	500	<960	<6600
Acenaphthylene	44	640	<960	<6600
Anthracene	85.3	1,100	<960	<6600
Benzo(a)anthracene	261	1,600	<960	<6600
Benzo(b)fluoranthene	NS	NS	<960	<6600
Benzo(k)fluoranthene	NS	NS	<960	<6600
Benzo(g,h,i)perylene	NS	NS	<960	<6600
Benzo(a)pyrene	430	1,600	<960	<6600
Benzoic acid	NS	NS	NA	<6600
Benzyl alcohol	NS	NS	<960	<6600
bis(2-Chloroethoxy)methane	NS	NS	<960	<6600
bis(2-Chloroethyl)ether	NS	NS	<960	<6600
bis(2-Chloroisopropyl)ether	NS	NS	<960	<6600
bis(2-Ethylhexyl)phthalate	NS	NS	<960	<6600
4-Bromophenyl-phenylether	NS	NS	<960	<6600
Butylbenzylphthalate	NS	NS	<960	<6600
4-Chloroaniline	NS	NS	<960	<6600
4-Chloro-3-methylphenol	NS	NS	<960	<6600
2-Chloronaphthalene	NS	NS	<960	<6600
2-Chlorophenol	NS	NS	NA	<6600
4-Chlorophenyl-phenylether	NS	NS	<960	<6600
Chrysene	384	2,800	<960	880 J
Dibenz(a,h)anthracene	63.4	260	<960	<6600
Dibenzofuran	NS	NS	<960	<6600
Di-n-butylphthalate	NS	NS	150 BJ	<6600
1,2-Dichlorobenzene	NS	NS	<960	<6600
1,3-Dichlorobenzene	NS	NS	<960	<13000
1,4-Dichlorobenzene	NS	NS	<960	<6600
3,3'-Dichlorobenzidine	NS	NS	<1900	<13000
2,4-Dichlorophenol	NS	NS	NA	<6600
Diethylphthalate	NS	NS	<960	<6600
2,4-Dimethylphenol	NS	NS	NA	<6600
Dimethyl phthalate	NS	NS	<960	<6600
4,6-Dinitro-2-methylphenol	NS	NS	NA	<6600
2,4-Dinitrophenol	NS	NS	NA	<6600
2,4-Dinitrotoluene	NS	NS	<960	<6600
2,6-Dinitrotoluene	NS	NS	<960	<32000
Di-n-octyl phthalate	NS	NS	<960	<6600
Fluoranthene	600	5,100	<960	<6600
Fluorene	19	540	<960	<6600
Hexachlorobenzene	NS	NS	<960	<6600
Hexachlorobutadiene	NS	NS	<960	<6600
Hexachlorocyclopentadiene	NS	NS	<960	<6600
Hexachloroethane	NS	NS	<960	<6600
Indeno(1,2,3-cd)pyrene	NS	NS	<960	<6600
Isophorone	NS	NS	<960	<6600
2-Methylnaphthalene	70	670	NA	<6600
2-Methylphenol	NS	NS	<960	<6600
4-Methylphenol	NS	NS	<960	<6600
Naphthalene	160	2,100	<960	<6600
2-Nitroaniline	NS	NS	<4700	<32000
3-Nitroaniline	NS	NS	<4700	<6600
4-Nitroaniline	NS	NS	<4700	<32000
Nitrobenzene	NS	NS	<960	<6600
2-Nitrophenol	NS	NS	NA	<6600
4-Nitrophenol	NS	NS	NA	<6600
N-Nitrosodiphenylamine	NS	NS	<960	<6600
N-Nitroso-di-n-propylamine	NS	NS	<960	<6600
Pentachlorophenol	NS	NS	NA	<6600
Phenanthrene	240	1,500	<960	<6600
Phenol	NS	NS	NA	<6600
Pyrene	665	2,600	<960	<6600
1,2,4-Trichlorobenzene	NS	NS	<960	<6600
2,4,5-Trichlorophenol	NS	NS	NA	<6600
2,4,6-Trichlorophenol	NS	NS	NA	<6600
Total SVOCs:	NS	NS	150	880
Total PAHs:	4,022	44,792	0	880

See last page for footnotes.

Table 2. Results of Semivolatile Organic Compound Analyses of Sediment Samples Collected in Area b, Allied Signal Inc., Elizabeth, New Jersey.

Parameter (concentrations in ug/kg)	1994 NOAA Sediment Quality Screening Values ER-L Concentrations (ug/kg)	ER-M Concentrations (ug/kg)	Phase: I Sample Designation: SS-4 Sample Depth*(inches): 6 - 12 Sample Date: 5/31/89	Phase: IV Sample Designation: SS-4A Sample Depth*(inches): 0-6 Sample Date: 12/1/94
Acenaphthene	16	500	<560	320 J
Acenaphthylene	44	640	<560	110 J
Anthracene	85.3	1,100	<560	160 J
Benzo(a)anthracene	261	1,600	<560	210 J
Benzo(b)fluoranthene	NS	NS	<560	340 J
Benzo(k)fluoranthene	NS	NS	<560	120 J
Benzo(g,h,i)perylene	NS	NS	<560	<550
Benzo(a)pyrene	430	1,600	<560	<550
Benzoic acid	NS	NS	NA	<2600
Benzyl alcohol	NS	NS	<560	<550
bis(2-Chloroethoxy)methane	NS	NS	<560	<550
bis(2-Chloroethyl)ether	NS	NS	<560	<550
bis(2-Chloroisopropyl)ether	NS	NS	<560	<550
bis(2-Ethylhexyl)phthalate	NS	NS	310 BJ	170 J
4-Bromophenyl-phenylether	NS	NS	<560	<550
Butylbenzylphthalate	NS	NS	<560	<550
4-Chloroaniline	NS	NS	<560	<550
4-Chloro-3-methylphenol	NS	NS	<560	<550
2-Chloronaphthalene	NS	NS	<560	<550
2-Chlorophenol	NS	NS	NA	<550
4-Chlorophenyl-phenylether	NS	NS	<560	<550
Chrysene	384	2,800	<560	510 J
Dibenz(a,h)anthracene	63.4	260	<560	<550
Dibenzofuran	NS	NS	<560	280 J
Di-n-butylphthalate	NS	NS	210 BJ	63 J
1,2-Dichlorobenzene	NS	NS	<560	<550
1,3-Dichlorobenzene	NS	NS	<560	<550
1,4-Dichlorobenzene	NS	NS	<560	<550
3,3'-Dichlorobenzidine	NS	NS	<1100	<1100
2,4-Dichlorophenol	NS	NS	NA	<550
Diethylphthalate	NS	NS	<560	<550
2,4-Dimethylphenol	NS	NS	NA	<550
Dimethyl phthalate	NS	NS	<560	<550
4,6-Dinitro-2-methylphenol	NS	NS	NA	<2600
2,4-Dinitrophenol	NS	NS	NA	<2600
2,4-Dinitrotoluene	NS	NS	<560	<550
2,6-Dinitrotoluene	NS	NS	<560	<550
Di-n-octyl phthalate	NS	NS	<560	<550
Fluoranthene	600	5,100	<560	2000
Fluorene	19	540	<560	300 J
Hexachlorobenzene	NS	NS	<560	<550
Hexachlorobutadiene	NS	NS	<560	<550
Hexachlorocyclopentadiene	NS	NS	<560	<550
Hexachloroethane	NS	NS	<560	<550
Indeno(1,2,3-cd)pyrene	NS	NS	<560	<550
Isophorone	NS	NS	<560	<550
2-Methylnaphthalene	70	670	NA	61 J
2-Methylphenol	NS	NS	<560	<550
4-Methylphenol	NS	NS	<560	<550
Naphthalene	160	2,100	<560	<550
2-Nitroaniline	NS	NS	<2700	<2600
3-Nitroaniline	NS	NS	<2700	<2600
4-Nitroaniline	NS	NS	<2700	<2600
Nitrobenzene	NS	NS	<560	<550
2-Nitrophenol	NS	NS	NA	<550
4-Nitrophenol	NS	NS	NA	<2600
N-Nitrosodiphenylamine	NS	NS	<560	<550
N-Nitroso-di-n-propylamine	NS	NS	<560	<550
Pentachlorophenol	NS	NS	NA	<2600
Phenanthrene	240	1,500	<560	2600
Phenol	NS	NS	NA	<550
Pyrene	665	2,600	<560	2200
1,2,4-Trichlorobenzene	NS	NS	<560	<550
2,4,5-Trichlorophenol	NS	NS	NA	<2600
2,4,6-Trichlorophenol	NS	NS	NA	<550
Total SVOCs:	NS	NS	520	9444
Total PAHs:	4,022	44,792	0	9,150

Table 2. Results of Semivolatile Organic Compound Analyses of Sediment Samples Collected in Area b, Allied Signal Inc., Elizabeth, New Jersey.

Parameter (concentrations in ug/kg)	1994 NOAA Sediment Quality Screening Values ER-L Concentrations (ug/kg)	ER-M Concentrations (ug/kg)		
		Phase:	I	I
		Sample Designation:	SS-5	SS-6
		Sample Depth*(inches):	6 - 12	6 - 12
		Sample Date:	5/31/89	5/31/89
Acenaphthene	16	500	140 J	<520
Acenaphthylene	44	640	<600	<520
Anthracene	85.3	1,100	<600	66 J
Benzo(a)anthracene	261	1,600	62 J	280 J
Benzo(b)fluoranthene	NS	NS	83 J	500 J
Benzo(k)fluoranthene	NS	NS	<600	500 J
Benzo(g,h,i)perylene	NS	NS	<600	110 J
Benzo(a)pyrene	430	1,600	<600	180 J
Benzoic acid	NS	NS	NA	NA
Benzyl alcohol	NS	NS	<600	<520
bis(2-Chloroethoxy)methane	NS	NS	<600	<520
bis(2-Chloroethyl)ether	NS	NS	<600	<520
bis(2-Chloroisopropyl)ether	NS	NS	<600	<520
bis(2-Ethylhexyl)phthalate	NS	NS	130 BJ	<520
4-Bromophenyl-phenylether	NS	NS	<600	<520
Butylbenzylphthalate	NS	NS	<600	<520
4-Chloroaniline	NS	NS	<600	<520
4-Chloro-3-methylphenol	NS	NS	<600	<520
2-Chloronaphthalene	NS	NS	<600	<520
2-Chlorophenol	NS	NS	NA	NA
4-Chlorophenyl-phenylether	NS	NS	<600	<520
Chrysene	384	2,800	86 J	380 J
Dibenz(a,h)anthracene	63.4	260	<600	<520
Dibenzofuran	NS	NS	<600	<520
Di-n-butylphthalate	NS	NS	210 BJ	200 BJ
1,2-Dichlorobenzene	NS	NS	<600	<520
1,3-Dichlorobenzene	NS	NS	<600	<520
1,4-Dichlorobenzene	NS	NS	<600	<520
3,3'-Dichlorobenzidine	NS	NS	<1200	<1000
2,4-Dichlorophenol	NS	NS	NA	NA
Diethylphthalate	NS	NS	<600	<520
2,4-Dimethylphenol	NS	NS	NA	NA
Dimethyl phthalate	NS	NS	<600	<520
4,6-Dinitro-2-methylphenol	NS	NS	NA	NA
2,4-Dinitrophenol	NS	NS	NA	NA
2,4-Dinitrotoluene	NS	NS	<600	<520
2,6-Dinitrotoluene	NS	NS	<600	<520
Di-n-octyl phthalate	NS	NS	<600	<520
Fluoranthene	600	5,100	170 J	440 J
Fluorene	19	540	<600	<520
Hexachlorobenzene	NS	NS	190 J	<520
Hexachlorobutadiene	NS	NS	<600	<520
Hexachlorocyclopentadiene	NS	NS	<600	<520
Hexachloroethane	NS	NS	<600	<520
Indeno(1,2,3-cd)pyrene	NS	NS	<600	150 J
Isophorone	NS	NS	<600	210 J
2-Methylnaphthalene	70	670	NA	NA
2-Methylphenol	NS	NS	<600	<520
4-Methylphenol	NS	NS	<600	<520
Naphthalene	160	2,100	<600	<520
2-Nitroaniline	NS	NS	<2900	<2500
3-Nitroaniline	NS	NS	<2900	<2500
4-Nitroaniline	NS	NS	<2900	<2500
Nitrobenzene	NS	NS	<600	<520
2-Nitrophenol	NS	NS	NA	NA
4-Nitrophenol	NS	NS	NA	NA
N-Nitrosodiphenylamine	NS	NS	<600	<520
N-Nitroso-di-n-propylamine	NS	NS	<600	<520
Pentachlorophenol	NS	NS	NA	NA
Phenanthrene	240	1,500	110 J	280 J
Phenol	NS	NS	NA	NA
Pyrene	665	2,600	120 J	420 J
1,2,4-Trichlorobenzene	NS	NS	<600	<520
2,4,5-Trichlorophenol	NS	NS	NA	NA
2,4,6-Trichlorophenol	NS	NS	NA	NA
Total SVOCs:	NS	NS	1301	3716
Total PAHs:	4,022	44,792	771	3,306

Table 2. Results of Semivolatile Organic Compound Analyses of Sediment Samples Collected in Area 6, Allied Signal Inc., Elizabeth, New Jersey.

Parameter (concentrations in ug/kg)	1994 NOAA Sediment Quality Screening Values ER-L Concentrations (ug/kg)	ER-M Concentrations (ug/kg)	Phase: IV	I
			Sample Designation: SS-6A	SS-7
			Sample Depth* (inches): 0-6	6 - 12
			Sample Date: 12/1/94	5/31/89
Acenaphthene	16	500	3 J	<3200
Acenaphthylene	44	640	3 J	<3200
Anthracene	85.3	1,100	14 J	<3200
Benzo(a)anthracene	261	1,600	110 J	680 J
Benzo(b)fluoranthene	NS	NS	140 J	<3200
Benzo(k)fluoranthene	NS	NS	68 J	<3200
Benzo(g,h,i)perylene	NS	NS	66 J	<3200
Benzo(a)pyrene	430	1,600	89 J	<3200
Benzoic acid	NS	NS	<2100	NA
Benzyl alcohol	NS	NS	<430	<3200
bis(2-Chloroethoxy)methane	NS	NS	<430	<3200
bis(2-Chloroethyl)ether	NS	NS	<430	<3200
bis(2-Chloroisopropyl)ether	NS	NS	<430	<3200
bis(2-Ethylhexyl)phthalate	NS	NS	200 J	8600 B
4-Bromophenyl-phenylether	NS	NS	<430	<3200
Butylbenzylphthalate	NS	NS	49 J	<3200
4-Chloroaniline	NS	NS	<430	<3200
4-Chloro-3-methylphenol	NS	NS	<430	<3200
2-Chloronaphthalene	NS	NS	<430	<3200
2-Chlorophenol	NS	NS	<430	NA
4-Chlorophenyl-phenylether	NS	NS	<430	<3200
Chrysene	384	2,800	140 J	770 J
Dibenz(a,h)anthracene	63.4	260	30 J	<3200
Dibenzofuran	NS	NS	<430	<3200
Di-n-butylphthalate	NS	NS	30 J	1000 BJ
1,2-Dichlorobenzene	NS	NS	<430	<3200
1,3-Dichlorobenzene	NS	NS	<430	<3200
1,4-Dichlorobenzene	NS	NS	<430	<3200
3,3'-Dichlorobenzidine	NS	NS	<860	<6300
2,4-Dichlorophenol	NS	NS	<430	NA
Diethylphthalate	NS	NS	<430	<3200
2,4-Dimethylphenol	NS	NS	<430	NA
Dimethyl phthalate	NS	NS	<430	<3200
4,6-Dinitro-2-methylphenol	NS	NS	<2100	NA
2,4-Dinitrophenol	NS	NS	<2100	NA
2,4-Dinitrotoluene	NS	NS	<430	<3200
2,6-Dinitrotoluene	NS	NS	<430	<3200
Di-n-octyl phthalate	NS	NS	<430	1900 J
Fluoranthene	600	5,100	150 J	2000 J
Fluorene	19	540	<430	<3200
Hexachlorobenzene	NS	NS	<430	6300
Hexachlorobutadiene	NS	NS	<430	<3200
Hexachlorocyclopentadiene	NS	NS	<430	<3200
Hexachloroethane	NS	NS	14 J	<3200
Indeno(1,2,3-cd)pyrene	NS	NS	56 J	<3200
Isophorone	NS	NS	<430	<3200
2-Methylnaphthalene	70	670	<430	NA
2-Methylphenol	NS	NS	<430	<3200
4-Methylphenol	NS	NS	<430	<3200
Naphthalene	160	2,100	<430	<3200
2-Nitroaniline	NS	NS	<2100	<15000
3-Nitroaniline	NS	NS	<2100	<15000
4-Nitroaniline	NS	NS	<2100	<15000
Nitrobenzene	NS	NS	<430	<3200
2-Nitrophenol	NS	NS	<430	NA
4-Nitrophenol	NS	NS	<2100	NA
N-Nitrosodiphenylamine	NS	NS	<430	<3200
N-Nitroso-di-n-propylamine	NS	NS	<430	<3200
Pentachlorophenol	NS	NS	<2100	NA
Phenanthrene	240	1,500	66 J	1200 J
Phenol	NS	NS	<430	NA
Pyrene	665	2,600	160 J	910 J
1,2,4-Trichlorobenzene	NS	NS	<430	<3200
2,4,5-Trichlorophenol	NS	NS	<2100	NA
2,4,6-Trichlorophenol	NS	NS	<430	NA
Total SVOCs:	NS	NS	1374	23360
Total PAHs:	4,022	44,792	1,095	5,560

Table 2. Results of Semivolatile Organic Compound Analyses of Sediment Samples Collected in Area b, Allied Signal Inc., Elizabeth, New Jersey.

Parameter (concentrations in ug/kg)	1994 NOAA Sediment Quality Screening Values ER-L Concentrations (ug/kg)	ER-M Concentrations (ug/kg)		
		Phase:	II	II
		Sample Designation:	SS-10	SS-11
		Sample Depth*(inches):	0-6	0-6
		Sample Date:	10/18/91	10/18/91
Acenaphthene	16	500	NA	NA
Acenaphthylene	44	640	<2700	<10000
Anthracene	85.3	1,100	<2700	<10000
Benzo(a)anthracene	261	1,600	<2700	<10000
Benzo(b)fluoranthene	NS	NS	<2700	<10000
Benzo(k)fluoranthene	NS	NS	<2700	<10000
Benzo(g,h,i)perylene	NS	NS	<2700	<10000
Benzo(a)pyrene	430	1,600	<2700	<10000
Benzoic acid	NS	NS	NA	NA
Benzyl alcohol	NS	NS	<5400	<21000
bis(2-Chloroethoxy)methane	NS	NS	<2700	<10000
bis(2-Chloroethyl)ether	NS	NS	<2700	<10000
bis(2-Chloroisopropyl)ether	NS	NS	<2700	<10000
bis(2-Ethylhexyl)phthalate	NS	NS	<2700	<10000
4-Bromophenyl-phenylether	NS	NS	<2700	<10000
Butylbenzylphthalate	NS	NS	<2700	<10000
4-Chloroaniline	NS	NS	<2700	<10000
4-Chloro-3-methylphenol	NS	NS	NA	NA
2-Chloronaphthalene	NS	NS	<2700	<10000
2-Chlorophenol	NS	NS	NA	NA
4-Chlorophenyl-phenylether	NS	NS	<2700	<10000
Chrysene	384	2,800	<2700	1,300 J
Dibenz(a,h)anthracene	63.4	260	<2700	<10000
Dibenzofuran	NS	NS	<2700	<10000
Di-n-butylphthalate	NS	NS	<2700	<10000
1,2-Dichlorobenzene	NS	NS	<2700	<10000
1,3-Dichlorobenzene	NS	NS	<2700	<10000
1,4-Dichlorobenzene	NS	NS	<2700	<10000
3,3'-Dichlorobenzidine	NS	NS	<5400	<21000
2,4-Dichlorophenol	NS	NS	NA	NA
Diethylphthalate	NS	NS	<2700	<10000
2,4-Dimethylphenol	NS	NS	NA	NA
Dimethyl phthalate	NS	NS	<2700	<10000
4,6-Dinitro-2-methylphenol	NS	NS	NA	NA
2,4-Dinitrophenol	NS	NS	NA	NA
2,4-Dinitrotoluene	NS	NS	<2700	<10000
2,6-Dinitrotoluene	NS	NS	<13000	<50000
Di-n-octyl phthalate	NS	NS	<2700	<10000
Fluoranthene	600	5,100	<2700	<10000
Fluorene	19	540	<2700	<10000
Hexachlorobenzene	NS	NS	<2700	2,400 J
Hexachlorobutadiene	NS	NS	<2700	<10000
Hexachlorocyclopentadiene	NS	NS	<2700	<10000
Hexachloroethane	NS	NS	<2700	<10000
Indeno(1,2,3-cd)pyrene	NS	NS	<2700	<10000
Isophorone	NS	NS	<2700	<10000
2-Methylnaphthalene	70	670	<2700	<10000
2-Methylphenol	NS	NS	NA	NA
4-Methylphenol	NS	NS	NA	NA
Naphthalene	160	2,100	<2700	<10000
2-Nitroaniline	NS	NS	<13000	<50000
3-Nitroaniline	NS	NS	<2700	<10000
4-Nitroaniline	NS	NS	<13000	<50000
Nitrobenzene	NS	NS	<2700	<10000
2-Nitrophenol	NS	NS	NA	NA
4-Nitrophenol	NS	NS	<2700	<10000
N-Nitrosodiphenylamine	NS	NS	<2700	<10000
N-Nitroso-di-n-propylamine	NS	NS	<2700	<10000
Pentachlorophenol	NS	NS	NA	NA
Phenanthrene	240	1,500	<2700	<10000
Phenol	NS	NS	NA	NA
Pyrene	665	2,600	<2700	<10000
1,2,4-Trichlorobenzene	NS	NS	<2700	<10000
2,4,5-Trichlorophenol	NS	NS	NA	NA
2,4,6-Trichlorophenol	NS	NS	NA	NA
Total SVOCs:	NS	NS	0	3700
Total PAHs:	4,022	44,792	0	1,300

Table 2. Results of Semivolatile Organic Compound Analyses of Sediment Samples Collected in Area 6, Allied Signal Inc., Elizabeth, New Jersey.

Parameter (concentrations in ug/kg)	1994 NOAA Sediment Quality Screening Values ER-L Concentrations (ug/kg)	ER-M Concentrations (ug/kg)	Phase: II	Phase: IV
		Sample Designation:	SS-12	SS-13A
		Sample Depth*(inches):	0-6	0-6
		Sample Date:	10/21/91	12/1/94
Acenaphthene	16	500	NA	<430
Acenaphthylene	44	640	<2500	<430
Anthracene	85.3	1,100	<2500	<430
Benzo(a)anthracene	261	1,600	<2500	<430
Benzo(b)fluoranthene	NS	NS	340	<430
Benzo(k)fluoranthene	NS	NS	<2500	<430
Benzo(g,h,i)perylene	NS	NS	<2500	<430
Benzo(a)pyrene	430	1,600	<2500	<430
Benzoic acid	NS	NS	NA	<2100
Benzyl alcohol	NS	NS	<5000	<430
bis(2-Chloroethoxy)methane	NS	NS	<2500	<430
bis(2-Chloroethyl)ether	NS	NS	<2500	<430
bis(2-Chloroisopropyl)ether	NS	NS	<2500	<430
bis(2-Ethylhexyl)phthalate	NS	NS	<2500	83 J
4-Bromophenyl-phenylether	NS	NS	<2500	<430
Butylbenzylphthalate	NS	NS	<2500	<430
4-Chloroaniline	NS	NS	<2500	<430
4-Chloro-3-methylphenol	NS	NS	NA	<430
2-Chloronaphthalene	NS	NS	<2500	<430
2-Chlorophenol	NS	NS	NA	<430
4-Chlorophenyl-phenylether	NS	NS	<2500	<430
Chrysene	384	2,800	7,500	<430
Dibenz(a,h)anthracene	63.4	260	<2500	<430
Dibenzofuran	NS	NS	<2500	<430
Di-n-butylphthalate	NS	NS	<2500	<430
1,2-Dichlorobenzene	NS	NS	<2500	<430
1,3-Dichlorobenzene	NS	NS	<2500	<430
1,4-Dichlorobenzene	NS	NS	<2500	<430
3,3'-Dichlorobenzidine	NS	NS	<5000	<860
2,4-Dichlorophenol	NS	NS	NA	<430
Diethylphthalate	NS	NS	<2500	<430
2,4-Dimethylphenol	NS	NS	NA	<430
Dimethyl phthalate	NS	NS	<2500	<430
4,6-Dinitro-2-methylphenol	NS	NS	NA	<2100
2,4-Dinitrophenol	NS	NS	NA	<2100
2,4-Dinitrotoluene	NS	NS	<2500	<430
2,6-Dinitrotoluene	NS	NS	<12000	<430
Di-n-octyl phthalate	NS	NS	<2500	<430
Fluoranthene	600	5,100	320	<430
Fluorene	19	540	<2500	<430
Hexachlorobenzene	NS	NS	<2500	<430
Hexachlorobutadiene	NS	NS	<2500	<430
Hexachlorocyclopentadiene	NS	NS	<2500	<430
Hexachloroethane	NS	NS	<2500	<430
Indeno(1,2,3-cd)pyrene	NS	NS	<2500	<430
Isophorone	NS	NS	<2500	<430
2-Methylnaphthalene	70	670	<2500	<430
2-Methylphenol	NS	NS	NA	<430
4-Methylphenol	NS	NS	NA	<430
Naphthalene	160	2,100	<2500	<430
2-Nitroaniline	NS	NS	<12000	<2100
3-Nitroaniline	NS	NS	<2500	<2100
4-Nitroaniline	NS	NS	<12000	<2100
Nitrobenzene	NS	NS	<2500	<430
2-Nitrophenol	NS	NS	NA	<430
4-Nitrophenol	NS	NS	<2500	<2100
N-Nitrosodiphenylamine	NS	NS	<2500	<430
N-Nitroso-di-n-propylamine	NS	NS	<2500	<430
Pentachlorophenol	NS	NS	NA	<2100
Phenanthrene	240	1,500	<2500	<430
Phenol	NS	NS	NA	<430
Pyrene	665	2,600	310	<430
1,2,4-Trichlorobenzene	NS	NS	<2500	<430
2,4,5-Trichlorophenol	NS	NS	NA	<2100
2,4,6-Trichlorophenol	NS	NS	NA	<430
Total SVOCs:	NS	NS	8470	83
Total PAHs:	4,022	44,792	8,470	0

Table 2. Results of Semivolatile Organic Compound Analyses of Sediment Samples Collected in Area o, Allied Signal Inc., Elizabeth, New Jersey.

Parameter (concentrations in ug/kg)	1994 NOAA Sediment Quality Screening Values ER-L Concentrations (ug/kg)	ER-M Concentrations (ug/kg)		
		Phase:	IV	IV
		Sample Designation:	SS-14A	SS-15A
		Sample Depth*(inches):	0-6	0-6
		Sample Date:	12/1/94	12/1/94
Acenaphthene	16	500	<1200	<500
Acenaphthylene	44	640	<1200	<500
Anthracene	85.3	1,100	<1200	<500
Benzo(a)anthracene	261	1,600	<1200	82 J
Benzo(b)fluoranthene	NS	NS	<1200	210 J
Benzo(k)fluoranthene	NS	NS	<1200	15 J
Benzo(g,h,i)perylene	NS	NS	<1200	<500
Benzo(a)pyrene	430	1,600	<1200	86 J
Benzoic acid	NS	NS	<6100	<2400
Benzyl alcohol	NS	NS	<1200	<500
bis(2-Chloroethoxy)methane	NS	NS	<1200	<500
bis(2-Chloroethyl)ether	NS	NS	<1200	<500
bis(2-Chloroisopropyl)ether	NS	NS	<1200	<500
bis(2-Ethylhexyl)phthalate	NS	NS	440 J	280 J
4-Bromophenyl-phenylether	NS	NS	<1200	<500
Butylbenzylphthalate	NS	NS	<1200	61 J
4-Chloroaniline	NS	NS	<1200	<500
4-Chloro-3-methylphenol	NS	NS	<1200	<500
2-Chloronaphthalene	NS	NS	<1200	<500
2-Chlorophenol	NS	NS	<1200	<500
4-Chlorophenyl-phenylether	NS	NS	<1200	<500
Chrysene	384	2,800	<1200	110 J
Dibenz(a,h)anthracene	63.4	260	<1200	<500
Dibenzofuran	NS	NS	<1200	<500
Di-n-butylphthalate	NS	NS	<1200	<500
1,2-Dichlorobenzene	NS	NS	<1200	<500
1,3-Dichlorobenzene	NS	NS	<1200	<500
1,4-Dichlorobenzene	NS	NS	<1200	<500
3,3'-Dichlorobenzidine	NS	NS	<2500	<1000
2,4-Dichlorophenol	NS	NS	<1200	<500
Diethylphthalate	NS	NS	<1200	<500
2,4-Dimethylphenol	NS	NS	<1200	<500
Dimethyl phthalate	NS	NS	<1200	<500
4,6-Dinitro-2-methylphenol	NS	NS	<6100	<2400
2,4-Dinitrophenol	NS	NS	<6100	<2400
2,4-Dinitrotoluene	NS	NS	<1200	<500
2,6-Dinitrotoluene	NS	NS	<1200	<500
Di-n-octyl phthalate	NS	NS	<1200	<500
Fluoranthene	600	5,100	<1200	160 J
Fluorene	19	540	<1200	<500
Hexachlorobenzene	NS	NS	<1200	<500
Hexachlorobutadiene	NS	NS	<1200	<500
Hexachlorocyclopentadiene	NS	NS	<1200	<500
Hexachloroethane	NS	NS	<1200	<500
Indeno(1,2,3-cd)pyrene	NS	NS	<1200	<500
Isophorone	NS	NS	<1200	<500
2-Methylnaphthalene	70	670	<1200	<500
2-Methylphenol	NS	NS	<1200	<500
4-Methylphenol	NS	NS	<1200	<500
Naphthalene	160	2,100	<1200	<500
2-Nitroaniline	NS	NS	<6100	<2400
3-Nitroaniline	NS	NS	<6100	<2400
4-Nitroaniline	NS	NS	<6100	<2400
Nitrobenzene	NS	NS	<1200	<500
2-Nitrophenol	NS	NS	<1200	<500
4-Nitrophenol	NS	NS	<6100	<2400
N-Nitrosodiphenylamine	NS	NS	<1200	<500
N-Nitroso-di-n-propylamine	NS	NS	<1200	<500
Pentachlorophenol	NS	NS	<6100	<2400
Phenanthrene	240	1,500	<1200	76 J
Phenol	NS	NS	<1200	<500
Pyrene	665	2,600	<1200	180 J
1,2,4-Trichlorobenzene	NS	NS	<1200	<500
2,4,5-Trichlorophenol	NS	NS	<6100	<2400
2,4,6-Trichlorophenol	NS	NS	<1200	<500
Total SVOCs:	NS	NS	440	1260
Total PAHs:	4,022	44,792	0	919

Table 2. Results of Semivolatile Organic Compound Analyses of Sediment Samples Collected in Area 6, Allied Signal Inc., Elizabeth, New Jersey.

Parameter (concentrations in ug/kg)	1994 NOAA Sediment Quality Screening Values ER-L Concentrations (ug/kg)	ER-M Concentrations (ug/kg)	Phase: IV Sample Designation: SS-15B Sample Depth*(inches): 18 - 24 Sample Date: 12/1/94	IV SS-16A 0-6 12/1/94
Acenaphthene	16	500	<430	<570
Acenaphthylene	44	640	<430	<570
Anthracene	85.3	1,100	<430	14 J
Benzo(a)anthracene	261	1,600	<430	70 J
Benzo(b)fluoranthene	NS	NS	<430	170 J
Benzo(k)fluoranthene	NS	NS	<430	53 J
Benzo(g,h,i)perylene	NS	NS	<430	34 J
Benzo(a)pyrene	430	1,600	<430	72 J
Benzoic acid	NS	NS	<2100	<2800
Benzyl alcohol	NS	NS	<430	<570
bis(2-Chloroethoxy)methane	NS	NS	<430	<570
bis(2-Chloroethyl)ether	NS	NS	<430	<570
bis(2-Chloroisopropyl)ether	NS	NS	<430	<570
bis(2-Ethylhexyl)phthalate	NS	NS	<430	120 J
4-Bromophenyl-phenylether	NS	NS	<430	<570
Butylbenzylphthalate	NS	NS	<430	150 J
4-Chloroaniline	NS	NS	<430	<570
4-Chloro-3-methylphenol	NS	NS	<430	<570
2-Chloronaphthalene	NS	NS	<430	<570
2-Chlorophenol	NS	NS	<430	<570
4-Chlorophenyl-phenylether	NS	NS	<430	<570
Chrysene	384	2,800	<430	96 J
Dibenz(a,h)anthracene	63.4	260	<430	<570
Dibenzofuran	NS	NS	<430	<570
Di-n-butylphthalate	NS	NS	60 J	36 J
1,2-Dichlorobenzene	NS	NS	<430	<570
1,3-Dichlorobenzene	NS	NS	<430	<570
1,4-Dichlorobenzene	NS	NS	<430	<570
3,3'-Dichlorobenzidine	NS	NS	<850	<1100
2,4-Dichlorophenol	NS	NS	<430	<570
Diethylphthalate	NS	NS	<430	<570
2,4-Dimethylphenol	NS	NS	<430	<570
Dimethyl phthalate	NS	NS	<430	<570
4,6-Dinitro-2-methylphenol	NS	NS	<2100	<2800
2,4-Dinitrophenol	NS	NS	<2100	<2800
2,4-Dinitrotoluene	NS	NS	<430	<570
2,6-Dinitrotoluene	NS	NS	<430	<570
Di-n-octyl phthalate	NS	NS	<430	<570
Fluoranthene	600	5,100	<430	160 J
Fluorene	19	540	<430	<570
Hexachlorobenzene	NS	NS	<430	<570
Hexachlorobutadiene	NS	NS	<430	<570
Hexachlorocyclopentadiene	NS	NS	<430	<570
Hexachloroethane	NS	NS	<430	<570
Indeno(1,2,3-cd)pyrene	NS	NS	<430	26 J
Isophorone	NS	NS	<430	<570
2-Methylnaphthalene	70	670	<430	<570
2-Methylphenol	NS	NS	<430	<570
4-Methylphenol	NS	NS	<430	<570
Naphthalene	160	2,100	<430	<570
2-Nitroaniline	NS	NS	<2100	<2800
3-Nitroaniline	NS	NS	<2100	<2800
4-Nitroaniline	NS	NS	<2100	<2800
Nitrobenzene	NS	NS	<430	<570
2-Nitrophenol	NS	NS	<430	<570
4-Nitrophenol	NS	NS	<2100	<2800
N-Nitrosodiphenylamine	NS	NS	<430	<570
N-Nitroso-di-n-propylamine	NS	NS	<430	<570
Pentachlorophenol	NS	NS	<2100	<2800
Phenanthrene	240	1,500	<430	47 J
Phenol	NS	NS	<430	<570
Pyrene	665	2,600	<430	170 J
1,2,4-Trichlorobenzene	NS	NS	<430	<570
2,4,5-Trichlorophenol	NS	NS	<2100	<2800
2,4,6-Trichlorophenol	NS	NS	<430	<570
Total SVOCs:	NS	NS	60	1218
Total PAHs:	4,022	44,792	0	912

Table 2. Results of Semivolatile Organic Compound Analyses of Sediment Samples Collected in Area 6, Allied Signal Inc., Elizabeth, New Jersey.

Parameter (concentrations in ug/kg)	1994 NOAA Sediment Quality Screening Values ER-L Concentrations (ug/kg)	ER-M Concentrations (ug/kg)	Phase: IV Sample Designation: SS-16B Sample Depth*(inches): 18 - 24 Sample Date: 12/1/94
Acenaphthene	16	500	<460
Acenaphthylene	44	640	<460
Anthracene	85.3	1,100	<460
Benzo(a)anthracene	261	1,600	<460
Benzo(b)fluoranthene	NS	NS	<460
Benzo(k)fluoranthene	NS	NS	<460
Benzo(g,h,i)perylene	NS	NS	<460
Benzo(a)pyrene	430	1,600	<460
Benzoic acid	NS	NS	<2200
Benzyl alcohol	NS	NS	<460
bis(2-Chloroethoxy)methane	NS	NS	<460
bis(2-Chloroethyl)ether	NS	NS	<460
bis(2-Chloroisopropyl)ether	NS	NS	<460
bis(2-Ethylhexyl)phthalate	NS	NS	<460
4-Bromophenyl-phenylether	NS	NS	<460
Butylbenzylphthalate	NS	NS	<460
4-Chloroaniline	NS	NS	<460
4-Chloro-3-methylphenol	NS	NS	<460
2-Chloronaphthalene	NS	NS	<460
2-Chlorophenol	NS	NS	<460
4-Chlorophenyl-phenylether	NS	NS	<460
Chrysene	384	2,800	<460
Dibenz(a,h)anthracene	63.4	260	<460
Dibenzofuran	NS	NS	<460
Di-n-butylphthalate	NS	NS	<460
1,2-Dichlorobenzene	NS	NS	<460
1,3-Dichlorobenzene	NS	NS	<460
1,4-Dichlorobenzene	NS	NS	<460
3,3'-Dichlorobenzidine	NS	NS	<920
2,4-Dichlorophenol	NS	NS	<460
Diethylphthalate	NS	NS	<460
2,4-Dimethylphenol	NS	NS	<460
Dimethyl phthalate	NS	NS	<460
4,6-Dinitro-2-methylphenol	NS	NS	<2200
2,4-Dinitrophenol	NS	NS	<2200
2,4-Dinitrotoluene	NS	NS	<460
2,6-Dinitrotoluene	NS	NS	<460
Di-n-octyl phthalate	NS	NS	<460
Fluoranthene	600	5,100	<460
Fluorene	19	540	<460
Hexachlorobenzene	NS	NS	<460
Hexachlorobutadiene	NS	NS	<460
Hexachlorocyclopentadiene	NS	NS	<460
Hexachloroethane	NS	NS	<460
Indeno(1,2,3-cd)pyrene	NS	NS	<460
Isophorone	NS	NS	<460
2-Methylnaphthalene	70	670	<460
2-Methylphenol	NS	NS	<460
4-Methylphenol	NS	NS	<460
Naphthalene	160	2,100	<460
2-Nitroaniline	NS	NS	<2200
3-Nitroaniline	NS	NS	<2200
4-Nitroaniline	NS	NS	<2200
Nitrobenzene	NS	NS	<460
2-Nitrophenol	NS	NS	<460
4-Nitrophenol	NS	NS	<2200
N-Nitrosodiphenylamine	NS	NS	<460
N-Nitroso-di-n-propylamine	NS	NS	<460
Pentachlorophenol	NS	NS	<2200
Phenanthrene	240	1,500	<460
Phenol	NS	NS	<460
Pyrene	665	2,600	<460
1,2,4-Trichlorobenzene	NS	NS	<460
2,4,5-Trichlorophenol	NS	NS	<2200
2,4,6-Trichlorophenol	NS	NS	<460
Total SVOCs:	NS	NS	0
Total PAHs:	4,022	44,792	0

ug/kg	Micrograms per kilogram.
ug/L	Micrograms per liter.
J	Result is detected below the reporting limit or is an estimated concentration.
B	Analyte was found in the blank, as well as in the sample.
NS	No standard given.
NA	Not analyzed.
*	Depth below land surface.
ER-L	Effects range - low.
ER-M	Effects range - medium.
PAHs	Polynuclear aromatic hydrocarbons.
NOAA	National Oceanic and Atmospheric Administration.
SVOCs	Semivolatile organic compounds.

920890020

Table 3. Results of Metal Analyses of Sediment Samples Collected in Area 6, AlliedSignal Inc., Elizabeth, New Jersey.

Parameter (concentration in mg/kg)	1994 NOAA Sediment Quality Screening Values: ER-L Concentrations mg/kg	1994 NOAA Sediment Quality Screening Values: ER-M Concentrations mg/kg								
Phase:			I	I	I	II	IV	I	IV	I
Sample Designation:			SS-1	SS-2	SS-3	SS-3	SS-3B	SS-4	SS-4A	SS-5
Sample Depth* (inches):			6 - 12	6 - 12	6 - 12	0-6	18 - 24	6 - 12	0 - 6	6 - 12
Sample Date:			5/31/89	5/31/89	5/31/89	10/18/91	12/1/94	5/31/89	12/1/94	5/31/89
Antimony	NS	NS	3.60 B	3.80 B	<2.00	<19.9	<11.0	18.10	72.1	7.30
Arsenic	8.2	70	5.10	2.70 B	<2.00	NA	13.3	23.40	55.2	9.50
Beryllium	NS	NS	<0.43	0.46 B	0.49 B	NA	<0.82	<0.26	<0.51	0,41 B
Cadmium	1.2	9.6	3.00	0.39 B	<0.49	NA	<2.7	<0.26	2.7	3.40
Chromium	81	370	28.30	67.20	7.50	NA	40.9	9.30	60.1	18.90
Copper	34	270	255.00	60.40	44.10	NA	9.9	10.10	42.3	28.50
Lead	48.7	218	510.00	73.60	30.60	NA	66.9	16.70	72.1	17.80
Mercury	0.15	0.71	0.59	0.64	0.25	NA	0.33	<0.12	0.80	0.61
Nickel	20.9	51.6	16.00 B	10.80 B	<12.30	NA	6.6 B	6.70 B	41.8	<7.40
Selenium	NS	NS	0.94 B	<0.30	<0.49	NA	7.2	<0.26	<0.84	<0.29
Silver	1	3.7	3.40 B	2.40 B	5.70	NA	<2.7	<1.30	<1.7	<1.50
Thallium	NS	NS	<1.70	<1.20	<2.00	NA	6.8	<1.00	<0.67	<1.20
Zinc	150	410	687.00	168.00	11.40	NA	7.7	52.70	158	201.00

NOAA National Oceanic and Atmospheric Administration.
mg/kg Milligrams per kilogram.
NS No standard given.
NA Not analyzed.
* Depth below land surface.
ER-L Effects range - low.
ER-M Effects range - medium.
B Compound detected in method blank.

920890021

Table 3. Results of Metal Analyses of Sediment Samples Collected in Area 6, AlliedSignal Inc., Elizabeth, New Jersey.

Parameter (concentrations in mg/kg)	1994 NOAA Sediment Quality Screening Values: ER-L Concentrations mg/kg	1994 NOAA Sediment Quality Screening Values: ER-M Concentrations mg/kg								
Phase:			I	IV	I	IV	II	II	II	IV
Sample Designation:			SS-6	SS-6A	SS-7	SS-7B	SS-10	SS-11	SS-12	SS-13A
Sample Depth* (inches):			6 - 12	0 - 6	6 - 12	18 - 24	0.6	0.6	0.6	0 - 6
Sample Date:			5/31/89	12/1/94	5/31/89	12/1/94	10/18/91	10/18/91	10/21/91	12/1/94
Antimony	NS	NS	14.00 B	<5.3	309.00 B	<6.3	162	106	<7.6	17.8
Arsenic	8.2	70	10.40	6.4	223.00	9.1	NA	NA	7.7	7.8
Beryllium	NS	NS	0.30 B	<0.39	1.60 B	<0.47	NA	NA	<0.31	<0.39
Cadmium	1.2	9.6	0.56 B	1.4	3.30 B	<1.6	NA	NA	2.8	<1.3
Chromium	81	370	28.10	18.9	157.00	35.4	NA	NA	29.7	25.8
Copper	34	270	21.80	5.5	157.00	37.9	NA	NA	166	6.7
Lead	48.7	218	143.00	41.0	40.20	59.8	NA	NA	308	28.0
Mercury	0.15	0.71	1.40	0.38	0.90	0.48	NA	NA	3.5	<0.13
Nickel	20.9	51.6	<6.80	14.8	44.60	43.3	NA	NA	27.6	14.3
Selenium	NS	NS	<0.27	<0.65	<1.00	2.3	NA	NA	<1.5	<0.65
Silver	1	3.7	<1.40	<1.3	<5.10	<1.6	NA	NA	<1.5	<1.3
Thallium	NS	NS	<1.10	<0.52	<4.10	0.92 B	NA	NA	<0.76	<0.52
Zinc	150	410	46.60	101	460.00	99.3	NA	NA	271	59.6

NOAA National Oceanic and Atmospheric Administration.
mg/kg Milligrams per kilogram.
NS No standard given.
NA Not analyzed.
* Depth below land surface.
ER-L Effects range - low.
ER-M Effects range - medium.
B Compound detected in method blank.

920890022

Table 3. Results of Metal Analyses of Sediment Samples Collected in Area 6, AlliedSignal Inc., Elizabeth, New Jersey.

Parameter (concentrations in mg/kg)	1994 NOAA Sediment Quality Screening Values: ER-L Concentrations mg/kg	1994 NOAA Sediment Quality Screening Values: ER-M Concentrations mg/kg					
Phase:			IV	IV	IV	IV	IV
Sample Designation:			SS-14A	SS-15A	SS-15B	SS-16A	SS-16B
Sample Depth* (inches):			0 - 6	0 - 6	18 - 24	0 - 6	18 - 24
Sample Date:			12/1/94	12/1/94	12/1/94	12/1/94	12/1/94
Antimony	NS	NS	238	<6.1	<5.3	<7.0	<5.7
Arsenic	8.2	70	165	11.90	1.2 B	4.5	1.4
Beryllium	NS	NS	<1.1	<0.46	<0.39	<0.53	<0.43
Cadmium	1.2	9.6	7.4	<1.5	<1.3	7.0	<1.4
Chromium	81	370	143	14.4	6.2	27.8	15.4
Copper	34	270	109	26.2	<1.3	22.9	<1.4
Lead	48.7	218	140	150	9.3	175	16.8
Mercury	0.15	0.71	1.3	0.60	0.67	1.8	<0.11
Nickel	20.9	51.6	51.3	9.7	6.6	33.8	11.4
Selenium	NS	NS	<1.9	7.5	<0.66	<0.86	<0.70
Silver	1	3.7	<3.7	<1.5	<1.3	<1.8	<1.4
Thallium	NS	NS	<1.5	3.7	<0.53	<0.69	<0.56
Zinc	150	410	401	68.4	17.2	397	23.7

NOAA National Oceanic and Atmospheric Administration.
mg/kg Milligrams per kilogram.
NS No standard given.
NA Not analyzed.
* Depth below land surface.
ER-L Effects range - low.
ER-M Effects range - medium.
B Compound detected in method blank.

920890023

Table 4. Results of Total Petroleum Hydrocarbon Analyses of Sediment Samples Collected in Area 6, Allied Signal Inc., Elizabeth, New Jersey.

Phase:	I	I	I	I	IV	I	I	IV	I	IV	IV	IV
Sample Designation:	SS-1	SS-2	SS-3	SS-4	SS-4A	SS-5	SS-6	SS-6A	SS-7	SS-13A	SS-14A	SS-15A
Sample Depth* (inches):	6 - 12	6 - 12	6 - 12	6 - 12	0 - 6	6 - 12	6 - 12	0 - 6	6 - 12	0 - 6	0 - 6	0 - 6
Sample Date:	5/31/89	5/31/89	5/31/89	5/31/89	12/1/94	5/31/89	5/31/89	12/1/94	5/31/89	12/1/94	12/9/94	12/194
Parameter (concentrations in mg/kg)												
TPHs	850	540	<140	<80	152	<90	<90	76.4	1,200	265	50.7	137

* Depth below land surface.
TPHs Total petroleum hydrocarbons.
mg/kg Milligrams per kilogram.

920890024

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Table 4. Results of Total Petroleum Hydrocarbon Analyses of Sediment Samples Collected in Area 6, Allied Signal Inc., Elizabeth, New Jersey.

Phase:	IV	IV	IV
Sample Designation:	SS-15B	SS-16A	SS-16B
Sample Depth* (inches):	18 - 24	0 - 6	18 - 24
Sample Date:	12/1/94	12/1/94	12/1/94
Parameter (concentrations in mg/kg)			
TPHs	56.6	226	320

* Depth below land surface.
TPHs Total petroleum hydrocarbons.
mg/kg Milligrams per kilogram.

920890025

Table 5. Results of Total Organic Carbon Analyses of Soil Samples Collected in Area 6, Allied Signal Inc., Elizabeth, New Jersey.

Phase:	IV	IV	IV	IV	IV	IV	IV	IV
Sample Designation:	*SS-4A*	*SS-6A*	*SS-13A*	*SS-14A*	*SS-15A*	*SS-15B*	*SS-16A*	*SS-16B*
Sample Depth* (inches):	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	18 - 24	0 - 6	18 - 24
Date Sampled:	12/1/94	12/1/94	12/1/94	12/1/94	12/1/94	12/1/94	12/1/94	12/1/94
Parameter (concentrations in ug/g)								
TOC	409	1570	305	2160	<200	<200	2750	510

* Depth below land surface.
TOC Total organic carbon.
ug/g Micrograms per gram.

GEOTECHNICAL TESTING REPORT
PROJECT NY 0731.001
ELIZABETH, NEW JERSEY

FOR:
GERAGHTY & MILLER, INC.
ROCHELLE PARK, NEW JERSEY

JOB NO. G043.004
DECEMBER, 1994

920890027

Huntingdon
Consulting Engineers Environmental Scientists

Empire Soils Investigations, Inc.
Corporate Offices
140 Telegraph Road
Box 297
Middleport, New York 14105
(716)735-3502
Fax: (716)735-9027

January 9, 1995

Mr. Stephen O'Krepky
Geraghty & Miller, Inc.
201 W. Passaic St., 3rd Fl.
Rochelle Park, NJ 07662

SUBJECT: GEOTECHNICAL TESTING
PROJECT NO. NY 0731.001
ELIZABETH, NEW JERSEY

Dear Mr. O'Krepky:

Transmitted herewith are the results of Geotechnical Laboratory testing performed on potentially contaminated soil samples from the subject project. The work was authorized by N. Valkenburg on our Quote No. 94-6058 dated December 5, 1994.

A total of eight (8) jar samples were received in good condition at our laboratory in Middleport, New York, on December 6, 1994. The samples were catalogued and identified as follows:

LAB NO.	SAMPLE NO.
2180.001	SS-4A
2180.002	SS-6A
2180.003	SS-13A
2180.004	SS-14A
2180.005	SS-15A
2180.006	SS-15B
2180.007	SS-16A
2180.008	SS-16B

In accord with your instructions, we have performed Grain Size Distribution Test (ASTM D422). The individual Grain Size Distribution Test reports are attached.

920890028

Should you have any questions or in case we may be of further service, do not hesitate to contact the undersigned at 716-735-3400.

Respectfully submitted,

EMPIRE SOILS INVESTIGATIONS, INC.

Jorgen F. Christiansen

Jorgen F. Christiansen, PE
Director, Geotechnical Laboratory

JFC/tas

Attachments

Huntingdon

Consulting Engineers Environmental Scientists

12/21/94 16:27

TRANSM OK.

Empire Soils Investigation, Inc.
P.O. Box 297, 140 Telegraph Road
Middleport, New York 14105
Telephone: (716) 735-3502
Fax: (716) 735-9027

THIS IS A FACSIMILE MESSAGE FOR THE ATTENTION OF:

NAME: MIKE GLOSE

COMPANY: GERAGHTY & MILLER, INC.

FAX NO: 201-909-0567 OR 0568

FROM: JORGEN F. CHRISTIANSEN

DATE: DEC. 21, 1994

THERE ~~IS~~/ARE 9 PAGE(S) BEING SENT TO YOU,
(INCLUDING THIS COVER PAGE)
IF YOU RECEIVE LESS THAN THIS, PLEASE CONTACT US,

TELEPHONE: (716) 735-3502

FAX: (716) 735-9027

REMARKS: PROJECT NY 0731.001, ELIZABETH, NEW JERSEY
ADVANCE GRAIN SIZE DISTRIBUTION REPORT
8 SAMPLES RECEIVED 12/6/94

MESSAGE FOLLOWS

920890030

Huntingdon

Empire Soils Investigations, Inc., Division
Corporate Offices
140 Telegraph Road
Box 297
Middleport, New York 14105

LABORATORY WORK ORDER

PROJECT: NY0731.001 ELIZABETH, N.J. JOB NO.: G043.004

CLIENT: GERAGHTY + MILLER INC. SHEET: 1 OF 2

ISSUED BY: KJC DATE: 12-6-94 SAMPLED BY: _____ DATE: _____

SAMPLE TYPE & SOURCE:	SS-4A	SS-6A	SS-13A	SS-14A	SS-15A	SS-15B
LABORATORY NO.	2180.001	2180.002	2180.003	2180.004	2180.005	2180.006
Atterberg Limits						
Natural Water Content						
Hydrometer Analysis	X	X	X	X	X	X
Sieve Analysis Sizes Required:	X	X	X	X	X	X
Proctor Test: ASTM D 698 (Standard) ASTM D1557 (Modified)						
Permeability Test: _ Undisturbed _ Remolded _____						
Specific Gravity						
Sample Classifications						

Specifications: ___ Job (list) ___ NYSDOT ___ ASTM

REMARKS: PLEASE FAX ADVANCE COPIES TO MIKE GLOSE
GERAGHTY & MILLER
FAX # 201-909-0567 OR 0568

920890031

Huntingdon

Empire Soils Investigations, Inc., Division
Corporate Offices
140 Telegraph Road
Box 297
Middleport, New York 14105

LABORATORY WORK ORDER

PROJECT: NY0731.001 JOB NO.: G043.004

CLIENT: GERAGHTY + MILLER INC. SHEET: 2 OF 2

ISSUED BY: KJL DATE: 12-6-94 SAMPLED BY: _____ DATE: _____

SAMPLE TYPE & SOURCE:	SS-16A	SS-16B				
LABORATORY NO.	2130.007	2130.008				
Atterberg Limits						
Natural Water Content						
Hydrometer Analysis	X	X				
Sieve Analysis Sizes Required:	X	X				
Proctor Test: ASTM D 698 (Standard) ASTM D1557 (Modified)						
Permeability Test: __ Undisturbed __ Remolded _____%						
Specific Gravity						
Sample Classifications						

Specifications: ___ Job (list) ___ NYSDOT ___ ASTM

REMARKS:

920890032

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL
PROTECTION AND ENERGY

OCT 11 1994

CHRISTINE TODD WHITMAN
Governor

ROBERT C. SHINN, J
Commissioner

Leon Mattioli
Allied Signal, Inc.
P.O. Box 1017
Markus Hook, PA 19061

Re: Administrative Consent Order (ACO) In the Matter of Allied Signal, Inc.
Elizabeth City, Union County
Letter Dated: September 16, 1994
ISRA Case #86103

Dear Leon Mattioli:

The New Jersey Department of Environmental Protection (Department) has received the above referenced document. The Departments' comments are as follows:

1. Declaration of Environmental Restriction:

The Department acknowledges that Allied Signal, Inc. plans to remediate the soils in the entire manufacturing area to the Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC).

Allied Signal, Inc. shall inform the Department, per Section 4i of P.L. 1993. c139., as to the basis upon which the decision was made to remediate soils to the Non-Residential Direct Contact Soil Cleanup Criteria and/or Impact to Ground Water Soil Cleanup Criteria. Allied Signal, Inc. shall submit to the Department, per P.L. 1993. c139. Section 4i paragraph 6, the cost difference between implementing the residential criteria and non-residential criteria.

Allied Signal, Inc. is also advised that Section 36 of P.L. 1993. c139., has specific requirements when a property is remediated to the Non-Residential Direct Contact Soil Cleanup Criteria [i.e. the area(s) to be included in the Declaration of Environmental Restriction (DER) must be delineated to the Residential Direct Contact Soil Cleanup Criteria (RDCSCC)]. Allied Signal, Inc. may refer to N.J.A.C. 7:26E-4.1(b) for establishing a contaminant gradient.

The DER map submitted with the September 16, 1994 letter is inadequate. Attached is a copy of the current Declaration of Environmental Restriction that is required pursuant to the Industrial Site Recovery Act (ISRA). Allied Signal, Inc. shall submit a Draft Declaration of Environmental Restriction which shall include a map(s) delineating the area(s) to be included in the DER to the RDCSCC at all depths where contamination was found. Allied Signal, Inc. shall refer to the DER itself for determining any additional requirements.

The above information/documentation shall be submitted to the Department within 30 days of receipt of this letter.

920890033

2. Drainage Ditches: Allied Signal, Inc. shall commence collecting the soil/sediment samples from the drainage ditches pursuant to the Department's July 13, 1994 letter.

Allied Signal, Inc. shall submit a revised schedule, pursuant to N.J.A.C. 7:26e-6.5, detailing the remaining remedial activities (ie. soil/sediment sampling, DER submission, etc.) at the site.

Also, the Department is in the process of reviewing the ground water portion of the above referenced document.

Also, on February 22, 1994, the New Jersey Department of Environmental Protection (NJDEP) promulgated the ISRA Fee Rule amendments at 26 N.J.R. 1142, which were proposed on April 5, 1993 at 25 N.J.R. 1375. Pursuant to the fee rule amendments, the NJDEP will bill an owner or operator according to the direct billing formula at N.J.A.C. 7:26B-1.10(f)2. At this time, the NJDEP intends to process bills on a semi-annual basis. The NJDEP encourages responsible parties to use the "Technical Requirements for Site Remediation" (N.J.A.C. 7:26E) as well as any other NJDEP guidance documents to assist in remediation activities and thereby minimize NJDEP review time. The complexity of the environmental contamination at the site and the quality of the workplans and reports submitted to the NJDEP will dictate the oversight costs to the regulated community.

If you have any questions, please contact the Case Manager, Stephen Myers, at (609) 777-0899.

Sincerely,

for Bryan Moore

Stephen E. Maybury, Section Chief
Bureau of Environmental Evaluation
and Cleanup Responsibility Assessment

c: Michael Glose, Geraghty & Miller, Inc.
Nicholas Valkenburg, Geraghty & Miller, Inc.

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL
PROTECTION AND ENERGY

CHRISTINE TODD WHITMAN
Governor

ROBERT C. SHINN, JR.
Commissioner

JUL 13 1994

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Leon Mattioli
Allied Signal, Inc.
P.O. Box 1017
Markus Hook, PA 19061

RE: Administrative Consent Order (ACO) In the Matter of Allied-Signal, Inc.
Elizabeth City, Union County
Remedial Investigation Report and Conceptual Remedial Action Plan Dated:
February 18, 1994
ISRA Case #86103

Dear Mr. Mattioli:

This is to advise you that the New Jersey Department of Environmental Protection and Energy (NJDEPE) has completed a review of the Remedial Investigation Report and Conceptual Remedial Action Plan dated February 18, 1994. Based on the review, the proposal is unacceptable.

Allied-Signal, Inc. shall submit a Revised Remedial Action Workplan pursuant to N.J.A.C. 7:26E, the Technical Requirements for Site Remediation, and the referenced ACO, which shall contain, at a minimum, a proposal that addresses all of the conditions stated below. The Remedial Action Workplan shall be submitted within 60 calendar days of the receipt of this letter pursuant to the referenced ACO. If Allied-Signal, Inc. fails to submit the required Remedial Action Workplan within the referenced time frame, this case will be referred to the Bureau of Applicability and Compliance for review. This letter does not represent an extension or modification of the time frames for compliance.

On February 22, 1994, the New Jersey Department of Environmental Protection and Energy (NJDEPE) promulgated the ISRA Fee Rule amendments at 26 N.J.R. 1142, which were proposed on April 5, 1993 at 25 N.J.R. 1375. Pursuant to the fee rule amendments, the NJDEPE will bill an owner or operator according to the direct billing formula at N.J.A.C. 7:26B-1.10(f)2. At this time, the NJDEPE intends to process bills on a semi-annual basis. The NJDEPE encourages responsible parties to use the "Technical Requirements for Site Remediation" (N.J.A.C. 7:26E) as well as any other NJDEPE guidance documents to assist in remediation activities and thereby minimize NJDEPE review time. The complexity of the environmental contamination at the site and the quality of the workplans and reports submitted to the NJDEPE will dictate the oversight costs to the regulated community.

920890035

I GROUND WATER

The ground water Remedial Action Workplan (RAW) proposal within the above referenced document is unacceptable. A revised RAW, which addresses all of the conditions below, shall be submitted.

OVERALL GROUND WATER REQUIREMENTS

Allied Signal shall submit a proposal for active remediation and hydraulic control. Allied Signal shall propose a ground water recovery method, a ground water treatment method, a discharge point for treated ground water, compliance point wells, source area wells, a quarterly sampling program and a hydraulic monitoring program. Allied Signal may want to take a phased approach, and submit a proposal for the delineation required below, a proposal for any aquifer testing necessary to develop a ground water recovery plan, a proposal for the work required in other conditions of this letter, and a conceptual ground water recovery and treatment plan, then submit a final Remedial Action Workplan with the results. Allied Signal shall also begin evaluating options for disposal of recovered ground water as soon as possible.

Unless Allied Signal provides a more detailed interpretation of ground water contamination in which individual contaminant plumes are identified and correlated to specific source areas, the Department will treat the site as if it were underlain by a single dissolved phase plume that requires remediation. Allied Signal will be required to establish compliance wells around the perimeter of the contaminant plume, up-gradient of surface water receptors. Allied Signal will be required to achieve hydraulic control of the contaminant plume to the extent that the ground water cleanup standards are maintained at the compliance wells throughout the duration of the cleanup. Quarterly sampling of compliance wells and hydraulic monitoring will be required to demonstrate that hydraulic control is adequate.

Allied Signal will not necessarily be required to remediate all ground water up-gradient of the compliance points to cleanup standards. Rather, Allied will be required to remove all DNAPL and LNAPL (see Conditions No. 1 and No. 2 below) and to remove as much dissolved phase contamination as feasible, and will then be allowed a post-remediation monitoring period to demonstrate that contamination has been reduced to the extent that it will naturally attenuate without causing an exceedance of cleanup standards at the compliance wells in the absence of hydraulic control. Quarterly monitoring at contaminated wells (source area wells) will be required to assess the progress of the cleanup.

Compliance wells should be wells that are clean, or wells that are only slightly contaminated and that will become clean once contaminant source areas have been hydraulically isolated through ground water recovery. Given the Phase III results, wells (moving clockwise) 24, 1, 14, 6, 4, 27 and 22 may all be suitable as compliance points. However, more detailed delineation appears necessary in areas shown on the attached map in order to identify the extent of contamination that requires capture and in order to establish a sufficient number of compliance wells.

While Allied Signal may petition the Department for reclassification of ground water at the site to IIB status, Allied is advised that according to the Ground Water Quality Standards, ground water areas subject to petition for reclassification shall constitute at least a significant portion of one or more geologic units or formations. That is, the Department will not reclassify on a site-by-site basis. Furthermore, reclassification from IIA to IIB status would not change the standards applicable to the site as, according to the Ground Water Quality Standards, the IIB criteria "shall be the Class-IIA criteria." Regarding the IIIB Classification, the Department finds that the shallow ground water zone does not qualify for IIIB status, given the failure of all of the wells to meet the minimum chloride and TDS criteria (ground water quality in the lower aquifer does meet these IIIB criteria.)

Additionally, the Ground Water Quality Standards, N.J.A.C. 7:9-6.7(g), state "Where ground water that receives pollutants from a discharge(s) subsequently flows to surface waters, the Department shall regulate such discharges as necessary so as not to exceed the Surface Water Quality Standards applicable to that body of surface water. The discharger may request application of only the ground water quality standards by showing, to the satisfaction of the Department, and in the context of the applicable regulatory procedure, that the flow of ground water pollutants into the surface water will not cause a violation of the Surface Water Quality Standards."

AREA SPECIFIC GROUND WATER REQUIREMENTS

1. MW23 contained DNAPL during Phase II (apparently none was observed in the well during Phase III), and wells MW16, MW17 and MW28 contain dissolved phase concentrations indicative of DNAPL (a concentration of 1% the solubility of a substance or greater is believed indicative of separate phase). Allied Signal shall submit a proposal to recover the DNAPL that is presumed present in at least the immediate area of MW23, and shall submit a proposal to investigate the presence of product in each of the other three wells. Allied shall also propose to check each significantly contaminated well for DNAPL during future sampling events.

2. LNAPL was found in new well MW30 in Phase III at a thickness of 3" - 1'. Allied sampled the LNAPL for VOs. The LNAPL was found to contain 443,500 ppb VOs, including largely 2,3-dihydro-1H-indene and various benzene compounds with smaller amounts of fluorocarbons, xylene and chlorinated compounds. Allied Signal shall submit a proposal for delineation and recovery of this LNAPL because MW27 is not sufficient for delineation of the product in MW30. MW27 appears to be down-gradient of MW30 but also appears to be located over 150' away. Significant product could still be present down-gradient of MW30. Additional wells shall be proposed down-gradient of MW30 as shown on the attached map.

Also, while Allied Signal believes that product in MW30 may be from the nearby fuel oil ASTs, the TPHC concentrations in soil in Area 2B suggest that an extensive area side-gradient of MW30 and the ASTs might be underlain by product, possibly due to the "Old Oil Spill." Therefore, Allied Signal shall propose installation of at least one well within the spill area, as shown on the attached map.

3. MW22, installed to investigate ground water quality at Area 1A (Former Gasoline and Diesel Tanks) is located on the up-gradient side of the area. A new well must be installed down-gradient of the area. The well shall be screened through the water table. The well shall be checked for floating product and shall be sampled for VO+15.

4. Soil in boring B126 in Area 3F (Fuel Oil ASTs) contained TPHC at up to 12,000 ppm and vertical delineation has not been required (VOs and BNs were not associated with the TPHC). The boring log did not indicate free product but a hydrocarbon odor was noted. The Department is concerned about free product on the water table in this area. Allied Signal shall inspect the drainage ditch water down-gradient of Area 3F for a product sheen and shall report the distance between boring B126 and the drainage ditch. Installation of a well may be required based on Allied Signal's response.

5. Allied Signal shall clarify the status of W-3. Allied Signal shall indicate whether this well needs to be abandoned and replaced.

6. Figure 3.1 , Locations and Contents of Storage Tanks, submitted in the March, 1992 report, shows a "chlorocarbon terminal" east of the Genesolv Blends and Warehouse building. According to the figure, the terminal contained ten storage units, with a total capacity of 44,000 gallons, that stored various chlorinated compounds. This area was apparently never identified as an area of concern. Allied shall provide a detailed description/history of this area and submit a remedial investigation workplan proposal.

II SOILS

The above referenced document reports the results of a phase III sampling activities, and offers proposals for all areas of concern. The proposals are acceptable for some areas and unacceptable for others. Allied seemed to change directions for several areas of concern resulting in the need for further investigation at those areas.

The Department acknowledges that Allied Signal plans to remediate some of the soils to the Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC).

Allied Signal shall inform the Department, per Section 4i of P.L. 1993. c139., as to the basis upon which the decision was made to remediate soils to the Non-Residential Direct Contact Soil Cleanup Criteria. Allied Signal shall submit to the Department, per P.L. 1993. c139. Section 4i paragraph 6, the cost difference between implementing the residential criteria and non-residential criteria.

Allied Signal is also advised that Section 36 of P.L. 1993. c139., has specific requirements when a property is remediated to the Non-Residential Direct Contact Soil Cleanup Criteria (i.e. **the area(s) to be included in the Declaration of Environmental Restriction must be delineated to the Residential Direct Contact Soil Cleanup Criteria**). Allied Signal may refer to N.J.A.C. 7:26E-4.1(b) for establishing a contaminant gradient. The Department's most recent version of a Declaration of Environmental Restriction is attached.

This information as well as, a map delineating the area(s) to be included in the Declaration of Environmental Restriction to the Residential Direct Contact Soil Cleanup Criteria (RDCSCC) at all depths where contamination was found and a proposal for implementing engineering/institutional controls shall be included in the next submittal.

INDIVIDUAL AREAS OF CONCERN

1. AOC 1A - Former Gasoline and Diesel UST's: Several USTs and an AST were removed in this area. Elevated levels of hexachlorobenzene and PHC were detected in the area. The hexachlorobenzene was found at the surface and at the water table at levels exceeding nonresidential health based levels. Arsenic and Beryllium are also present at elevated levels. PHC concentrations exceeded 10,000 ppm at one location.

Proposal: Allied proposes no further remedial action because the risk is reduced due to paving.

Requirement: The proposal is unacceptable. The Department has requested characterization and delineation in this area for years. The request was waived because Allied proposed to investigate the efficacy of VES/bioventing (6/28/93 correspondence G&M to DEPE) remediation in the area. The Department believed that characterization and/or remediation would be achieved through this activity. It is necessary to delineate and characterize the PHC and hexachlorobenzene contamination in the area in accordance with the Technical Requirements for Site Remediation. The metals levels found may be due to fill and should be treated accordingly. An expansion of the area to be included in the Declaration of Environmental Restriction (DER) may be acceptable in lieu of further sampling.

2. AOC's 1B, 1C & 1D - Former Truck Parking Area, UST Adjacent to the Administration & Alleged Drum Storage Area: No further action was accepted for these areas however, levels exist above the Residential Direct Contact Soil Cleanup Criteria at AOC's 1B and 1C. Allied shall submit a proposal for a Declaration of Environmental Restrictions in these areas.

3. AOC 2A and 2B - Former Sulfuric Acid Production and Old Oil Spill Areas: There were two areas investigated because of oil spills. Levels of PHC to 70,000 ppm and BAP at 1.1 ppm were detected in the area. Only one location had BAP above the current cleanup criteria however, most of the samples had very elevated MDL's for the BN analyses. Free product was detected in a well in the spill area.

Proposal: Pave and implement a Declaration of Environmental Restriction.

Requirement: Allied states that no delineation is required since the worst case areas have been sampled. This is unacceptable, at a minimum it is necessary to delineate the contamination in this area to the Residential Direct Contact Soil Cleanup Criteria to establish the area to be included in the DER. Furthermore soil remediation shall be tied to groundwater remediation. Allied had proposed to investigate the efficacy of VES/bioventing in this area, but did not pursue this.

4. AOC 3A - Drum Storage Area Adjacent to Boring B-11: Several locations have elevated levels of BN and one had elevated Be levels.

Proposal: Pave and implement institutional controls.

Requirement: The proposal is conditionally acceptable. Allied Signal shall implement a Declaration of Environmental Restriction which requires delineation to the Residential Direct Contact Soil Cleanup Criteria.

5. AOC's 3B and 3C - Drum Storage Area Adjacent to Boring B-12 and Drum Storage Area Adjacent to Boring B-21: The one exceedance of the Residential Direct Contact Soil Cleanup Criteria in each of these areas (Pb=129 ppm and Sb=16.2 ppm, respectively) meets the compliance averaging criteria. Therefore, no further action has been approved for these areas.

6. AOC 3D - Process Structures: Metal and BN contamination has been detected at levels exceeding the Non-Residential Direct Contact Soil Cleanup Criteria.

Proposal: Pave the area and implement institutional controls.

Requirement: The proposal is conditionally acceptable. A Declaration of Environmental Restriction shall be implemented which requires delineation to the Residential Direct Contact Soil Cleanup Criteria as well as, provisions for maintenance of cap.

7. AOC 3E - Chloroform Tanks: No further action was previously approved because levels are below the Residential Direct Contact Soil Cleanup Criteria.

8. AOC 3F - Fuel Oil Tanks: A sample collected within this area had PHC levels of 12,000 ppm. The Department requested sampling below a drain pipe in this area. Allied indicates that this pipe does not exist.

Proposal: Pave the area and implement institutional controls.

Requirement: The proposal is conditionally acceptable. A Declaration of Environmental Restriction shall be implemented which requires delineation to the Residential Direct Contact Soil Cleanup Criteria. Also, if later it is verified in the field that the drain pipe exists sampling may be required.

9. AOC 3G - G-11 Tanks: No further action is required because levels are below the Residential Direct Contact Soil Cleanup Criteria.

10. AOC 3H - Former Lagoon Area: This area was a former lagoon. Numerous samples were collected for metal and VO analyses. Elevated levels of contaminants were found in different parts of the AOC and groundwater has been impacted.

Proposal: Allied states "No further action is recommended for the former lagoon area because the excess lifetime cancer risk (ELCR) for 1,1,2,2-tetrachloroethane (4E-6) was lower than 1E-5, which is the ELCR standard for a Class C carcinogen."

Requirement: The proposal is unacceptable. **Pursuant to P.L. 1993. c139. Section 35f.(1) a person performing a remediation may submit to the Department a request to use alternative residential use and non-residential use soil remediation standard and based on the proposed standard propose a remedial action. The reference to using a site specific risk assessment (35f.(1)) involves generating the alternate standard, not to determine the need for a remedial action as stated in Allied's baseline risk assessment. The alternate soil remediation standard can use site specific risk assessment protocol consistent with CERCLA to generate a level to compare site data by area of concern (AOC) as pursuant to the Technical Requirements for Site Remediation, N.J.A.C. 7:26E.**

A "risk assessment" is not used to determine the need for remedial action. Additionally, the risk assessment is not acceptable because of the way the Department defines an AOC.

Therefore, as indicated in previous correspondence, Allied shall delineate the contamination, and propose an appropriate remediation. Soil remediation shall be done with consideration for the fate of groundwater.

11. AOC 4A - Boring B-24 Area: Elevated metals levels were found at a location during the Phase I investigation. The contaminants included Be and Zn at 9.1 and 1850 ppm respectively, exceeding the Non-Residential Direct Contact Soil Cleanup Criteria, and Cd and Pb at 4.5 and 365 ppm.

Proposal: Allied proposes no further action.

Requirement: Allied shall remove the contaminated soil from this area or include it as part of areas to be paved and implement a Declaration of Environmental Restriction, which requires delineation to the Residential Direct Contact Soil Cleanup Criteria.

12. AOC 4B and 4C - Drum Storage Areas and Temporary Drum Staging Area: No further action is acceptable because levels are below the Residential Direct Contact Soil Cleanup Criteria.

13. AOC 4D - Alleged Drum Storage Area: No further action is required because levels are below the Residential Direct Contact Soil Cleanup Criteria.

14. AOC 5 - Electrical Substations: Two locations had PCB concentrations right at the non-residential cleanup criteria and one location exceeded the residential level. NFA was approved in the Department's 7/11/91 letter to Allied. Therefore, the NFA shall stand however, Allied shall implement a Declaration of Environmental Restriction, which requires delineation to the

Residential Direct Contact Soil Cleanup Criteria, and institutional controls in this area because PCB levels exceed the Non-Residential Direct Contact Soil Cleanup Criteria.

15. AOC 6 - Drainage Ditches: Contamination has been detected in the ditches around the site.

Proposal: Allied proposes no further action for the drainage ditches.

Requirement: The Department required the following sampling in the Remedial Investigation Workplan approval issued July 22, 1993 in order to do an assessment: Allied shall collect several additional samples within the public ditch. A sample shall be collected from the surface of the sediment at the mouth of the ditch, at SS-4, at two locations 400 and 800 feet upstream from SS-4 and at SS-6. The previous samples were collected 6-12" below the sediment surface. It shall be noted that the highest elevation of contamination for many of the contaminants were directly downgradient of outfall 002. The contamination within the site drainage ditch shall be treated as surface contamination. Vertical delineation samples shall be collected from 18-24" and analyzed for target metals at SS-3 and SS-7. Allied shall refer to the Department's Draft Guidance for Sediment Quality Evaluations, for Allied's use in evaluating the sediment quality. Further investigation regarding the Newark Bay may also be required. Allied shall conduct this sampling as outlined above.

In addition Allied had proposed to conduct a study to determine the history of discharges from other facilities into the drainage ditch. Allied shall also conduct this study.

16. AOC 7 - Background and Random Soil Borings: The Department requested a sample be collected to determine if levels of Pb and As were isolated hits or associated with a discharge. The delineation samples showed that the original hit was isolated.

Proposal: Allied proposes no further action.

Requirement: This proposal is acceptable because contaminants meet the compliance averaging criteria.

17. AOC 8 - Stressed Vegetation: Areas of stressed vegetation were sampled in the Phase III investigation, samples were analyzed for VO's, pH, PPM, TOC, and particle grain size. No contaminants were detected above cleanup criteria, however, the pH at 7 out of 10 locations was below 3.

Proposal: Allied proposes no further action.

Requirement: Allied shall remediate the pH in the areas of stressed vegetation. This remediation should be inexpensive and will improve the environmental quality of the area.

If you have any questions regarding this letter, please contact the Case Manager, Stephen Myers, at (609) 633-7141.

Sincerely,

for Bryan Moore

Douglas Stuart, Chief
Bureau of Environmental Evaluation and
Cleanup Responsibility Assessment

c: Nicholas Valkenburg, Geraghty & Miller, Inc.
Samuel Ezekwo, USEPA Region II
Kenneth Sandor, Health Officer
Kris Geller, BEERA
Beverly Phillips, BGWPA

NOTICE ABOUT UNSCANNABLE MAP

THIS MAP CAN BE FOUND IN THE SITE FILE LOCATED AT: U.S. EPA SUPERFUND RECORDS CENTER, 290 BROADWAY, 18TH FLOOR, NY, NY 10007. TO MAKE AN APPOINTMENT TO VIEW THE MATERIAL PLEASE CONTACT THE RECORD CENTER AT (212) 637-4308.

LOCATION OF SURFACE-WATER AND SEDIMENT SAMPLES IN AREA 6 ALLIEDSIGNAL INC. ELIZABETH, NEW JERSEY	FIGURE 1

920890044

NOTICE ABOUT UNSCANNABLE MAP

THIS MAP CAN BE FOUND IN THE SITE FILE LOCATED AT: U.S. EPA SUPERFUND RECORDS CENTER, 290 BROADWAY, 18TH FLOOR, NY, NY 10007. TO MAKE AN APPOINTMENT TO VIEW THE MATERIAL PLEASE CONTACT THE RECORD CENTER AT (212) 637-4308.

SUBJECT:	FIGURE
AREAS OF POTENTIAL ENVIRONMENTAL CONCERN AND EXISTING MONITORING WELLS	2

920890045

920890046

920890047

GERAGHTY & MILLER, INC.
Environmental Services

Ground Water *Hydrocarbon* *Remediation* *Education*

SEP 13 10 13 AM '94

September 16, 1994

VIA FEDERAL EXPRESS

Douglas Stuart
Chief, Bureau of Environmental Evaluation and
Cleanup Responsibility Assessment
New Jersey Department of
Environmental Protection
401 East State Street
Trenton, New Jersey 08625-0028

RE: AlliedSignal Inc., Elizabeth, New Jersey, ISRA Case Number 86103

Dear Mr. Stuart:

At the request of AlliedSignal Inc., Geraghty & Miller, Inc. has prepared this conceptual scope of work in response to your July 13, 1994 letter which discussed the New Jersey Department of Environmental Protection (NJDEP) comments to Geraghty & Miller's February 18, 1994 Remedial Investigation Report and Conceptual Remedial Action Plan. This letter also contains comments discussed at an August 25, 1994 meeting with NJDEP representatives in Trenton. If the NJDEP agrees with the scope of work outlined below, AlliedSignal will revise and resubmit the February 18, 1994 Remedial Action Plan.

For convenience, an item-by-item response to the NJDEP's July 13 letter is provided below. We have also included three figures which show the proposed locations of Declaration of Environmental Restriction (DER) areas and additional monitoring points.

I. GROUNDWATER

Individual responses to sections referring to groundwater have been prepared and are included later. However, the following response addresses the proposed approach to the groundwater which will be treated on a site-wide basis.

OVERALL GROUNDWATER REQUIREMENTS

Because the site history and hydrogeologic conditions indicate that it will be virtually impossible to separate individual constituent plumes, the groundwater will be approached on a site-wide basis. Geraghty & Miller also proposes a phased plan to address the groundwater which will consist of three stages. The first step will be to define and assess the DNAPL (G11) and LNAPL (No. 2 fuel oil). Immediately following the first stage, an appropriate remedial

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program will be proposed for the NAPLs as the second stage. The second stage will include a monitoring program which will involve quarterly monitoring (for 3 years) of Wells 24, 1, 14, 6, 4, 27, 22, and a replacement for W-3, which, we agree with NJDEP, are good compliance wells. Since the intent of the monitoring is to determine if the remediation of the NAPLs is having a beneficial effect, the existing monitoring well network should be sufficient to show a statistical decrease. Geraghty & Miller does not believe the additional compliance wells proposed by the NJDEP are necessary at this time.

While the monitoring program is ongoing, AlliedSignal may pursue a petition to reclassify the groundwater in the area. The petition will likely be submitted on behalf of a number of property owners whose facilities are located over the same geologic units as AlliedSignal's Elizabeth plant and where the groundwater has similar chemical characteristics.

If after the three-year monitoring period in stage 2, the groundwater concentrations of site-related compounds do not appear to be declining in a statistically significant trend, and if the groundwater is not reclassified, one of two approaches will be proposed by AlliedSignal, as follows:

a) AlliedSignal will propose alternate constituent concentrations (ACLs) for both the groundwater and surface water.

b) AlliedSignal will propose a remedial program to address the dissolved phase. If a remedial program is proposed, the dissolved phase will be further defined in a pre-engineering study.

The 3-year monitoring program in stage 2 is necessary to determine if natural attenuation is capable of ultimately achieving groundwater standards after the remediation of the NAPLs which are the sources for the dissolved constituents. A minimum of ten sets of data are required for a statistical analysis; a three-year monitoring program will provide 12 sets of data. Also, if AlliedSignal wishes to pursue alternative a) above, sufficient time must be allowed to develop supporting data for petitions for ACLs.

If a remedial program for the groundwater is necessary it will address both the groundwater and surface water since all groundwater from the site ultimately discharges into the drainage ditches which surround the manufacturing area. The groundwater data from the remedial investigation indicates that the drainage ditches are hydraulic boundaries which intercept all groundwater flow from the site.

not a ... [illegible]

Under Section 35a of ISRA, the NJDEP has the authority to establish groundwater and surface water remediation standards on a case-by-case basis in accordance with the guidance issued by the United States Environmental Protection Agency (USEPA) pursuant to the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). As discussed more fully below, AlliedSignal is proposing engineering and institutional controls for the entire manufacturing area which will allow soil disturbance only if applicable federal, state,

per/in line w/ GWQS?

and local health and safety standards are met. Use of groundwater will not be allowed for potable purposes. A site-specific risk assessment (already submitted), which was performed in accordance with CERCLA guidance, has already indicated that the risks associated with the residual concentrations of site-related compounds in soil, groundwater and surface water are all acceptable. Under the ISRA authority, AlliedSignal would seek to establish Alternate Cleanup Levels (ACLs) for ground and surface water which take into account the establishment of engineering and institutional controls and the information obtained from the revised February 1994 risk assessment.

Any petition for reclassification of the groundwater will require a considerable time to prepare. First the geology must be evaluated, property owners in the area must be contacted to join in a petition for reclassification and the petition must be prepared after all the data are assembled. The petition for reclassification will also be supported with the data from the already-submitted risk assessment and with whatever data has been obtained (up to the date of the petition) from the monitoring program to be conducted under stage 2 (see above).

AREA SPECIFIC GROUNDWATER REQUIREMENTS

1. As discussed above, AlliedSignal proposes to delineate the DNAPL found in MW-23. The proposed delineation strategy includes the installation of 4 monitoring wells. The new wells and existing Wells 16, 17, and 28 will be monitored monthly for three months for the presence of DNAPL. After the delineation phase of the DNAPL investigation is complete, AlliedSignal will evaluate remedial technologies for the recovery of the DNAPL.

2. AlliedSignal proposes to delineate LNAPL with the installation of 5 temporary wells. The proposed locations are shown on the attached site map. The wells will be monitored monthly for LNAPL for a period of three months. After the monitoring program is complete, AlliedSignal will evaluate remedial technologies to recover the LNAPL.

3. AlliedSignal believes that W-22S is located at the best possible position to detect LNAPL and dissolved constituents in the former UST area. The well is located within the former tank pit between the two former USTs, and due to the low permeability of the soils LNAPLs are not expected to migrate. In addition, the former USTs contained diesel fuel which has a comparatively low VOC concentration. Since no LNAPL has been detected in the well, and the total concentration of VOCs associated with petroleum hydrocarbons in the September 1993 groundwater sample collected from the well was approximately 106 parts per billion, Geraghty & Miller believes that there is little potential for migration of LNAPL or dissolved petroleum constituents from this location.

4. During an NJDEP inspection on July 14, 1992, a sheen was observed on the surface of the drainage ditch. Since that time, the ditch has been inspected and no sheens have been observed. AlliedSignal believes that the sheen was a one time event, and most importantly, the sheen was not related to petroleum hydrocarbons but rather the sheen

was composed of iron hydroxide. However, we propose that the area be monitored once a month for three months. If a sheen is detected, a visual determination of the sheens composition will be made. The distance between boring B126 and the ditch is approximately 100 feet.

5. W-3 is assumed to be destroyed and cannot be located. AlliedSignal proposes to replace W-3 with a well of similar construction.

6. The chlorocarbon terminal located east of the Genesolv Blends and Warehouse building was constructed in 1989. Considered "state of the art" when constructed, the terminal is equipped with secondary containment and impervious liners. Because of its construction, this terminal was not identified as an AOC and was therefore not considered as such. In addition, the chlorocarbon terminal will be included within the DER, which obviates the need for an investigation.

do you need document?

II. SOILS

As an overall strategy for remediation of impacted soils at the site, AlliedSignal proposes that the entire manufacturing area will be subject to a DER. One of the requirements of imposing a DER is the delineation of contamination to Residential Direct Contact Soil Cleanup Criteria (RDCSCC). AlliedSignal believes that the existing data shows that the areas outside of the drainage ditches meets the RDCSCC, therefore, no further soil delineation should be required. In addition, since the area outside of the ditches has no history of manufacturing or industrial activity, concentrations of constituents meet, by definition, the RDCSCC.

INDIVIDUAL AREAS OF CONCERN

1. AOC: 1A, 1B, 1C, 1D, 2A, 2B, 3A, 3D, 3F,3H, 4A, and 5. These areas are proposed to be included in the DER. In accordance with the February 18, 1994 report submitted to the NJDEP, the following unpaved AOCs will be paved: 2B, 3A, 3D, and 3H.

2. AOC: 3B, 3C,3E, 3G, 4B, 4C, 4D, and 7. The NJDEP has accepted the proposal for no further action in these areas.

3. AOC 6 - Drainage Ditches. The 6 sampling locations required by the NJDEP are acceptable. AlliedSignal proposes to collect two additional sediment samples from upgradient locations to be used for background. Surface sediment samples will be collected from the mouth of the ditch (SS-4 location), at locations 400 and 800 feet upgradient of SS-4, and at SS-6. Vertical delineation samples will be collected from SS-3 and SS-7 at a depth of 18-24 inches. The vertical delineation samples will be analyzed for target metals. A historical evaluation of upgradient discharges will also be conducted.

4. AOC 8. The area of stressed vegetation will be remediated with lime. The appropriate amount of lime necessary to remediate the area will be calculated and spread over the area. The pH of the soil will be monitored once a month for three months to evaluate the effectiveness of the remediation. Additional lime will be added if necessary to raise the pH of the soil to the pH range of native soil.

If there are any questions, please contact us.

Sincerely,

GERAGHTY & MILLER, INC.

Michael J. Glose by NV

Michael J. Glose
Senior Scientist/Project Manager
(201) 909-0700

Nicholas Valkenburg

Nicholas Valkenburg
Vice President/Project Director
(516) 391-5234

cc: Leon Mattioli
Tom Eck
Gordon Quinn

MJG/NV:mg
g:\aproject\AlliedSI\NY0731.001\Corres\912njdep.ltr

920890052

920890053

CC

McCARTER & ENGLISH, LLP
ATTORNEYS AT LAW
FOUR GATEWAY CENTER
100 MULBERRY STREET
P.O. BOX 652
NEWARK, NJ 07101-0652
(973) 622-4444
TELECOPIER (973) 624-7070

CHERRY HILL, NJ
NEW YORK, NY
BOCA RATON, FL
WILMINGTON, DE
PHILADELPHIA, PA

September 28, 1999

BY HAND

Re: AlliedSignal Inc.
ISRA Case No. 86103

Ms. Tina Layre
Industrial Site Evaluation Element
New Jersey Department of Environmental Protection
401 East State Street, 5th Floor
Trenton, New Jersey 08625

Dear Ms. Layre:

I enclose on behalf of Continental Airlines, Inc. ("Continental") the following original documents that had been executed by Continental in order to effect the transfer of the primary responsibility for ISRA Case No. 86103 from AlliedSignal Inc. to Continental:

1. Remediation Agreement dated September 24, 1999;

2. Secretary's Certification and Acknowledgement dated September 22, 1999;

3. Remediation Trust Fund Agreement dated September 21, 1999 between Continental and Chase Bank of Texas establishing a trust fund in the amount of $3.6 million; and

4. A check in the amount of $36,000 in payment of the annual remediation funding source surcharge for 1999-2000.

Kindly acknowledge your receipt of the enclosed documents and payment by signing the enclosed copy of this letter and returning the signed copy to our waiting messenger.

BAA000049

43096

Thank you for your help in expediting the issuance of the Remediation Agreement on such short notice and facilitating the parties' desire to transfer responsibility of this ISRA matter. If you have any questions concerning any of the enclosed documents, please do not hesitate to call me.

Very truly yours,

Paul C. Dritsas

Paul C. Dritsas

PCD/dk
Encl.
cc: Ms. Leah Raney (w/encl.)
Mr. Jim Tiefenthaler
Pam Cissik, Esq. (w/encl.)
Colleen Donovan, Esq.

Receipt of the original executed copies of the Remediation Agreement, Secretary's Certification and Acknowledgement and Remediation Trust Fund Agreement and check in the amount of $36,000 in payment of the remediation funding source annual surcharge submitted on behalf of Continental Airlines, Inc. is hereby acknowledged.

By:_____ Date: September , 1999

State of New Jersey

Christine Todd Whitman
Governor

Department of Environmental Protection

Robert C. Shinn, Jr.
Commissioner

IN THE MATTER OF THE ELIZABETH SITE AND ALLIED CORP, CHEMICAL DIVISION OF ALLIEDSIGNAL INC. AND ALLIEDSIGNAL INC. AND CONTINENTAL AIRLINES, INC.	: : :	REMEDIATION AGREEMENT

ISRA Case # 86103

This Remediation Agreement is issued and entered into pursuant to the authority vested in the Commissioner of the New Jersey Department of Environmental Protection, (hereinafter the "NJDEP") by N.J.S.A. 13:1D-1 et. seq., and the Industrial Site Recovery Act, N.J.S.A. 13:1K-6 et. seq., and duly delegated to the Assistant Director within the Division of Responsible Party Site Remediation pursuant to N.J.S.A. 13:1B-4.

FINDINGS

1. The property that is the subject of this Remediation Agreement is operated by Allied Corp. a chemical division of AlliedSignal Inc., and owned by AlliedSignal Inc. It is located at 10 North Avenue East and is designated as Block Ward # 1, Lot Accounts 1314, 1315, 1316 & 1205 on the tax maps of the City of Elizabeth, Union County, New Jersey (hereinafter the "Elizabeth industrial establishment"). The Standard Industrial Classification ("SIC") number which best describes the operations at the Elizabeth industrial establishment is 2821.

2. AlliedSignal, Inc. ("Allied") entered into a Remediation Agreement, formerly known as an Administrative Consent Order, with NJDEP effective July 31, 1986 (the "Allied RA") to allow Allied to complete a stock transfer, merger and sale prior to the completion of the ISRA requirements. The Allied RA encompassed several industrial establishments, among which, is the Elizabeth industrial establishment, ISRA Case # 86103.

3. On or about June 2, 1999, Allied submitted a General Information Notice ("GIN") to NJDEP for the sale of the real property at the Elizabeth industrial establishment to Continental Airlines, Inc. ("Continental"), ISRA Case # 99291. Thereafter, Allied submitted to NJDEP a Remediation in Progress Waiver Application for the sale of the real property at the Elizabeth

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industrial establishment. NJDEP issued a Remediation in Progress Waiver for this transaction on or about August 24, 1999.

4. On September 16, 1999, Continental submitted to NJDEP an application for a Remediation Agreement pursuant to N.J.A.C. 7:26B-4.1. Continental has requested in its application for Remediation Agreement that NJDEP allow Continental to assume all of Allied's ISRA obligations for the Elizabeth industrial establishment, ISRA Case # 86103, pursuant to the Allied RA. Additionally, Continental has requested that the remediation funding source which, was established pursuant to the Allied RA, in the amount of $2,000,000.00 for the Elizabeth industrial establishment be released upon Continental's submission of an alternate remediation funding source.

5. Consolidation of Responsible Parties' ISRA Obligations

A. NJDEP and Continental expressly agree that the terms and conditions of this Remediation Agreement shall apply to the Elizabeth industrial establishment. Furthermore, NJDEP and Continental agree to administer and complete all applicable ISRA program requirements, including the remediation funding source requirements and any other remedial measures undertaken pursuant to this Remediation Agreement and ISRA, for the Elizabeth industrial establishment.

B. NJDEP agrees to terminate Allied's obligations under the Allied RA for the Elizabeth industrial establishment and incorporate Allied's ISRA obligations for the Elizabeth industrial establishment in this Remediation Agreement. Therefore, this Remediation Agreement supersedes the Allied RA in connection with the Elizabeth industrial establishment. NJDEP further agrees that the remediation funding source in the amount of $2,000,000.00 will be released upon Continental's submission of an alternate remediation funding source.

C. Person(s) executing this Remediation Agreement and responsible for conducting the remediation of the Elizabeth industrial establishment.

Lead Responsible Person:

Name:	Continental Airlines, Inc.
Business:	Corporation
Address:	1600 Smith Street, 33rd Floor Houston, Texas 77002

6. By entering into this Remediation Agreement, Continental neither admits to any fact, fault or liability under any statute or regulation concerning the condition of the Site nor waives any rights or defenses with regard to the site except as specifically provided in this Remediation Agreement.

AGREEMENT

I. Remediation

1. Continental agrees to remediate the Elizabeth industrial establishment and to submit the following documents as established below:

A. Within thirty (30) calendar days after the effective date of this Remediation Agreement, Continental shall submit a schedule for all remedial investigation and remedial action in accordance with N.J.A.C. 7:26E for the Elizabeth industrial establishment.

B. The NJDEP will review all documents in accordance with N.J.A.C. 7:26B and N.J.A.C. 7:26E.

2. If NJDEP determines any submittal made under this section is inadequate or incomplete, the NJDEP shall provide Continental with written notification of each deficiency, and Continental shall revise and resubmit the required information within thirty (30) calendar days, or longer as authorized by NJDEP, from receipt of such notification.

3. If the NJDEP determines that no further action is required at the Elizabeth industrial establishment, Continental shall submit a negative declaration, in accordance with N.J.A.C. 7:26B-6.6, within thirty (30) calendar days or longer as authorized by NJDEP from receipt of the NJDEP's request for the submission of the negative declaration.

4. Nothing in this Remediation Agreement shall be construed to limit, restrict or prohibit any person(s) responsible for conducting the remediation of the Elizabeth industrial establishment from implementing any applicable ISRA compliance options in accordance with N.J.A.C. 7:26B-5 to satisfy the requirements of ISRA.

5. If at any time that this Remediation Agreement is in effect the NJDEP determines that the requirements of N.J.A.C. 7:26E are not being achieved or that additional remediation is required to protect the public health and safety or the environment, Continental shall conduct such additional remediation as the NJDEP directs.

6. The NJDEP will consider a request for an extension of time to perform any requirement under this Remediation Agreement, provided that any extension request is submitted to the NJDEP fourteen (14) calendar days prior to any applicable deadline to which the extension request refers.

II. Remediation Funding Source

7. Continental shall establish and maintain a remediation funding source in a form pursuant to N.J.A.C. 7:26C-7 in the amount of $3,600,000.00.

8. Upon submission of the remediation funding source and annually thereafter, Continental shall submit a remediation funding source surcharge payment in an amount equal to one percent of the required amount of the remediation funding source. Continental shall submit to the NJDEP a cashier's or certified check payable to the "New Jersey Economic Development Authority" for the full amount of the remediation funding source surcharge. No surcharge is due on the amount of the remediation funding source established as self-guarantee or the amount of the remediation funding source that is established by financial assistance or a grant from the Hazardous Discharge Site Remediation Fund.

9. Whenever the remediation cost increases, Continental shall cause the amount of the remediation funding source to be increased to an amount at least equal to the new estimate within thirty (30) calendar days.

10. Whenever the remediation cost decreases, Continental may file a written request to NJDEP to decrease the amount in the remediation funding source. If NJDEP approves, Continental may decrease the remediation funding source upon receipt of NJDEP's written approval to the person who established the remediation funding source and to the person or institution providing the remediation funding source.

11. NJDEP shall return the remediation funding source established upon Continental submission of a substitute remediation funding source or upon NJDEP's issuance of a no further action letter for the Elizabeth industrial establishment.

12. In the event that NJDEP determines that Continental has failed to perform any of its obligations under this Remediation Agreement or ISRA, NJDEP shall notify the Continental in writing of the obligation(s) with which it has not complied and Continental shall revise and resubmit the required information within a reasonable period of time not to exceed thirty (30) calendar days or longer as authorized by NJDEP from receipt of such notification. If Continental fails to revise and resubmit the required information within the schedule established above, NJDEP may perform the remediation in place of Continental making disbursements from the remediation funding source and may pursue any additional rights and remedies in accordance with N.J.S.A. 58:10B-3(g). Nothing in this paragraph shall prevent NJDEP from seeking civil or civil administrative penalties, costs and damages or any other legal or equitable relief against Continental.

III. Project Coordination

13. Within seven (7) calendar days after the effective date of this Remediation Agreement, Continental shall submit to the NJDEP the name, title, address and telephone number of the individual who shall be Continental's technical contact for the NJDEP for all matters concerning this Remediation Agreement and Continental shall designate an agent for the purpose of service for all matters concerning this Remediation Agreement and shall provide the NJDEP with the agent's name and address.

14. Unless otherwise directed by NJDEP, any submission to be made to NJDEP in accordance with this Remediation Agreement and ISRA shall be directed to:

Wayne C. Howitz, Assistant Director
Industrial Site Evaluation Element
Division of Responsible Party Site Remediation
401 East State Street
P.O. Box 432
Trenton, NJ 08625-0028

IV. Oversight Cost Reimbursement

15. All submissions required pursuant to this Remediation Agreement shall be accompanied by all appropriate fees pursuant to N.J.A.C. 7:26B-8.

16. Within thirty (30) calendar days after receipt from the NJDEP of a written summary, conforming to N.J.A.C. 7:26B-8.2, of the NJDEP's oversight costs, including all accrued interest incurred pursuant to the paragraph below, determined pursuant to N.J.A.C. 7:26B-8, Continental shall submit to the NJDEP a cashier's or certified check payable to the "Treasurer, State of New Jersey" and submitted with DEP Form 062A in accordance with N.J.A.C. 7:26B-8.4, for the full amount of the NJDEP's oversight costs. Nothing contained in the paragraph shall be construed to limit or restrict any person's ability to contest any oversight costs calculated pursuant to N.J.A.C. 7:26B-8.2(d) in accordance with the oversight cost review procedures at N.J.A.C. 7:26B-8.3.

17. Interest shall accrue on the unpaid balance of oversight costs, beginning at the end of the thirty (30) calendar day period established in the preceding paragraph, at the rate established by Rule 4:42 of the current edition of the Rules Governing the Courts of the State of New Jersey.

V. Force Majeure

18. If any event specified in the following paragraph occurs which Continental believes or should believe will or may cause delay in the compliance or cause non-compliance with any provision of this Remediation Agreement, Continental shall notify the NJDEP in writing within seven (7) calendar days of the start of delay or knowledge of the anticipated delay, as appropriate, referencing this paragraph and describing the anticipated length of the delay, the precise cause or causes of the delay, any measures taken or to be taken to minimize the delay, and the time required to take any such measures to minimize the delay. Continental shall take all necessary action to prevent or minimize any such delay.

19. The NJDEP will extend in writing the time for compliance for a period no longer than the delay resulting from such circumstances as determined by the NJDEP only if:

(a) Continental has complied with the notice requirements of the preceding paragraph;

(b) Any delay or anticipated delay has been or will be caused by fire, flood, riot, strike or other circumstances beyond the control of Continental; and

(c) Continental has taken all necessary action to prevent or minimize any such delay.

20. The burden of proving that any delay is caused by circumstances beyond the control of Continental and the length of any such delay attributable to those circumstances shall rest with Continental.

21. "Force Majeure" shall not include the following:

(a) Delay in an interim requirement with respect to the attainment of subsequent requirements;

(b) Increases in the cost or expenses incurred by Continental in fulfilling the requirements of this Remediation Agreement;

(c) Contractor's breach, unless Continental demonstrates that such breach falls within paragraph 19 above; and

(d) Failure to obtain access required to implement this Remediation Agreement, unless denied by a court of competent jurisdiction.

VI. Reservation of Rights

22. By entering into this Remediation Agreement, the NJDEP does not waive its right to seek, assess or collect civil or civil administrative penalties or any other legal or equitable relief against Continental for past, present and future violations by Continental of any New Jersey environmental statutes or regulations.

23. The NJDEP reserves the right to require Continental to take or arrange for the taking of any and all additional measures if the NJDEP determines that such actions are necessary to protect human health or the environment.

24. Continental admits that it has agreed to comply with the terms of this Remediation Agreement. Neither the entry into this Remediation Agreement nor the conduct of Continental hereunder, shall be construed as any admission of fact, fault or liability by the Continental under any applicable laws or regulations.

25. Except as otherwise set forth herein, by the execution of this Remediation Agreement, the NJDEP does not release any person, including without limitation, AlliedSignal Inc., from any liabilities or obligations such person may have pursuant to ISRA and the ISRA regulations, or any other applicable authority, nor does the NJDEP waive any of its rights or remedies pursuant thereto.

VII. General Provisions

26. No modification or waiver of this Remediation Agreement shall be valid except by written amendment to this Remediation Agreement duly executed by Continental and the NJDEP. Any amendment to this Remediation Agreement shall be executed by the NJDEP and Continental. The NJDEP reserves the right to require the resolution of any outstanding violations ISRA or this Remediation Agreement prior to executing any such amendment.

27. This Remediation Agreement shall be binding, jointly and severally, on each signatory, its successors, assignees and any trustee in bankruptcy or receiver appointed pursuant to a proceeding in law or equity. No change in the ownership or corporate status of any signatory or of the industrial establishment or site shall alter signatory's responsibilities under this Remediation Agreement.

28. Continental agrees not to contest the authority or jurisdiction of the NJDEP to issue this Remediation Agreement; Continental further agrees not to contest the terms or conditions of this Remediation Agreement except as to interpretation or application of such specific terms and conditions that are being enforced in any action brought by the NJDEP to enforce the provisions of this Remediation Agreement.

29. Continental shall provide to the NJDEP written notice of the dissolution of its corporate or partnership identity, the liquidation of the majority of its assets or the closure, termination or transfer of operations at least five (5) calendar days prior to such action. Continental shall also provide written notice to the NJDEP of a filing of a petition for bankruptcy no later than five business days after such filing. These requirements shall be in addition to any other statutory requirements arising from the dissolution of corporate or partnership identity, the liquidation of the majority of assets, or the closure, termination or transfer of operations.

30. For persons executing this Remediation Agreement on behalf of a corporate entity, Continental shall submit to the NJDEP, along with the executed original Remediation Agreement, documentary evidence in the form of a corporate resolution, that the signatory has the authority to bind Continental to the terms of this Remediation Agreement.

31. Continental expressly agrees that in the event that Continental fails or refuses to perform any obligation(s) under this Remediation Agreement as determined by the NJDEP, the NJDEP shall have the right to exercise any option or combination of options available to the NJDEP under this Remediation Agreement, or any other statute.

32. Except as otherwise provided, the requirements of this Remediation Agreement shall be deemed satisfied upon the receipt by Continental of written notice from the NJDEP that Continental has demonstrated, to the satisfaction of the NJDEP, that Continental has completed the substantive and financial obligations imposed by this Remediation Agreement. Such written notice shall not relieve Continental from the obligation to conduct future investigation or

remediation activities pursuant to federal, State or local laws for matters not addressed by this Remediation Agreement.

33. Compliance with the terms of this Remediation Agreement shall not excuse any Person(s) from obtaining and complying with any applicable federal, state or local permits, statutes, regulations and/or orders while carrying out the obligations imposed by ISRA through this Remediation Agreement. The execution of this Remediation Agreement shall not excuse any Person(s) from compliance with all other applicable environmental permits, statutes, regulations and/or orders and shall not preclude NJDEP from requiring that the Person(s) obtain and comply with any permits, and/or orders issued by NJDEP under the authority of the Water Pollution Control Act, N.J.S.A. 58:10A-1 et seq., the Solid Waste Management Act, N.J.S.A. 13:1E-1 et seq., and the Spill Compensation and Control Act N.J.S.A. 58:10-23.11 et seq., for the matters covered herein. The terms and conditions of any such permit shall not be preempted by the terms and conditions of this Remediation Agreement if the terms and conditions of any such permit are more stringent than the terms and conditions of this Remediation Agreement. Should any of the measures to be taken by the Person(s) during the remediation of any ground water and surface water pollution result in a new or modified discharge as defined in the New Jersey Pollutant Discharge Elimination System ("NJPDES") regulations, N.J.A.C. 7:14A-1 et seq., then the Person(s) shall obtain a NJPDES permit or permit modification from NJDEP prior to commencement of said activity.

34. This Remediation Agreement shall be effective upon the execution of this Remediation Agreement by the NJDEP and Continental. Continental shall return a fully executed Remediation Agreement to the NJDEP together with the signature authorization required above within five business days from the effective date.

Date: 9-21-99

By: Ronald T. Corcory
Ronald T. Corcory, Assistant Director
Responsible Party Cleanup Element

CONTINENTAL AIRLINES, INC.

Date: 9-24-99

By: [signature]

HOLDEN SHANNON
Print Full Name Signed Above

VICE PRESIDENT CORPORATE REAL ESTATE & ENVIRONMENTAL AFFAIRS
Title

920890063

SECRETARY'S CERTIFICATION

I, Jeffrey A. Smisek, do hereby warrant and certify as follows to the New Jersey Department of Environmental Protection ("NJDEP") in connection with the Remediation Agreement issued by the NJDEP on September 22, 1999 with respect to ISRA Case No. 86103 ("RA"):

(1) That I am the duly elected, qualified and acting Secretary of Continental Airlines, Inc. ("Continental").

(2) That the following person is the duly elected, qualified, incumbent, and acting officer of Continental and holds the office set forth beside his name, and the signature appearing opposite his name is the genuine signature of such officer:

Holden Shannon Vice President Corporate Real Estate and Environmental Affairs

Signature

(3) That Holden Shannon is duly authorized to execute the RA on behalf of Continental.

IN WITNESS WHEREOF, I hereunto set my hand and affix the seal of Continental on this 22 day of September 1999.

CONTINENTAL AIRLINES, INC.

By: _____
Jeffrey A. Smisek
Executive Vice President General Counsel and Secretary

(CORPORATE SEAL)

920890064

ACKNOWLEDGEMENT

STATE OF TEXAS)
)
COUNTY OF HARRIS)

Before me, a Notary Public in and for said County and State, did personally appear Jeffrey A. Smisek, who acknowledged himself to be the Secretary of Continental Airlines, Inc., and that he did execute the foregoing Secretary's Certification on behalf of said corporation, being authorized to do so by signing his name, and that said execution is the free and voluntary act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 22 day of September 1999.

Cindy Treece
Notary Public

My Commission Expires:

4-4-02

CINDY TREECE
MY COMMISSION EXPIRES
April 4, 2002

920890065

NWK2: 584567.01

920890067

McCARTER & ENGLISH, LLP
ATTORNEYS AT LAW
FOUR GATEWAY CENTER
100 MULBERRY STREET
P.O. BOX 652
NEWARK, NJ 07101-0652
(973) 622-4444
TELECOPIER (973) 624-7070

CHERRY HILL, NJ
NEW YORK, NY

BOCA RATON, FL
WILMINGTON, DE
PHILADELPHIA, PA

RECEIVED
SEP 22 1999

September 21, 1999

BY HAND

Re: AlliedSignal Inc.
ISRA Case No. 86103

Ms. Tina Layre
Industrial Site Evaluation Element
New Jersey Department of Environmental Protection
401 East State Street, 5th Floor
Trenton, New Jersey 08625

Dear Ms. Layre:

As requested, I enclose another copy of the Remediation Agreement Application submitted by Continental Airlines, Inc. in connection with the property purchase and sale transaction with AlliedSignal Inc.

Kindly acknowledge your receipt of the enclosed Remediation Agreement Application by signing the enclosed copy of this letter and returning the signed copy to our waiting messenger.

Thank you for your cooperation and assistance. If you have any questions, please do not hesitate to call me.

Very truly yours,

Paul C. Dritsas

Paul C. Dritsas

PCD/dk
Encl.
cc: Ms. Leah Raney
Mr. Jim Tiefenthaler
Pam Cissik, Esq.

Receipt of the Remediation Agreement Application submitted on behalf of Continental Airlines, Inc. is hereby acknowledged.

BAA000051

By:_____ Date: September , 1999

45 098

ISRA-012
11/97

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION AND ENERGY
DIVISION OF RESPONSIBLE PARTY SITE REMEDIATION
INDUSTRIAL SITE EVALUATION ELEMENT
CN028, TRENTON, NJ 08625-0028

INDUSTRIAL SITE RECOVERY ACT (ISRA)

REMEDIATION AGREEMENT APPLICATION

PLEASE TYPE OR PRINT

Date: September 16, 1999

1. Industrial Establishments (s)
[Attach additional sheets if there is more than one to be included in this Remediation Agreement.]

Name AlliedSignal Inc. Telephone # (908) 558-5101

Street Address 10 North Avenue East

City or Town Elizabeth State NJ Zip Code 07201

Municipality Elizabeth County Union

Tax Block Number(s) Ward #1 Tax Lot Number(s) Accounts 1314, 1315, 1316 & 1205

State of Incorporation, if applicable: Delaware

Standard Industrial Classification (SIC) Number 2821

2. Has a General Information Notice (GIN) been filed for this transaction?

If yes, ISRA Case Number # 99291 and 86103
If no, attach a completed GIN to this application.

3. Current Property Owner(s) [Attach additional sheets if more than one.]

Name AlliedSignal Inc. Telephone # (973) 455-5422

Firm

Street Address 101 Columbia Road, P.O. Box 2245

Municipality Morristown State NJ Zip Code 07962

State of Incorporation, if applicable: Delaware

Type of Business Association and General Partner(s), if applicable:

Not applicable ("N/A")

920890068

ISRA-012
11/97

4. Prior Owner/Operator at site since December 31, 1983 (Attach additional sheets if necessary.)**

** AlliedSignal and its predecessor companies, Allied Corporation and Allied Chemical & Dye Corporation, have owned and operated all or substantially all of the site since 1956.

Name	Owner/ Operator	From	To
Ausimont (13 acres)	Owner/operator	6/17/86	2/1/89
DAS	Operator (tenant)	3/1/98	10/31/98
Palmer Industries	Operator (tenant)	10/31/97	Present

5. Party(ies) Agreeing to be responsible under the Remediation Agreement [Attach additional sheets if more than one.]

Name Continental Airlines, Inc. Telephone

Firm

Street Address 1600 Smith Street, 33rd Floor

Municipality Houston State Texas Zip Code 77002

State of Incorporation, if applicable: Delaware

Type of Partnership and General Partner(s), if applicable:

N/A

Designate lead party responsible for Remediation Agreement where multiple parties are proposed:

N/A

6. Describe the transaction for which this Remediation Agreement is requested: [Attach additional sheets, if necessary.]

See Attachment 1

7. Purchaser or New Lessee:

Name Continental Airlines, Inc. Telephone # (__)

Firm

Street Address 1600 Smith Street, 33rd Floor

Municipality Houston State Texas Zip Code 77002

State of Incorporation, if applicable: Delaware

Type of Business Association and General Partner(s), if applicable:

N/A

8. Attach a detailed cost estimate for remediation of the industrial establishment(s).

See Attachment 1. The remediation funding source amount established by the NJDEP for Case No. 86103 is $2 million.

9. Have there been any previous ISRA/ECRA Remediation Agreements/Administrative Consent Orders executed for this Industrial Establishment or another Industrial Establishment which occupied the same tax block and lot number? [Attach additional sheets if more than one industrial establishment is included in this application.]

X Yes ____ No

If Yes, Name of Industrial Establishment AlliedSignal Inc.

ISRA/ECRA Case No. 86103 Submitted 1986

Ordered/Responsible Party: AlliedSignal Inc.

Current Status See Attachment 1

Has this Industrial Establishment received a No Further Action Letter or Negative Declaration Approval? ____ Yes (please provide copy) X No

10. Is this request for an amendment to the existing Remediation Agreement/Administrative Consent Order?

____ Yes X No

11. Identify the type of remediation funding source to be submitted in an amount equal to the estimated cost of remediation:

Continental plans to submit a Line of Credit.

12. Individual submitting this request for a Remediation Agreement:

Name Paul C. Dritsas, Esq. Telephone # (973) 622-4444

Firm McCarter & English, LLP

Street Address Four Gateway Center, 100 Mulberry Street

Municipality Newark State NJ Zip Code 07102

13. AUTHORIZATIONS/CERTIFICATIONS:

A. Owner or Operator Statutory Liability:

1. I hereby certify that I am fully aware of the requirements of the Industrial Site Recovery Act, N.J.S.A. 13:1K-1 et seq., as it pertains to the remediation of the industrial establishment subject to this remediation agreement. Specifically, I am fully aware of the responsibilities of the owner or operator of the industrial establishment to remediate the site in accordance with ISRA and this chapter. I acknowledge that a remediation agreement has been requested to allow the transaction referenced in the remediation agreement application to proceed prior to completion of all ISRA compliance requirements and that the person entering into the remediation agreement is agreeing to comply with all ISRA requirements. I further acknowledge that the execution of a remediation agreement shall not release [ ] from any responsibilities [ ] has pursuant to ISRA and this chapter.

Typed/Printed Name N/A Title _____

Signature _____ Date _____

Sworn and Subscribed Before Me on this
___ Day of _____ 19___

_____
Notary

2. I hereby certify that I acknowledge that the transaction and industrial establishment that are the subject of this remediation agreement is a transfer of ownership or operations of an industrial establishment as defined by ISRA and N.J.A.C.7:26B. I further acknowledge that [ ] is subject to penalties for violations of ISRA and this N.J.A.C. 7:26B. I am fully aware of [ ]'s responsibilities to allow the Department access to the subject industrial establishment and of the requirements to prepare and submit any documents relevant to the remediation of the subject industrial establishment as required by the Department.

Typed/Printed Name N/A Title _____

Signature _____ Date _____

Sworn and Subscribed Before Me on this
___ Day of _____ 19___

_____
Notary

ISRA-012
11/97

3. I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, to the best of my knowledge the submitted information is true, accurate and complete. I am aware that there are significant civil penalties for knowingly submitting false, inaccurate or incomplete information and that I am committing a crime of the fourth degree if I make a written false statement which I do not believe to be true. I am also aware that if I knowingly direct or authorize the violation of N.J.S.A. 13:1K-6 et seq., I am personally liable for the penalties set forth at N.J.S.A. 13:1K-13.

Typed/Printed Name N/A _____ Title _____

Signature _____ Date _____

Sworn and Subscribed Before Me
on this _____
Date of _____ 19____

_____
Notary

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B. Transferee or New Lessee Certification:

I hereby certify that [ ] is the transferee and/or new lessee of the industrial establishment subject to this remediation agreement. I have read this application and am aware of the requirements and conditions of ISRA and the remediation agreement. [ ] expressly agrees to allow the Department, seller, previous owner, previous operator, or any other person subject to the remediation agreement, and any of their respective agents or assignees the right to enter the industrial establishment after the ISRA-subject transaction has taken place and/or the lease has been executed for completion of the remediation of the industrial establishment. Additionally, I acknowledge and understand that if a remedial action is warranted at the subject industrial establishment, institutional controls and engineering controls as defined in ISRA, N.J.S.A. 58:10B-1 et seq., N.J.A.C. 7:26C, N.J.A.C. 7:26E and N.J.A.C. 7:26B may be necessary at the industrial establishment.

Typed/Printed Name N/A Title _____

Signature _____ Date _____

Sworn and Subscribed Before Me
on this _____
Date of _____ 19____

_____
Notary

ATTACHMENT 1

AlliedSignal Inc. ("AlliedSignal") and Continental Airlines, Inc. ("Continental") have entered into an Agreement of Sale dated May 21, 1999 (the "Agreement"), by which Continental will acquire from AlliedSignal certain real property located at 10 North Avenue East, Elizabeth, New Jersey (the "Property").

AlliedSignal is currently conducting an ISRA compliance proceeding at the Property under an Administrative Consent Order dated July 31, 1986 (the "ACO"). The ACO requires AlliedSignal to maintain a remediation funding source in the amount of $2 million with respect to the Property. AlliedSignal currently maintains this remediation funding source by means of a self-guarantee. The Department has designated this ISRA proceeding as Case No. 86103.

AlliedSignal submitted a General Information Notice to the Department in May 1999 in connection with the execution of the Agreement and the transaction contemplated thereunder. The Department designated this ISRA matter as Case No. 99291. AlliedSignal subsequently submitted in July 1999 a Remediation in Progress Waiver ("RIP") Application to the Department with respect to the Property. The Department issued a RIP Waiver approval to AlliedSignal on August 24, 1999 with respect to the contemplated transfer of the Property to Continental.

Under the terms of the Agreement, Continental has agreed to assume from AlliedSignal the primary responsibility for completing ISRA compliance activities at the Property under ISRA Case No. 86103, including the replacement of the remediation funding source currently maintained by AlliedSignal. In order to effect the transfer of ISRA compliance obligations for ISRA Case No. 86103 from AlliedSignal to Continental, Continental has agreed (as requested by the Department) to execute a Remediation Agreement with respect to the Property and ISRA Case No. 86103. This Application is being submitted by Continental in order to secure such a Remediation Agreement before the Closing of the transaction (which is scheduled to occur on or before September 21, 1999). In addition, Continental plans to submit a Line of Credit to satisfy the remediation funding source amount of $2 million currently required (and maintained by AlliedSignal) pursuant to the ACO with respect to ISRA Case No. 86103.

TELEFAX

O'BRIEN & GERE ENGINEERS, INC. *Direct Line Fax No. (732) 225-7931*

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Number of Pages: 5 (including cover sheet) Date: September 21, 1999

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To: **Mr. Stephen Myers**

COMPANY: **NEW JERSEY DEP**

FAX NO: **(609) 633-1454**

FROM: **Vernon C. Burrows**

E 86/03

ORIGINAL —

_____ **will follow via regular mail** _____ **will follow via overnight delivery** _____ **will not follow**

MESSAGE:

Steve: Here is the revised cost estimate. I will e-mail you these spread sheets in Excel after I convert them from Quattro Pro.

---Vern

Tina, they didn't give an overall total but my math has it at $3,647,912

It should work for now.

SBM

Re: E 86/03

File Allied continued

O'Brien & Gere Engineers, Inc., an O'Brien & Gere Limited Company
Raritan Plaza I/Edison, NJ 08837/(732) 225-7380
and offices in major U.S. cities

920890075

CONTINENTAL AIRLINES

Elizabeth, New Jersey

Preliminary Remedial Technology Cost Estimate

Excavation of Source Area with On-Site Treatment/ Old Oil Spill Area Excavated with Off-site Disposal

This alternative consists of excavation of the source area, addition of conditioning agent, and on-site mechanical aeration to volatilize organic compounds.
On-site treatment may be accomplished by a screening device and a pug mill or hammer mill.
Treated soil will then be backfilled to the original excavation. Cleanup standards will be consistent with NJDEP's Impact to Ground Water Soil Cleanup Criteria.
LNAPL containing soils to be excavated and landfilled without on-site treatment.

Cost Analysis:	Total Cost
1. Direct Capital Costs	
Site Preparation	$80,000
Mobilization/demobilization	
Local construction permits	
Air pollution control system (including vents)	
Install SESC measures	
Excavated soils dewatering system	
Site Work/Treatment/Restoration	$1,600,000
Monitoring well abandonment	
Excavation/load	
Temporary excavation dewatering	
Temporary water storage	
Off-site water disposal	
Haul on-site to treatment area	
Screening Material	
Conditioning agent admixture	
Loading material from stockpiles to truck	
Transportation (assumes 20 miles)	
LNAPL disposal as non-hazardous (ID27)	
Backfill material (crushed stone, 1/2" to 3/4")	
On-Site Mechanical Aeration	
Activated Carbon Replacement	
Treatment Samples	
On-site haul & backfill/compact treated soil	
Site regrading of excavated material (as appropriate)	
Paving (parking lot specification)	
Restoration activities (fence repair/landscape)	
TOTAL DIRECT CAPITAL COSTS	$1,680,000

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CONTINENTAL AIRLINES

Elizabeth, New Jersey

Preliminary Remedial Technology Cost Estimate

Excavation of Source Area with On-Site Treatment/Old Oil Spill Area Excavated with Off-site Disposal (continued)

Cost Analysis:	Total Cost
2. Indirect Capital Costs	
Contract drawings (soil)	
Excavation area site survey	
Performance & technical specifications (soil)	
Front end administrative specifications (soil)	
Bidding assistance/contractor selection	
Soil re-use proposal	
Post excavation confirmation sampling	
Air monitoring (equipment & labor)	
On-site gas chromatograph sampling	
Construction oversight	
Engineering during construction	
TCLP (TPH/VOC) sampling of soil stockpiles	
ID27 soil classification request	
Coordination with State solid waste bureaus	
Deed notice confirmation sampling (labor)	
Deed notice analytical costs	
Deed notice/CEA petition	
Remedial action report	
Misc. technical support/NJDEP coordination	
Total engineering and field oversight costs	$250,000
Total analytical costs	$60,000
Contingency (10% of Direct Capital Costs)	$168,000
Admin/legal fees (5% of Direct Capital Costs)	$84,000
TOTAL INDIRECT CAPITAL COSTS	$562,000
TOTAL CAPITAL COSTS	$2,242,000

Notes:
1. Cost estimate is based on R.S. Means 1998 Environmental Remediation Cost Data, and O'Brien & Gere Engineers' professional experience on projects of similiar size and scope.
2. Line items provided to form budget cost only.
3. The costs in this table were developed based upon the data currently available and several assumptions necessary to evaluate the alternatives. These costs should only be used for comparison of technical alternatives. Contractor bids could vary considerably from the costs and assumptions presented herein (especially ground water treatment system costs).
4. Remediation system (soils) draft air permit and draft SESC are completed and not included in above estimate.
5. LNAPL assumed to be stabilized with conditioning agent prior to sampling/shipment for off-site disposal. Full RCRA characterization TCLP sampling not costed.
6. Costs assume that abovegrade demolition of structures, asphalt and concrete will not be performed under this contract.
7. Costs do not include any NJDEP oversight or permit application/permit review fees.

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CONTINENTAL AIRLINES

Elizabeth, New Jersey

Preliminary Remedial Technology Cost Estimate

Ground water recovery and treatment system

This alternative consists of the recovery, treatment and discharge of up to 25 gpm of ground water from 2 recovery wells and an interceptor trench network.

Cost Analysis:	Total Cost
1. Direct Capital Costs	
Site Preparation	$25,000
Mobilization/Demobilization	
Construction Permits	
SESC Measures	
Site Work/Restoration	$175,000
Recovery well (below peat)	
Shallow GW collection trenching	
Interceptor trench PVC/filter fabric	
Interceptor trench material (crushed stone)	
Interceptor trench collection sump	
Construct infiltration beds	
Pipe trenching & backfill (influent/effluent)	
Site restoration	
Treatment building	
Mechanical	$65,000
Recovery well pumps	
HDPE piping/fittings to treatment system	
HDPE piping/fittings to infiltration bed	
Interceptor trench lift pump	
Shallow tray air stripper	
Effluent transfer pump	
Interconnecting piping, valves & fittings	
Potable water service to building	
Building unit heaters	
Air discharge stack and duct (20 ft high)	
Electrical & Instrumentation	$60,000
480/277V 3ph, 4-wire panelboard w/breakers	
Recovery well electrical supply & hookup	
Level probes and transmitters	
Magnetic flow meters	
Treatment building & equipment elec. labor	
Treatment system PLC	
TOTAL DIRECT CAPITAL COSTS	$325,000

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CONTINENTAL AIRLINES

Elizabeth, New Jersey

Preliminary Remedial Technology Cost Estimate

Cost Analysis:	Total Cost
2. Indirect Capital Costs	
Contingency (10% of Direct Capital Costs)	$32,500
Engineering (15% of Direct Capital Costs)	$48,750
Admin/Legal Fees (5% of Direct Capital Costs)	$16,250
DGW Permitting	$10,000
TOTAL INDIRECT CAPITAL COSTS	$107,500
TOTAL CAPITAL COSTS	$432,500
3. Annual Operation and Maintenance Costs	
Ground Water Recovery & Treatment	
Qrtly CEA/NJPDES DGW sampling, analys & rptng	
System operation (labor & reporting)	
System maintenance	
Annual cleanout	
Ground water treatment (electricity/materials)	
ANNUAL O&M COST	$204,500
PRESENT WORTH OF ANNUAL O&M (FOR 5 YRS @ 5%)	$973,412
TOTAL ESTIMATED COST	$1,405,912

Notes:
1. Cost estimate is based on R.S. Means 1998 Environmental Remediation Cost Data, and O'Brien and Gere Engineers, Inc. professional experience.
2. Line items provided to form budget cost only.
3. The cost in this table was developed based upon the data currently available and several assumptions necessary to evaluate the alternatives. These costs should only be used for comparison of technical alternatives.
4. Project management cost include yearly evaluations for remedial modifications/enhancements.

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O'BRIEN & GERE
ENGINEERS, INC.

March 17, 1999

Mr. Stephen Myers
Case Manager
NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Environmental Evaluation
Cleanup and Responsibility Assessment
401 East State Street
P.O. Box 432
Trenton, New Jersey 08625

RECEIVED

Re: ISRA Case #E86103 - AlliedSignal, Inc
Elizabeth, NJ Facility
Amended Remedial Action Work Plan

File: 1163/22696.001 #2

Dear Mr. Myers:

Attached please find three copies of the amended Remedial Action Work Plan (RAWP) for the AlliedSignal, Inc. (AlliedSignal) facility located in Elizabeth, New Jersey. This RAWP was developed with regard to the New Jersey Department of Environmental Protection's (NJDEP) comment letter dated October 16, 1998, N.J.A.C. 7:26E (Technical Requirements) and our discussions during the January 7, 1999 meeting.

The RAWP has been developed to address those areas of concern at the facility that are resulting in an impact to ground water quality. Specifically, remedial actions presented within this RAWP entail the mass removal of soil and ground water containing chlorinated solvents and fuel oil consistent with AlliedSignal's proposals presented to the NJDEP at the January 7, 1999 meeting. An interim remedial measure will be implemented on an as needed basis at a stressed vegetation area. AlliedSignal proposes to implement post remedial ground water capture in both the shallow ground water and deep aquifer at the site. AlliedSignal anticipates that a 3 to 5 year program will be sufficient to achieve appropriate ground water quality objectives. A monitored natural attenuation program will be implemented to document the attainment of ground water quality objectives and petition the NJDEP for closure of ISRA case #E86103.

AlliedSignal's proposal for deed restricting the site is also included within this RAWP. Where appropriate, these areas will be covered with an impermeable soil cap or paved. AlliedSignal has proposed the collection of a limited number of property border samples in support of documenting the limits of those areas to be included in a deed notice. This RAWP also includes a project schedule which identifies the remedial action program milestones and future submittals. AlliedSignal has several appendices to this RAWP. Two of these appendices (Appendix B and Appendix C) will be submitted under separate cover at a later date. These appendices document the results of treatability testing and aquifer characterization studies that are currently on-going at the facility.

7/6/99 8/2/99

BAA000054

O'Brien & Gere Engineers, Inc., an O'Brien & Gere company
Raritan Plaza I / Edison, NJ 08837
(732) 225-7380 / FAX (732) 225-7931 • http // www.obg.com
and offices in major U.S. cities

58

We look forward to working with you towards completing the AlliedSignal ISRA program. As we have discussed, in light of the aggressive remedial schedule associated with this RAWP, AlliedSignal appreciates the agency's priority review of the RAWP and welcomes the opportunity to address any comments or questions that the NJDEP may have. Please feel free to call me at (732) 225-7380 or Mr. Bill Snyder at (973) 455-3190.

Vert truly yours

O'BRIEN & GERE ENGINEERS, INC.

Vernon C. Burrows
Project Manager

I:\EDISON\PROJECTS\1163\22696\5_RPTS\RAWP\LTR-001.WPD

cc: Ms Beverly Phillips, NJDEP BGWPA
Mr. William Snyder, AlliedSignal, Inc.
Mr. Richard Galloway, AlliedSignal, Inc.

1163/22696

REPORT

Amended Remedial Action Work Plan
AlliedSignal, Inc.
Elizabeth, New Jersey Facility
(ISRA Case No. E86103)

AlliedSignal, Inc.
Morristown, New Jersey

Richard P. Cawley, C.P.G.
Vice President

March 1999

O'BRIEN & GERE ENGINEERS, INC.

Raritan Plaza I
Edison, New Jersey 08837

920890083

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O'BRIEN & GERE
ENGINEERS, INC.

March 17, 1999

Mr. Stephen Myers
Case Manager
NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Environmental Evaluation
Cleanup and Responsibility Assessment
401 East State Street
P.O. Box 432
Trenton, New Jersey 08625

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7/6/99 8/2/99

BAA000054

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Vert truly yours

O'BRIEN & GERE ENGINEERS, INC.

Vernon C. Burrows
Project Manager

I:\EDISON\PROJECTS\1163\22696\5_RPTS\RAWP\LTR-001.WPD

cc: Ms Beverly Phillips, NJDEP BGWPA
Mr. William Snyder, AlliedSignal, Inc.
Mr. Richard Galloway, AlliedSignal, Inc.

1163/22696

REPORT

Amended Remedial Action Work Plan
AlliedSignal, Inc.
Elizabeth, New Jersey Facility
(ISRA Case No. E86103)

AlliedSignal, Inc.
Morristown, New Jersey

Richard P. Cawley, C.P.G.
Vice President

March 1999

O'BRIEN & GERE ENGINEERS, INC.

Raritan Plaza I
Edison, New Jersey 08837

920890086

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EXECUTIVE SUMMARY

Executive summary

This amended Remedial Action Work Plan (RAWP) was prepared by O'Brien & Gere Engineers, Inc. (O'Brien & Gere) on behalf of AlliedSignal, Inc. (AlliedSignal) for the AlliedSignal Specialty Film Plant located in Elizabeth, New Jersey. This RAWP has been prepared based in part upon the conclusions within Geraghty & Miller's Remedial Investigation Report and Conceptual Remedial Action Plan (1994) and recommendations from Geraghty & Miller's Draft Remedial Action Work Plan (1996). Based upon the conclusions and recommendations formulated in these reports, as well as field activities conducted by O'Brien & Gere and Handex Environmental, Inc. (Handex) and meetings with the New Jersey Department of Environmental Protection (NJDEP), the proposed remedial actions described in this RAWP include:

- Excavation of both chlorinated solvent and fuel oil contaminated soil. The excavated soil will either be treated on-site and used as backfill or disposed off-site at a permitted landfill. If the soil is disposed off-site, a clean fill material will be used to backfill the excavation
- Installation of a post remedial interceptor trench to capture residuals within the shallow ground water
- Installation of a recovery well system to capture residuals within the deep aquifer
- Installation of a ground water treatment system
- Implementation of a post remedial monitored natural attenuation program for shallow and deep ground water
- Implementation of an interim remedial measure on an as needed basis at a stressed vegetation area

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AMENDED REMEDIAL ACTION WORK PLAN
AlliedSignal Inc.
Elizabeth, New Jersey Facility
(ISRA Case No. E86103)

AlliedSignal Inc.
Morristown, New Jersey

March 1999

O'BRIEN & GERE
ENGINEERS, INC.

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1. Introduction and objective

This report presents the amended Remedial Action Work Plan (RAWP) for the AlliedSignal Inc. (AlliedSignal) Specialty Film Plant located on North Avenue East, Elizabeth, New Jersey. This amended RAWP has been developed based upon the sampling results obtained during previous investigations; in accordance with the New Jersey Department of Environmental Protection's (NJDEP) comment letter dated October 16, 1998; and, the meeting held between AlliedSignal and the NJDEP on February 7, 1999. The NJDEP's Technical Requirements for Site Remediation NJAC 7:26E (Technical Requirements) have also been incorporated, as applicable. This RAWP discusses the proposed remedial activities including limits of excavation, verification sampling, the proposed Declaration of Environmental Restriction/Deed Notice (DER), and the monitored natural attenuation program as part of the Classification Exception Area (CEA).

1.1. Background

The AlliedSignal facility is located in the City of Elizabeth , Union County, New Jersey. The site is located on the corner of North Avenue East and McLester Street. The site is bordered by Newark Bay to the east, by the OENJ mall complex to the south, and by a container shipping and transportation company (Palmer Industries) to the west. To the north, the site is bordered by North Avenue East and industrial land currently used for parking and container storage by the Port Authority. A legal description provided by The RBA Group (October, 1998) indicates "the site occupies 177.987 acres of land, more or less". Dredge spoils were deposited at the site from the mid to late 1940's until 1970 (Geraghty & Miller's RI Report and Conceptual RAWP, February 1994). Approximately 40 acres are used for plant production operations (Figure 1-1). Of this 40 acres, an estimated 85 percent is paved or covered by structures. The remaining acreage (approximately 138 acres) consists of a mix of valands, wetlands/open waters and upland habitats (Killam Associates wetlands delineation map, 1995).

The Elizabeth facility has operated since 1957. Three types of chlorofluorocarbon refrigerant gases (Genetron® 11, 12 and 22) were produced at the facility until 1988. Genetron® R13 was produced as a byproduct. Chlorinated and chlorofluorocarbon solvents were used in refigerant plant processes until 1992. Current operations at the facility involve the manufacture of specialty fluorocarbon polymers and copolymers. In 1986, prompted by the merger of Allied Chemical Corporation and The

Signal Companies, Inc., the facility became subject to the requirements of the Environmental Cleanup and Responsibility Act (ECRA) and was assigned Case Number E86103. A detailed description of the plant production processes and the chemicals used at the facility are contained within AlliedSignal's Site Evaluation Submission submitted in 1986 as part of the initial notification process under ECRA.

AlliedSignal retained the services of Geraghty & Miller, Inc. to conduct ECRA (now Industrial Site Recovery Act, or ISRA) investigations at the site. Investigations were conducted consistent with the requirements of ECRA (ISRA) and the Administrative Consent Order (ACO) entered into by AlliedSignal and the NJDEP. These investigations are summarized in Section 2 of this RAWP. In brief, a total of nine areas of concern (AOC) were identified at the facility. Several phases of investigatory activities were conducted by Geraghty & Miller, Inc. as summarized below:

- Phase I investigation conducted from May through September, 1989 with the Phase I report submitted to the NJDEP in 1989
- Phase II investigation conducted from August through December, 1991 with the Phase II report submitted to the NJDEP in 1992
- Phase III investigation conducted from August through September, 1993 with the Phase III report submitted to the NJDEP in 1994
- Investigative activities conducted from November 1995 through September, 1996 with a Draft Remedial Action Work Plan submitted to the NJDEP in 1996

In addition, AlliedSignal retained the services of Handex to conduct select drilling and sampling activities at the site in 1998 and 1999. The results of these activities were submitted to the NJDEP on February 19, 1999 in the following reports:

- Cone penetrometer survey
- Gross beta radiological testing of ground water
- Results of ground water sampling

O'Brien & Gere conducted a trenching and well installation program in February and March, 1999 in order to address certain issues raised by the NJDEP in a meeting with AlliedSignal and O'Brien & Gere on January 7, 1999. This program is described in Appendix A. Issues presented by the NJDEP within the October 18, 1995, August 5, 1997, October 16, 1998 and

February 5, 1999 comment letters are also addressed in this RAWP. The findings from the O'Brien & Gere and Handex investigations and the above reports are discussed in Section 2.

1.2. Report format

This RAWP contains a description of the selected remedial actions for all six open AOC, and for shallow and deep ground water. This document has been prepared pursuant to and in accordance with the requirements set forth in the NJDEP's Site Remediation Program: Technical Requirements for Site Remediation, N.J.A.C. 7:26E et. seq., dated May 19, 1997. This RAWP provides the basis for the selection of the proposed remedial actions for the site, describes how the remedial action is to be implemented, and discusses the follow-up activities that will be required after completion of the remediation program. As such, this RAWP contains the following sections:

Section 1 - Introduction: provides the purpose of the proposed remediation, a brief regulatory chronology of the activities implemented at the site prior to this RAWP, and the RAWP presentation format

Section 2 - Remedial investigations (RI) activities: provides information concerning the current site condition, the site geology and hydrogeology, the contaminant distribution in soil and ground water, and the potential risks of migration

Section 3 - Remedial action selection: discusses the alternative remedial options with respect to the NJDEP selection criteria and provides a description for the selected remedial actions. This section also provides a cost estimate for the remedial activities including engineering, administrative, and technical costs

Section 4 - Remedial action program: discusses the remedial actions for the facility and a discussion regarding their proposed implementation

Section 5 - Declaration of environmental restriction/deed notice (DER): presents AlliedSignal's approach to comply with the NJDEP's Technical Requirements at certain areas of concern via institutional or engineering controls

Section 6 - Ground water activities: describes the proposed ground water remediation activities to address the NJDEP's Technical Requirements at the site

Section 7 - Classification exception area: presents AlliedSignal's post remedial action monitored natural attenuation program to document attainment of ground water quality criteria at the site

Section 8 - Project schedule: presents the projected schedule of events required to complete this remedial action program including field programs and document deliverable dates

2. Remedial investigation (RI) activities

Investigations at the site consist of remedial investigations conducted under ISRA (previously ECRA) in accordance with the Technical Requirements. A total of nine AOC have been identified at the site:

- AOC 1 - Former Fluoroisobutylmonomer Production
- AOC 2 - Former Sulfuric Acid Production
- AOC 3 - Genetron® Process and Tank Farm
- AOC 4 - Fluoropolymers Production
- AOC 5 - Electrical Substations
- AOC 6 - Drainage Ditches
- AOC 7 - Background and Random Soil Borings
- AOC 8 - Stressed Vegetation
- AOC 9 - Chlorocarbon Terminal

Each of the above AOC have been divided into sub-AOC where appropriate (see Figure 2-1). The Draft RAWP prepared by Geraghty & Miller (1996) summarizes the status of investigatory activities at each AOC. On January 7, 1999 a meeting was held between the NJDEP and AlliedSignal. The status of each AOC was discussed at this meeting. Table 2-1 lists those AOC that do not require additional investigations. Table 2-2 lists those AOC where AlliedSignal has proposed additional activities.

These open AOC are as follows:

- AOC 2B - Old Oil Spill
- AOC 3H - Former Lagoon
- AOC 2A - Former Sulfuric Acid Production
- AOC 3E - Former Chloroform Tank Area
- AOC 6 - Drainage Ditches
- AOC 8 - Stressed Vegetation

The RI activities for each of these AOC are summarized in this section. Based on the amount of previous investigations conducted AlliedSignal is proposing certain remedial actions to gain ISRA case closure at the Elizabeth facility.

As indicated on Table 2-2, AlliedSignal is proposing mass removal remedial actions and subsequent ground water recovery at four AOC: AOC 2B - old oil spill, AOC 3H - former lagoon, and in the vicinity of MW-16S (AOC 2A), and MW-23S (AOC 3E). The remaining two AOC, AOC 6 -Drainage Ditches and AOC 8 - Stressed Vegetation, will be monitored on a periodic basis and appropriate actions will be conducted in the future pending the results of the monitoring activities.

Section 3 presents the proposed remedial actions at these AOC. All AOC depicted within Table 2-2 will be included within a DER as part of securing a no further action status for these areas. The proposed deed notice process is discussed in Section 5. Post remedial ground water extraction will be conducted within both the first encountered water table and the confined aquifer at the site. Section 6 discusses the proposed ground water extraction program. AlliedSignal will implement a monitored natural attenuation program at AOC 1, AOC 2B, AOC 3E, AOC 3H, and AOC 4 following the completion of remedial activities. The proposed monitored natural attenuation program is discussed in Section 7.

2.1. RI summary

The following RI summary section is organized to discuss the site geology and hydrogeology followed by a discussion of RI findings at those AOC where AlliedSignal proposes to conduct remedial actions.

2.1.1 Geology and hydrogeology

A review of the literature and an analysis of the soil and equipment logs generated from the monitoring wells and soil borings throughout the site indicate that the surficial geology consists of Recent age unconsolidated sediments and fill related materials, consisting in part of dredged materials from Newark Bay. This unit is approximately 10 ft thick. Directly underlying the Recent age unconsolidated sediments and fill related materials is a 5 to 10 ft thick silty clay and peat layer. Underlying this silty clay layer are unconsolidated sediments (predominantly silty sands and gravels) deposited during Wisconsin age glaciation (Pleistocene Epoch). This unit is approximately 50 ft thick. These glacial deposits mantle Triassic age sandstone and shales of the Passaic Formation. Regionally, the sandstone and shales are encountered at approximately 60 to 85 feet below grade.

The RI identified two discrete water-bearing zones at the site. A shallow water bearing zone is in the Recent age deposits (shallow ground water) and is encountered at about 3 ft below grade. A confined deep aquifer is present beneath the silty clay layer which exists between the water bearing zones. This clay layer occurs anywhere from 6 to 16 feet below grade and is frequently accompanied by peat deposits within the clay matrix. This silty clay/peat layer acts as an aquitard and retards the vertical migration of ground water within the shallow aquifer. Hydraulic head data from wells screened within the sediments of the second water-bearing zone beneath the silty clay/peat layer indicate a potentiometric head above the bottom of the silty clay horizon. This supports that the aquifer beneath the silty clay/peat is under confined conditions. The confined aquifer beneath the silty

clay/peat layer is referred to in this report as the deep aquifer.

The deep aquifer has high chloride and total solids concentrations and therefore meets the NJDEP requirements of a Class IIIB aquifer; namely, a total dissolved solids content over 5,000 mg/l and chloride content exceeding 3,000 mg/l (Geraghty & Miller's RI Report and Conceptual RAWP, 1994).

Slug testing conducted by Geraghty & Miller (RI Report and Conceptual RAWP, 1994) indicates that the hydraulic conductivity of the shallow ground water ranges from 1×10^{-2} feet per minute (ft/min) to 9.3×10^{-5} ft/min. Slug testing conducted by O'Brien & Gere at wells screened within the deep aquifer indicates the hydraulic conductivity to be approximately 3.4×10^{-3} ft/min. Locally, shallow ground water migrates towards the drainage ditches. Overall, regional ground water within both the shallow and deep water bearing units migrates towards the adjacent Newark Bay.

2.1.2. Summary of RI findings - soil

The results of soil and ground water sampling conducted at the site prior to 1995 lead the NJDEP to the conclusion that the area encompassed by monitoring wells W-2S, W-25S, W-29S, W-27S, W-22S, W-15S, and W-24S (see Figure 1-1) constituted a single source of shallow ground water contamination (NJDEP October 18, 1995 comment letter). This area constitutes part of AOC 1 - former fluoroisobutylmonomer production, most of AOC 2 - former sulfuric acid production, and AOC 3 - Genetron® process and tank farm. The primary ground water pollutants encountered consists of Genetron® products, chloroform, and certain industrial solvents used or stored at the facility (primarily chloroform, 1,1,2,2-Tetrachloroethane and the various isomers of Dichloroethene).

Additional activities conducted by Geraghty & Miller and O'Brien & Gere indicate that there are separate and distinct residual sources of chlorinated solvents and/or fuel oil within the area encompassed by monitoring wells W-2S, W-25S, W-29S, W-27S, W-22S, W-15S, and W-24S. The old oil spill (AOC 2B) is also a ground water contamination source area. The former lagoon (AOC 3H) is a source of dissolved phase shallow ground water contamination. Areas surrounding monitoring wells W-16S (AOC 2A) and W-23S (AOC 3E) are also contributing sources of ground water contamination.

This RAWP also addresses an area containing elemental sulfur which appears to be affecting vegetative growth. The stressed vegetation (AOC 8) is the result of acidic conditions due to the interaction of rain and ground water with the elemental sulfur. These low pH conditions have in the past resulted in low pH of the drainage ditch waters (AOC 6).

2.1.3. Summary of RI findings - ground water

The Results of Ground Water Sampling report prepared by Handex (February 19, 1999) supports the previous findings of Geraghty & Miller. Ground water above the silty clay/peat confining layer is impacted by chlorinated organics and fuel oil found at AOC 2B, AOC 3H, AOC 2A, and AOC 3E. Handex installed and sampled monitoring well W-39D in August 1998. This deep well is strategically located between shallow monitoring wells W-16S (AOC 2A) and W-23S (AOC 3E) in the vicinity of the former chloroform tanks. Both chloroform and Genetron® were detected in this well. All other wells screened beneath the peat (W-1D, W-15D, W-17D and W-21D) are not impacted by any site related compounds.

The remainder of Section 2 discusses AOC 2B, AOC 3H, AOC 2A/AOC 3E and AOC 6/AOC 8 in greater detail.

2.2. Old oil spill (AOC 2B)

The old oil spill area is located in the southern corner of AOC 2 (see Figure 2-1). Investigatory activities conducted within this area focused upon two empty fuel oil above ground storage tanks and the area identified as an old oil spill. Geraghty & Miller drilled soil borings and installed monitoring wells (LNW-1 through LNW-5) to delineate the extent of fuel oil at this area. An interim remedial measure consisting of manually bailing oil from wells containing measurable Light Non Aqueous Phase Liquid (LNAPL) was recently terminated in lieu of AlliedSignal's proposal to remove the LNAPL via the excavation of this area. Handex conducted a cone penetrometer based evaluation in this area from October, 1998 through January, 1999 to better assess the vertical and horizontal extent of LNAPL. The findings from this investigation are summarized in Handex's February 19, 1999 report.

The cone penetrometer testing indicates that there are two separate LNAPL areas (see Figure 2-2). AlliedSignal proposes to remediate these area to a depth extending one foot below encountered LNAPL. The first LNAPL area is in the vicinity of monitoring wells LNW-5 and W-30. In this area, LNAPL appears from 3.5 to 5.5 feet below grade. AlliedSignal proposes to remediate, to a depth of 6.5 ft below grade, an estimated 1,907 cubic yards

(in-situ) of soil. The second LNAPL area is in the vicinity of monitoring well LNW-3 from this area. At LNW-3, the LNAPL occurs from 4.5 to 6.5 feet below grade. AlliedSignal proposes to remediate, to a depth of 7.5 ft below grade, an estimated 305 cubic yards (in-situ) of soil.

2.3. Former lagoon (AOC 3H)

The former lagoon is located in the southeastern portion of AOC 3 (see Figure 2-1) and was used for the disposal of wastewater residuals and may contain spent antimony catalyst from the former sulfuric acid production plant. Geraghty & Miller (RI Report and Conceptual RAWP, 1994) conducted a soil boring and sampling program within the lagoon and conducted ground water sampling of monitoring wells W-17S and W-28S (installed within the lagoon). The sampling results indicate that chlorinated solvents (1,1,2-Tetrachloroethene, various Dichloroethene isomers, 1,2-Dichloroethane, Trichloroethene, and 1,1,2-Trichloroethane) are present at concentrations exceeding 1% of their maximum solubilities. As such, and based on a USEPA/NJDEP conservative rule of thumb, the former lagoon is suspected as a source of Dense Non Aqueous Phase Liquid (DNAPL) residuals. A ground water plume is resultant and extends hydraulically downgradient from the former lagoon to the drainage ditch (see Figure 2-2). AlliedSignal proposes to proceed with the remediation of this area under the assumption that further delineation activities past the drainage ditch are not necessary and would provide no additional value (see AlliedSignal February 19, 1999 response letter to the NJDEP October 16, 1998 comment letter).

Previously, Geraghty & Miller estimated that the areal extent of the former lagoon is approximately 10,400 ft^2. The delineation standard used by Geraghty & Miller was the Residential Direct Contact (RDC) soil cleanup criteria and a site specific risk assessment (Draft RAWP, 1996). Investigations indicated that lagoon related materials directly mantle a silty clay/peat confining layer. O'Brien & Gere installed two trenches within the lagoon in February, 1999. The silty clay/peat layer throughout the general vicinity of the lagoon area varies from 6.5 to 13 feet below grade. The average depth to this silty clay/peat layer is estimated to be approximately 10 feet below grade, indicating that the lagoon may contain an estimated 3,850 cubic yards (in-situ) of soil, depending on its configuration. AlliedSignal intends to excavate beyond the western limit of the former lagoon by extending the remediation past monitoring well W-31S (see Figure 2-2). Up to 6,840 cubic yards of soil (in situ) may be excavated.

2.4. Former sulfuric acid production and chloroform tank areas (AOC 2A and 3E)

Investigations conducted by Geraghty & Miller indicated that a DNAPL was present in monitoring wells W-16S (AOC 2A) and W-23S (AOC 3E). A DNAPL recovery program consisting of manually bailing product from monitoring well W23S (the only well with measurable DNAPL) was initiated in September 1997 and continued into 1999. The DNAPL at monitoring well W-23S consists primarily of chloroform.

In 1995, Geraghty & Miller attempted to delineate the initial DNAPL measured within monitoring wells W-16S and W-23S (Draft RAWP, 1996) by drilling delineation soil borings around each well. While the soil analytical results infer that DNAPL was present in the delineation soil borings, free phase DNAPL was not observed in the samples (hydrophobic dye testing was also negative). The conclusion from the 1995 investigation was that "the DNAPL is residual and not pooled since DNAPL is bound by capillary forces to the substrate".

In February, 1999 O'Brien & Gere conducted a test trenching program in the area of monitoring wells W-16S and W-23S to assess the horizontal extent of soil impact around each well. The delineation standard used was the Impact to Ground Water (IGW) Soil Cleanup Criteria, which is the most stringent criteria for the DNAPL constituents. Soil samples were collected for subsequent laboratory analysis. Upon backfilling the trenches, temporary PVC screen was placed above the silty clay/peat layer. After two days, a bailer was used to evaluate the presence of DNAPL in the trenches. Figure 2-2 presents the test trench locations and the extent of contaminants based on the observations and sampling. Based on this investigation, approximately 5,940 cubic yards (in-situ) of soil will be excavated around monitoring well W-23S, and 2,745 cubic yards (in situ) will be excavated around monitoring well W-16S. This is a total of 8,685 cubic yards (in situ). Appendix A is a report summarizing the test trenching program.

2.5. Drainage ditches (AOC 6) and stressed vegetation (AOC 8)

Elemental sulfur was deposited at certain areas of the site, associated with the decommissioning of the sulfuric acid plant. The area where the elemental sulfur was deposited is easily discernible by the stressed vegetation, yellow staining and surficial sulfur deposits.

Handex was contracted by AlliedSignal to complete a soil pH delineation and IRM in this area. Lime was applied to AOC 8 as an IRM in October, 1989. Lime was again applied to AOC 8 in October, 1995 and in

September, 1998. Handex's report dated October 29, 1998 summarizes the 1998 IRM. The NJDEP comments on the Handex report were provided in a letter dated February 5, 1999. In accordance with that letter and associated correspondence, further monitoring and lime application will occur in this area as discussed in Section 4.1.2.

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3. Remedial action program

3.1. Remedial action objectives and approach

The RI identified four AOC where AlliedSignal is proposing to conduct remedial actions. These areas include the old oil spill (AOC 2B), the former lagoon (AOC 3H), and the former sulfuric acid production and chloroform tank areas (AOC 2A and 3E). The remedial actions consist of the mass removal of constituents that are affecting site ground water quality. Following these remedial actions, a deed notice will be recorded for the site (Section 5). Ground water remediation will occur upon removal of the source areas and will consist of localized ground water recovery and treatment for a period of approximately 3 to 5 years as described in Section 6. A monitored natural attenuation program is proposed under a Classification Exception Area (CEA) designation for the ground water. The CEA program is described in Section 7.

AlliedSignal is proposing a remedial action for the four AOC which involves the removal of solvent and fuel oil impacted soil. Once the soil is excavated, AlliedSignal is considering three options for managing the excavated material:

Option 1: Removal of contaminated media (including soil, excavation water, chlorinated solvents and fuel oil) from the identified AOC to the appropriate depth (AOC-specific). The excavated soil will then be treated on-site and used to backfill the excavations. Also, excavation water will be managed in accordance with Section 4.5.

Option 2: Removal of contaminated media (including soil, excavation water, chlorinated solvents and fuel oil) from the identified AOC to the appropriate depth (AOC-specific). The excavated soil will then be staged on-site for characterization and subsequent off-site disposal at permitted landfills. Also, excavation water will be managed in accordance with Section 4.5.

Option 3: A combination of Options 1 and 2 based on the following criteria:

- Ability for the mechanical volatilization system (MVS) on-site treatment technology (see Section 4) to treat the soils to cleanup criteria.
- Cost-effectiveness of on-site treatment or offsite disposal based on volume of soils to be treated in a specific area.

- Characteristic of soils and amount of pre-conditioning that will be required to allow processing by the MVS technology.
- Timeliness of permits to allow on-site MVS operation and amount of air pollution control that will be required.

The decision to treat on-site (Option 1), dispose offsite (Option 2), or implement a combination of these two alternatives (Option 3) will be made during the remedial design and contracting process, as well as, in the field during excavation activities based on conditions encountered. Due to the flexibility built into this remedial approach, remedial costs cannot be finalized at this time. Rather, AlliedSignal presents unit rate costs within Section 3.3.

The drainage ditch area and an area of stressed vegetation (AOC 6 and AOC 8) will continue to be monitored for pH. Lime stabilization will occur on an as-needed basis. This program was presented in AlliedSignal's February 19, 1999 letter to the NJDEP. Surface water within the drainage ditches will be monitored for pH quarterly. This quarterly sampling will continue until the pH levels are within the acceptable range for four consecutive quarters. In addition, AlliedSignal will take soil pH samples during the Spring of 1999 as requested in the February, 1999 NJDEP letter. AlliedSignal proposes a pH of less than 5 standard units as the criteria for considering additional remedial actions, which will consist of additional lime application in the effected area.

3.2. Remedial action description and selection criteria

As described above, the selected remedial alternative requires the removal of contaminated soil from the identified AOC to the appropriate depth. For the solvent contaminated soil AOC, (AOC 2A, 3E, and 3H) the appropriate depth is the top of the silty clay/peat confining layer (an average of 9 to 13 feet below grade). The confining silty clay/peat unit has been selected as the base of the excavation due to its ability to inhibit the vertical migration of contaminants. An estimated total of 15,525 cubic yards of solvent contaminated soil will be excavated.

For the fuel oil removal action (AOC 2B), proposed excavation limits extend one foot below the water table. An estimated total of 2,212 cubic yards of fuel oil contaminated soil will be excavated. The minimum expected volume of material to be removed and treated either on-site or off-site is 17,740 cubic yards.

The following subsections describe how this selected remedial action meets the requirements of the NJDEP selection criteria.

3.2.1. Technical performance and effectiveness in attaining compliance with the remediation standards

The applicable remediation standards for the media of concern are based on the surrounding property use and the potential future use for the site. As stated in Section 2, the AlliedSignal site is surrounded by commercial and industrial property. Despite the nature of the surrounding area, AlliedSignal proposes that the applicable soil remediation standard for the site be the NJDEP IGW Soil Cleanup Criteria, which is the most stringent for the site constituents. The applicable shallow ground water remediation standard is the Class IIA Ground Water Quality Standard (GWQS).

The removal of contaminated soil and the replacement of these soils with either treated soil or clean backfill is expected to achieve the NJDEP IGW Soil Cleanup Criteria for site soils. The removal of the contaminated soil and associated post-remediation ground water capture is expected to achieve the Class IIA GWQS. The deep ground water meets the requirements of an NJDEP Class III - B aquifer.

3.2.2. Reliability of the remedial action in maintaining compliance with the applicable remediation standards

Since this remedial action will result in the removal of the contaminant source material from the site, it is anticipated that the remedial action will be reliable in maintaining compliance with applicable remediation standards.

3.2.3. Degree to which the proposed remedial action reduces toxicity, mobility, and/or volume of contaminants through treatment, reuse, or recycling

The contamination within the soil will be removed from the site by excavation. Once excavated, the toxicity, mobility, and volume of the contaminated soil will be reduced through either on-site treatment or off-site disposal at a permitted landfill. The toxicity, mobility, and volume of the residual contamination in ground water will be also be reduced, through recovery and treatment.

3.2.4. Degree to which the remedial action minimizes risks and short-term impacts associated with the implementation of the remedy and with any contamination left on-site, while providing long-term protection

There are inherent but manageable short-term risks associated with excavation programs; however, these risks will be minimized through the compartmentalization of the excavation and using sheeting and/or trench

boxes, as appropriate. Additionally, the excavation of contaminated soils may increase the potential for a short-term impact to the air quality. To reduce the potential for short-term risks to air quality, the excavation and handling activities will be conducted within a segregated area with an appropriate suppression system for dust, if required. Air emissions resulting from the on-site treatment processes will be permitted and controlled in accordance with N.J.A.C. 7:27.

Since the selected remedial action will result in the removal of the contaminated soil and shallow ground water, the long-term risks will be minimized. Post-remedial monitoring will be conducted for both the shallow ground water and the deep aquifer to identify whether long-term risks associated with site operations will remain on-site; however, based on the RI results, it is not anticipated that a long-term risk will remain for either shallow ground water or the deep aquifer.

3.2.5. Engineering and scientific feasibility and availability

As previously indicated, excavation and either on-site treatment or off-site disposal at a permitted landfill are proven technologies for soils remediation. The high vapor pressure of the chemical residues at the site make them ideal candidates for remediation via a Mechanical Volatilization System (MVS). The proposed ground water dewatering and treatment technologies (see Section 4 and Section 6) are also proven technologies for the compounds present. As such, the proposed remediation technologies for this site are considered to be both feasible and available.

3.2.6. Ability to implement the proposed remedial action

AlliedSignal and O'Brien & Gere have successfully remediated other properties with the same residual chemicals using excavation with subsequent on-site treatment and off-site disposal of soil. Dewatering and ground water treatment technologies for similar contaminants are commercially available. As such, the selected remedial action has a documented record for being successfully implemented.

3.2.7. Consistency of the action with other Federal, State and local laws

Prior to and during the implementation of the remedial action, the proper permits will be obtained and plans will be developed to allow the remedial action to be accomplished in accordance with other Federal, State, and local laws. The required permits and plans are discussed in Section 4.2 of this RAWP. Since contaminant removal will be achieved through the implementation of the selected remedial action, the remedial action is anticipated to meet the requirements of other Federal, State, and local laws.

3.2.8. Impact of the proposed remedial action on the local community

The local community consists of other industrial facilities with no residences identified in proximity of the site. The impact of this remedial action on the local community is expected to be minimal. Steps to be taken to minimize impacts on the local community will include:

- The implementation of the excavation activities in a segregated area and an appropriate dust suppression system, as necessary, to minimize particulate emissions and odors.
- The queuing of trucks and other vehicles directly onto the New Jersey Turnpike to minimize additional traffic through the City of Elizabeth.
- The completion of the remedial action within a three month time period.

3.2.9. Degree of permanence of the remedial action

Contaminant removal is a permanent remedial option.

3.2.10. Potential natural resources injury

During the implementation of the selected remedial action, damages to natural resources will be minimized through the implementation of a Soil Erosion Sediment Control (SESC) plan and the use of any required air pollution control device.

3.2.11. Timeliness of implementation

The NJDEP considers a remediation program to be timely if it is completed within five years. The anticipated time period for the source removal program is anticipated to be 3 months. The time required for ground water remediation is based on the successful removal of contaminant concentrations above the IGW criteria. The time for ground water remediation will be estimated based on the anticipated decline in ground water contaminant concentrations following the soil remedial action but is anticipated to be less than 48 months in duration.

3.3. Remedial action cost comparison

This section provides a unit cost comparison of the selected permanent remedial action. As discussed above, excavated soil will be either treated on-site and used to backfill the excavation, disposed of off-site at a permitted landfill, or a combination of both on-site treatment and off-site disposal.

3.3.1. Unit rates and assumptions

Based on experience with similar projects and average costs provided in *RS Means-Environmental Remediation Cost, 1998*, the following units costs were utilized, as applicable, for each option:

Excavation, with backfilling using treated soil

Cost Analysis	Unit	Unit Cost
Site Preparation		
Mobilization/Demobilization	LS	$20,000
Treatability Testing	LS	$10,000
Carbon Adsorption System (Air)	LS	$85,000
Site Work/Treatment/Restoration		
Excavation/Load	CY	$11
Temporary Dewatering	GAL	$2
Haul On-Site to Treatment Area	CY	$5
Conditioning Agent Solidification	CY	$30
On-Site Treatment (Mechanical Aeration)	CY	$35
Treatment Samples	EA	$120
On-Site Haul & Backfill Treated Soil	CY	$11
Site Regrading	AC	$5,000
Storm Water Collection	LF	$25
Cleanup and Landscaping	AC	$1,600
Other		
Confirmation Sampling	EA	$120
Air Monitoring	LS	$3,500
Risk Assessment	LS	$15,000
Monitoring Well Installation	EA	$1,500
Ground Water Sampling	QTR	$1,900
DER & CEA	EA	$30,000
Ground Water Extraction System	LS	$75,000
Ground Water Treatment	GAL	$2
Carbon Disposal	YR	$1,855

Excavation, off-site disposal, backfill with clean fill

Cost Analysis	Unit	Unit Cost
Site Preparation		
Mobilization/Demobilization	LS	$20,000
Site Work/Restoration		
Excavation	CY	$4
Temporary Dewatering	GAL	$2
Screening Material	CY	$5
Transportation (assumes 50 miles)	CY	$2
Disposal as Non-hazardous	CY	$116
Backfill	CY	$5
Site Regrading	AC	$5,000
Storm Water Collection	LF	$25
Cleanup and Landscaping	AC	$1,600
Other		
Confirmation Sampling	EA	$120
Air Monitoring	LS	$3,500
Risk Assessment	LS	$15,000
Monitoring Well Installation	EA	$1,500
Ground Water Sampling	QTR	$1,900
DER & CEA Filing	EA	$30,000
Ground Water Extraction System	EA	$75,000
Ground Water Treatment	GAL	$2

A soil volume to weight ratio of 1.5 tons per cubic yard (excavated) was used for materials handling estimations.

3.3.2. Cost calculations

AlliedSignal's proposed remedial actions implements permanent remedial remedies. As discussed in Section 3.2 and throughout Section 2, an estimated 17,740 cubic yards of soil will be excavated at the site (15,525 cubic yards of solvent contaminated soil and 2,212 cubic yards of fuel oil

contaminated soil). Based on this soil volume and if all the soil is treated on-site, the maximum projected remedial costs could approach $3,840,000. If all soil is excavated and sent off-site to a landfill, the maximum projected remedial cost could approach $5,745,000.

AlliedSignal notes that the decision regarding the use of on-site treatment or off-site disposal will be made based upon the timely receipt of required permits and the receipt of bids from qualified contractors. Also, AlliedSignal will make field decisions based upon encountered conditions. It is possible that a combination of both on-site treatment and off-site disposal will be used. Final costs (actual costs) will be contained within the remedial action report which will be submitted within approximately 8 months of commencement of field activities (see Section 8 of this RAWP).

3.4 Option selection based on selection criteria and cost comparison

The mass removal remedial action achieves the goals and objectives established for the site. It satisfies the NJDEP's preferred objective of a permanent remedy and AlliedSignal's goals and objectives for protecting the public health, while providing a cost effective program which eliminates long-term liability for the site and essentially allows for unrestricted future industrial uses of the site. While the quantities of soil that will be either treated on-site or disposed off-site will not be determined until AlliedSignal has completed the bidding process and received all requested permits, it is the control and treatment of ground water that becomes a significant factor in calculating the long term cost of these options as well as the extended liability associated with the site.

4. Source removal program

4.1. Source area removal strategy

4.1.1. AOCs 2A, 2B, 3E, and 3H

The proposed remedial action program for the source areas will follow the NJDEP's current IGW Soil Cleanup Criteria and GWQS. Currently, total petroleum hydrocarbons (TPH) and polynuclear aromatic hydrocarbons (PAHs) exist at the old oil spill (AOC 2B). Chlorinated organics (solvents) have been detected in the former lagoon (AOC 3H) and the former sulfuric acid production and chloroform tank areas (AOC 2A and 3E).

TPHC

The source area program will remove affected soils above the silty clay/peat layer to the extent necessary so that residual soils are below the IGW Soil Cleanup Criteria for these compounds. The soils that are excavated will either be treated on-site and returned to the excavation areas or disposed off-site. In the latter case, clean backfill would be brought on-site to restore these areas to original grade. A low permeability soil cap or paving will then be placed on these areas.

The areas subject to source removal and the associated in-place volumes are as follows:

old oil spill (AOC 2B)	2,212 cubic yards
former lagoon (AOC 3H)	6,840 cubic yards
former sulfuric acid production and tank areas (AOC 2A and 3E)	8,685 cubic yards

The approximate limits of excavation at each AOC are shown on Figure 2-2.

Prior to excavation, the soils may be pre-conditioned to improve handling ability for further processing. Figure 4-1 presents a conceptual process schematic of the MVS technology.

4.1.2 Stressed vegetation area (AOC 8)

AlliedSignal will perform pH stabilization measures in AOC 8 on an as needed basis. Specifically, surface water within the drainage ditches (AOC 6) will be monitored for pH on a quarterly frequency beginning in April, 1999. This quarterly sampling will continue until the pH levels are within the acceptable range (pH from 6.5 to 8.5 for a SE-3 water body) for four consecutive quarters. In addition, AlliedSignal will take soil pH samples in

the Spring of 1999 as requested in the NJDEP February, 5, 1999 letter. AlliedSignal will take random soil samples for pH analysis throughout the site from non-process areas in order to establish a background soil pH value. AlliedSignal proposes a soil pH criteria of less than 5 as the criteria for considering additional remedial actions. Section 3 discusses the proposed IRM program for AOC 6 and AOC 8.

4.2. Permits

Based on the proposed scope of remedial activities, the following permits have been considered for applicability:

- **Soil erosion and sediment control plan (SESC):** A SESC plan will need to be developed and submitted to the Somerset-Union Soil Conservation District for approval in accordance with the Soil Erosion and Sediment Control Act, Chapter 251, P.L. 1975, since it is anticipated that the project will entail the disturbance of soil greater than 5,000 ft^2 in area.

- **Stream encroachment permit:** A stream encroachment permit is not anticipated to be needed due to the following: 1) the project will not involve work within the 100 year floodplain of the Newark Bay and 2) applicability to the requirements given in the "Technical Manual for Land Use Regulation Program, Bureau of Inland and Coastal Regulations, Stream Encroachment Permits," prepared by the NJDEP, revised September 1997, Appendix A - N.J.A.C. 7:13-1.3, Part (b), Item 1. A stream encroachment permit is required if the project includes the construction, installation or alteration of any structure or permanent fill along, in, or across the channel or 100 year floodplain of any stream, unless specifically exempted as provided in N.J.A.C. 7:13.

- **Transition area waiver:** Since the project will involve work performed within 150 feet of wetlands on the property, a transition area waiver, specifically a Special Activity General Permit #4, will need to be obtained from the NJDEP in accordance with N.J.A.C. 7:7A-1.1 et seq.

- **Air quality regulation permit (On-site soils):** Based on the requirements given in the "Guidance Document for the Remediation of Contaminated Soils," prepared by the NJDEP, dated January 1998, Appendix G - Subpart IV, Items 1 through 15, an air permit will most likely be required for the on-site soil processing equipment to address emissions and control of particulates and VOCs. The specific air permits required from the NJDEP will be identified in the final design.

- **Air quality regulation permit (Wastewater):** An air permit may be required from the NJDEP for off-gas from potential unit processes generated from wastewater storage, conveyance, and treatment units vented to the atmosphere. Specifically, a permit to construct would be required for each piece of vented equipment that handles wastewater containing greater than 3,500 ppb of VOCs or 100 ppb of toxic organic substances (TXS) as defined under N.J.A.C. 7:27-17. In addition, processes from the ground water recovery treatment system generating VOC emissions at 0.5 lb/hr or greater, TXS emissions at 0.1 lb/hr or greater, or having an incremental hazard risk of TXS exceeding one in one million will require emission control and an air permit from the NJDEP. The specific air permits required from the NJDEP will be identified in the final design.

- **Treatment Works Approval (TWA):** In accordance with N.J.A.C. 7:14A-22, a TWA will be required from the NJDEP for the construction, installation, and operation of the treatment works for the ground water recovery treatment system influent.

- **NJPDES/DGW Permit:** In accordance with N.J.A.C. 7:14A, a New Jersey Pollution Discharge Elimination System/Discharge to Ground Water permit will be required from the NJDEP for the discharge of the effluent from the ground water recovery treatment system to the final discharge location.

- **Permit-by-rule:** A permit-by-rule is not anticipated as being needed since the work to be performed at the site will be part of a remedial action program, and therefore, does not meet the requirements or conditions for a permit-by-rule. Issuance of a permit-by-rule requires that a remedial investigation of the site is being conducted pursuant to the Technical Requirements. Also, the Site Remediation Program can only authorize certain discharges back to the ground waters of the State related to: homeowner site remediations, pilot test activities, aquifer tests, or remedial design tests without a full NJPDES permit.

- **Non-hazardous soil (ID 27):** If excavated soils at the site meet the following criteria to be considered a non-hazardous waste for disposal at the Hackensack Meadowlands Development Corporation (HMDC) then it may be classified as an ID 27 solid waste. Excavated soils are considered to be non-hazardous when the following criteria are met: 1) soil contaminants exceed the NJDEP's soil cleanup criteria, or, 2) exceed the site specific cleanup criteria, and 3) are not a hazardous waste as defined in Title 40 Code of

Federal Regulations (CFR) Part 261 Subpart C (261.21-261.24) and Subpart D (261.31-261.33).

Contaminated soils that are designated as non-hazardous solid waste may not be stockpiled for more than six months pursuant to the Solid Waste Regulations, N.J.A.C. 7:26-1.1:1.4.

- **Soil reuse:** For on-site treatment and backfill of soils, a Soil Reuse Proposal will be submitted to the NJDEP. Allied Signal will submit its determination of waste classification along with the rationale used for characterization of the soil. The soil use/reuse applications will meet the following criteria:

  a) Pinelands area - non applicable

  b) Objectionable odors or appearance - Soils having objectionable odors, including petroleum or synthetic chemical odors, shall not be used in residential areas or other locations where the public would be exposed or where such odors or appearance would render a site or its improvements unusable for their reasonably intended purpose. Specifically, the soils to be used must not violate the air pollution rules, N.J.A.C. 7:28-1 et seq., or local nuisance codes. Since these soils will be used in a commercial/industrial area, this item is not applicable.

  c) Regulatory compliance - The soils will be used in accordance with all applicable federal, state, and local requirements.

  d) Allowable storage time - Non-hazardous soils will not be stockpiled at the site of generation or elsewhere for more than six months from the date of excavation pursuant to the Solid Waste Regulations, N.J.A.C. 7:26-1.1:1.4.

- **Local permits:** Construction permits, including building, fire, electrical, and plumbing subsections, will be obtained as appropriate during full-scale operations. The selected contractor will be responsible for obtaining required local permits.

4.3. Site mobilization and control

Upon obtaining the necessary and appropriate permits, the contractor will mobilize to the site. The mobilization activities will consist of contractor arrival and set-up on-site, establishing the remediation and support zones, and locating the limits of excavation. A decontamination corridor will be established within the work zone.

Soil erosion and sediment control activities will also be established upon mobilization and will continue, as appropriate, for the duration of the remedial program. These activities are anticipated to consist of the following:

- construction sequencing
- control of on-site vehicles
- interception of runoff and delivery to a stable area
- slope stabilization
- control of soil loss from driveway entrances/exists
- limiting disturbed areas of soils
- temporary stabilization of disturbed areas
- permanent stabilization of final graded area

Site safety will be determined by the Site Safety Officer and may include yellow caution tape and temporary fencing, as appropriate.

Equipment mobilization will occur based on the construction sequencing. Site preparation for the excavation and treatment program will include the removal of surficial asphalt or concrete where it exists in the areas of excavation. Soils excavation, treatment and dewatering equipment will then be mobilized once the asphalt and concrete debris is removed from the excavation area. Site restoration equipment will be mobilized as the excavation is backfilled with clean backfill or treated soil. Debris may be backfilled along with treated soil as long as it is compatible with compaction requirements for future use scenarios and in accordance with the NJDEP's "Management of Excavated Soils" criteria. Covered stock piles, roll-offs and/or 55-gallon DOT drums may be used for the temporary storage of accumulated waste and will be placed at an appropriate location adjacent to the remediation area. The roll-offs and drums will be secured and surrounded by protective fencing and caution tape at the end of each day prior to exiting the site.

Technical specifications will be developed to specify the contractors performance during the remedial activities. It is anticipated that site controls will include maintaining remediation zones, decontamination

corridors, and site security. Prior to entering the remediation zones, proper personal protection equipment (PPE) will be required as specified in the remedial program's Health and Safety Plan.

4.4 Remedial process

The approximate limits of the area to be excavated, the proposed location of the mobile equipment, and the proposed soil stockpiles are shown in Figure 4-2. Approximately 17,740 cubic yards of soil, as measured in-place, will be excavated from the four AOC identified. The excavation depth will be to about 10 foot below grade within the DNAPL areas, and to one foot below the occurance of LNAPL (see Section 2.2 and 3.2). Based on previous investigations, it is anticipated that ground water will be encountered within each excavation area at approximately 3 feet below grade. The excavation will be dewatered as discussed in Section 4.5.

Based on the capabilities of the equipment to be used and the type of soil, it is anticipated that soils will be processed at an average rate of 15 to 25 tons per hour. The soils will be handled and processed using the following steps:

1. Excavation will occur in each area to the limits of the excavation. In AOC 2B, soil above the LNAPL will be segregated and subsequently used as backfill. Prior to excavation, the soil may be preconditioned to facilitate handling. Excavated soils will be stockpiled in approximate 100 cubic yard batches. Once stockpiled, soils will either be treated in accordance with steps 2 - 10 below or, alternatively, the stockpiled soils will be characterized and shipped off-site for disposal. The decision to treat on-site or dispose offsite will be based on the following criteria:

   - ability for the MVS technology to treat the soils to IGW Soil Cleanup Criteria
   - cost-effectiveness of on-site treatment or offsite disposal based on volume of soils to be treated in a specific area
   - characteristic of soils and amount of pre-conditioning that will be required to allow processing by the MVS technology
   - timeliness of permits to allow on-site MVS operation and amount of air pollution control that will be required.

   The decision to treat on-site, dispose offsite, or implement a combination of these two alternatives will be made during the remedial design and contracting process as well as in the field during excavation activities based on conditions encountered.

2. Soils will be pre-conditioned by the addition of a drying agent (lime or lime kiln dust) to the excavation area. The drying agent will be added at an estimated rate of 5 - 10% (by weight) based on the amount of moisture content present in the soils. Sufficient agent will be added to pre-condition the soil. The agent will be added under a covered area to minimize fugitive dust generation. An excavator or backhoe bucket will then mix the agent with the appropriate amount of soils to break up large clumps and provide a more uniform texture for further processing. During these activities, the open excavation face will be minimized by appropriate excavation sequencing and tarping as necessary.

3. Upon obtaining suitable consistency with the agent and soil, the mixture will be stockpiled in batches of approximately 100 cubic yards. To minimize contact of the excavated and untreated soils with the ground surface, designated areas of the site will be used for stockpiling excavated and/or pre-conditioned soils. The designated areas used for soil stockpiling will be covered with 20 mil polyethylene plastic sheeting. The sheeting will be weighted at the edges to prevent movement. Excavated soil will then be placed on the plastic sheeting. Upon completion of the activities for the day, the soil stockpile will be covered with 20 mil plastic sheeting. The plastic cover will be weighted to prevent blowing.

4. Prior to processing the soil, each stockpile will be characterized so that an evaluation of treatment effectiveness can be made based on a comparison of pretreatment and post-treatment analytical results. A description of the soils sampling and analyses that will be performed is provided in Section 4.6.

5. The stockpiled soils will be screened to remove large, non-processible materials and debris. The large, non-processible material (such as large stones, bricks, timber, concrete, etc.) will be collected and stockpiled separately on-site. It is anticipated that the debris will be used as on-site fill.

6. The screened soils will be loaded into and processed through the hammermill shredder (and pugmill if necessary) where the soils will be pulverized to reduce soil particle size, increase particle surface area, and promote volatilization of the VOCs. Emissions from this equipment will be vented to a carbon adsorption system to capture the vapor-phase VOCs generated during the soils processing.

7. Soils processed each day will be stockpiled in separate batches of approximately 100 cy pending post-processing characterization. These post-treatment stockpiles also will be placed on and covered with polyethylene sheeting to eliminate potential contact with the ground surface and precipitation

8. Each stockpile of processed soil will be sampled and analyzed following the procedures described in Section 4.6. Soils not sufficiently treated to the treatment objectives, based on the results of the post-processing sampling and analyses, will be reprocessed and will be subsequently recharacterized

9. Once the levels of VOC residues in the soil are below IGW based on the results of the post-processing sampling and analyses, the separate stockpiles will be designated for use as backfill on-site

10. Following backfill and compaction of the treated soils, the excavation area will be graded to promote drainage. Either a 2 foot soil cover will be placed on these areas or the area will be paved.

4.5. Excavation dewatering

The water collected within the excavation areas and the wastewater collected from the decontamination procedures will be pumped to an on-site holding tank or impoundment (Baker Tank or FRAC Tank). The wastewater, upon characterization sampling results, will either be transported off-site for treatment and disposal or to the on-site treatment system.

4.6. Soil sampling and analysis (process monitoring)

Sampling of the excavated soils will be conducted to monitor the effectiveness of the treatment system. The program consists of sampling and analyses of the soil stockpiles prior to treatment and soil stockpiles after treatment. Due to the volume of soil proposed to be treated or removed, AlliedSignal is proposing that one soil screening sample be obtained from each 100 cubic yard soil stockpile to evaluate VOC removal efficiency of the treatment process. Each screening sample will be analyzed on-site as discussed below. Considering that a percentage of the screening samples will also be confirmation samples to be analyzed at a certified laboratory, AlliedSignal believes that this proposal is in accordance with N.J.A.C. 7:26E sections 6.4 and 1.6. The results of the post-processing soil samples will also be used to document that processed soils do not contain VOCs at levels above the treatment objectives discussed previously.

If the MVS on-site treatment technology is selected for the site, a gas chromatograph (GC) using a purge and trap method of analysis will be utilized to provide real time quantitative analytical results for VOCs treatment performance. The instrumentation will be set up in an on-site field trailer or nearly building. The proposed GC soil screening method is as follows:

Sample Preparation
Soil samples will be collected from the excavation or treated soil piles and placed in standard laboratory containers and transported to the field laboratory. Two grams of sample will be weighed and placed in a screw cap vial containing methanol and surrogate solution. The vial will be shaken vigorously for a period of 1 to 2 minutes. The vial will then be placed in a centrifuge to facilitate phase separation. Fifty microliters of extract will be transferred to 10 ml glass leur tip syringe containing 5 ml of deionized water.

Instrument Calibration
Consistent with laboratory analytical methods, the GC will be calibrated via a 4 point curve (initial calibration) prior to the start of analysis. The calibration compounds will be those previously detected in the solvent areas. Continuing calibration, consisting of analysis of a mid-level concentration standard will be performed after each 10 soil samples. Additional QA/QC measures including surrogates, matrix spikes and matrix spike duplicates and field duplicates will be analyzed as applicable.

Sample Analysis
The solution of extract and water will be transferred to the 10 ml fritted air sparger attached to a Tekmar LSC-2000 single port purge and trap concentrator. The solution will be purged with helium gas for a period of 10 to 12 minutes and volatile constituents present in the solution are expected to adsorbed to a tenax/charcoal trap. The trap will then be heated to 300 degrees Celsius, the volatile constituents will vaporized and carried via a heated transfer line to the injection port of Hewlett Packard 5890 Series II GC. The gaseous constituents will be injected onto the GC column for analysis. The GC will be equipped with an electron capture detector (ECD).

Reporting
A computerized analytical report sheets with compound specific results will be produced following the completion of an analytical run. These reports will be saved electronically and also printed in hard copy for inclusion in the Remedial Action Report.

If the GC soil screening indicates the processed soil pile does not meet soil cleanup criteria, the pile will be reprocessed. The post-treatment soil samples, after being screened by the GC, will be submitted to a NJDEP-certified laboratory where they will be analyzed, with a 48-hr turnaround, for VOCs using EPA Method 8010/8020. The initial frequency of laboratory confirmation analysis and field GC analysis will be 1 sample for every 10 screening samples. The frequency of laboratory analysis may be decreased to 1 in 20 field GC samples based on the treatment efficiency and acceptable field screening results.

4.7. Air sampling and analysis

Air sampling will be performed to assess breakthrough of the vapor-phase carbon adsorption system. This monitoring will consist of periodic monitoring by a photoionization detector. The methods and frequency of air monitoring will be prescribed within the air permit application for approval by NJDEP.

4.8. Post-excavation soil sampling activities

Post-excavation soil sampling will be conducted upon completion of the excavation activities at AOC 2A, 3E and 3H. No post-excavation sampling is proposed at AOC 2B due to the completeness of the cone penetrometer testing in this area (Handex, February 1999 Cone Penetrometer Report). Post-excavation soil sampling will be collected at the soil/peat interface for DER documentation purposes (see Section 5). Also, the results will be used by AlliedSignal to evaluate horizontal excavation limits. Therefore, an alternate post-excavation sampling approach is requested instead of the requirements in the NJDEP's Technical Requirements for Site Remediation NJAC 7:26E.

The proposed post-excavation sampling activities will consist of collecting approximately one sample for every 30 linear ft of excavation sidewall. Due to the shallow depth of the excavation and topographic contours of this area, it is anticipated that these samples will be collected near the bottom of the excavation. The post-excavation samples will be analyzed for VOCs. Since excavation limits extend to the peat confining layer, no bottom post-excavation samples are proposed.

The exact number of post-excavation samples and locations will be determined based on field conditions. Post-excavation samples will be collected in accordance with the NJDEP's May 1992 Field Sampling Procedures Manual and as outlined in the attached Quality Assurance Project

Plan (QAPP), Appendix D for safety reasons, samples will be taken from the backhoe bucket using a stainless steel trowel, scoop, or spoon.

Upon determination of the post-excavation sample locations, appropriate volumes of soil will be collected and transferred immediately to the laboratory supplied sample container. The container size and material shall be applicable for the analyses to be performed.

4.9. Backfill and restoration activities

The excavation area will be backfilled with either treated soils from the MVS process or certified backfill. The quality of the treated soil from the MVS process will be documented per Section 4.6 above.

The backfilled areas will either be paved, or a 2 foot low permeability soil cap will be placed in these areas as part of DER requirements (Section 5).

4.10. Remediation equipment decontamination

Equipment which will be used to excavate and treat the affected soils will be decontaminated via steam cleaning. Washwater generated during decontamination will be collected and treated, as appropriate, in the dewatering/treatment system.

4.11. Transportation and disposal

Based on the remedial activities outlined in this RAWP, anticipated off-site disposal activities may include:

- Residuals from the MVS process
- Untreated soils
- Wastewater from soil excavation

Residuals from the MVS process
The residuals of the MVS process will include excavation debris that is not suitable for backfill, spent activated carbon used in the vapor-phase carbon adsorption system, and miscellaneous parts and consumables, such as polyethylene tarps, temporary piping for the dewatering equipment, and other trash generated as a result of construction activities. Disposal of the spent activated carbon will be accomplished through the contract with the carbon vendor. Typically, the spent activated carbon is accepted by the

vendor for regeneration and re-use by them. Disposal of the miscellaneous trash will occur through a local hauler.

Untreated Soils
Excavated soils removed from the source areas that will not be treated on-site will be stockpiled per Section 4.4. until disposal off-site. Characterization samples will be obtained from the excavated soils and analyzed for disposal in accordance with applicable Federal, state and local requirements. Upon receipt of the characterization results, disposal activities will be coordinated and the soils transported to an approved facility for offsite disposal.

Wastewater from soil excavation
The water collected within the excavation areas and the wastewater collected from the decontamination procedures will be pumped to an on-site holding tank or impoundment (Baker Tank or FRAC Tank). The wastewater, upon characterization sampling results, will be transported off-site for treatment and disposal or managed in the on-site treatment system..

The total amount of soils and material disposed offsite from the above will be summarized in the RA Report along with the ultimate disposal location. Transportation and disposal logs summarizing these activities along with manifest documentation will be provided in the RA Report.

4.12. Demobilization

The excavated soil not suitable for on-site backfill and other affected materials will be coordinated for offsite disposal once the excavation activities are complete. Upon completion of the backfill, restoration, and disposal activities, remediation equipment will be decontaminated and removed offsite.

4.13. Field documentation

Remediation activities will be documented in field log books. Photographs will also be used for field documentation. Chain-of-custody forms will be completed as part of proper sample shipment procedure.

4.14. Quality assurance/quality control

Quality assurance/quality control (QA/QC) procedures will be conducted in accordance with the QAPP included in the RAWP as Appendix D. The QA/QC procedures have been established for the remedial activities in accordance with the Technical Requirements - Appendix A and the NJDEP May 1992 Field Sampling Procedures Manual, as applicable. QA/QC procedures will be followed to maintain sufficient data quality to meet the required objectives for use of the data. These objectives will require that accuracy and precision be monitored and that steps be taken to identify situations involving unacceptable levels of accuracy and/or precision. The QA/QC procedures will include the collection and analysis of field blanks, duplicate samples, and laboratory QA/QC samples.

4.15. Health and safety

A site specific Health and Safety Plan is provided as Appendix E. The Health and Safety Plan has been developed only for O'Brien & Gere personnel. Health and safety monitoring will be conducted independently by the remediation contractor and O'Brien & Gere, in accordance with their individual Health and Safety Plans. The Health and Safety Plan identifies, at a minimum, health and safety personnel, protection levels, proposed remedial activities, and emergency response procedures.

5. Declaration of environmental restriction/deed notice (DER)

The proposed remedial alternative is anticipated to remove the bulk of soil contamination which has the ability to act as a source to degrade ground water quality. However, this remedial approach is not designed exclusive to excavation. Consequently, there may be residual constituents remaining in the overburden soils or at the clay/peat confining layer. Additionally, through the initial three phases of the RI, some low levels of polynuclear aromatic hydrocarbons, trace metals, and polychlorinated biphenyls have been detected within closed AOC. The NJDEP requires engineering and/or institutional controls for a site when approving a remedial action that proposes to leave low levels of some contaminants in-place. Placement of an institutional control, known as a DER or deed notice, is required to protect human health and the environment.

A DER is intended to provide record or deed notice of certain conditions and restrictions on the property and to reflect the regulatory and statutory obligations imposed as a condition of using institutional and/or engineering controls.

5.1. Basis for DER

The implementation of an institutional control will ensure that contaminant concentrations remaining in the soils will not pose an unreasonable threat to human health during future site use and to assure that any remaining contamination is properly managed. In demarcating the area where the DER will be imposed, there are three applicable criteria which may be used to delineate elevated residual levels. These are the Impact to Ground Water, Residential Direct Contact, and Non-Residential Direct Contact Soil Remediation Criteria. AlliedSignal has proposed to evaluate the soil excavation/treatment portion of the remedial action with respect to the IGW soil criteria. This criteria was selected primarily because the intent of the excavation program was to remove soil contaminant levels which could degrade ground water quality. By design, the IGW criteria is protective of ground water and residuals left in-place below this level should not result in impacts to ground water above Class II-A criteria and the deep aquifer's Class III-B criteria.

The other applicable remediation criteria, RDC and NRDC, are based on health impacts under residential and non-residential exposure conditions. Below these levels, there is not anticipated to be any adverse human health impacts. Typically, these criteria are used when developing a DER at the site boundary and for surface soil. However, because of the solubility of the

chemical constituents (typically chlorinated solvents) in the proposed soil excavation areas, the IGW criteria is more stringent than the RDC and NDRC criteria. Consequently, remediation of soils to this level is assumed to be protective both of ground water impacts and hypothetical human health concerns.

As discussed above, the previous RIs have identified low concentrations of contaminants such as the semi-volatile organic compounds and trace metals. In some areas of the site, the concentration of these constituents exceeds the RDC and NRDC criteria, which are more stringent criteria for these constituents. Since the constituents are below the applicable IGW criteria and are not anticipated to degrade ground water quality, AlliedSignal is proposing to cap these soils leaving the residues in-place. In the *Site Remediation News* (Winter 1995 edition) the NJDEP writes that, "If contaminant concentrations to be left on-site exceed the Residential Cleanup Criteria but do not exceed the Non-residential Cleanup Criteria, engineering controls may be required depending on the current or anticipated use of the property. However, if concentrations to be left on-site exceed the Non-residential Cleanup Criteria, then engineering controls are required." As it applies to the AlliedSignal facility, "engineering controls" include the existing site fence and current impervious cover (consisting of building foundations, parking lots, and asphalt roadways) and proposed cap.

Process area delineation

Figure 5-1 is a site plan which indicates the proposed current extent of the deed notice. With few exceptions, the demarcation line on this Figure indicates the limits of contamination in the process area and is supported by soil samples which do not exceed the RDC and NRDC cleanup criteria. These sample locations include:

- B-301, B-400, B-401, B-500, and B-501 to delineate the northern and western boundary of Area 1
- B-503 and B-63 the delineate portions of the western boundary of Area 3 and Test Trench 1, boring B-106, B-316, B-110, B-312, and B-311 to delineate portions of the southern boundary of Area 3
- B-513, B-510, B-508, B-519, B-518, B-517, and B-516 to delineate the eastern and northern boundary of Area 4.

Historic fill delineation

Approximately 78% of the AlliedSignal property was formed by dredging the adjacent bay and depositing the dredge spoils on the site. By definition, "historic fill material" is non-indigenous material, deposited to raise the topographic elevation of the site, which was contaminated prior to emplacement, and is in no way connected with the operations at the location of emplacement and which includes dredge spoils, among others. The fill

at the AlliedSignal facility conforms to this definition. As such, in accordance with N.J.A.C. 7:26E-4.6 the delineation of historic fill is not required beyond the property boundary. Since the fill material is ubiquitous at the site, AlliedSignal will use available historic aerial photographs to delineate the fill material to the site boundary.

In lieu of collecting additional fill material samples, AlliedSignal is currently accepting the historic fill database characterization. As such, no additional characterization or delineation activities are proposed in the historic fill areas. The fill areas will be included in the deed notice by reference.

Covered areas
Much of the facility (approximately 20 acres) is already covered by an impervious material, either concrete or facility buildings. Figure 5-1 indicates the areas of the site which have been field verified to be either buildings with concrete foundations or concrete and asphalt pavement and parking areas. In order to comply with the requirement to install an engineering control in conjunction with soils which exceed to NRDC criteria, AlliedSignal will install a cap over those areas which are not already covered within the DER area and exceed the NRDC/RDC criteria.

5.2. Supplemental soil sampling

Based on the requirements of N.J.A.C. 7:26E-4.1, AlliedSignal is required to determine if soil contamination has migrated off the property above the unrestricted use (i.e. RDC) criteria. Based on the results of the previous RI sampling activities, additional delineation sampling will be required along certain boundaries of the site to complete the delineation and deed notice. The areas where additional sampling is required are indicated on Figure 5-1 and summarized as follows:

- Along RI Area 1B border, south of previous sample location B-502 to delineate exceedances of RDC and NRDC criteria in samples B-303A and B-302C
- Along RI Area 2A to delineate exceedances of RDC and NRDC criteria in sample B-309A. These samples may be collected as post excavation samples pending the remediation of AOC 2B
- Along RI Area 3A to delineate exceedances of RDC and NRDC criteria north of sample B-63 and west of B-11
- South of the former lagoon area, these samples may be collected as post excavation samples pending the remediation of the DNAPL area.

The proposed perimeter for the deed notice is over 300 linear feet. As such, AlliedSignal is proposing to bias the supplemental delineation samples toward the areas and depths of the highest exceedances observed in perimeter sampling during the RI activities. To minimize sampling frequency where no pre-existing bias exists, AlliedSignal will bias sample locations toward potential migration paths of the contaminant. Samples shall be biased based on professional judgment, area history, discolored soil, stressed vegetation, drainage patterns, field instrument measurements, odor, and other field indicators.

In two locations, it is expected that the delineation samples will coincide with post-excavation sampling activities. Specifically, the post excavation samples along the western wall of AOC 2B will define the western boundary of the deed notice in Area 2. Also, the southern post-excavation samples in the former lagoon area will define the southern boundary of the deed notice in Area 3.

Samples will be analyzed for contaminants of concern previously detected above the RDC and NRDC criteria. As such, the individual sampling methodology will vary based on the required delineation. All analysis will be performed in accordance with the methods described in the Quality Assurance Plan.

5.3 Documentation

AlliedSignal will prepare a deed notice to document certain conditions and restrictions on the property and to reflect the regulatory and statutory obligations imposed as a condition of using institutional and/or engineering controls. The deed notice will conform to NJDEP's typical deed notice specification and include:

- The location of the site including block, lot, township, municipality, and ISRA case number
- A brief description of the property included as an appendix to the deed notice
- The NJDEP concurrence with the delineation scheme as documented by the approval of this remedial action work plan
- As an attachment to the deed notice, a description of the in-place residual above the applicable RDC criteria that would allow for the unrestricted use of the property
- The type, concentration and specific location of the contaminants provided on site plans
- A description of institutional controls and associated monitoring and maintenance activities

- A description of engineering controls such as barriers, fences, covers and associated monitoring and maintenance activities
- A restriction stipulating that the demarcated area of the site is to be used for "non-residential uses only".

sumps will be installed intermittently along the trench system. The actual spacing between the collection sumps and the construction specifications of the perforated pipe will be specified as part of the basis of design activities scheduled prior to AlliedSignal's preparation of contractor bid documents.

AlliedSignal will periodically monitor the quality of the ground water recovered from the extraction trench system. This will be accomplished concurrently with the monitored natural attenuation program discussed within Section 7. This data will form the basis for petitioning the NJDEP to allow termination of the ground water collection activities.

6.2. Ground water capture below peat (AOC 2A and 3E)

Solutes were detected in the deep aquifer at monitoring well W-39D. Rather than pursue localized delineation of solutes beneath the peat in this area, AlliedSignal proposes to install a recovery well network with an associated zone of capture that extends to those deep monitoring wells at the site which do not exhibit an impact to ground water quality (these wells represent the delineation limits).

An aquifer characterization test was conducted from wells screened within the deep aquifer (Appendix C) to assess pumping rates necessary to extend the capture zone out to the "clean" deep monitoring wells. Specifically, the pollutants which have been detected at monitoring well W-39D will be removed via ground water extraction. Ground water extraction will be accomplished via the installation of a ground water recovery well or wells positioned so that the zone of capture will extend nominally to those deep monitoring wells which do not exhibit an impact to ground water quality (W-1D, W-15D, and W-17D). A flow rate of 5 to 15 gallons per minute is anticipated.

AlliedSignal will periodically monitor the quality of the ground water recovered from the deep aquifer. This will be accomplished concurrently with the monitored natural attenuation program discussed within Section 7. This data will form the basis for petitioning the NJDEP to allow termination of the ground water extraction and treatment activities in the future.

6.3 Ground water treatment system

The recovered shallow ground water from the trench system and the deep aquifer will be treated on-site prior to discharge. The extent of treatment will be dependent on the discharge alternative selected and the quality of the ground water. However, based on the characterization of the ground water, it is anticipated that some form of VOC removal will be required. Characterization data is included within Appendix B.

The estimated flow rate [illegible] on the extent of deep aquifer pumping required. [illegible] ducted in March 1999 to evaluate sustainable dis[illegible] zones attainable from pumping the deep aquifer (App[illegible] this flow range and the nature of the VOCs presen[illegible] AlliedSignal plans on installing a temporary treat[illegible] employ air stripping, carbon adsorption, or a comb[illegible] chnologies. Additional treatment may be required for [illegible] cessary to comply with discharge limitations under P[illegible] scenarios. Similarly, a treatment works application [illegible] also be obtained for air emissions resulting from th[illegible] he necessity for vapor-phase control will be evaluate[illegible] erization of the influent water, quantity of VOCs em[illegible] ent, and location of the treatment system on-site.

The duration of the ground w[illegible] nent system is estimated to be 3 to 5 years. Compliance [illegible] ue to occur during this time frame. Ground water [illegible] the monitored natural attenuation program (discus[illegible] il form the basis for terminating ground water re[illegible]

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7. Classification exception area

The site-wide ground water remedial measure proposed for the shallow aquifer is monitored natural attenuation. Natural attenuation can be defined as the reduction in contaminant concentration in ground water over time or distance due to naturally occurring physical, chemical, and/or biological processes. Factors contributing to natural attenuation include dispersion, dilution, sorption, volatilization, and bidegradation. To augment the natural attenuation process, post remediation ground water capture will occur for a period of up to 3 to 5 years hydraulically downgradient of the areas subject to mass removal. A ground water recovery well(s) will be installed beneath the silty clay/peat layer to capture solutes detected at monitoring well W-39D. However, a monitored natural attenuation program is not proposed for the deep aquifer. The reasons for this are that the mass removal actions are anticipated to significantly reduce the loading of solutes to the deep aquifer. In addition, the lower aquifer meets the requirements of a Class IIIB aquifer (3,000 mg/l of chlorides and 5,000 mg/l of total dissolved solids).

The chlorinated organic compounds found at the site undergo aerobic transformations that produce daughter products. For example, anaerobic degradation of Tetrachloroethane may produce a Trichloroethene, Dichloroethene, Vinyl Chloride and Chlorothene sequence of daughter products. The NJDEP's current CEA guidance document assumes that biodegradation is occurring as a first-order decay function. Chlorinated compounds degrade in a step-wise manner relative to second-, third-or fourth-order decay functions, this may seem to invalidate the use of natural attenuation at the site. However, current literature indicates that the combined effects of those factors contributing to natural attenuation in field situations (dispersion, dilution, etc.) produces an overall first-order decay function.

The assumption that natural attenuation of chlorinated compounds is occurring in field situations is based upon field case histories and theoretical studies as presented at the "Symposium on Natural Attenuation of Chlorinated Organics in Ground Water" (Dallas, Texas; September 11-13, 1996). The case histories presented at this symposium indicate that first-order decay is an appropriate way to report attenuation rates of chlorinated hydrocarbons (Imbrigotta et al., 1996[1]; Weaver et al., 1996[2]; Wiedemeier et al., 1996[3]; and, Wilson et al., 1996[4]). A first-order analytical solution, as presented within the NJDEP's CEA guidance document, is proposed initially to predict the natural attenuation values at the site. Calculations will be performed using site specific data on those compounds that exceed the Class IIA GWQS at the property line.

The use of monitored natural attenuation will require obtaining a CEA. Specially, the CEA is an area representing the duration and length of transport required for a contaminant to decrease to concentrations below GWQS. The following describes the variables anticipated to be used to estimate the necessary components of the CEA:

- The duration of transport will be based upon the following:
  - the attenuation half-life as determined by historical data,
  - the analytical concentration of the compound, and
  - the GWQS of the given solute.
- The length of transport will be based upon the following:
  - the duration of transport,
  - the transport velocity of the ground water, and
  - the retardation factor of the given solute.

After the initial analytical solution has been generated, ground water flow modeling will be used to conceptualize the behavior of the hydraulic flow regime. This approach involves several areas of effort. These areas include data compilation and review, data preparation for the model, model calibration and model verification for predictive simulation. Initially, the conceptualization of the hydraulic flow regime at the site entails the evaluation of the model suitability based upon the following criteria:

- The amount of hydrogeologic and ground water analytical data that is available from the site,
- The degree to which the behavior of the aquifer must be quantified, and
- The available and applicable cleanup technologies under consideration.

7.1. Description of proposed remedial action

Delineation activity findings support the following positions relative to impacted ground water at the facility:

- The ground water plume and its components have been delineated
- The source of the VOC contamination will be addressed via the soil remedial action plan discussed within this RAWP

- Exposure pathways to receptors do not exist based on hydrogeological analyses, solute migration patterns and surrounding land uses

- The impacted shallow ground water is not used for domestic, irrigations or industrial requirements within 1000 feet of the facility

- The extent of impacted off-site ground water migration is represented by vinyl chloride. Vinyl chloride is a breakdown product indicating that the plume is naturally degrading.

The proposed ground water monitoring is designed to:

- Detect any downgradient plume migration

- Provide additional analytical data (geochemical indicators) which is intended to support that whether natural attenuation of ground water contaminants is occurring.

Geochemical indicators provide a signature of the degradation processes and estimate the magnitude of degradation. The proposed remedial action for ground water will include the following tasks.

- Monitor chlorinated solvent concentrations over time and down gradient distance from select AOC

- Develop a conceptual attenuation model for the compounds of concern

- Obtain characterization data for subsurface geochemical conditions

- Refine attenuation model based on monitoring data.

Monitoring wells W-3, W-15S, W-17S, W-22S, W-24S,W-25S, W-31S, W-32S, W-37S and W-38S will be sampled on a quarterly basis for VOC (EPA Method 624 plus 15 forward library search) during the first year, and semi-annually thereafter. Geochemical indicator parameters, Redox potential, and Dissolved Oxygen will be analyzed from ground water samples collected upgradient (W-24S), within (W-17S), and downgradient (W-31S) of the plume.

A conceptual attenuation model would be developed based on the data. A decrease in concentration of a chlorinated compound such as 1,1,2,2-Teterachloroethane or Trichloroethene and an increase and subsequent decrease in degradation daughter compounds such as 1,1-DCA, *cis*-DCE, 1,1-DCE to vinyl chloride or chloroethane provides empirical evidence of biologically mitigated attenuation. The result of this process would be a

reduction in the total mass of the chlorinated compounds dissolved in ground water. The rate of degradation and travel distance of the parent or daughter compounds would be estimated using first order kinetic assumptions and standard transport equations that consider seepage velocity, and retardation factors.

Mass removal of chlorinated compounds is typically limited by the presence and concentration of electron donors and electron acceptors in the impacted ground water. Naturally occurring organic carbon or anthropogenic sources such as benzene, toluene, ethylbenzene or xylene can serve as electron donors and compounds such as nitrate, sulfate, sulfide, ferrous iron, carbon dioxide, and methane can serve as electron acceptors. Since reducing conditions are typically more conducive for biodegradation of chlorinated compounds the presence of oxygen (an electron acceptor under aerobic conditions) would inhibit the reductive dechlorination process. As a group electron donors and acceptors, as well as pH, temperature and redox potential are considered geochemical parameters and are included to evaluate intrinsic attenuation potential. Geochemical and contaminant analytical data collected during the monitoring period would be used to re-evaluate the conceptual model.

7.2. Cleanup goals and remedial monitoring plan/effectiveness evaluation plan

A summary report will be generated documenting the procedure and analytical results after the completion of each quarterly or semi-annual sampling event. The quarterly summary reports will include the following:

- Summary of field activities, with focus on sampling performance
- Summary table of analytical data including a tabularization of VOC concentrations detected relative to the
- Appendices containing laboratory data packages and field notes
- Inclusion of past data to evaluate analytical findings/trends.

An effectiveness evaluation will be provided annually. Data will be tabularized and graphed (concentration versus sampling data) per parameter. Empirical decay coefficients per compound can be estimated from the data. Using these estimates, and site specific param collected during the delineation activities, a prediction of the length and duration of transport per compound can be calculated. This information and the empirical data will be used to confirm attainment of Class IIA GWQS for the termination of the ground water compliance monitoring program.

8. Remedial action implementation schedule

Figure 8-1 contains the proposed schedule of events for the RA program.

It is anticipated that a RA report will be submitted within approximately 8 months of commencement of field activities. Field activities will commence upon the following : 1) receipt of the NJDEP's final approval of the RAWP (conditional ground water approval); and 2) preparation, submittal, and approval of all permits necessary to perform the proposed remedial activities. As shown in the schedule, the duration of the permitting activities is anticipated to be approximately four months.

To organize activities, mark out utilities and coordinate subcontractors, a minimum of two weeks is proposed for mobilization and field preparation. The majority of the field components are expected to be completed within approximately 5 months.

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Table 2-1

PROPOSED REMEDIAL ACTIONS
CLOSED AREAS OF CONCERN
AlliedSignal, Elizabeth, NJ

NJDEP AOC No.	Description	Status	Anticipated Actions	Notes
1A	Former Gasoline & Diesel USTs	NFA per NJDEP	Include in DER	3,4,5
1B	Former Truck Parking Area	NFA per NJDEP	Include in DER	3,5
1C	Administration Building AST	NFA per NJDEP	Include in DER	3,5
1D	Alleged Drum Storage Area	NFA per NJDEP	Include in DER	3,5
2	Former Sulfuric Acid Production Area		Implement Monitored Natural Attenuation Program & Include in DER	2
3B	Drum Storage Area (adjacent Boring Area B-12)	NFA per NJDEP	None	3
3C	Drum Storage Area (adjacent Boring Area B-12)	NFA per NJDEP	None	3
3E	Chloroform Tanks	NFA per NJDEP	None	3
3G	G-11 Tanks	NFA per NJDEP	None	3
4B	Drum Storage Areas	NFA per NJDEP	None	3
4C	Temporary Drum Storage Area	NFA per NJDEP	None	3
4D	Alleged Drum Storage Area	NFA per NJDEP	None	3
5	Electrical Substations	NFA per USEPA	NFA per NJDEP in 1991; Include in DER	1,3
7	Background & Random Soil Borings	NFA per NJDEP	None	3
9	Chlorocarbon Terminal	NFA per NJDEP	None	6

1) NFA per 1992 HSWA permit
2) Interim remedy in place
3) See NJDEP July 13, 1994 letter to L. Mattioli
4) See Geraghty & Miller September 16, 1994 letter to NJDEP
5) Per October 18, 1995 NJDEP letter to L. Mattioli, a DER will not be approved until a ground water RAW is approved
6) See NJDEP August 5, 1998 letter to William Yanovitch

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Table 2-2

PROPOSED REMEDIAL ACTIONS
OPEN AREAS OF CONCERN
AlliedSignal, Elizabeth, NJ

NJDEP AOC No.	Description	Status	Anticipated Actions	Notes
1	Former Fluoroisobutylmonomer Production		Implement Monitored Natural Attenuation Program	1
2B	Old Oil Spill Area	LNAPL present	Mass Removal with GW Recovery	1
3	Former Genetron Process & Tank Farm	DNAPL present	Mass Removal with GW Recovery	1
3A	Drum Storage Area (adjacent to Borings B-11)		Soil Cover/Pave & Include in DER	2,3
3D	Process Structures		Soil Cover/Pave & Include in DER	2,3
3F	Fuel Oil Tanks		Soil Cover/Pave & Include in DER	2,3
3H	Former Lagoon Area		Mass Removal with GW Recovery	2,3
4	Fluoropolymers Production		Implement Monitored Natural Attenuation Program	1
4A	Borings B-24 Area		Pave & Include in DER	2,3
6	Drainage Ditches	No Remedial Action	Surface Water Monitoring	1
8	Stressed Vegetation	Remediated 10/95	Periodic Lime Application	3

1) On-going investigation
2) See NJDEP July 13, 1994 letter to L. Mattioli
3) Per October 18, 1995 NJDEP letter to L. Mattioli, a DER will not be issued until a ground water RAW is approved.

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APPENDIX A

RESULTS OF TEST TRENCHING ACTIVITIES

APPENDIX A

Results of Test Trench Activities

Introduction

This document serves to summarize supplemental field delineation activities conducted at the AlliedSignal site, located on North Avenue in Elizabeth, N.J., during the week of February 22, 1999. The field program included the completion of ten test trenches, collection of soil samples for volatile organic compounds (VOCs) and treatability studies, and the installation of temporary PVC well screens in order to monitor for the presence/absence of light or dense non-aqueous phased liquids (LNAPL or DNAPL, respectively). Figure A-1 depicts the locations of the test trenches.

Methodology

Field activities were conducted by Handex of Morganville, N.J. under the supervision of an O'Brien & Gere geologist. Test trenches were continued through the overburden material until the first naturally deposited, organic-rich, clay, silty clay, or peat ("meadow mat") was encountered. At no location were test trenches continued beyond the vertical limits of the first clay/peat layer encountered. Detailed lithologic descriptions were recorded at each of the ten test trench locations. Digital photographs were obtained of the trenching activities to assist in documenting visual field observations.

A single soil sample from each of the ten test trenches was collected for the analysis of VOCs. In addition, a 5-gal bucket of soil was collected from nine of the ten trenches for the purpose of completing a treatability study (see Appendix B for treatability sampling results). After the clay/peat was encountered, a single 4 inch PVC well screen was placed in the approximate center of each excavation and the trench was backfilled with clean gravel (crush and run). The purpose of the PVC was to visually determine the presence of a floating (light non-aqueous phase liquid) or sinking (dense non-aqueous phase liquid) product in shallow ground water.

Results

Throughout field activities trench cuttings, workers' breathing zones, and ambient air conditions were monitored for the presence of VOCs using a photo ionization detection. The results of monitoring did not indicate any need to upgrade the personal protection level from modified level D to Level C. A table documenting the soil sampling results is included within this appendix.

The following presents a summary of field trenching activities and findings:

Trench 1 - Trench 1 was completed in the area identified as the former Sulfuric Acid Plant.

Trench 1 was terminated at 5 ft below grade, in a gray to very dark gray silty clay containing black organic material (predominantly phragmites stems). Approximately 0.5 to 2 ft below grade a yellowish-gray fine to very coarse grained sand with pieces of sulfur was encountered with very strong sulfur-like odors. Water was encountered at 5 ft below grade. No sheen or product was observed.

Trench 2 - Trench 2 was completed in the location identified as the former lagoon area.

Trench 2 was terminated at approximately 18 ft below grade. No clay or peat layer was encountered at this location, however trenching activities were terminated due to excessive caving of the excavation and strong odors. Water was encountered at approximately 4 ft below grade, no sheen or product was noted. Beginning at approximately 8 ft below grade, and continuing until the terminating depth of the trench (approximately 18 ft below grade) a black, very fine grained, silty material was encountered (consistent with characteristics of a lagoon sludge). The material was ribboned with a lighter gray, grease-textured material and some pebble to cobble sized chunks of a bluish material. The black

material yielded a strong, pungent odor characteristic of solvent or refrigerant. Due to unstable, unconsolidated, saturated conditions of the subsurface, the excavating equipment could not continue to a depth deeper than 18 ft below grade. Caving overburden material from beneath the surface created an enlarged hole (approximately 12 ft in diameter) and immediately hazardous working conditions.

Trench 3 - Trench 3 was completed in the location identified as the former tank farm area.
Trench 3 was terminated at approximately 5 ft below grade in a very dark, olive-gray, silty clay containing black organic material, reed fragments, and remnant phragmites stems. Water was encountered at approximately 4 ft below grade. A ribboned sheen was observed flowing into the excavation. A strong "old petroleum" like odor was observed coming from the basal silty clay of the trench.

Trench 4 - Trench 4 was completed in the location identified as the former tank farm area.
Trench 4 was terminated at approximately 6.5 ft below grade in a black and olive-gray silty clay containing organic material, reed fragments, and remnant phragmites stems. Water was encountered at approximately 4.5 ft below grade. A sheen and a strong odor was observed.

Trench 5 - Trench 5 was completed proximal to well W-23S (previously identified as a potential DNAPL concern). Trench 5 was terminated at approximately 5 ft below grade in a gray-black silty clay with organic material, reed fragments, and remnant phragmites stems. Water was encountered at approximately 4.5 ft below grade. No sheen or odor was observed.

Trench 6 - Trench 6 was completed in the location identified as the former lagoon area.
Trench 6 was terminated at approximately 6.5 ft below grade in an olive-gray and very dark gray silty clay with organic material, reed fragments, and phragmites stems. The top surface of the clay appeared to incline (decrease in elevation) westward. Six cylinders were removed from approximately 2 to 4 ft below grade at this location. The cylinders were rusted, partially corroded, and previously punctured, without identifying marks. Water was encountered at approximately 5 ft below grade. A viscous, dense, black free product, and an iridescent floating product was observed entering the excavation at the approximate same depth as water. A sweet solvent or refrigerant-like odor was observed.

Trench 7 - Trench 7 was completed 60 ft northeast of W-16S (previously identified as a potential DNAPL concern). Trench 7 was terminated at approximately 12 ft below grade in an olive-gray clay finely interbedded with very thin laminae of reddish-brown silty clay immediately overlying a black clay tightly interwoven with fine-roots and significant organic material. A mephitic odor was observed from the basal black organic peat/clay. Water was encountered at approximately 4.5 ft below grade. No sheen or product was observed.

Trench 8 - Trench 8 was completed 130 ft northeast of W-16S (previously identified as a potential DNAPL concern). Trench 8 was terminated at approximately 15 ft below grade in a tight, dense, olive-gray clay with little to no silt immediately overlain by black clay finely interbedded with thin laminae of dark gray slightly silty clay and tightly interwoven with fine-roots and significant organic material. A strong mephitic odor was observed from the organic material. Water was encountered at approximately 4.5 ft below grade.

Trench 9 - Trench 9 was completed southwest of W-23S (previously identified as a potential DNAPL concern). Trench 9 was terminated at approximately 12.5 ft below grade in an interbedded sequence of gray silty clay and black clay laminae, overlying a black clay tightly interwoven with fine-roots and significant organic material. Water was encountered at approximately 4.5 ft below grade. A sheen and free product was observed in addition to a creosote-like odor. The interbedded clay and silty clay encountered at the base of the excavation demonstrated a petroleum-like odor.

Trench 10 - Trench 10 was completed at the location previously identified as a potential LNAPL concern. Trench 10 was terminated at approximately 16 ft below grade in a black and olive-gray, dense, tight clay immediately overlain by a gray-black clay tightly interwoven with fine-roots and significant organic material. Water and a black to very dark brown free product was encountered at approximately 2 ft below grade. A very strong petroleum odor was noted. A residual sheen was observed on soil from approximately 2 to 14 ft below grade.

As is discussed in Appendix B, soil samples from test trenches 2, 4 and 10 were selected for treatability testing based upon the soil analytical results (see test trenches sample results table). Furthermore, excavation limits depicted within the RAWP were finalized within AOC 2A, AOC 3E and AOC 3H based in part on the findings discussed within this appendix. Figure A-1 indicates which compounds were found at each test trench above the NJDEP Impact to Ground Water Soil Cleanup Criteria.

AlliedSignal Inc.
Elizabeth, NJ
Test Trenches Sampling Results

Sample ID LabID Date Matrix Units	NJ RDC Soil Cleanup Criteria mg/kg	NJ NRDC Soil Cleanup Criteria mg/kg	NJ IGW Soil Cleanup Criteria mg/kg	Trench-1 114901 02/24/99 Water mg/kg	Trench-2 114902 02/24/99 Water mg/kg	Trench-3 114903 02/24/99 Water mg/kg	Trench-4 114904 02/24/99 Water mg/kg	Trench-5 114905 02/24/99 Water mg/kg
Volatile Organic Compounds								
Methylene Chloride	49	210	1	U	U	U	U	U
Trichlorofluoromethane	NA	NA	NA	U	U	U	U	U
1,1-Dichloroethene	8	150	10	U	U	U	U	U
trans-1,2-Dichloroethene	1000	1000	50	U	U	U	U	U
cis-1,2-Dichloroethene	79	1000	1	U	U	U	U	U
Chloroform	19	28	1	U	1500 R N I	U	24 J R I	0.12 J
1,2-Dichloroethane	6	24	1	U	1400 R N I	U	U	U
Carbon Tetrachloride	2	4	1	U	U	U	1000 R N I	U
Trichloroethene	23	54	1	U	770 R N I	U	U	U
1,1,2-Trichloroethane	22	420	1	U	U	U	U	U
Tetrachloroethene	4	6	1	U	U	U	U	U
1,1,2,2-Tetrachloroethane	34	70	1	U	32000 R N I	U	U	U
Chlorobenzene	37	680	1	U	U	U	U	U
Ethylbenzene	1000	1000	100	0.067 J	U	U	U	U
Xylene (Total)	NA	NA	NA	0.36 J	U	U	U	U

Notes:
NJ RDC - New Jersey Residential Direct Contact
NJ NRDC - New Jersey Non-residential Direct Contact
NJ IGW - New Jersey Impact to Ground Water
R - sample result exceed NJ RDC Soil Cleanup Criteria
N - sample result exceed NJ NRDC Soil Cleanup Criteria
I - sample result exceed NJ IGW Soil Cleanup Criteria
U - Compound not detected above method detection limit

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AlliedSignal Inc.
Elizabeth, NJ
Test Trenches Sampling Results

Sample ID	NJ RDC	NJ NRDC	NJ IGW	Trench-6	Trench-7	Trench-8	Trench-9	Trench-10
LabID	Soil	Soil	Soil	115540	115541	115542	115543	115544
Date	Cleanup	Cleanup	Cleanup					
Matrix	Criteria	Criteria	Criteria	Water	Water	Water	Water	Water
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Volatile Organic Compounds								
Methylene Chloride	49	210	1	U	0.96 J	U	U	U
Trichlorofluoromethane	NA	NA	NA	U	5	U	U	1.3
1,1-Dichloroethene	8	150	10	U	U	U	2.2	U
trans-1,2-Dichloroethene	1000	1000	50	1.9	U	U	U	U
cis-1,2-Dichloroethene	79	1000	1	1.9 I	U	U	U	U
Chloroform	19	28	1	U	48 R N I	0.16 J	1.5 J I	0.14 J
1,2-Dichloroethane	6	24	1	U	U	U	U	U
Carbon Tetrachloride	2	4	1	U	U	U	U	U
Trichloroethene	23	54	1	1.4 I	U	U	U	U
1,1,2-Trichloroethane	22	420	1	0.12 J	U	U	U	U
Tetrachloroethene	4	6	1	2.7 I	U	U	U	0.19
1,1,2,2-Tetrachloroethane	34	70	1	31 I	U	U	U	U
Chlorobenzene	37	680	1	U	U	U	U	1.2 I
Ethylbenzene	1000	1000	100	0.37 J	U	U	U	0.25 J
Xylene (Total)	NA	NA	NA	3.1	U	U	U	0.49 J

Notes:
NJ RDC - New Jersey Residential Direct Contact
NJ NRDC - New Jersey Non-residential Direct Contact
NJ IGW - New Jersey Impact to Ground Water
R - sample result exceed NJ RDC Soil Cleanup Criteria
N - sample result exceed NJ NRDC Soil Cleanup Criteria
I - sample result exceed NJ IGW Soil Cleanup Criteria
U - Compound not detected above method detection limit

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Appendix C
Summary of aquifer characterization activities

Amended Remedial Action Work Plan
AlliedSignal Inc.
Elizabeth, NJ Facility
(ISRA Case No. E86103)

AlliedSignal Inc.
Morristown, New Jersey

Rec'd 8/2/99 w/o Coverlet
SBM

March 1999

O'BRIEN & GERE
ENGINEERS, INC.

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Exhibit

Raw time-drawdown data per well (Microsoft Excel format)

1. Introduction

This report summarizes the aquifer characterization activities undertaken by O'Brien & Gere Engineers, Inc. beginning in February 1999 at the AlliedSignal Inc. (AlliedSignal) facility in Elizabeth, New Jersey. A site location map is provided as Figure 1. Certain aspects of the program were performed with assistance from Handex of New Jersey, Inc. (Handex) at the request of AlliedSignal. A general site plan including monitoring well locations is included as Figure 2.

1.1. Summary of activities

Aquifer characterization activities were conducted to assess the transmissivity and storativity of the confined aquifer. Obtaining this information will allow AlliedSignal to evaluate well placement and spacings to begin pumping the confined aquifer. The scope of services performed during this investigation included the following:

1) Completion of a tidal study utilizing select monitoring wells to observe possible tidal influences;

2) Installation of four additional double-cased deeper aquifer monitoring/observation wells (designated as W-42D, W-43D, W-44D, and W-45D);

3) Completion of hydraulic parameter step testing using multiple pumping rates at two of the four new wells;

4) Completion of a 72-hour aquifer performance test at monitoring well W-45D; and,

5) Estimation of spacings between possible recovery wells and sustainable discharge rates at each pumping well.

1.2. Site geology and hydrogeology

As is discussed in detail in Section 2 of the March 1999 Remedial Action Work Plan, there are two discrete water bearing zones at the site: a shallow water bearing zone consisting of 8 to 15 feet of fill type materials (silty sands and clay with intermixed gravel, cobbles, and boulders) which directly overlies a silty clay/peat confining layer. This silty clay/peat layer is anywhere from a few feet to over 10 feet thick; geotechnical

permeability testing indicates this material has a vertical permeability of approximately 1 x 10^{-7} cm/sec. Underlying the confining layer is a confined aquifer. Extending from the bottom of the silty clay/peat layer 15 to 20 feet vertically, the confined aquifer consists of silty sands with varying amounts of intermixed clays and gravels. The aquifer becomes finer grained with depth and at approximately 45 to 50 feet below grade becomes a dense, silty clay. This dense silty clay directly mantles the Brunswick Shale of the Passaic Formation. Bedrock is anticipated to occur from approximately 70 to 90 feet below grade throughout the site.

Ground water quality in the upper water bearing zone exceeds the Class IIA Ground Water Quality Standards (GWQS) for chlorinated volatile organic compounds. Recent ground water sampling of W-39D indicates site-related volatile organic compounds are present within the confined layer. Since the confined aquifer meets the definition of a Class IIIB aquifer, there are no GWQS. The extent of these volatile organic compounds within the confined aquifer has previously been defined by W-17D, W-15D and W-1D since none of these wells are impacted by site related solutes (Figure 3).

1.3. Report organization

To clearly present the activities conducted, this report is organized in five sections as outlined below:

Section 1 - Presents an introduction to this investigation summarizing the site geology, a summary of the activities documented in this report and the report organization.

Section 2 - Presents the tidal study and monitoring well installation information.

Section 3 - Presents the aquifer performance testing data, including the step drawdown testing and 72-hour pumping test.

Section 4 - Provides an analysis of sustainable pumping rates and expected drawdown at various radii from a pumping well.

Section 5- Summarizes the findings of this investigation.

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2. Tidal study and well installation program

2.1. Tidal study

A tidal study was completed to gauge potential influence upon the ground water at the site, in general. Two wells were selected for observation: monitoring wells W-17S and W-17D. These wells were chosen for observation based upon their central location at the site. Furthermore, monitoring wells W-17S and W-17D monitor the first encountered water bearing zone and the confined aquifer, respectively. Since these two wells are only a few feet apart, they were observed in an attempt to differentiate the tidal effects, if any, between the two water bearing zones at the site.

Ground water levels were recorded at monitoring wells W-17S and W-17D for a 13-day period from February 3 to February 15, 1999. Solinst Leveloggers were deployed in these wells to record the water levels. As these transducers are pressure sensitive, an additional Levelogger was used to monitor barometric fluctuations. This barometric Levelogger was hung on the inside of MW-17S between the protective stick-up guard casing and the PVC riser well pipe. Graphs of the pressure changes (water level) data for the barometric still well, W-17S and W-17D are provided in Appendix A.

Throughout the entire monitoring period, a maximum change of approximately 1.05 feet was observed in W-17S, and a maximum change of approximately 0.7 feet was observed in W-17D. The maximum changes over a 24-hour period during the tidal monitoring period was approximately 0.75 feet in W-17S, and 0.55 feet in W-17D. In both wells, the period from mid-day February 11 to mid-day February 12 showed the greatest change. This phenomenon is not explained by precipitation events, as local climatological data during this period was gathered (Appendix B). Rather, it appears that most of the changes can be explained when the barometric Levelogger data plot is compared to W-17S and W-17D. When the plots for W-17S and W-17D are corrected for the barometric readings, and compared to tidal data, only a minor tidal influence in either W-17S or W-17D is observed. As expected, the tidal fluctuation in W-17S is less than that seen in W-17D. Of significance, the observed tidal influence was considered small enough to be disregarded during the pumping test and data evaluation.

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2.2. Well installation program

The well installation program resulted from the previous detections of site-related compounds in ground water at W-39D. Four additional confined aquifer monitoring wells were installed during this program: W-42D through W-45D. These wells were positioned around MW-39D at various distances and orientations to allow for aquifer heterogeneity to be evaluated. The location of these wells is shown on Figure 2.

The well installation services were provided by Handex. Well installation logs are presented as Appendix C. As shown in the logs, the first encountered water bearing zone (above the silty clay/peat confining layer) in the area surrounding W-39D consists primarily of gravelly sands and silts. The underlying silty clay/peat layer is encountered at approximately 14 feet below grade which demarcates the bottom of the first encountered water bearing zone at the site. A Shelby tube sample was collected during the drilling program from the confining layer at W-42D (13 to 15 ft below grade) which indicated a vertical permeability of 7.6 x 10^{-8} cm/sec (Appendix C). The silty clay/peat layer extends from approximately 14 feet to 18 feet below grade. Underlying this confining layer is a coarse to fine sand which extends from approximately 18 feet to 30 feet below grade. Underlying the sand is a silt-based layer which extends to approximately 45 feet below grade. This silt layer grades vertically into a stiff clay which in turn extends to bedrock. Bedrock is the Brunswick Shale of the Passaic Formation which is encountered at approximately 70 feet below grade in W-42D. A Shelby tube sample of the clay was collected from the 45-47 foot zone at W-45D, which demarcates the bottom of the confined aquifer. A vertical permeability of 3.3 x 10^{-8} cm/sec was determined for the underlying clay (Appendix C).

Outer casings were installed 5 feet (if possible) into the silty clay/peat confining layer at each well. The casings were then grouted in place, sealing off the first encountered water bearing zone from the underlying confined aquifer. Based upon the grain size of the soils encountered, the four new monitoring wells were constructed using 0.010 slot sized PVC well screen from approximately 20 to 45 feet below grade. A 5-foot solid PVC sump was attached to the bottom of the screened interval (to prevent pumping within the screened interval of any well). Each well was developed using a submersible pump prior to beginning the step drawdown testing described in the following section.

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3. Aquifer performance testing

Aquifer performance testing was performed in two stages: preliminary pumping rate step drawdown testing, followed by the 72-hour aquifer performance ("pumping") testing. The purpose of step drawdown testing is to assess the optimal pumping rate for the aquifer performance test. Typically, it is that rate which induces a 75% drawdown of the water column in the test well.

3.1. Equipment setup

The equipment described below was used for both the step drawdown test and the 72-hour aquifer performance test.

Five monitoring wells (W-45D, W-44D, W-42D, W-39D, and W-23S) were connected to a Hermit 8-channel data-logger for hydraulic monitoring. Three additional monitoring wells (W-43D, W-17D and W-17S) were hydraulically monitored using in-well Troll transducer/data-loggers. Water level measurements from each well were based on the top of inner casing as the datum. Well pumping was accomplished using a submersible pump. Monitoring wells W-43D, W-17D and W-17S were monitored with Troll transducer/Hermit data-logger because it was reasoned that due to their distance from the pumped well (W-45D) variable frequency data collection intervals were not required.

3.2. Step drawdown testing

A step drawdown test is a single-well test in which the well is pumped at a low constant-discharge rate until the drawdown within the well stabilizes. The pumping rate is then increased to a higher constant-discharge rate and the well is pumped until the drawdown stabilizes once more. This process is repeated at least three times. The information obtained by the step drawdown test was used to determine the optimal pumping rate for the aquifer performance test.

Based upon preliminary observations during the development of the newly-installed confined aquifer monitoring wells, it was noted that W-42D would not produce a sufficient volume of water for a sustained pumping program (1 gallon per minute was the achievable development rate). Consequently, wells W-44D and W-45D were evaluated as potential pumping test wells. Pumping rates were initially determined based upon the well development data. Three pumping rates (steps) were performed at well W-44D. At the

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time of testing, the water column in W-44 D was 38.01 feet. Each of the first two steps was run for 1 hour, with time allowed for sufficient recharge between steps. Due to equipment problems, the third step at W-44D was run for 45 minutes. The raw data for the W-44D step testing is provided in Appendix D.

Three step tests were performed at well W-45D. Again, pumping rates were initially determined based upon the well development data. At the time of testing, the water column in W-45D was 37.52 feet. Each of the three steps was run for at least 1 hour, with time allowed for sufficient recharge between steps. The raw data for the W-45D step testing is provided in Appendix D.

Pumping rates during the development of this well indicated this well would have a low sustainable discharge rate. One step test was performed at W-42D to attempt to evaluate a sustainable pumping rate; W-42D went dry in 20 minutes at a flowrate of 3.5 gallons per minute (gpm). As such, this well was not considered further as a possible pumping well.

3.3. Step drawdown test analysis

Using the step test data presented in Appendix D, graphs of drawdown versus yield were developed. The graphs were used to develop constants in a formula which yield an optimal pumping rate. The pumping rate equations are also presented in Appendix D. The calculations indicate that theoretical pumping rates of 11.8 gpm for W-44D, and 8.5 gpm for W-45D are sustainable. Due to W-45D being closer to W-39D (sampling indicates there are site related solutes in the confined aquifer at this location), W-45D was selected as the pumping well for the aquifer performance test.

The step testing results were reviewed in light of the soil boring log descriptions. It is evident that the more permeable, coarser portions of the confined aquifer extend from just below the confining unit (the silty clay/peat layer) extending vertically approximately 12 feet. The confined aquifer becomes finer grained with depth, becoming a stiff to very stiff silty clay at approximately 45 feet below grade. While the step drawdown tests provided an indication of the sustainable discharge rates, the finer grained nature of the aquifer below 45 feet below grade indicates that reduced flow rates over time were probable. As such, a more conservative sustainable flow rate of 6.3 gpm was selected for the pumping test, as described below.

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3.4. Pumping test

The purpose of a pumping test is to calculate the hydraulic characteristics of an aquifer by pumping water from a well at a constant rate and measuring the drawdown over time in wells at known distances from the pumping well.

Two 25,000 gallon water storage tanks were mobilized to the site to contain the ground water collected during the test. On March 23, 1999, a 72-hour aquifer performance test was started at W-45D at the conservative flow rate of 6.3 gpm. Drawdown progressed throughout the day as expected. However, approximately 300 minutes into the test, the ground water level in the pumping well began to rapidly decline. The test was abandoned after 400 minutes since the well was essentially dewatered. Recovery data was monitored for approximately 1000 minutes after this test. A review of the data supports the inference that a sustainable pumping rate cannot be maintained once the water level within the well reached the finer grained (silt-based) sediments. This hydraulic transition was not observed during the step-drawdown tests since the step drawdown tests were not conducted for a sufficient amount of time to allow the water level to reach the finer grained sediments. The aquifer was allowed to recharge overnight. The data was analyzed, and the aquifer performance test was re-initiated on March 24, 1999 at 8:00 AM, using a pumping-rate of 4.35 gpm.

The second test was successful with drawdown occurring throughout the 72-hour duration of the test. Approximately 46% drawdown of the available water column was observed at W-45D during the test. This represents over 60% drawdown if the silt based interval is not considered in the available water component. Ground water level recovery was monitored for approximately 3 days following the termination of pumping.

3.5. Pumping test analysis

Data from both aquifer performance tests were downloaded from the Hermit and Troll data-loggers upon completion of the testing. This raw data is extensive, and is not provided as a print-out with this report; rather, the data is provided as a Microsoft Excel spreadsheet on disk. The data is organized by well, with time and drawdown/recovery. Also, the water level data has been graphed for each of the monitored wells, and is provided in Appendix E. The aquifer performance test data are provided in graphical format (Appendix E) for wells W-39D, W-42D, W-44D, W-45D, and W-23S, representing the recovery data from the first test, and the drawdown and recovery data from the second test. Appendix E also contains data graphs for the entire monitoring test period for wells W-17S, W-17D, and W-43D.

Drawdown versus time graphs were generated for the recovery phase of the first test, and the drawdown and recovery phases of the second test for each well included in the program. This data was inputted into the Aqtesolv (Duffield, Rumbaugh) Version 2.01 computer program, which determines values for transmissivity (T) and storativity (S) for each plot. The Type Curves were selected for analysis of this confined aquifer. These plots are included in Appendix F. A summary of the T and S values attained from each test are provided below:

Table 1. Transmissivity and Storativity

	Transmissivity (T) gal/min/ft	Storativity (S) (Dimensionless)
TEST-1 (6.3 gpm) Recovery		
W-39D	0.66	0.0034
W-42D	1.25	0.0025
W-44D	1.82	0.0032
W-45D*	0.34	0.12
TEST-2 (4.35 gpm) Pumping		
W-17D**	0.0027	0.00077
W-39D	0.64	0.0024
W-42D	1.12	0.0014
W-43D	8.11	0.0086
W-44D	1.86	0.0015
W-45D*	0.12	0.057
TEST-2 (4.35 gpm) Recovery		
W-17D**	3.20	0.0037
W-39D	0.58	0.0022
W-42D	0.64	0.0015
W-43D	2.49	0.021
W-44D	0.78	0.0011
W-45D*	0.84	0.15

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Notes: *Generally, transmissivity and storativity values calculated from the pumping well are unreliable due to pumping rate fluctuations and turbulent flow conditions that exist during pumping.

**Due to pumping rate fluctuations effect and this wells' distance from the pumped well, the transmissivity and storativity values calculated during pumping are not considered reliable. Rather, the recovery portion of the test is considered to yield a more accurate value.

From the above table, transmissivity values in the areas surrounding W-39D range from a low of 0.64 gal/min/ft at W-39D itself to a high of 8.11 gal/min/ft at W-43D.

4. Interpretation

The transmissivity and storativity values determined for the observation wells (W-17D, W-39D, W-42D, W-43D, W-44D and W-45D) and the pumping well (W-45D) are summarized in Appendix G. A high degree of aquifer heterogeneity is evident in the confined aquifer as transmissivity values between wells varies from a low of 0.64 gpm/ft at W-39D (922 gal/day/ft) to a high of 8.11 gpm/ft (11,678 gal/day/ft) at W-43D. An analysis of the well development discharge rates, observations made during the pumping test, the range of transmissivity values, and grain size observations made during the drilling of these wells (see Appendix C) supports the following general statements:

- those wells installed in the southern part of the facility (W-17D, W-43D and W-44D) exhibit higher transmissivity (and thus hydraulic conductivity) than those wells installed in the northern part of the facility (W-39D, W-42D and W-45D);
- the confined aquifer exhibits a fining downward grain size distribution;
- the upper 15 to 20 feet of the confined aquifer produces significantly more water than the lower 10 to 15 feet of the confined aquifer; and,
- the pumping test derived transmissivity values are probably more representative of the upper 15 to 20 feet of aquifer (W-45D was rapidly dewatered once the water level in the well declined and reached the finer grained sediments).[1]

Appendix G provides a Theis-based analytical solution for sustainable pumping rates at the site. For illustrative purposes, an average aquifer transmissivity and storativity value was calculated for the analytical solution. Using this approach, the calculated sustainable discharge rate over 100 days is approximately 20 gpm (see Appendix G). Calculation of drawdown at various radii over time support that recovery well spacings of 150 to 200 feet would be sufficient to provide capture.

[1] Well W-45D was initially pumped at 6.3 gpm. This rate caused the water level to decline into the finer grained sediments within the confined aquifer.

The heterogeneity evident throughout the confined aquifer indicates that using an average transmissivity and storativity value for the entire site will lead to erroneous conclusions. Well spacings will vary depending upon the area over which pumping is to occur. For example, in the area around W-42D, W-43D and W-44D, wells could be placed up to 200 feet apart. Sustainable discharge rates theoretically could approach 20 gpm, but since the pumping test derived transmissivity calculations are biased towards the upper more permeable portion of the confined aquifer, sustainable discharge rates are more likely closer to 10 gpm. Well spacings within the confined aquifer in the northern part of the site could be 50 to 100 feet apart, with sustainable discharge rates being anywhere from 3 to 5 gpm.

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5. Summary of findings

The purpose of the aquifer characterization activities discussed within this report was to assess pumping well locations and associated sustainable discharge rates. This data will be used to design a ground water extraction program for the solutes detected within the confined aquifer at W-39D. Four confined aquifer monitoring/observation wells (W-42D through W-45D) were installed around W-39D, and were located at various distances and orientations from each other so that aquifer heterogeneity could be determined. During the installation of these wells, it was observed that the confined aquifer at the site extends from just below the silty clay/peat confining layer for an additional 25 feet. The confined aquifer becomes finer grained with depth indicating the permeability of the confined aquifer is highest just below the confining layer and decreases with depth.

Step drawdown testing was conducted at 3 wells (W-42D, W-44D and W-45D) to evaluate a suitable pumping well and pump rate for the 72 hour pumping test. The results of the step drawdown testing program indicated W-45D was a suitable pumping well. The step drawdown tests yielded sustainable discharge rates that were biased towards the more permeable portions of the confined aquifer, resulting in an initial over-estimation of sustainable pumping rates for the 72 hour test. As such, the first rate chosen for the pumping test, 6.3 gpm, resulted in dewatering of W-45D within 400 minutes. The pumping test was resumed and successfully completed using a lower pumping rate (4.35 gpm).

A high degree of confined aquifer heterogeneity is evident as transmissivity values between wells varies from a low of 0.64 gpm/ft at W-39D (922 gal/day/ft) to a high of 8.11 gpm/ft (11,678 gal/day/ft) at W-43D.

Within the area of the pumping test, sustainable discharge rates will be lower in the north and increase towards the south. An analytical Theis-based solution indicates that sustainable discharge rates of 3 to 5 gpm are possible in the northern part of the area covered by the pumping test with associated well spacings of 50 to 100 feet. In the southern area, sustainable discharge rates of approximately 10 gpm are possible with associated well spacings of 150 to 200 feet.

NOTICE ABOUT UNSCANNABLE MAP

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SITE LOCATION MAP

MARCH 1999

SCALE: 1"=150'-0"

FILE NO. 1163.22696-15

O'BRIEN & GERE ENGINEERS, INC.

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SITE PLAN

MARCH 1999

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FILE NO. 1163.22696-15

O'BRIEN & GERE ENGINEERS, INC.

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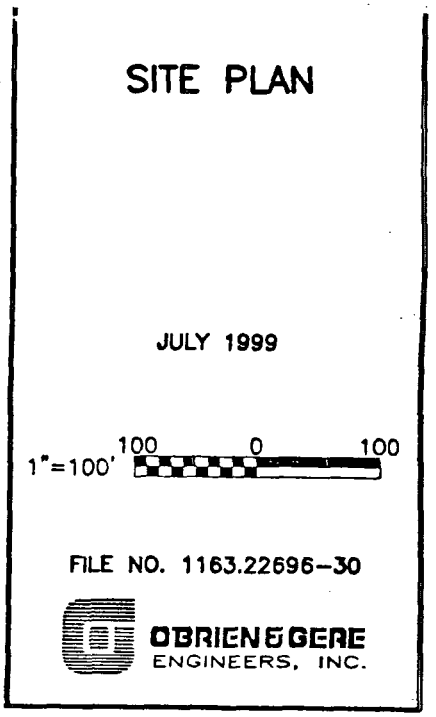

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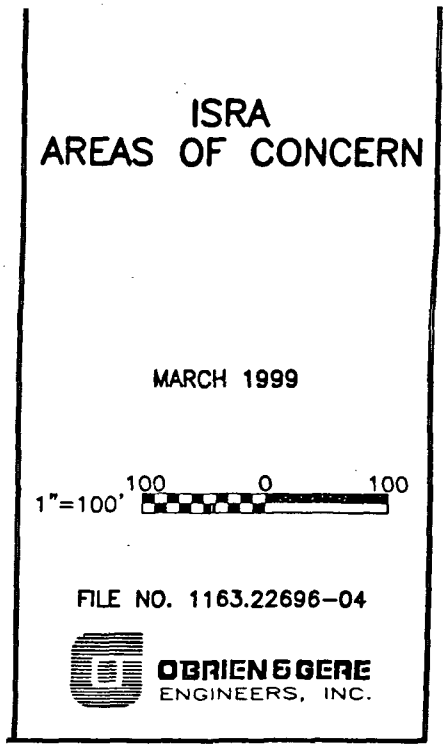

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MASS REMOVAL AREA PLAN

MARCH 1999

1"=100' 100 0 100

FILE NO. 1163.22696-02

O'BRIEN & GERE ENGINEERS, INC.

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GROUND WATER SAMPLING RESULTS (CONFINED AQUIFER)

JULY 1999

1"=100' 100 0 100

FILE NO. 1163.22696-31

O'BRIEN & GERE ENGINEERS, INC.

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DECLARATION OF ENVIRONMENTAL RESTRICTION

MARCH 1999

1"=100' 100 0 100

FILE NO. 1163.22696-14

O'BRIEN & GERE ENGINEERS, INC.

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TEST TRENCH LOCATIONS AND SAMPLING RESULTS

MARCH 1999

1"=100' 100 0 100

FILE NO. 1163.22696-12

O'BRIEN & GERE ENGINEERS, INC.

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State of New Jersey

Christine Todd Whitman
Governor

Department of Environmental Protection

Robert C. Shinn, Jr.
Commissioner

Leah G. Raney
Director, Environmental Affairs
Continental Airlines, Inc.
PO Box 4607 HQSEN
Houston, TX 77210-4607

MAY 17 2000

Re: REMEDIATION AGREEMENT IN THE MATTER OF THE ELIZABETH SITE AND ALLIED CORP, CHEMICAL DIVISION OF ALLIEDSIGNAL, INC. AND ALLIEDSIGNAL INC. AND CONTINENTAL AIRLINES, INC. SIGNED SEPTEMBER 24, 1999
Elizabeth City, Union County
ISRA Case #E86103
Response to NJDEP's October 16, 1998 Letter dated February 19, 1999
Gross Beta Radiological Testing of Groundwater Report dated February 19, 1999
Cone Penetrometer Survey Report dated February 19, 1999
Results of Groundwater Sampling August 24 and December 3, 1998 dated February 19, 1999
Amended Remedial Action Workplan dated March 1999
Amended Remedial Action Workplan - Appendix C Summary of Aquifer Characterization Activities dated March 1999

Dear Ms. Raney:

The New Jersey Department of Environmental Protection (NJDEP) has completed their review of the groundwater issues in the above referenced documents. Continental shall note that the NJDEP's May 13, 1999, June 24, 1999, September 23, 1999, and November 1, 1999 letters, which were addressed to AlliedSignal, Inc., commented on the soil and health and safety plan issues in the Amended Remedial Action Workplan and its appendices. The NJDEP cannot issue a Remedial Action Workplan (RAW) Approval since groundwater contamination has not been delineated. The NJDEP can however issue a Remedial Investigation Workplan (RIW) Approval based on the remedial work proposed in the above referenced documents, as conditioned below:

The NJDEP would like to point out that subsequent to AlliedSignal, Inc.'s submission of the above referenced documents the above referenced industrial establishment was transferred to Continental Airlines, Inc. (Continental). Continental signed a Remediation Agreement on September 24, 1999, at which time Continental took possession of the above referenced industrial establishment therefore accepting responsibility for remediation of this industrial establishment. The NJDEP may refer to AlliedSignal, Inc. (Allied) below since they submitted the above referenced documents (which Continental did not modify or amend) however Continental is now responsible for completing the remedial work so the NJDEP's Comments refer to Continental not Allied.

Continental shall not submit multiple documents under one cover letter as Allied has, as referenced above. Multiple submittals or responses that will be submitted during the same time frame shall be combined into one document.

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Ground Water Conditions

Within the submittals listed above, Allied describes the various soil and groundwater actions that have been performed since completing the fourth phase of soil and ground water work, the results of which were submitted in November of 1996. Since completion of the fourth phase of work Allied has:

- Installed additional shallow and deep monitoring wells.
- Sampled ground water for VOs and gross-beta activity.
- Discontinued interim DNAPL and LNAPL recovery.
- Performed a pump-test in the lower aquifer.
- Further characterized sources of ground water contamination in the following areas by completing a test-trenching program and a cone penetrometer survey:
    - Area of monitoring well W23S within the former chloroform AST area (AOC 3E);
    - Area of monitoring well W16S within the former sulfuric acid production area (AOC 2A);
    - Area of the former wastewater lagoon (AOC 3H);
    - Area of the old oil spill (AOC 2B).
- Performed a mechanical volatilization system treatability study on contaminated soil.
- Applied lime to soil at the stressed vegetation area (AOC 8) as a remedial measure.

Allied also provides proposals for further action and responses to the requirements of the NJDEP's October 16, 1998 letter. A summary of this information is provided below and is followed by the NJDEP's comments.

<u>AlliedSignal Inc.'s Proposals (which CONTINENTAL AIRLINES, INC. has not modified)</u>:

1. Allied proposes no further delineation of ground water contamination. Allied concludes that delineation has been accomplished both above and below the meadow mat and that further delineation is not necessary in order to proceed with the proposed remedial program.

Allied specifies that further delineation down-gradient of the former wastewater lagoon on the opposite side of the drainage ditch is not necessary because:

- Removal of lagoon material and installation of a ground water extraction trench down-gradient of the lagoon will eliminate the source of the dissolved contamination that is presently migrating toward the ditch.

- Allied's Phase IV MODFLOW simulation indicated that 86 percent of the site's ground water discharged to Newark Bay and that 14 percent of it discharged to the drainage ditches around the site. Allied explains that the modeling results do not indicate that appreciable quantities of the site's ground water migrate across the drainage ditch, down-gradient of AOC 3H.

- Piezometer PZ-01 was formerly located down-gradient of the lagoon on the opposite side of the drainage ditch and Phase III sampling of it revealed that it contained no site-related VOs. Specifically, a September 15, 1993 sample contained 2,3-dichloro-1H-indene at 29 ppb, chlorobenzene at 5 ppb, benzene at 1 ppb and 1,2-dichlorobenzene at 0.3 ppb.

- According to a May 1994 RIW that had been prepared for the OENJ site, monitoring wells screened above and below the meadow mat at the OENJ site had not been impacted by the VOs present at the Allied site.

- OENJ installed a leachate collection system above the meadow mat for remediation at that site that helps limit the need for further delineation past the drainage ditch.

- After the January 1999 meeting with the NJDEP, Allied once again inspected the area across the drainage ditch down-gradient of AOC 3H. The area is not readily accessible because of flooding. Access is also limited by a 15-foot high retaining wall that OENJ has constructed on the opposite side of the drainage ditch.

- OENJ has denied Allied access for delineation on the opposite side of the drainage ditch

Allied also specifies that it does not intend to pursue localized delineation of the contaminants detected below the meadow mat in the area of monitoring well W39D.

2. Allied proposes to excavate chlorinated volatile organic contaminated soil at AOC 3H (Former Wastewater Lagoon), around monitoring well W16S at AOC 2A (Former Sulfuric Acid Production Area), and around monitoring well W23S at AOC 3E (Former Chloroform Tank Area). Allied also proposes to excavate LNAPL-contaminated soil at AOC 2B (Old Oil Spill). Allied proposes to excavate contaminated soil from each of these four areas in order to remove all sources of ground water contamination at the site and in order to achieve the impact-to-ground-water soil cleanup criteria (IGWSCC) at the site.

Allied intends to excavate the entire former lagoon and to extend the excavation beyond the limits of the former lagoon, westward beyond monitoring well W31S. Allied estimates that the lagoon may contain 3,850 cubic yards of material depending on its configuration but that

up to 6,840 cubic yards of material may be excavated.

Allied estimates that approximately 2,745 cubic yards of soil will be excavated around monitoring well W16S and that approximately 5,940 cubic yards of soil will be excavated around monitoring well W23S.

For each of these three areas, Allied proposes to excavate vertically to the meadow mat based on the meadow mat's ability to inhibit vertical migration of contaminants. Allied notes that the depth of the meadow mat averages 9 to 13 feet below grade among the three areas and states that the excavation depth will be about 10 feet below grade in each area.

At each of these three excavations, Allied will collect sidewall post-excavation samples from the backhoe at the soil/peat interface and will analyze the samples for VOs to evaluate the adequacy of the horizontal limits of excavation. The number of samples collected will be determined in the field. Allied indicates that VO IGWSCC will be used as excavation endpoints.

For AOC 2B, Allied proposes to excavate the two areas that were determined to contain hydrocarbon contamination through the CPT investigation. Allied indicates that both areas will be excavated to a depth of one foot below the depth where LNAPL was encountered. At the area near monitoring wells LNW-5 and W30s, therefore, Allied will excavate to a depth of 6.5 feet and at the area near monitoring well LNW-3, Allied will excavate to a depth of 7.5 feet.

Allied estimates that 1,907 cubic yards of soil will be excavated from the area of monitoring wells LNW-5 and W-30 and that about 305 cubic yards of soil will be excavated from the area of monitoring well LNW-3. Allied proposes, however, to segregate the clean soil present above each area of LNAPL and to use it as backfill. Allied calculates, therefore, that the volume of soil that would be treated from these areas is less than the volume that will be excavated.

Allied proposes to collect no post-excavation samples at AOC 2B because of the completeness of the CPT testing in this area.

Allied estimates that a total of approximately 17,740 cubic yards of soil will be excavated from the four areas. Excavated soil will be treated on-site using the MVS and reused and/or will be characterized and disposed off-site.

3. Allied proposes monitored natural attenuation (MNA) as the remedial approach for the upper aquifer. Allied suggests that MNA is an appropriate remedial approach for the upper aquifer because:

- The plume has been delineated.
- The sources of contamination will be removed.

- "Exposure pathways to receptors do not exist based on solute migration patterns and surrounding land uses"; Allied reports that shallow ground water is not used for domestic, irrigation, or industrial purposes within 1,000 feet of the facility.
- The presence of breakdown products in ground water indicates that the plume is naturally degrading.

Allied indicates that MNA is not proposed for the lower aquifer because the proposed source excavation is expected to significantly reduce the loading of dissolved contamination to the lower aquifer and because the lower aquifer is a Class IIIB aquifer. Allied recalls that in 1994 it reported that the lower aquifer contained TDS concentrations over 5,000 ppm and chloride concentrations over 3,000.

4. Allied expects the proposed source removal to allow ground water quality in the upper aquifer to attain the appropriate remediation criteria naturally. However, Allied proposes to supplement the MNA program with operation of a ground-water recovery trench in the upper aquifer and operation of a recovery well system in the lower aquifer.

The trench will be installed down-gradient of the four source areas, after their excavation, to "capture solutes and residuals migrating from these areas". Allied notes that in the four areas that will be excavated, shallow ground water and dissolved contaminants are migrating toward the southern drainage ditch and then to Newark Bay. According to a map provided by Allied the trench will be located between the four source areas and the southern drainage ditch and will be approximately 1,000 feet long.

Allied indicates that the trench will extend down to the meadow mat. Perforated piping will be placed immediately above the meadow mat. Collection sumps will be installed intermittently along the trench with the spacing and construction of the sumps yet to be determined. Allied estimates that up to 1,000 gallons per day (gpd) will be recovered from the trench based on earlier hydraulic conductivity testing.

With respect to the lower aquifer, Allied acknowledges it has been impacted by two of the four source areas that have also impacted the upper aquifer, AOC 2A and AOC 3E. Allied proposes to install a recovery well or wells in the lower aquifer in order to achieve a zone of capture that extends from the area of monitoring well W39D outward to existing, clean, deep monitoring wells: W1D, W15D and W17D.

Allied expects to recover ground water from both the upper and lower aquifers for up to three to five years.

Allied plans to treat recovered ground water by air stripping, carbon adsorption or a combination of the two. Allied indicates that the extent of treatment will depend on the discharge point and that

treatment of other parameters may be required, depending on the discharge point. An inflow rate of 5 to 15 gallons per minute (gpm) is anticipated depending on the extent of deep aquifer pumping required.

Treated ground water will be discharged to the publicly owned treatment works (POTW; Joint Meeting of Essex and Union Counties), to an off-site disposal facility, to surface water or to ground water.

Allied will periodically monitor the ground water recovered from the trench and the recovery well system. Allied specifies that this monitoring will be done concurrently with the MNA monitoring program proposed below. Allied suggests that this data, as well as the MNA monitoring data, will be used to determine when to petition the NJDEP to allow termination of ground water recovery.

5. Allied proposes to perform the following MNA monitoring program within the upper aquifer during the 3 to 5 years of ground water recovery:

Monitoring wells W-3, W-15S, W-17S, W-22S, W-24S, W-25S, W-31S, W-32S, W-37S and W-38S will be sampled quarterly for the first year and semi-annually thereafter. Samples will be analyzed for VO+15 using Method 624. Additionally, samples from W24S (which Allied indicates is located up-gradient of the plume), from W17S (which Allied indicates is located within the plume), and from W31S (which Allied indicates is located down-gradient of the plume), will also be analyzed for geo-chemical indicator parameters (Allied implies nitrate, sulfate, sulfide, ferrous iron, carbon dioxide, and methane), redox potential and dissolved oxygen, apparently on the same schedule.

Allied indicates that the proposed MNA monitoring program has been designed to:

- Monitor chlorinated solvent concentrations over time down-gradient of certain AOCs.
- Detect any down-gradient plume migration.
- Provide geo-chemical data that will confirm whether contaminants are naturally attenuating.

6. Allied states that use of MNA for the upper aquifer will require establishment of a Classification Exception Area (CEA) for the upper aquifer. Allied suggests that a CEA for the upper aquifer will be proposed at some point during performance of the MNA monitoring program, and that it may be refined as ground-water monitoring data is collected.

Allied suggests that the following will be used to calculate the CEA:
- The first-order decay equation of the NJDEP's CEA guidance document.

- "Site-specific data on those compounds that exceed the Class IIA GWQS at the property line."
- Empirically determined half-lives.
- A conceptual ground water flow model that will be developed for the site.

7. Allied proposes to submit a report, after collecting each quarterly or semi-annual round, that documents recent field activities and results as well as past data in order to evaluate trends. Allied also proposes to submit an effectiveness evaluation annually. Data for each parameter will be tabulated and graphed. Allied suggests that this data will be used to determine when to terminate the MNA monitoring program.

8. In response to the NJDEP's October 16, 1998 letter Allied indicates that the issue of butylbenzyl phthalate detected above Ground Water Quality Criteria (GWQC) in monitoring well MW4 will be addressed in the proposed post-remediation MNA program.

9. In response to the NJDEP's October 16, 1998 letter, Allied indicates that the elevated levels of antimony and arsenic detected in ground water are likely from the on-site dredge spoils. Apparently, therefore, Allied proposes no further action for the arsenic and antimony exceedances.

10. Allied proposes no further action for the gross beta activity detected in ground water.

11. In response to the NJDEP's October 16, 1998 letter, Allied responds that the issue of the status of monitoring well W2S and W16S and their proper abandonment has already been addressed.

12. In response to the NJDEP's October 16, 1998 letter, Allied indicates that the requirement to submit a map that illustrates the Allied site, all sites immediately adjacent it, and all sites located between the Allied site and Newark Bay has been addressed.

13. Allied proposes to perform pH stabilization measures on an as-needed basis at AOC 8. Specifically, Allied proposes to collect another round of soil samples in the Spring of 1999 and to analyze them for pH in order to demonstrate that the pH of soil has stabilized, in accordance with the NJDEP's February 5, 1999 letter. Allied proposes that a pH of less than 5 be used as the criterion for considering additional lime application in the affected area. Allied also proposes, however, to collect randomly-located soil samples from non-process areas throughout the site and to analyze them for pH in order to establish background pH levels.

Allied also proposes to monitor pH in the drainage ditches quarterly starting in April 1999. The monitoring will continue until pH levels

in surface water are within the range acceptable for a SE-3 water body (6.5 to 8.5) for four consecutive quarters.

14. Allied indicates that the only soil cleanup criteria exceedances that will remain after the proposed source excavation will be PAHs, PCBs and metals above the Direct Contact Soil Cleanup Criteria but below the IGWSCC. Allied proposes to finish delineating the extent of such exceedances that are related to site operations (Allied believes that some are related to fill) and to then cap and deed restrict this contamination. The locations of some of these samples will coincide with the locations of some of the post-excavation samples that will be collected as part of the proposed source excavation.

NJDEP's Comments:

1. As stated above, Continental's proposal is conditionally acceptable as a RIW with a proposed Interim Remedial Action (IRM), i.e. the excavation of contaminated soil. The proposal cannot be approved as a RAW because delineation of ground water contamination has yet to be completed and because only a conceptual plan was provided for ground water recovery that lacks a decisive proposal for the disposal of treated ground water. Regarding the latter point, the NJDEP emphasizes that before Continental may receive RAW approval, they must document that the POTW has agreed to accept the discharge of treated ground water, or demonstrate that discharge of treated ground water to surface water or to ground water is feasible and that the appropriate corresponding permits applications have been submitted.

2. Chlorinated VOs, largely trichlorofluoromethane (Freon 11), 1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113) and chloroform were detected at high concentrations in monitoring wells W39D, W42D, W44D and W45D during the August 1998 and July 1999 sampling event. The concentrations of Freon 113 detected in W39D and W42D, and the concentration of Freon 11 detected in W44D, exceeded 1% of their respective, commonly reported solubility. The presence of this contamination below the meadow mat demonstrates that the meadow mat in this area is not a barrier to vertical contaminant migration and the magnitude of the concentrations suggests that DNAPL is present below the meadow mat (refer to N.J.A.C. 7:26E-2.1(a)11i of the Technical Requirements for Site Remediation).

Pursuant to the Technical Requirements for Site Remediation at N.J.A.C.7:26E-4.4(h)3i Continental shall vertically and horizontally delineate the extent of source material, including but not necessarily limited to free and residual product, present below the meadow mat in this general area. Continental shall accomplish this through, at a minimum, installation of additional monitoring wells.

Given the distances of the contaminated deep wells from each other, Continental shall install at least one well below W45D, one well below the area of W42D and W39D and one well below the area of W44D for the required vertical delineation. Ground water from these wells shall be sampled and analyzed for VO+10 (Method 624). This required delineation may be scheduled to take place after completion of the upper aquifer excavation proposed for the area.

During the lower aquifer characterization study, it was determined that a low permeability unit might be present in this area at a depth of about 27 feet below the bottom of the meadow mat. Screening of the required wells directly above this layer to provide vertical delineation and to investigate for accumulated DNAPL would be appropriate.

Additional wells (or well pairs, depending on the thickness of the lower aquifer) shall also be installed to provide horizontal delineation of the source material and to provide a deep sampling point beneath shallow well W16S. The NJDEP's August 5, 1997 and August 16, 1998 letters previously required a sampling point in this location however it has not been installed. While Continental does have clean monitoring wells W1D, W15D and W17D in place, these wells are relatively distant from the contaminated deep wells (approximately 400 feet) and do not clearly define the region of the lower aquifer that contains source material. Continental may want to take a phased approach and install the three wells required above first, then propose installation of horizontal delineation wells in locations based on the results.

The NJDEP acknowledges that Continental has indicated that it does not want to pursue localized delineation of the contamination detected in the lower aquifer in this area but would rather create a capture zone that extended out to wells W1D, W15D and W17D. Continental is advised, therefore, that not only is more detailed source delineation required by the Technical Requirements for Site Remediation, but that the required monitoring wells should be useful as recovery wells and performance monitoring wells during the proposed lower aquifer remediation.

3. Continental shall install additional monitoring wells for vertical delineation of both the source material and the dissolved contamination detected in shallow wells located in the former wastewater lagoon area. During recent sampling wells W31S and W28S both contained high concentrations of contamination. Well W28S in particular contained 1,1,2,2-PCA and cis-1,2-DCE at concentrations above 1% of each compounds' commonly reported solubility.

Continental shall comply with the NJDEP's previous requirement to demonstrate that monitoring well MW17D suffices for this vertical delineation. Regardless, given that the meadow mat has now been shown

not to prevent downward migration of contamination in another area of the site, and given the magnitude of the contaminant concentrations recently detected in wells in this area, the NJDEP will no longer accept MW17D for vertical delineation.

Given the contaminant concentrations detected in W28S and W31S and the distance between these wells, Continental shall install at least one well below the meadow mat next to each of these wells. Ground water from these wells shall be sampled and analyzed for VO+10 (Method 624.) This required delineation may be scheduled to take place after completion of the upper aquifer soil excavation proposed for the area.

4. The NJDEP's August 5, 1997 letter required three wells to be installed for horizontal delineation of shallow ground water contamination, down-gradient of the former wastewater lagoon, on the opposite side of the drainage ditch. Only one of these three wells has been installed. Installation of the two additional wells may not be necessary if Continental can provide technical justification.

First, if Continental wants the NJDEP to consider the historic sampling results for PZ-1 sufficient for the required delineation, Continental must provide a cross-section that shows PZ-1 and other wells located in the area of the former wastewater lagoon, and that shows the drainage ditch and the meadow mat. Using this cross-section (and using concurrent historical water elevation data for the ground water monitoring points and for the drainage ditch) Continental must show whether ground water or product above the meadow mat might flow under the ditch, from the Continental site to the opposite side, and if so, whether PZ-1 would have extended deep enough to encounter such contamination.

Second, if Continental wants the NJDEP to consider data from OENJ's monitoring wells sufficient for the required delineation, Continental must provide a map that shows the locations of OENJ's monitoring wells, the construction specifications for these wells, and the relevant analytical deliverables.

If through the actions above Continental is unable to demonstrate that existing data sufficiently precludes the need for shallow ground water investigation on the opposite side of the drainage ditch, Continental shall propose the additional investigation. Continental is advised that the NJDEP does not consider any of the other arguments that Allied has made against performing this additional investigation relevant at this time.

5. Allied is advised that installation of wells on the opposite side of the drainage ditch may still be required, if the vertical delineation required in the area of the former wastewater lagoon reveals that contamination extends below the meadow mat in this area. If warranted based on the results of the vertical delineation in the

former wastewater lagoon area, Allied shall propose to install such wells.

6. Continental shall install a shallow well down-gradient of the W37S area for delineation of dissolved phase contamination, as the NJDEP has previously required. The well shall be sampled and analyzed for VO+10 (Method 624.)

7. With the results of the next phase of well installation, Continental shall submit a ground-water flow map for the upper aquifer and a ground-water flow map for the lower aquifer. A flow map for the lower aquifer was not included in the above referenced RAW.

8. The proposal to excavate all free and residual product and all soil containing VOs above IGWSCC criteria within the upper aquifer is acceptable. The NJDEP is not certain, however, that Continental will achieve this goal by excavating the areas illustrated in Figure 2-2 of the RAW down to the meadow mat, or to a depth of one foot below LNAPL in the case of AOC 2B. Specifically:

a. Continental has not indicated the exact locations or depths at which soils samples were collected during the test-trenching program. However, using the trench locations shown on Figure 2-2 and the information that one soil sample was collected per trench, it is not clear how the proposed horizontal excavation limits around wells W16S, W23S and the former wastewater lagoon were determined. In many cases excavation boundaries appear to extend to trenches that contained IGWSCC exceedances but do not extend significantly beyond them, or appear to be based on no sampling results at all. Also, product sheen was observed flowing into trench T-3, but this trench is located outside of the proposed excavation boundaries in the area of W23S.

b. In some instances test trenches apparently may not have extended vertically to the actual meadow mat. Soil samples collected from such trenches may have missed soil contamination that is present deeper in the soil column at their locations.

W23S is reported to be 14 feet deep and to be screened directly above the meadow mat. Nearby trenches T-3, T-4 and T-5, however, extended to depths of only 5 feet to 6.5 feet. Similarly, W28S is reported to be 14 feet deep and to be screened directly above the meadow mat. While nearby trench T-2 extended to 18 feet, trenches T-1 and T-6 extended to depths of only 5 and 6.5 feet, respectively.

c. As the NJDEP understands, Continental is not certain of the specific locations of the discharges responsible for the contamination detected in wells W16S and W23S. Therefore, it is not clear if the excavations, appropriate for addressing the

contamination encountered by these wells, should be centered on the wells.

d. It was reported that at trench T-10, located in the area scheduled for LNAPL excavation around LNW-5, a residual sheen was present on soil from 2 feet below grade to 14 feet below grade. Hence, excavation to a depth of only 6.5 feet here would not remove this contamination. While the LNAPL in this area may be fuel oil, the fuel oil was shown to contain chlorinated VO contamination earlier in the investigation. The sheen, therefore, may constitute a significant source of dissolved chlorinated VO contamination.

e. Whether soil samples were analyzed for all of the VOs present in ground water, especially Freon 113, is not clear to the NJDEP.

f. Allied did not indicate the results of the temporary well investigation for product.

Having noted this, the NJDEP strongly recommends that Continental excavate as much source material as possible in order to minimize the need for hydraulic containment within the upper aquifer. Such source material would include free and residual product, but as implied by the proposal to excavate all IGWSCC exceedances, would not necessarily be limited to this.

To achieve this the NJDEP recommends that in areas where excavation to the meadow mat is the goal, Continental shall ensure that the actual meadow mat is reached.

The NJDEP also recommends that Continental perform a rigorous post-excavation soil sampling and DNAPL testing program to ensure that they remove all source material and document what contamination, if any, is left behind (Continental shall refer to the Technical Requirements for Site Remediation at 7:26E-2.1(a)11 for acceptable methods for determining the presence of free and residual product in soil, in particular). This sampling should include the two areas excavated in AOC 2B. Also, Continental should ensure that soil sample analyses include all of the contaminants found in ground water above the GWQC.

Furthermore, if Continental intends to propose MNA for any of the ground water contamination associated with these four source areas, the recommendations above shall be considered minimum requirements.

9. Continental shall indicate the nature of the obstructions encountered during the CPT investigation near LNW-3. Additionally, this area shall be further investigated in the direction of (i.e. beneath) the containers until refusal is no longer encountered.

10. The presence of buried cylinders in trench T-6 suggests that this area of the site was used for more than disposal of wastewater, therefore, Continental shall perform a thorough investigation of this area of the site for buried material.

11. Continental shall indicate the source of the floating product observed in trench T-6. The NJDEP is not aware that LNAPL has ever been a concern associated with the former wastewater lagoon.

12. Continental shall indicate the source(s) of the sheen detected in trench T-3 and the free product detected in trench T-9. Continental shall clarify whether or not the product observed in T-9 was LNAPL, as the NJDEP assumes. The NJDEP is not aware that LNAPL has ever been a concern in this area of the site before.

13. Continental shall determine the extent of the need for hydraulic containment of contamination within the upper aquifer, such as through operation of a recovery trench, on the basis of the post-excavation soil sampling results and on the basis of the quality of down-gradient ground water and surface water evident after the excavation. Therefore, with the results of the post-excavation soil sampling, Continental shall submit a proposal for the following work:

a. Continental shall submit a proposal to install monitoring wells within the upper aquifer immediately down-gradient of the excavations.

b. Continental shall submit a proposal to sample the monitoring wells above, along with any other relevant down-gradient wells, for VOs.

c. Continental shall submit a proposal to sample surface water down-gradient of the excavated areas and to analyze the samples for VOs.

14. It has been proposed that both MNA and ground water recovery will be implemented to address ground water contamination in the upper aquifer. As indicated above, the need for hydraulic containment and similarly, the appropriateness of performing MNA for any part of the upper aquifer must be re-evaluated after the proposed source excavation. However, for future reference, in the RAW to be submitted Continental shall be specific about what portion of the aquifer will be hydraulically contained, if any, and to what specific portion of the aquifer they want to apply an MNA program, if any. Typically, when both techniques are proposed, the MNA is proposed specifically for the contamination down-gradient of the containment zone, but this was not clearly the case in this proposal.

15. Continental is also advised, for future reference, that if they want the NJDEP to entertain a proposal for MNA for any of the ground water contamination present at the site, the proposal must satisfy the requirements for natural remediation workplans in N.J.A.C. 7:26E-6.3(d). Specifically, to receive the NJDEP's approval for natural remediation Continental would have to:

a. Demonstrate that natural remediation of the contamination were viable by evaluating the parameters provided in N.J.A.C. 7:26E-6.3(d).

b. Demonstrate that the contamination would not migrate to a receptor as defined in N.J.A.C. 7:26E-6.3(d) using the methods provided in N.J.A.C. 7:26E-6.3(d).

c. Present a monitoring plan that satisfied the natural remediation monitoring requirements provided in N.J.A.C. 7:26E-6.3(d).

Continental is also advised that the NJDEP considers the surface water present in the drainage ditches that surround the site to be a receptor that must be protected. It was suggested otherwise when discussing the appropriateness of MNA as a remedial approach for the upper aquifer.

16. As for the upper aquifer, Continental shall hydraulically contain, if not remove, all sources of the ground water contamination detected in the lower aquifer, including but not necessarily limited to free and residual product. Using the results of the required lower aquifer delineation, therefore, Continental shall submit an appropriate, detailed, remedial plan.

While the proposal has indicated the intent to hydraulically contain contamination that has been detected in the lower aquifer, the proposal also appears to suggest at the same time that the lower aquifer is not subject to any remedial standards because it is a IIIB aquifer. Continental is advised that this is not correct. Hydraulic containment and/or removal of all free and residual product are required for all aquifer classes.

Additionally, at N.J.A.C. 7:9-6.7(f) the Ground Water Quality Standards indicate that the GWQC for a Class IIIB aquifer shall be determined on a case-by-case basis but must be selected so as to ensure that no violation of the Surface Water Quality Criteria (SWQC) of any down-gradient surface water body will occur as a result and that no violation of the GWQC of any down-gradient aquifer will occur as a result. Continental has not yet shown where ground water in the lower aquifer discharges, but it likely discharges to a surface water body and/or to a Class IIA aquifer.

17. Establishment of a long-term monitoring program for the purpose of assessing the effectiveness of ground water recovery or natural remediation is not appropriate at this time. Continental shall submit a revised ground water monitoring proposal for both the upper and lower aquifers with its revised RAW. As indicated in the NJDEP's August 5, 1997 letter, Continental must propose hydraulic monitoring and surface water quality monitoring programs as well. Neither were proposed in the above referenced RAW.

18. Continental shall submit a proposal for identifying the region of ground water near AOC 8 that does not meet the Class IIA GWQC for pH (6.5 - 8.5). In Allied's November 1996 Draft Remedial Action Work Plan, it was reported that the pH of shallow ground water in the vicinity of AOC 8 was depressed. In August 5, 1997 and October 6, 1998 letters the NJDEP approved the proposal to investigate the extent of the affected ground water but this work has not been completed. Continental shall address this issue.

19. Continental must ensure that the actions proposed to address the pH of soil at AOC 8 are sufficient to restore the pH of ground water in that area to the 6.5-8.5 range, or to background pH, and are sufficient to eliminate any ground water discharges to surface water that cause an in-stream violation of the SWQC for pH (6.5-8.5 for FW2 as well as all SE surface water bodies.)

Monitoring of ground water for pH at AOC 8 shall be proposed for this purpose. Also, while a proposal has been made to monitor surface water for pH, the monitoring locations have not been indicated. Continental shall propose specific locations. Continental shall be made aware that the sulfur that was deposited during the decommissioning of the sulfuric acid plant, causing the low pH in soil and ground water at AOC 8, may have to be removed if pH levels can not be sustained in the appropriate range.

20. Three of six ground water sample were above the Safe Drinking Water screening criteria for gross beta located at section 141.26(b)(1)(i) of the US Environmental Protection Agency's National Interim Primary Drinking Water Regulations (NIPDWR). "If the gross beta particle activity exceeds 50 pCi/L, an analysis of the sample must be performed to identify the major radioactive constituents present and the appropriate organ and total body doses shall be calculated to determine compliance with 141.16." In addition, none of the detection limits reported complied with the 4 pCi/L detection limit specified in Section 141.25(c)(2) Table B of the NIPDWR.

The gross beta activity that was detected in site monitoring wells may have been the result of naturally occurring potassium-40, especially if the ground water were brackish. Hence, Continental shall analyze ground water for potassium-40 by gamma spectroscopy in order to determine whether this is the case.

Continental shall sample the seven wells that had the highest gross-beta activity in 1989 and that were consequently resampled in 1998: W1D, W5, W15D, W17D, W19S, W21S and W21D. Samples from these wells shall be analyzed for both potassium-40 and gross beta so that the results can be correlated.

21. Continental shall provide a brief, but more detailed than previous, argument to support the conclusion that the arsenic and antimony historically detected above the GWQC in ground water are the result of historic fill. Continental shall provide soil sampling data that shows the presence of arsenic and antimony as well as evidence that such detections are related to historic fill. Continental shall also compare the distribution of the fill to the distribution of the arsenic and antimony in ground water. If appropriate, Continental may refer to previous submittals rather than resubmit data.

22. Continental shall review its ground water data and shall identify all constituents (other than arsenic and antimony) that have been detected above the GWQC at the site, but that are not attributable to the four source areas targeted for excavation. At this time the NJDEP is aware that at least benzene in various wells and butyl-benzyl phthalate in W4 meet these criteria. Continental must indicate the source(s) of these constituents and provide an appropriate remedial proposal. At a minimum, Continental must ensure that the sources of these constituents are contained or removed.

23. Establishment of a CEA will not be necessary or appropriate until ground water contamination has been fully delineated. Also, Continental is advised that CEAs are established to notify potential ground water users of areas where GWQC are not or will not be met. The NJDEP does not establish CEAs in order to allow MNA programs, per se.

24. As indicated in the August 5, 1997 letter, in the future, Continental shall submit a field log for each ground water sample collected. Field logs shall be prepared in accordance with the NJDEP's field sampling Procedures Manual. Field logs were not submitted for the recent ground water sampling.

25. Continental shall provide a list of all monitoring wells and piezometers that are no longer in use for sampling or water elevation measurement because they are missing and/or have been replaced. Continental shall propose to locate and abandon these wells, as appropriate.

26. In its August 5, 1997 and October 16, 1998 letters the NJDEP required the submission of a map that showed the property boundaries of the above referenced industrial establishment, all properties immediately adjacent to the above referenced industrial establishment, and all properties, if any, located between the above referenced

industrial establishment and Newark Bay. Since issuing this requirement NJDEP has not received such a map. Continental shall submit this map. If such a map has already been submitted, Continental shall indicate the name and date of the submittal that contained the map.

The NJDEP required this map in order to clarify the properties under which the above referenced industrial establishment's ground water contamination might migrate. Additionally, as the NJDEP stated, clarification of the well search results for some of these lots may be necessary. While the proposal indicates that ground water within the upper aquifer is not used within 1,000 feet of the site, it has been stated in a prior submittal that W38S appeared to be influenced by local pumping.

The submitted map shall be to scale, shall identify each property, and shall show each property's full perimeter. Continental's monitoring wells, local drainage ditches and Newark Bay shall be included on the map. Any supply wells on these properties that Continental is aware of shall be illustrated on the map.

Baseline Ecological Evaluation (BEE)

Continental shall conduct a BEE in accordance with N.J.A.C. 7:26E-3.11.

Data QA/QC

A total of 43 monitoring wells were sampled on August 24, 1998 and December 3, 1998 for volatile organic analyses. The analytical data associated with these sampling events are acceptable.

Permits

Continental shall contact the following as necessary for permit approval, prior to conducting the proposed remedial work:

1. New Jersey Air Permits may be required for the discharge of vapors from the treatment unit to the atmosphere. Contact:

Bureau Chief
Bureau of New Source Review
PO Box 027
401 East State Street, Floor 2
Trenton, N.J. 08625-0027
(609) 292-9258

2. Continental shall contact the Bureau of Pretreatment and Residuals to determine if the proposed discharge of recovered ground water to the sanitary sewer will require a NJPDES Significant Industrial User (SIU) Permit. Contact:

Bureau Chief
Bureau of Pretreatment and Residuals
PO Box 029
401 East State Street, Floor 2
Trenton, N.J. 08625-0029
(609) 633-3823

Please note that the NJDEP will not approve a Remedial Action Workplan which proposes to discharge to a publicly-owned treatment works (POTW) without the prior written consent of the POTW.

3. Soil Erosion and Sediment Control Certifications are required for any extensive soil sampling or cleanup projects that disturb more than 5,000 square feet of surface area of land including demolition of structures, construction of parking areas and clearing or grading of land for other than agricultural purposes. As appropriate, Continental shall contact the County Soil Conservation District for guidance in the development and approval of a Soil Erosion and Sediment Control Plan for the site.

4. Continental shall contact the Bureau of Standard Permitting to obtain an application for a surface water permit for the proposed discharge of recovered ground water to a surface water body. Contact:

Bureau Chief
Bureau of Standard Permitting
PO Box 029
401 East State Street, Floor 2
Trenton, N.J. 08625-0029
(609) 292-4860

5. Continental shall contact the Bureau of Construction and Connection Permits to obtain an application for a Treatment Works Approval (TWA) for the proposed use of the oil/water separator, etc. Contact:

Bureau Chief
Bureau of Construction and Connection Permits
PO Box 029
401 East State Street, Floor 2
Trenton, N.J. 08625-0029
(609) 984-4429

Please note that the NJDEP will not approve a Remedial Action Workplan which proposes to discharge to a publicly-owned treatment works (POTW) without the prior written consent of the POTW.

6. Continental shall contact the NJDEP's Land Use Regulation Element at (609) 984-3444 to determine if the remedial activities at the above referenced site require a Wetlands Permit and/or a Transition Area Waiver or other applicable land use permits.

General Requirements

1. Pursuant to the referenced Remediation Agreement, Continental shall perform all actions as outlined in the RIW, and conditioned in this approval. If any change in methods outlined in the RIW is necessary, Continental shall inform BEECRA in writing prior to implementation.

2. Continental shall notify the Case Manager at least 14 calendar days prior to implementation of all field activities included in the RIW. If Continental fails to initiate sampling in accordance with the approved schedule, any request for an extension may be denied.

3. Continental shall collect and analyze all samples in accordance with the sampling protocol outlined in the most current edition of the NJDEP's "Field Sampling Procedures Manual" and Technical Requirements for Site Remediation (TRSR), N.J.A.C. 7:26E.

4. Continental shall submit all reports or additional workplans, in triplicate. **Continental shall submit a revised project schedule to the NJDEP within 30 days of receipt of this letter, as required by item I.2. of the AGREEMENT section of the above referenced Remediation Agreement. The schedule shall include the start/finish date of all field activities, and the submission date of the next document.** Please note that only one copy of the Quality Assurance/Quality Control deliverables is needed. All reports shall follow the requirements of the TRSR, N.J.A.C. 7:26E. Technically and administratively incomplete submissions not prepared pursuant to N.J.A.C. 7:26E may be rejected.

5. If contamination is determined to exist above a level found acceptable by NJDEP, Continental may prepare and submit either a Remedial Investigation Workplan or a Remedial Action Workplan pursuant to N.J.A.C. 7:26E. However, in accordance with N.J.S.A. 13:1K-9(f), Continental may elect to remediate the site without prior submission or approval from the NJDEP, except in cases involving a remedial action of ground water or surface water, or for the closure of an underground storage tank subject to N.J.S.A. 58:10A. If contamination exists on-site, but has not been fully delineated pursuant to N.J.A.C. 7:26E-4, then such delineation shall be completed as a Remedial Investigation which meets the criteria of N.J.A.C. 7:26E.

6. Any remedial action performed, or proposed in a Remedial Action Workplan, shall be in accordance with N.J.S.A. 58:10B-12(g).

7. Any proposal to leave contaminant concentrations on-site exceeding the NJDEP's current residential cleanup criteria, shall be in accordance with the Technical Requirements for Site Remediation N.J.A.C. 7:26E-5.1 and 5.2. Continental shall also submit proof of acceptance of the non-residential cleanup criteria by the current property owner.

8. Pursuant to N.J.S.A. 58:10B-3, a remediation funding source is to be established in an amount equal or greater than the cost estimate of the implementation of the remediation and shall be in effect for a term not less than the actual time necessary to perform the remediation at the site. N.J.S.A. 58:10B-3 allows for a change of the amount in the remediation funding source as the cost estimate changes. Please provide the current estimated cost of the remaining remediation required at the site.

Any increases in the estimated cost estimate will require an increase in the amount in the remediation funding source to an amount at least equal to the new estimate. Any requests to decrease the amount in the remediation funding source will be reviewed and approved by the NJDEP upon a finding that the current remediation cost estimate will be sufficient to fund all necessary remediation.

9. Pursuant to the TRSR, N.J.A.C. 7:26E-3.13(c)3v, all analytical data shall be presented both as a hard copy and an electronic deliverable using the database format outlined in detail in the current HAZSITE application or appropriate spreadsheet format specified in the NJDEP's electronic data interchange manual.

For further information related to electronic data submissions, please refer to the Site Remediation Program's (SRP's) home page at the following Internet address: http://www.state.nj.us/dep/srp. The **Regulations and Guidance** page of this web site has a section dedicated to HazSite which includes downloadable files, an explanation of how to use these files to comply with the NJDEP's requirements, the SRP's Electronic Data Interchange (EDI) manual, and **Guidance for the Submission and Use of Data In GIS Compatible Formats Pursuant to "Technical Requirements for Site Remediation"**.

If you have any questions, please contact the Case Manager, Stephen Myers, at (609) 633-1392.

Sincerely,

Bryan Moore

Bryan Moore, Supervisor
Bureau of Environmental Evaluation,
Cleanup and Responsibility Assessment

c: James R. Tiefenthaler, Continental Airlines, Inc.
Health Officer, Elizabeth Division of Health
Beverly Phillips, NJDEP/BGWPA, 4th floor
Jenny Goodman, NJDEP/BER, P.O. Box 415
Kris Geller, NJDEP/BEERA, 4th floor
Clifford Ng, USEPA Region II

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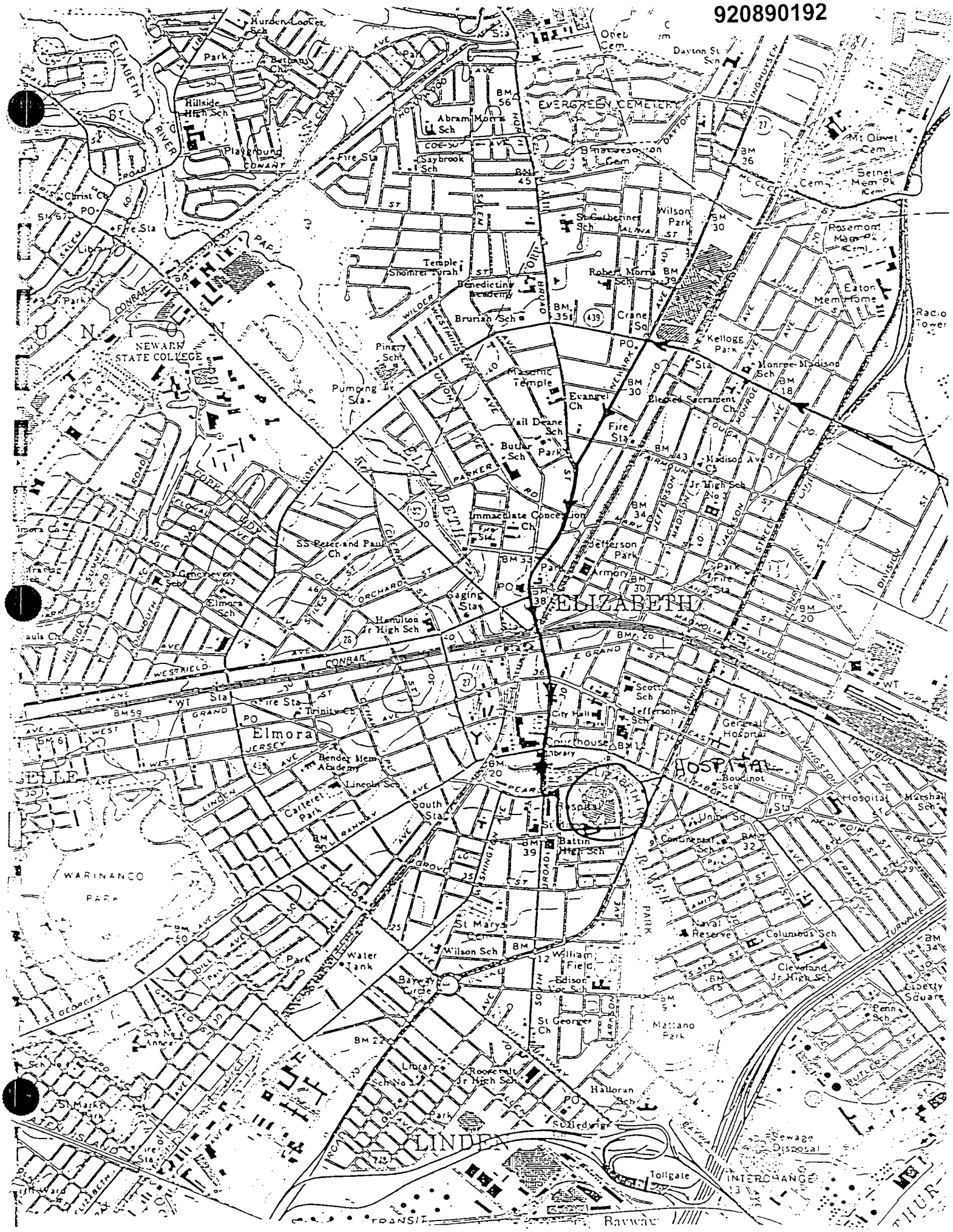

ELIZABETH
Elmora
HOSPITAL
LINDEN
NEWARK STATE COLLEGE
EVERGREEN CEMETERY
WARINANCO PARK
Hillside High Sch
Playground
Abram Morris Sch
Saybrook Sch
Fire Sta
Temple Shomrei Torah
Benedictine Academy
Brunah Sch
Pingry Sch
Pumping Sta
Masonic Temple
Evangel Ch
Vail Deane Sch
Butler Sch
Immaculate Conception Ch
SS Peter and Paul Ch
St Genevieve Sch
Elmora Sch
Hamilton Jr High Sch
Gaging Sta
Jefferson Park
Armory
Scott Sch
Jefferson Sch
City Hall
Courthouse
Library
Bender Mem Academy
Lincoln Sch
Carteret Park
South Sta
Battin High Sch
St Marys Sch
Wilson Sch
William Field
Edison Voc Sch
St Georges Ch
Mattano Park
Roosevelt Jr High Sch
Halloran Sch
Water Tank
Bayway Circle
Naval Reserve
Columbus Sch
Cleveland Jr High Sch
Liberty Square
Penn Sch
Sewage Disposal
Tollgate
INTERCHANGE
Bayway
Hurden Cooker Sch
Bethany Ch
Christ Ch
Dayton St Sch
Mt Olivet Cem
Betnel Mem Pk
Wilson Park
St Catherines Sch
Robert Morris Sch
Crane Sq
Kellogg Park
Monroe-Madison Sch
Eaton Mem Home
Rosemont Mem Pk
Elected Sacrament Ch
Madison Ave Ch
Jr High Sch No 3
Radio Tower
Scott Sch
General Hospital
Boudinot Sch
Hospital
Marshall Sch
Union Sq
Continental Sch
Hospital
Library
Sch No 4 Annex
St Marks Park
Park
Fire Sta
Trinity Ch
Sta
Park

EXHIBIT 1

ALLIEDSIGNAL VISITOR & CONTRACTOR ENVIRONMENTAL, SAFETY, & HEALTH GUIDE

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10 North Avenue East
Elizabeth, NJ 07201

Specialty Films

VISITOR AND CONTRACTOR

ENVIRONMENTAL, SAFETY, AND HEALTH

GUIDE

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Elizabeth Plant

AlliedSignal Elizabeth Plant
Visitor and Contractor Guide

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Items in Bold Face Type Must be Completed for all Contractors

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AlliedSignal Elizabeth Plant
Visitor and Contractor Guide
General Rules and Requirements

SAFETY IS PART OF EVERYONE'S JOB !

AlliedSignal is committed to providing a safe environment to all employees, visitors, and contractors, free of all recognizable health, safety, and environmental hazards. In order to accomplish this goal, it is essential that all persons who are on the plant premises cooperate in reducing and eliminating conditions that may result in the injury of themselves or others.

This guide presents general rules and requirements in order to accomplish this goal. These rules and regulations are not all inclusive. All visitors and contractors shall comply at all times with any and all applicable local, state, and federal regulations, including, but not limited to OSHA, EPA, and NJDEPE.

In the event of a fire alarm or other emergency, contractors and visitors shall stop work immediately and proceed to the nearest exit. They shall assemble at the front gate and check in with the guard. If any contract workers are unaccounted for, notify the guard immediately.

Make your visit a safe and healthful one.

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GENERAL RULES AND REQUIREMENTS

EMERGENCY NUMBERS

- PLANT EMERGENCY x 5555
- Safety Department x 5164
- Environmental Department x 5140
- Security x 5106
- EMS 9 - 911
- PA System x 23

ALARMS / EMERGENCY EVACUATION

In the event of an emergency such as a fire, toxic gas leak, or other event, the appropriate alarm will be sounded.
Each area is equipped with a fire alarm system.
The plant also is equipped with a steam whistle that is used to alert personnel of emergency situations.
In the event of an emergency or activation of an alarm, visitors and contractors shall report to their plant contact, who shall in turn, report to the guard. If the plant contact is unavailable, visitors and contractors shall report immediately to the guard, and check in.

ALCOHOL, DRUGS, AND FIREARMS

- Alcohol, illegal drugs, and firearms are prohibited from AlliedSignal property. anyone found with any of these will be immediately removed from the premises and will not be permitted to return.

PARKING

- All contract personnel shall park vehicles in the lot to the right, once entering the AlliedSignal driveway.

IDENTIFICATION BADGES

- Upon reporting to work at the plant each day, you must check in with the guard, and sign the contractor's or visitor's log. You will be given a "VISITOR" or "CONTRACTOR" Badge after receiving the visitor/contractor safety orientation by your plant contact.
- Badges must be worn at all times while on plant property. The badge must be returned to the guard at the end of each day. Badges are non-transferable to others persons.

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SECURITY

- For security reasons, contract personnel shall enter and exit the site through the guard house only. You shall sign in and out each time you enter or leave the site.
- You are only authorized to access those areas where you are performing work. Entering unauthorized areas of the plant is prohibited any may result in removal from the site.
- Doors that are locked with magnetic or other locking devices shall not be propped open unless authorized by your plant contact.

VEHICLES

- Personal vehicles are prohibited on plant property unless a gate pass is issued from the guard for a specific reason, such as equipment transporting. Vehicles must not block fire hydrants, roadways, loading docks, garages, or other essential facilities. A speed limit of 15 miles per hour shall be observed at all times on plant property.

CHEMICALS / HAZARD COMMUNICATION

- CHEMICALS include all substances used including paints, oils, fuels, cleaners, etc. If there are any questions on what to include contact your plant contact.
- All chemicals proposed for use on the plant must be approved in writing by the Environmental, Safety, and Health Department.
- A list of materials and a copy of all Material Safety Data Sheets must be submitted to the plant and approved, prior to bringing them onto the premises.
- ALL CONTAINERS SHALL BE CLEARLY LABELED AT ALL TIMES.
- All chemicals found that have not been authorized will be removed from the premises until approval is granted.
- Inquire with the plant contact about any chemical hazards associated with area you will be working in.
- Know the location of the nearest eyewash and safety shower in case you are exposed to hazardous chemicals in the course of your duty. Eyes and skin should be washed for a minimum of fifteen (15) minutes.
- Contractors are responsible for the proper disposal of all waste created in the course of your work.

COMPRESSED GAS CYLINDERS

- Valve protection caps shall be in place at all times when compressed gas cylinders are transported or not in use.

- Cylinder valves shall be closed when work is complete and when cylinders are empty or moved.
- Cylinders shall be secured with chains or ropes in an upright position at ALL TIMES.
- Cylinders shall be kept at a safe distance from physical or chemicals hazards, and from fire or heat.
- Regulators shall be in proper working conditions.
- Leaking cylinders shall be immediately removed from service. move cylinder outside, notify others in the area, and call x 5555 for assistance.
- Cylinders must be labeled as to the contents at all times.

CONFINED SPACE ENTRY

- Confined spaces include tanks, bins, sewers, degreasers, boilers, manholes or other area not intended for human occupancies or with limited or restricted means of egress. Confined spaces may present hazards such as asphyxiation, toxic atmospheres, and flammable / explosive atmospheres.
- Before any confined space entry is performed, the contractor shall notify the plant contact, who will initiate a confined space entry permit.
- Confined space entry may not occur until the following requirements have been met:

  - ◊ All contract employees have been trained in and have submitted documentation of confined space entry requirements.
  - ◊ Contractor submits a written Confined Space Entry Program, which is approved by ESH Department and Supervisor of plant location.
  - ◊ All contract employees have reviewed and understand the Plant Confined Space Entry Program.
  - ◊ All requirements of both written programs have been met.
  - ◊ All equipment, including safety gear (harness, lifelines, ventilation, respirators) are in good condition.

CRANES AND HOISTS

- Contractors are not permitted to use AlliedSignal cranes, hoists, or other lifting equipment unless approval is given by the operating department manager.
- Mobile cranes shall not be operated within 50 feet of electric power lines.

ELECTRICAL SAFETY

- Extension cords shall be three-wire. Worn or frayed cords shall be immediately removed from service.
- Expose bulbs on lighting equipment shall be guarded from physical damage or personnel contact. Temporary lights shall not be suspended by their cords unless designed for this purpose.
- All temporary electrical installations shall be protected by ground fault circuit interrupters, in accordance with the National Electric Code.
- Whenever work is to be performed on any energized equipment, contractors shall comply with plant and OSHA Control of Hazardous Energy requirements (See Lockout / Tagout).

ENGINES (INDOOR OPERATION)

- Gasoline, LP gas (propane), diesel, or other types of internal combustion engines shall not be operated inside buildings unless approved in advance by the ESH Manager.

EXCAVATIONS AND TRENCHES

- Before any excavation work is started, the existence and location of any underground pipes, electric lines, sewers, steam lines, or other utilities shall be determined. The contractor shall contact the Plant Engineering Department for this information.
- Walls and faces of trenches deeper than five (5) feet shall be guarded by shoring, sloping, or other equivalent means, in accordance with OSHA Construction Standard (29 CFR 1926).
- The contractor is responsible for conducting daily inspections of the excavation. Immediate corrective action shall be taken upon discovery of any sign of slides or cave-ins.
- Trenches deeper than four (4) feet shall have ladders or steps every 25 feet of lateral distance.

HAZARDOUS CONDITIONS REPORTING

- Report to your plant contact all hazardous conditions that you create or observe, in order to prevent injuries from occurring.

HOT WORK

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- HOT WORK is defined as any spark or flame producing work, including, but not limited to welding, cutting, grinding. In addition, any powered tool use in Class 1, Division 1 or 2 areas is considered hot work.
- Prior to performing hot work, a HOT WORK permit must be issued by the operating or maintenance department where work is to occur.
- Non-combustible screens shall be provided by the contractor to protect others and property from sparks or harmful light.
- Contractor shall ensure that a fire watch is present, and trained in the use of fire extinguishers. Contractors shall provide their own extinguishers. PLANT FIRE EXTINGUISHERS SHOULD NOT BE REMOVED FOR FIRE WATCH.

HOUSEKEEPING

- Equipment and material shall be kept neatly during and after work. Equipment shall not block aisleways, emergency equipment, doors, etc.
- All nails and screw shall be removed or sufficiently bent down.
- All scrap, debris, cardboard, packaging or other waste shall be disposed of at regular, frequent intervals, and shall not be allowed to accumulate in the work area.
- Contractors are responsible for providing their own waste disposal means, unless otherwise instructed.
- No materials shall be stored or suspended overhead.

INJURIES / ACCIDENTS

- Report all injuries or accidents to your plant contact immediately, no matter how minor.

LADDERS / SCAFFOLDS

- The use of ladders with broken or missing rungs or steps, broken handrails, or other faults is prohibited.
- All ladders must have non-slip safety feet.
- Ladders may not be used in front of doors unless door is locked shut or guarded.
- Metal ladders shall not be used for any electrical work - only wood, fiberglass or equivalent ladders may be used.
- Scaffolds must be equipped with locking wheels, kick plates, side rails and toe boards, where applicable.
- Personnel required to work within 10 feet of any roof ledge or other elevated surface higher than 6 feet, shall wear a safety harness attached to a lifeline that limits the travel to 1 foot from the roofs edge. If work must be done at the edge, a lanyard that limits free-fall to 6 feet or less shall be utilized. Lanyards shall be rated for a minimum of 5400 pounds

breaking strength. EXCEPTION: Lifelines are not required in installations with permanent or portable handrails.

- Work on ladders that may present falling hazards requires the use of a harness and lifeline.
- All lifelines shall be safely secured to a support. DO NOT SECURE LIFELINES TO SPRINKLERS OR OTHER PIPES.

LASERS

- Lasers are not permitted to be used on AlliedSignal premises unless approved by the ESH Department.
- No individual shall operate a laser unless he possesses a valid certificate of competence by the State of New Jersey.

LINEBREAKING

- No process or utility lines may be broken until a plant LINEBREAKING PERMIT has been issued. Your plant contact will coordinate this. This applies to chemical lines, steam, water, compressed air, nitrogen or other lines with pressure or chemicals.

LOCKOUT / TAGOUT

- Whenever visitors or contractors perform service or maintenance to any energized piece of machinery or equipment, proper lockout / tagout procedures must be followed, in accordance with the OSHA standard for Control of Hazardous Energy.
- Energy may include electrical, mechanical, pneumatic, hydraulic, chemical, thermal, or potential (stored).
- Contractors and visitors are responsible for providing their own materials to perform lockout procedures.

MEDICAL SERVICE

- A company nurse is on duty at certain times. Check with your plant contact for the hours.

NOISE

- Upon entering areas of high noise levels, contractors and visitors shall don appropriate hearing protection. All contractors are responsible for their own hearing conservation plans.
- Any operations performed by the contractor which result in high noise levels, shall be communicated to the plant contact so that all personnel may be warned of the hazard.

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OSHA 200 LOG

- All contractors shall maintain an OSHA 200 log of recordable injuries. This form shall be kept on site, or be readily accessible.

OVERHEAD WORK

- No work shall be performed overhead of personnel.
- When overhead work is to be performed, the area shall be barricaded to warn others of the extra hazard.

PERSONAL PROTECTIVE EQUIPMENT

- Safety glasses are required at all times on plant premises, except while in offices.
- Safety toed shoes are required at all times on plant premises, except while in offices.
- Hard hats are required outside at all times and in certain indoor areas. Your plant contact can inform you of these requirements. The only exception is hard hats are not required in YELLOW outside walkways. Contractors and visitors will be issued YELLOW hard hats.
- Respirators shall be used at all times where hazardous air contaminants are generated. Contractors are responsible for providing their own respirators. Respiratory protection shall be of adequate type and size, and in good condition. Contractors shall provide the plant safety department with a copy of Respiratory Protection Program if respirator use is required.
- Hearing protection shall be worn in all areas with a noise level above 85 dBA.
- Hand protection shall be worn to protect against heat, chemicals, cuts, abrasions, or other hazards.

PLANT EMERGENCY EQUIPMENT

- Emergency equipment shall not be moved, blocked, or otherwise rendered inaccessible, unless specifically approved by ESH Department and Operating department management.

POWDER ACTUATED TOOLS

- Powder actuated tools shall not be used on plant property unless approved by the Manager of ESH.

- All tools shall meet the requirements of ANSI A10.3-1970 - Explosive actuated fastening tools.
- Tools shall not be left unattended at any time.
- Each user shall carry and present to the safety engineer, his certification to operate powder actuated equipment.

PROCESS SAFETY MANAGEMENT

- The MicroOptic devices operation is covered by the OSHA Process Safety Management Standard for Highly Hazardous Chemicals.
- Any contractors or visitors to the MicroOptic Devices operation will be informed of the impact of the process on their purpose.
- No contractor or visitor activities may occur until a Process Safety Management training meeting has been attended by all persons involved.

SAFETY BELTS

- Safety harnesses and lifelines shall be worn at all times when :
  - ◊ working above 6 feet above the floor.
  - ◊ work on a ladder involves pushing, pulling or other action that may dislodge worker.
  - ◊ working on scaffolds without handrails.
  - ◊ working in confined spaces
  - ◊ working in portable manlifts.
- Lanyards shall have a minimum breaking strength of 5400 pounds, and shall be labeled as such.

SMOKING AND OPEN FLAMES

- Smoking and open flames are prohibited in areas where flammable liquids, gases or highly combustible materials are stored, handled, or processed. Your plant contact will direct you to permitted smoking areas.

SOLVENTS AND PAINTS

- Paints and solvents may only be used in well ventilated areas. No spray painting is permitted inside buildings.
- Proper respiratory and protective clothing are required to be worn.
- No flammable materials may be used near ignition sources.
- Flammable materials shall be stored in approved cabinets inside buildings. If a cabinet is not available, flammable materials shall be removed from the building when not in use.
- Flammable liquids must be dispensed from safety cans with flash screens, and properly bonded.

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TOOLS

- Hand and power tools shall be kept in safe operating condition.
- Non-sparking tools are required in certain areas of the plant. Check with your plant contact for these areas.

TOXIC CATASTROPHE PREVENTION ACT (TCPA)

- The ACLON process is covered by the New Jersey Toxic Catastrophe Prevention Act, due to the presence of a toxic, compressed gas.
- All contractors or visitors whose scope of work may expose them to this operation shall be trained in the hazards and protective measures associated with the operation.
- No visitor or contractor shall perform any work or activity on any part of the operation without authorization from the Production Supervisor.

TRADE SECRETS

- All of the processes, chemicals, equipment, and procedures are protected by trade secret provisions in the Code of Federal regulations.
- All visitors and contractors shall sign non-disclosure agreements prior to entering any plant areas with proprietary information.
- Contractors and visitors shall be escorted at all times in these areas.

WARNING SIGNS

- Follow the instructions of all warning signs.
- Contractors shall place all appropriate warning signs to alert personnel of hazards created by the contractor.

WORK PERMITS

- Prior to work each day, the contractors plant contact shall issue a CONTRACTOR WORK PERMIT, stating the type of work, equipment, and precautions to be used.
- Work permits shall be signed by the Manager of the plant location, and displayed at the work site.
- Modifications to the scope of work shall be reviewed by the Area Supervisor and noted on the permit.
- Work permits may be revoked for non-compliance reasons.

DISCIPLINARY ACTION

A written notification of safety rule violation will be issued for violations of all safety requirements. Any visitor or contractor receiving two written

notices will be removed from the site, and will not be permitted to return, unless approved by the Plant Manager, Manager of Environmental, Health, and Safety, and area Production or Maintenance Manager..

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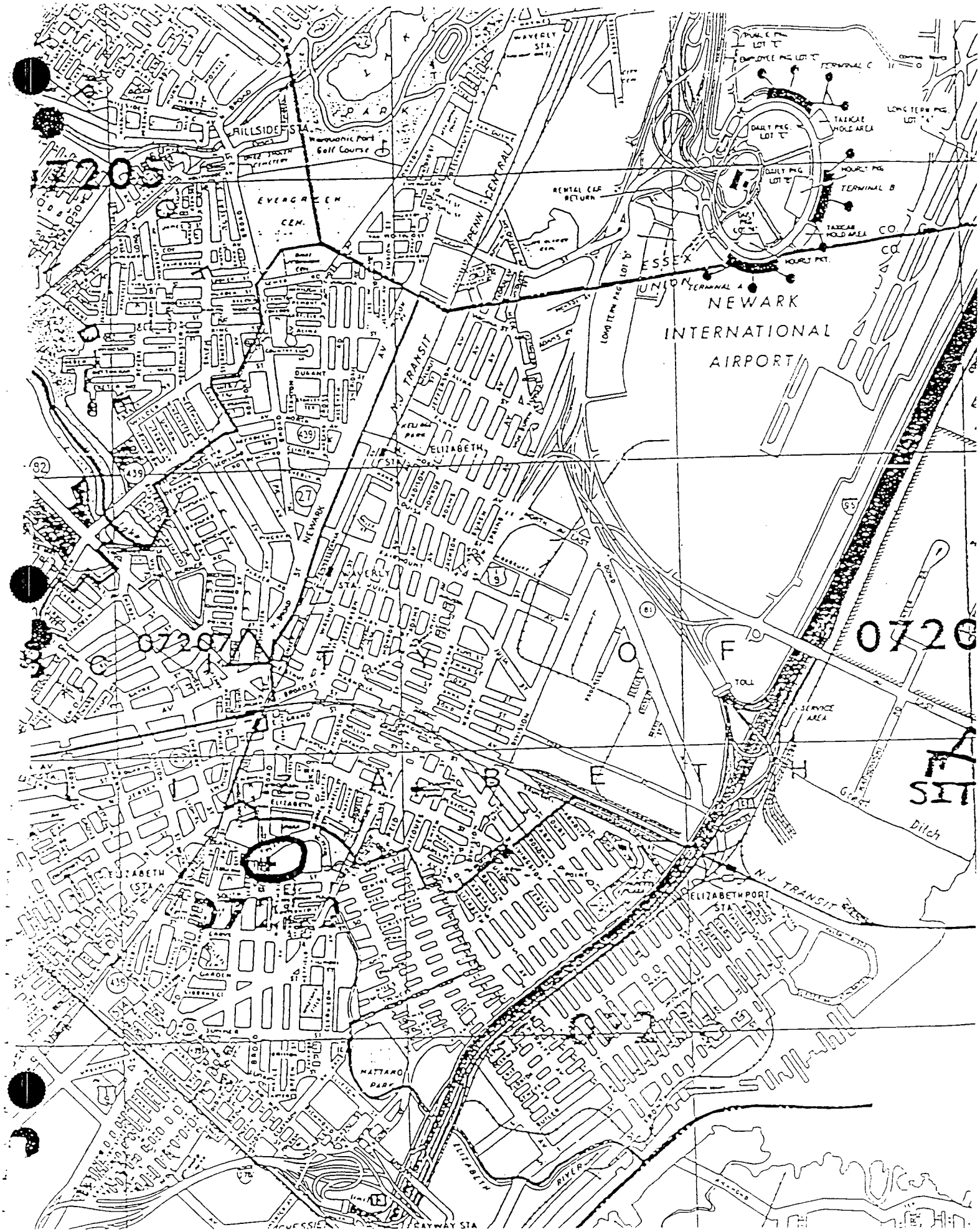

HILLSIDE STA.
Golf Course
EVERGREEN CEM.
PENN CENTRAL
RENTAL CAR RETURN
TERMINAL C
TAXICAB HOLD AREA
DAILY PKG. LOT "C"
HOURLY PKG.
TERMINAL B
TAXICAB HOLD AREA
HOURLY PKT.
TERMINAL A
ESSEX
UNION
CO.
NEWARK
INTERNATIONAL
AIRPORT
N.J. TRANSIT
ELIZABETH STA.
WAVERLY STA.
NEWARK
TOLL
SERVICE AREA
Great Ditch
ELIZABETHPORT STA.
N.J. TRANSIT
MATTANO PARK
ELIZABETH RIVER
RAYWAY STA.

No. 315

MATERIAL SAFETY DATA SHEET

GENIUM PUBLISHING CORPORATION
1145 CATALYN STREET
SCHENECTADY, NY 12303-1836 USA
(518) 377-8855

GENIUM PUBLISHING CORP.

CHLOROFORM
Revision C

Date August 1979

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: CHLOROFORM
OTHER DESIGNATIONS: Trichloromethane, $CHCl_3$, COBEHN Spray-Clean Solvent (Trade name), CAS# 000 067 663
MANUFACTURER: Available from many suppliers, including Cobehn, Inc., 226 Passaic, Fairfield, NJ 07006

SECTION II. INGREDIENTS AND HAZARDS	%	HAZARD DATA
Chloroform plus stabilizer* *0.5-1% ethyl alcohol or 0.025% amylene. **ACGIH (1979); labeled as a suspected carcinogen. NIOSH (1976) recommended a 2 ppm ceiling level and a suspected carcinogen classification when a high level of $CHCl_3$ by gavage was found to cause liver cancer in mice and kidney tumors in rats. NIOSH also warned of an increased toxic hazard with $CHCl_3$ when alcohol had been consumed. Current OSHA TLV remains at a 50 ppm ceiling limit.	ca 100	8-hr TWA 10 ppm** or 50 mg/m³ Human, oral LDLo 140 mg/kg Rat, inhalation LCLo 8000 ppm/4 hr Rat (6-15 day preg) inhalation TCLo 100 ppm/7 hr (teratogenic)

SECTION III. PHYSICAL DATA

Boiling point, 1 atm, deg F (C)	142 (61)	Specific gravity, 20/4 C	1.489
Vapor pressure at 20 C, mm Hg	159	Volatiles, %	ca 100
30 C, mm Hg	245	Evaporation rate (CCl_4=1)	1.18
Vapor density (Air=1)	4.13	Freezing point, deg F (C)	-82(-63.5)
Solubility in water at 25 C, %	0.8	Molecular weight	119.38

Appearance & Odor: Clear, colorless, volatile liquid with a characteristic "sweetish" etheral odor.

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	LOWER	UPPER
None	—	None	—	—

Nonflammable material. Use extinguishing media appropriate for surrounding fire.
When this material is involved in a fire situation, firefighters should use self-contained breathing apparatus for protection against suffocating vapors and toxic and corrosive decomposition products.

SECTION V. REACTIVITY DATA

Chloroform is stable in a sealed container in the dark. Even when stabilized with ethanol it develops acidity from prolonged exposure to air and light.
Thermal-oxidative decomposition at high temperature can generate toxic and corrosive oxides of chlorine and carbon, hydrogen chloride, and chlorine.
Avoid contact with strong alkalis.

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MATERIAL SAFETY DATA SHEET

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(518) 377-8855

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NO. 473

FUEL OIL #5

Date October 1981

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: Fuel Oil #5
DESCRIPTION: Medium viscosity residual fuel oil; "light" and "heavy" types
OTHER DESIGNATIONS: GE Material D27B1, ASTM D396, Bunker Fuel, Navy special, CAS # 068 476 335
MANUFACTURER: Available from many suppliers, including: AMOCO Oil Company
200 East Randolph Drive
Chicago, IL 60601
Phone: (312) 856-5371

SECTION II. INGREDIENTS AND HAZARDS

	%	HAZARD DATA
FUEL OIL #5 Complex mixtures of paraffinic, olefinic, naphthenic and aromatic hydrocarbons.	ca 100	8-hr TWA 5 mg/m^3 (mineral oil mist)*
Benzene**	<100	

*Current OSHA standard and ACGIH (1981) TLV. Current OSHA 8-hr TWA standard for petroleum distillates (naphtha) is 500 ppm or 2,000 mg/m^3.
**A low benzene level reduces carcinogenic risk. Fuel oils can be exempt under the benzene standard (29 CFR 1910.1028).

SECTION III. PHYSICAL DATA

Initial boiling point, 1 atm, deg C	>220	Specific gravity (H_2O=1)	0.93-1.05
Vapor pressure, 20 C, mmHg	<0.1	Evaporation rate (n-BuAc=1)	<0.01
Vapor density (Air=1)	>6	Viscosity @ 40 C, cSt:	
Solubility in water	negligible	Light type	24-58
		Heavy type	58-168

Appearance and Odor: Homogeneous, black oily liquid with a strong asphalt-like odor.

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	LOWER	UPPER
>140°F* (PM)	—	% by volume	1.0	5

Extinguishing Media: Dry chemical, carbon dioxide, alcohol foam, water spray. Use water spray to cool fire exposed containers. This combustible liquid needs a smothering technique for extinguishment. Do not use a forced water stream directly on oil fire as this can scatter burning oil. Material is an OSHA Class IIIA combustible liquid.
Firefighters should wear self-contained breathing apparatus and full protective clothing.
*A flash point >130 F is allowed under ASTM D396.

SECTION V. REACTIVITY DATA

This is a stable material in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization.
Incompatible with strong oxidizing agents; heating increases its fire hazard.
Thermal-oxidative degradation may produce various low molecular weight hydrocarbons and hydrocarbon derivatives, carbon monoxide, and oxides of sulfur.

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MATERIAL SAFETY DATA SHEET

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NO. 474

FUEL OIL NO. 6

Date October 1981

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: FUEL OIL NO. 6
DESCRIPTION: A high-viscosity residual oil; Preheating required for use.
OTHER DESIGNATIONS: ASTM D396, Bunker C, GE Material D27B1D, CAS # 068 553 004
MANUFACTURER: Available from many suppliers, including:
Amerada Hess Corp.
1 Hess Plaza
Woodbridge, N.J. 07095 Tel: (201) 636-3000

SECTION II. INGREDIENTS AND HAZARDS

SECTION II. INGREDIENTS AND HAZARDS	%	HAZARD DATA
Fuel Oil No. 6 Complex mixture of paraffinic, olefinic, naphthenic, and aromatic hydrocarbons, including polycylic aromatic hydrocarbons.		8-hr TWA 5 mg/m^3 (mineral oil mist)*
Sulfur content**	<2.8	

*Current OSHA standard and ACGIH (1981) TLV
**No. 6 fuel oil with low sulfur (0.2 and 1.2%) is commercially availble.

SECTION III. PHYSICAL DATA

Boiling point, 1 atm, deg C — >260
Vapor pressure, 70F, mmHg — ca 0.2
Solubility in water — negligible
Specific gravity (H_2O=1) (approx) — 0.966
Viscosity at 122 F, cSt — 92-638

Appearance and Odor: Black liquid to heavy paste, petroleum odor.

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air % by volume	LOWER	UPPER
>140 F (PMCC)	765F		3.9	20.1

Extinguishing Media: Dry chemical, carbon dioxide, foam, water spray. Use a water spray to cool fire exposed containers. Use a smothering technique for extinguishing fire of this combustible liquid. Do not use a forced water stream directly on oil fire as this will only scatter the fire. Material is an OSHA Class IIIA combustible liquid. Exhibits "boil-over" characteristics.
Firefighters should wear self-contained breathing apparatus and full protective clothing.

SECTION V. REACTIVITY DATA

This is a stable material in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization.
Incompatible with strong oxidizing agents; heating greatly increases fire hazard.
Thermal-oxidative degradation may yield various hydrocarbons and hydrocarbon derivatives (partial oxidation products), CO_2 and CO and SO_2.

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No. 467

AUTOMOTIVE
GASOLINE, LEAD-FREE

Date October 1981

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: AUTOMOTIVE GASOLINE, LEAD-FREE
DESCRIPTION: A volatile blend of hydrocarbons for automotive fuel
OTHER DESIGNATIONS: Petrol, CAS #008 006 619, ASTM D439
MANUFACTURER: Available from several suppliers.

SECTION II. INGREDIENTS AND HAZARDS	%	HAZARD DATA
Gasoline A hydrocarbon blend that can include normal and branched chain alkanes, cycloalkanes, alkenes, aromatics and other additives.** (Lead max 0.013 g/L, phosphorus max 0.0013 g/L, sulfur max 0.10 wt%. May contain benzene, <5%; see ASTM D3606). *ACGIH 1981 TLV (Intended Changes List). See also Am. Ind. Hyg. A. 39 110-117 (1978) **The composition of fuel is varied with altitude and seasonal requirements for a locality. The blend must meet antiknock requirements. (Antiknock Index min 85, ASTM D439.)	100	8-hr TWA 300 ppm or 900 mg/m^3* Man Eye: 500 ppm/1H Moderate irritation Inhalation: TCLo 900 ppm/1H TFX:CNS

SECTION III. PHYSICAL DATA

Distillation at 1 atm, Initial, deg C >39
50% distilled - 77-121
End point ——— <240
Vapor density (Air=1) ——— 3.0-4.0
Solubility in water ——— Insoluble

Specific gravity, 60/60 F - 0.72-0.76
Melting point, deg C ——— -90.5-95.4
Evaporation rate ——— N/A

Appearance and Odor: A clear, mobile liquid with a characteristic odor which can be recognized at about 10 ppm in air. (Gasoline may be colored with dye.)

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air % by volume	LOWER	UPPER
-45 F	536-853 F		1.4	7.6

Extinguishing Media: Dry chemical, carbon dioxide, alcohol foam. Use of water may be ineffective to extinguish fire, but use water spray for cooling fire-exposed drums and tanks to prevent pressure rupture. It is a dangerous fire and explosion hazard when exposed to heat and flames. Vapors can flow along surfaces, reach distant ignition sources and flash back. Can react violently with oxidizing agents.
Firefighters should wear self-contained breathing apparatus and full protective clothing.

SECTION V. REACTIVITY DATA

This is a stable material in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization.
This is an OSHA Class IA flammable liquid. A mixture of gasoline vapors and air can be explosive. It is incompatible with oxidizing agents.
Thermal-oxidative degradation can yield carbon monoxide and partially oxidized hydrocarbons.

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GENIUM PUBLISHING CORP.

BENZENE

Revision C

Date November 1978

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: BENZENE

OTHER DESIGNATIONS: Benzol, Phenylhydride, Phene, C_6H_6, GE Material D5853, ASTM D835, D836, D2359, CAS #000 071 432

MANUFACTURER: Available from many sources.

SECTION II. INGREDIENTS AND HAZARDS

SECTION II. INGREDIENTS AND HAZARDS	%	HAZARD DATA
Benzene	ca 100	8-hr TWA 10 ppm (skin)* with 25 ppm ceiling level and 50 ppm 10 minute peak

*Current OSHA and ACGIH (1978) permissible exposure level. Note that the OSHA standard on benzene which would reduce the TLV to 1 ppm with a 5 ppm ceiling, forbid contact with liquid with over 0.5% benzene, and legally classify benzene as a human carcinogen has been struck down by U.S. Court of Appeals.

ACGIH (1978) lists benzene as a suspected carcinogen for humans.

SECTION III. PHYSICAL DATA

Boiling point, 1 atm, deg F (C)	176 (80)	Specific gravity, 20/4 C	0.879
Vapor pressure at 20 C, mm Hg	74.6	Volatiles, %	ca 100
Vapor density (Air=1)	2 77	Evaporation rate (CCl_4=1)	1.0
Solubility in water, wt. %	0.06	Molecular weight	78.12
		Melting point, deg F (C)	42 (5.5)

Appearance & Odor: Clear, colorless liquid having a characteristic aromatic odor. The odor recognition threshold (100% of panel) is 4.68 ppm (unfatigued) in air. Odor is is not an adequate warning of hazard.

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air Volume %	LOWER	UPPER
12°F (-11C) (TCC)	1044°F (562°C)		1.3	7.1

Extinguishing Media: Water fog, CO_2, dry chemical or foam. Use a blanketing effect to smother fire. A water stream will scatter the fire. A water spray can be used to cool fire exposed containers.

Firefighters should wear approved self-contained breathing apparatus.

This material can form explosive and flammable mixtures with air at room temperature. It is a severe explosion hazard and toxic hazard in a fire situation. Vapors can flow along surfaces to distant ignition sources and flash back.

SECTION V. REACTIVITY DATA

Benzene is a stable compound under normal storage and use conditions; it does not polymerize.

Benzene will react vigorously with strong oxidizers such as ozone, permanganate, sulfuric or nitric acids, potassium peroxide, sodium peroxide, et al. It is a flammable liquid. OSHA Class IB. Heating greatly increases the fire and explosion hazards.

Oxidation in air will produce oxides of carbon and nitrogen.

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NO. 317

TOLUENE

Revision C

Date August 1979

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: TOLUENE
OTHER DESIGNATIONS: Toluol, Methylbenzene, Phenylmethane, $CH_3C_6H_5$, GE Material D5B11, ASTM D362 and D841, CAS# 000 108 883
MANUFACTURER: Available from many suppliers, including Shell Chemical Co. and Sun Oil Co.

SECTION II. INGREDIENTS AND HAZARDS	%	HAZARD DATA
Toluene	ca 100	8-hr TWA 100 ppm (skin)* or 375 mg/m^3
		Human, inhalation TCLo 200 ppm (central nervous syst.)
*ACGIH (1978); (skin) notation indicates a potential contribution to overall exposure via skin absorption. OSHA/NIOSH (1976) proposed an 8-hr TWA of 100 ppm, with a 15-minute ceiling of 200 ppm, and an action level of 50 ppm. Current OSHA TLV is 200 ppm.		Rat, inhalation LCLo 4000 ppm/4 hr
		Rat, oral LD_{50} 5000 mg/kg

SECTION III. PHYSICAL DATA

Boiling point, 1 atm, deg F (C)	231 (110.6)	Specific gravity (Water=1)	0.866
Vapor pressure @ 25 C, mm Hg	28	Volatiles, %	100
Vapor density (Air=1)	3.2	Evaporation rate (BuAc=1)	1.9
Solubility in water, %	0.05	Molecular weight	92.15

Appearance & Odor: Water white liquid with a characteristic aromatic odor, whose recognition threshold (unfatigued) is 2-5 ppm (100% of test panel). Odor detection is unsatisfactory for safety because of fatigue.

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air % by volume	LOWER	UPPER
40 F (4.4 C) Closed cup	(536 C) 997 F		1.2	7

Extinguishing Media: Carbon dioxide, dry chemical, foam, and water fog. Water may be ineffective for putting out fire, but use spray to cool fire-exposed containers.

At room temperature, toluene emits vapors that can form flammable mixtures with air. It is a dangerous fire hazard and a moderate explosion hazard when exposed to heat and flame. Vapors can flow along surfaces to distant ignition sources, then flash back.

Firefighters should wear self-contained breathing apparatus and eye protection when fighting toluene fires.

SECTION V. REACTIVITY DATA

Toluene is a stable material under normal storage and handling. It does not undergo hazardous polymerization.

Since toluene is a flammable liquid, avoid contact with heat, sparks or open flames. Avoid contact with strong oxidizing agents. Nitric acid and toluene, especially in combination with sulfuric acid, will produce nitrated compounds which are dangerously explosive.

Oxidation in air can form oxides of carbon and nitrogen.

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No. 318

XYLENE
(mixed isomers)

Revision C

Date November 1980

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: XYLENE (mixed isomers)
OTHER DESIGNATIONS: Xylol, Dimethylbenzene, $C_6H_4(CH_3)_2$; ASTM D843, D845 and D846; GE Material D5B9, CAS #001 330 207.
MANUFACTURER: Available from many suppliers, including EXXON Company USA and Shell Chemical Company.

SECTION II. INGREDIENTS AND HAZARDS

	%	HAZARD DATA
Xylene (o, m, p-isomers)	>90	8-hr TWA 100 ppm (skin)** or 435 mg/m^3
Other C_7 to C_9 Hydrocarbons*	<10	

*Material may contain ethylbenzene (8-hr TWA 100 ppm) and traces of toluene and C_9 aromatic and aliphatic hydrocarbons. Some commercial products may contain over 10% non-xylene hydrocarbons, mostly ethylbenzene.
**Current OSHA standard and ACGIH (1980) TLV. NIOSH has proposed a 10-hr TWA of 100 ppm with a 200 ppm ceiling level (10 min. sample).
STATUS: NCI bioassay for carcinogenesis study 9/78. TLV set to prevent irritant effects and CNS depression.

Xylene Typical

Human, inhalation
TCLo 200 ppm
(Irritation Effects)

Rat, oral
LD_{50} 4.3 g/kg

Human, oral
LDLo 50 mg/kg

SECTION III. PHYSICAL DATA

Boiling range, 1 atm, deg C	135-145*	Specific gravity (H_2O=1)	0.86-0.87
Vapor pressure at 20 C, mm Hg	ca 6	Volatiles, %	ca 100
Vapor density (Air=1)	3.7	Evaporation rate (BuAc=1)	0.6
Solubility in water	Negligible	Molecular weight	106.18

Appearance & Odor: Light colored or colorless, mobile liquid with an aromatic odor. The recognition threshold (100% of test panel) is about 0.3 ppm in air (unfatigued) for xylene.

*Wider and narrower boiling range materials are commercially available.

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air Volume %	LOWER	UPPER
>77 F (TCC)	867 F		1	7

Extinguishing Media: Use dry chemical, foam, CO_2, and water fog or steam to provide a smothering effect on fire. A water stream can scatter flames. A spray of water may be used to cool fire-exposed containers.

This flammable liquid is a dangerous fire hazard and a moderate explosion hazard when exposed to heat or flame. Heavier-than-air vapors can flow along surfaces to distant ignition sources and flash back.

Firefighters should use self-contained breathing apparatus.

SECTION V. REACTIVITY DATA

This material is stable in closed containers at room temperature. It does not polymerize.

It is flammable (OSHA Class IC liquid) and can form explosive mixtures with air. Keep away from sources of heat, sources of ignition and strong oxidizing agents. Thermal-oxidative degradation in air can produce toxic vapors and gases, including carbon monoxide and oxides of nitrogen.

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EXHIBIT 2

O'BRIEN & GERE RESUMES

920890215

O'Brien & Gere Engineers, Inc.

Gary A. Angyal, PE

Project Associate

PROJECT ASSIGNMENT

Technical Coordinator

PROFESSIONAL PROFILE

Mr. Angyal has extensive experience in site assessment programs and remedial designs, and is thoroughly familiar with state and federal regulatory requirements for hazardous waste disposal, wastewater disposition, and air permitting.

YEARS OF EXPERIENCE

With O'Brien & Gere: 19
With Other Firms: 0

EDUCATION

MBA/1990/Management
BS/1984/Chemical Engineering

REGISTRATIONS

Professional Engineer in NC, PA

REPRESENTATIVE PROJECTS

AIR MANAGEMENT SERVICES:

As Project Associate, Mr. Angyal provides expertise in coordination of projects involving air permitting, emission inventories and control technology evaluations. He has served as project manager or lead engineer for multi-disciplinary, multi-phase projects performed for diverse industrial clients and has successfully completed these projects on schedule, within budget and in an environmentally sound manner. Representative projects include:

Directed emissions inventories and Title V major source applicability evaluations for numerous clients in the Southeast. Emission sources have included scrubbers, distillation columns, fugitive emissions, process boilers, dust collectors, storage tanks and paint spray booths. Potential-to-emit was calculated on the basis of current federally-enforceable limits (for Title V) as well as State permit conditions.

Currently managing the preparation of a Title V permit application for a major source also regulated by MACT standards and New Source Performance Standards. Program involves the permitting of approximately 75 sources at the facility.

Managed an emissions testing program for a chemical manufacturer in Georgia to evaluate wastewater emissions and their effect on the facility's Title V major source status.

Managing the evaluation of Hazardous Organic NESHAP provisions as they relate to wastewater from a chemical manufacturing facility. Project entails the development of a wastewater sampling program to meet the USEPA characterization requirements of that rule.

Developed New Source Performance Standard (NSPS) Compliance Manual for a chemical manufacturer. NSPS categories included storage tanks, boilers, Leak Detection and Repair (LDAR), reactors and distillation columns for the SOCMI industry.

Compiled air emissions inventory for major pharmaceuticals manufacturer. Project involved calculation of organic emissions from 150 process steps involving condensers, driers, and packed-bed scrubbers. State permit applications filed and approved for all processes. Emissions inventory was based on stack sampling results and known material balances for each process (such as percent recovered solvent and wastewater emissions) as well as theoretical control efficiencies for condensers.

Prepared air permit applications for reconstruction of a damaged plastic resins manufacturing plant. Activities included evaluation of existing permit status (including grandfathering), emissions inventory program and

completion of permit applications for replacement equipment utilizing a modified vent configuration for simplifying plant permit compliance.

Conducted control technology evaluation for a roll mill operation emitting volatile organic compounds. Project involved assessing capture efficiencies, venting evaluations (including smoke tests to characterize venting patterns), and cost estimates for thermal oxidation control devices. Safety features such as explosion vents and isolation valves were also evaluated.

Directed the development of a batch air permit application specifically designed for batch R&D/pilot plant operations in New Jersey. Permit was for a client in the pharmaceutical industry and focused on volatile organic and particulate emissions. Permit application was developed based on a range of raw material to afford operational flexibility.

Conducted 5-year annual air emissions audit for chemical manufacturing facility in New Jersey. Activities included process building walkthroughs, equipment inspections, review of equipment modifications, emissions inventory and permit application/approval status review.

Prepared air permit applications and/or evaluated process emissions from clients in the chemical, cosmetic, beverage, and metal fabricating industries. Activities included emission calculations and compliance evaluation with State
regulations in categories such as surface coating, particulate control and degreasing.

Evaluated air permitting requirements of various thermal treatment systems for contaminated soils in the State of New Jersey; included preparation of draft permit applications and discussions with NJDEPE regarding specific control and monitoring requirements. Project was part of a CERCLA remedial design and entailed the evaluation of various control technologies (condensation, adsorption, thermal oxidation) based on soil loading rates, processing temperatures and retention times. Emission limitations were based on de minimus levels or percent removal rates. Monitoring requirements specified included CEMs and stack sampling.

Directed a particulate control feasibility study for a can spray coating operation. Goal of study was to develop alternative control measures to attain compliance with NJDEPE particulate control regulations. Existing control entailed chain baffles and alternatives evaluated included filtration and wet scrubbing.

Prepared NJDEPE air permit application for incineration of landfill gases based on landfill gas sampling data and proposed control equipment.

Designed flare system for odor control of displaced vapors from tank truck loading facility. Developed air permit applications for subsequent

NJDEPE compliance. Permit was approved on expedited basis.

Performed desk-top calculations for determining volatilization of benzene from an oil sludge lagoon covered by a water layer. Vapor-liquid equilibrium and convective mass-transfer calculations were compared in determining emission rate.

INDUSTRIAL WASTEWATER:

Mr. Angyal's experience includes wastewater characterization studies, treatability studies, facilities modifications, and process design. He has coordinated programs involving:

- metals and toxic organics removal
- pH control
- conveyance and storage systems
- Best Management Practices
- odor control
- wastewater characterization

A representative listing of Mr. Angyal's industrial wastewater projects includes:

Wastewater characterization study for major chemical/pharmaceutical research and development facility; consisted of interviews with research scientists to obtain information on toxic organic and solvent usage, which was then used to prepare and implement site-wide sampling program of laboratory equipment and wastewater discharges. Project led to feasibility study for conveyance and treatment of wastewaters containing toxic organic constituents; identified various conveyance and treatment alternatives with associated capital and operating costs.

Feasibility study for modifications to pharmaceutical wastewater pretreatment facility; included addition of odor control system and re-design of neutralization system.

Toxic Organic Management Plan for automotive assembly plant; included evaluation of all plant processes and characterization of waste streams evolving from electroplating, spray painting and extrusion processes.

Best Management Practices plan for a major chemical and resins manufacturer, a pharmaceutical firm and a beverage packaging facility; included assessment of all external storage and loading/offloading facilities for adequacy of containment and potential spillage.

Designed pH control systems for discharge pits of 4 laboratory buildings at a pharmaceutical research and development facility; Responsible for development of contract drawings, specifications and bid package.

Designed RCRA waste stream conveyance and storage facility for electroplating operation at a military installation; design was in accordance with Corps of Engineers specifications.

HAZARDOUS WASTE MANAGEMENT:

Mr. Angyal has extensive experience in site assessment and remedial design activities related to hazardous waste. He has conducted programs involving:

- PCB remediation
- tank removals
- soil remediation
- sludge disposal

Representative hazardous waste projects include:

Final design, plans, and specifications for a CERCLA site remediation entailing on-site, ex situ thermal treatment of contaminated soils, building demolition, and soils stabilization. Design was performed in accordance with U.S. Army Corps of Engineers requirements.

Remedial design activities at CERCLA site in central New Jersey; included coordination of soil boring and well installation program, in-situ stripping pilot study for VOC contaminated soils, and pilot decontamination program for internal building surfaces. Site was former electroplating/degreasing facility.

Oversight of bench-scale solidification/stabilization testing program to immobilize heavy metals in soil; program conducted at U.S. Army Corps of Engineers Waterways Experiment Station in Vicksburg, MS.

New Jersey ECRA site assessments and GIS/SES submittals for clients in the metal fabricating, label-making, natural gas transmission, and printing industries; included development and implementation of sampling plans, tank removals and groundwater monitoring programs.

Site assessments for potential buyers of pharmaceutical, chemical, and electroplating facilities within New Jersey and other states. Deliverables included liability assessments based on file reviews, previous historical sampling results, and sampling based on site walkthroughs.

Sampling and cleanup activities for PCB-contaminated soils within a proposed highway right-of-way; included sampling of over 100 locations, excavation of contaminated soils, and post-excavation sampling for confirmation.

PCB sampling program at former machinery manufacturer in New Jersey; involved sampling over 100 locations for surface, concrete core and oil matrices. Assisted in development of cleanup specifications for overall site remediation.

PILOT TESTING:

Mr. Angyal has directed numerous pilot studies for removal of chemical

wastes from contaminated soils and wastewater. Programs have involved a variety of technologies such as:

- in situ air stripping
- carbon adsorption
- low temperature thermal treatment
- filtration

Representative pilot tests include:

Pilot study using in-situ air stripping (vacuum extraction) for treatment of volatile organic contaminated soils at CERCLA site; involved portable gas chromatography for on-site monitoring during various operating conditions.

Pilot study using low temperature thermal treatment for removal of VOCs in soil; involved rotary drying, with heat and mass balances developed based on empirical data.

Bench-scale and pilot-scale testing for removal of chelated antimony and cadmium from a phosphor washing operation waste stream; involved sulfide and caustic precipitation under varying pH and polymer dosages and settleability and filtration tests to assess effluent concentrations.

Bench and pilot studies for treatment of VOC contaminated groundwater at a chemical manufacturing facility; included air stripping and carbon adsorption, the results of which were incorporated into the full-scale remedial design.

Treatability studies on PCB-laden SPDES outfall; involved pilot tests using mixed media, activated carbon and diatomaceous earth filtration.

O'Brien & Gere Engineers, Inc.

Vernon C. Burrows, CPG

Project Associate

PROJECT ASSIGNMENT

Project Manager

PROFESSIONAL PROFILE

Mr. Burrows directs Remedial Investigations and Feasibility Studies (RI/FS) and RCRA Facility Investigations at sites throughout the Northeastern U.S. for industrial and governmental clients.

YEARS OF EXPERIENCE

With O'Brien & Gere: 11
With Other Firms: 1

EDUCATION

MS/1988/Geology
BS/1985/Geology

CERTIFICATIONS

State of New Jersey - Certified Subsurface Evaluator (UST) 2512
State of Tennessee - Registered Professional Geologist, TN2196
State of Wyoming - Registered Professional Geologist 1554
Province of Alberta, Canada - Professional Geologist
British Columbia - Professional Geologist
Certified Professional Geologist - AIPG
Professional Geoscientist - Pennsylvania #3108-G

TECHNICAL EXPERTISE:

- Report preparation, and regulatory requirements identification under ECRA, CERCLA, and RCRA
- Generation of work plans, project management plans, data collection protocols, quality assurance plans, health and safety plans and community awareness programs
- Regulatory compliance programs, environmental liability investigations and due diligence surveys
- Soil, surface waters and ground water investigations

Experience includes initial site assessments through to cleanup plan submittal and corrective measures implementation. He also directs staff personnel in environmental remediation programs, environmental liability assessments, industrial compliance, and the implementation of hydrogeological site assessments via hydraulic analyses for the purpose of ground water remediation, water supply development and well head protection.

REPRESENTATIVE PROJECTS

Experience includes background literature investigations, report preparation, work plan development, implementation and coordination of soil, surface water, ground water, and air monitoring programs, the investigation of the geology/hydrogeology of sites, cleanup plan development and corrective measures implementation.

The following projects include sample collection, sample management including chain-of-custody and QA/QC procedures, research and development, site investigations, health and safety programs and program management.

RCRA CORRECTIVE ACTION PROGRAMS:

Ferndale, MI - Project Manager for an EPA Region V and MDNR managed Corrective Action Consent Order. Project included a RCRA Facility Assessment which lead to the on-going RCRA Facility Investigation and the implementation of an Interim Measures program. A Corrective Measures Study and subsequent Corrective Measures Implementation are under development pending the finalization of the RFI report. The consent order requires knowledge of the HSWA to RCRA, Michigan's HWMA 1979 PA 64 as amended, and Michigan's WRCA 1929 PA 245 as amended. Overall project cost is estimated to be $40 million.

ADMINISTRATIVE CONSENT ORDER PROGRAMS:

Woodbury, NJ - Conducted a remedial investigation (RI) of a former coal gas manufacturing facility. The site is presently a residential area. Sensitivity to public relations was required in conducting the program.

Responsible for the development of the QAPP, HSAP, RI Work Plan and implementation of the RI program. Identified and obtained all applicable permits for wetland activities. Installed double case monitoring wells, soil borings; completed electronic cone penetration testing for stratigraphic correlation; and implemented a ground penetrating radar survey to identify structures. Presently

providing data validation for laboratory packages; utilized internal QA/QC mechanisms to maintain deliverables quality; and developing Draft RI Report.

Gas Transmission Company, Hanover, NJ - Operations Manager for the ECRA and EPA Consent Decree investigation of the New Jersey pipeline system. Project included preparing contract documents and drawings, assistance in bidding proposal and report preparation, coordination with regulatory agencies, and work plan development/oversight. Project involved extensive ground water investigations and ground water treatment programs, soils delineation and investigation of feasible remediation technologies. Overall project scope entailed over one million dollars for the initial remedial investigation/feasibility study.

BUREAU OF UNDERGROUND STORAGE TANKS (State of New Jersey):

National Contract - Project Manager responsible for a major food processing company national UST management program. Processing and storage facilities in New Jersey, New York, Pennsylvania, Texas and Illinois required system upgrades to meet EPA and applicable state requirements. Coordinated upgrades to state requirements and managed the subsequent investigations of potential UST related impacts where identified, and the implementation of corrective action leading to admonishment of liability and closure.

Major Pharmaceutical Corporation, Franklin Township, Hunterdon County, NJ - Project Manager for the mitigation and abatement of an UST related impact to ground water quality. Petitioned the NJDEP for a Natural Remediation Compliance Program (NRCP), and established a sufficient data base to request a Classification Exception Area (CEA) under N.J.A.C. 7:9-6:6. A Mann-Whitney statistical analyses and a desk top fate and transport evaluation were completed to finalize the CEA petition.

Basking Ridge, NJ - Provided Technical Oversight to the Project Manager. Provided guidance and directed the activities required to petition the NJDEP for a Classification Exception Area (CEA). Coordinated the presentation of data, the preliminary fate and transport evaluation and the statistical analyses to support the CEA petition. The CEA was granted which allowed waiver of sampling requirements until such a time that natural remediation lowers regulated compound concentrations to compliance standards.

Publicly Owned Treatment Works - Project Manager responsible for a system upgrade involving over 80 underground storage tanks at Newark, NJ. Implemented coordination with the Bureau by underground storage tanks as per applicable sections of N.J.A.C. 7:26E. Responsible for all investigatory activities required to assess any environmental impacts and the development of associated reports.

Clark, NJ - Project Manager responsible for an accidental spill from underground storage tanks. Coordinated response to Bureau of Underground Storage Tanks and implemented activities required to comply with Discharge Investigation and Corrective Action Requirements.

CERCLA PROGRAMS:

Edison, NJ - Project Manager for a dewatering design program used as the basis for an ordnance abatement project. Prepared contract documents and drawings and assisted in the implementation of the dewatering activities during ordnance abatement activities.

Franklin, NJ - Project Manager responsible for the initiation of a CERCLA Remedial Investigation/Feasibility Study at a former electroplating factory. Scope of work included a soils delineation study and a ground water investigation study. Project involved a pump and treatment system for ground water remediation and excavation of identified contaminant source soils. Project cost exceeded $3 million.

Edison, NJ - Field operations manager for monitoring well installation, soil boring, surface soil sampling, surface water sampling, ground water sampling, air monitoring, and in-situ permeability analysis. Assisted in the hydrogeological synthesis and presentation of findings to the client; responsible for geological/hydrogeological analysis of this formerly 3,300 acre facility. Overall scope of the project involved a six million dollar remedial investigation study.

Wall Township, Monmouth County, NJ - Field operations manager for implementation of a CERCLA monitoring well installation, soil boring program. Responsible for geological analysis of the site.

Rockaway Township, NJ - Ground water sampling and monitoring well development. Assisted in the delineation of the geology and hydrogeology of the site; assisted in the aquifer performance test investigations by determining the hydraulic properties of the aquifer for the development of a water treatment system.

ISRA (Formerly ECRA) PROGRAMS:

Carteret, NJ - Operations manager for implementation of ground water sampling, soil sampling, and implementation of aquifer performance tests. Assisted in work plan development, implementation of product recovery and ground water treatment system installed at the facility, geological and hydrogeologic activities performed on-site. Assisted in the coordination of the cleanup plan and implementation. Overall project cost is anticipated to exceed $20 million.

Elizabeth, NJ - Field operations manager for a RCRA and ECRA monitoring well installation, soil boring, and surface soil sampling; characterized site hydrogeology via in-situ permeability testing and site geological analysis; assisted in overall contamination delineation and proposed remedial strategies. Coordinated development of cleanup plan.

KSM Fastening Systems, Moorestown, NJ - Performed aquifer performance test in preparation for a pump and treatment system; assisted in development of the treatment system; assisted in preparation of applicable NJPDES DGW permits; responsible for summation of the hydrogeology and the geology of the site; responsible for submission of aquifer performance test report and proposed treatment system to the client. Assisted in the design and implementation of the treatment system.

TECHNICAL DEVELOPMENT:

Mr. Burrows has a demonstrated ability to use common computer programs such as Word Perfect, Lotus 1-2-3, Edix, Harvard Graphics, Freelance and Surfer.

Mr. Burrows also has experience in both analytical and numerical computer modelling techniques. Demonstrated ability to use analytical programs to evaluate in-situ permeability test data, aquifer performance test data, and other miscellaneous hydrological data. Familiar with GWAP (Ground Water Analysis Package) and AQTESOLV (Aquifer Test Solver). Numerical modelling experience includes both 2-dimensional and 3-dimensional finite difference ground water flow and solute transport models such as GWPATH (Ground Water Pathline and Travel Time Analysis), FLOWPATH (University of Waterloo 2-dimensional horizontal aquifer simulation model), MODFLOW (U.S.G.S. Modular Flow Model) and FLOWNET (2-dimension steady state saturated ground water flow).

PROFESSIONAL AFFILIATIONS

American Institute of Professional Geologists - Certified Professional Geologist #9039

Association of Ground Water Scientists/National Water Well Association

American Association of Petroleum Geologists

SPECIAL TRAINING

OSHA 40-hour Hazardous Waste Training Program

OSHA 8-hour Supervisor's Course

Ground Water Associates of Princeton: Ground Water Pollution and Hydrology

National Water Well Association: IBM PC Applications in Ground Water Pollution and Hydrology

National Water Well Association: MODFLOW (U.S.G.S. Modular Flow Model) for Simulation of Ground Water Flow and Advective Transport

PUBLICATIONS

Burrows, V.C., and Coogan, A.H., 1988, **The Subsurface Geology of the Berea Sandstone in Medina County, Ohio** (Abst.): Geol. Soc. Am. Abst. Programs, 20: p.338.

Burrows, V.C, Mickam, J.T.., and Bellandi, R., 1995, **Evaluation of Decontamination Procedures for Equipment Used to Sample VOCs** (Abst.): ASTM Committee D-34 on Waste Management Symposium on Sampling Environmental Media, April 5-7, 1995, p. 4.

O'Brien & Gere Engineers, Inc.

Richard P. Cawley, CPG

Vice President

PROJECT ASSIGNMENT

Project Officer

PROFESSIONAL PROFILE

Mr. Cawley's areas of expertise comprise geologic and hydrogeologic research and investigation, site assessments an remediation of industrial facilities and hazardous waste sites, underground storage tank programs, and ndustrial facility decommissioning and demolition.

YEARS OF EXPERIENCE

With O'Brien & Gere: 14
With Other Firms: 3

EDUCATION

BS/1982/Geology

CERTIFICATIONS

Certified Professional Geologist: AIPG

Professional Geologist: Indiana, Alaska, Pennsylvania, Delaware, Wyoming, Tennessee

New Jersey Certified Subsurface Evaluator

REPRESENTATIVE PROJECTS

HAZARDOUS WASTE MANAGEMENT:

Experience includes research, development and implementation of hydrogeologic studies for hazardous waste site investigations and site remediation programs. Representative projects include:

Manufactured Gas Plant Site - Woodbury, NJ - Program Manager for the evaluation, investigation, and remedial analyses for this former MGP site which has been developed as a residential community. Project concerns included public relations, deep aquifer investigation, geophysical assessments (ECP, GPM, May; EM) and surface water/sediment impacts. Responsible for planning, work plan development, RI and RAA components. The NJDEP recently communicated approval of the RI and confirmed that the RAWP should be submitted incorporating expected comments.

MGP Site - Medford, NJ - Program manager for this implementation of a RI Work Plan at this former MGP site. Investigating activities included soil borings, test trenching, monitoring wells in both shallow and deep ground water and off-site impact evaluation. The RI report for this facility is pending.

MGP Site - Trenton, NJ - Program manager for this evaluation, work plan development, investigation and remedial analyses for this former MGP site. Project concerns included impacts to off-site soils, ground water and possible bedrock impacts. Investigation methods included electronic core penetrometer testing, soil borings, test trenching, monitoring well installation, and bedrock cores. Remedial alternatives were evaluated and submitted for client consideration. Remedial action will be refined once off-site impacts are confirmed and defined.

Cincinnati, OH - Assisted in the survey of an active pigments, dyes, and coatings facility which is scheduled for closure. The client requested an estimate be provided to identify the potential costs associated with decommissioning and demolition in order to develop a budget for closure. Responsibilities included inspection of processes and structures and estimates for decommissioning/demolition and disposal. These activities and a formal cost presentation were performed within a 48-hour time period as requested by the client.

New Brunswick, NJ - Project Manager for a site investigation and environmental evaluation of a former illegal hazardous waste treatment storage and disposal facility that was being considered for cleanup and development. Responsibilities included design and implementation of an extensive soil and ground water sampling program to evaluate existing conditions. This information was compiled in a report which was utilized by the developer to plan the future use and value of this property.

Rockaway Township, NJ - Researched the historical industrial activities in a sole-source valley fill aquifer and developed a ground water analytical data base to identify other potential responsible parties in the area. This information was critical in negotiations between the client and the regulatory agency to support off-site source areas.

Batavia, NY - Project Manager for a subsurface investigation at a former magnesium land spreading/disposal operation where explosions had occurred. Responsibilities included supervising the installation and development of overburden and bedrock monitoring wells, the operation of heavy ground moving equipment for excavation and mobilizing drilling equipment, sampling of monitoring wells for contaminant identification, and compilation of data into a comprehensive investigation report.

ISRA PROGRAMS:

Experience includes conducting site evaluations and researching facility operations and available hydrogeologic data to develop and implement sampling and remediation programs under NJAC 7:26E. Representative projects include:

Moorestown, NJ - Project manager for a field sampling program designed to identify the horizontal and vertical extent of Petroleum Hydrocarbons and Trichloroethylene contamination. Activities included installation of monitoring wells, extensive grid sampling, ground water sampling, in-situ permeability tests, installation of pump well and conducting aquifer performance test. Designed and negotiated technical approaches for soil and ground water remediations. On-site development issues were utilized in combination with a warehouse construction (which acted as a cap) to save $500,000 in soil remediation. The ground water program used fate and transport and risk evaluation to eliminate off-site recovery of ground water. The strategy utilized a combination of science and source control to convince regulators to limit ground water recovery to site boundaries only.

Carteret, NJ - Performed site evaluation and prepared the RI work plan for a forty acre facility. ISRA PA/SI activities included conducting an inventory of over one hundred abandoned drums and assisting in a subsurface geophysical survey using an electromagnetometer and a magnetometer to identify near-surface buried metallic objects (drums, tanks, etc.). Managed the investigation and remediation of soil and ground water. Extensive negotiation with current owners, NJDEP and former owners was required for the implementation of the RAWP.

Ground water remediation included contaminant fate and transport to support a natural degradation approach for the on-site plan. This data and on-site monitoring convinced the NJDEP to approve this approach.

Soil remediation included removal and off-site treatment of land housed

soil and encapsulation of over 250 yd^3 of a metal slag waste. O'Brien & Gere and the client were currently negotiating with the property owners for DER and CEA criteria.

Elizabeth, NJ - Project Manager for an $8 million facility decommissioning and demolition project as well as the successful completion of the ECRA sampling program for a 40 acre industrial facility. Responsibilities included development of contract documents and specifications for asbestos removal and decommissioning/demolition activities; and the development and implementation of the site cleanup for soil and ground water which has been successfully integrated into the facilities decommissioning program.

Kearny, NJ - Project Manager for an estimated $7 million ECRA Closure program. Responsibilities included development of site evaluation submission sampling plans and decommissioning plans. ECRA sampling and facility decommissioning underway.

Hawthorne, NJ - Project Manager for a $3 million facility decommissioning and demolition project. Responsibilities included specifications development, review of bidders' proposals; bidders' interviews, documentation, coordination and negotiation with the regulatory agency. This project also required the simultaneous closure of two (2) RCRA storage facilities. This ECRA program was conducted "at peril" by the client and, therefore, required experience and knowledge of ECRA procedures and requirements.

CERCLA PROGRAMS:

Experience includes project management, scheduling, estimating, sample collection and data management. Responsible for research development and implementation of preliminary assessments, site inspections, remedial investigations, health and safety programs, and the completion of the Mitre Model Hazardous Ranking System reports. Representative projects include:

Kin Buc Landfill, Edison, NJ - Project Manager for a hydrogeologic investigation to identify the extent of PCB contaminated soil in the landfill. Activities included monitoring well sampling, aquifer performance tests and overview of monitoring well installations. Work was conducted under Level B respiratory and dermal protection.

Lone Pine Landfill, Freehold, NJ - Contracted for periodic sampling of monitoring wells at the landfill, the sampling of private residences in the surrounding area, and data management and reporting.

Price's Pit Landfill, Pleasantville, NJ - Periodic sampling of monitoring wells and surface water in the vicinity of the fill area.

CECOS Landfill, Buffalo, NY - Directed a field sampling team to

confirm that the glacial till below the landfill was allowing contaminants to enter the underlining limestone bedrock. Activities included the redevelopment of existing wells and the sampling of wells for contaminant identification data management and evaluate. Work was conducted under Level B and C respiratory and dermal protection.

Moreau, NY - Conducted soil sampling programs to determine the extent of PCB and dioxin contamination. Work was conducted under Level C respiratory and dermal protection.

Newark, NJ - Dioxin sampling team leader for the residential Iron Bound section of Newark. This six month program required sensitive public relations and extensive media contact. Work was conducted under Level C respiratory and dermal protection.

Bound Brook, NJ - Performed Level A sampling of an abandoned herbicide and fungicide mixing facility. This three month program required sensitive public relations and extensive media contact.

Love Canal, NY - Performed soil, surface water, and sediment sampling of a residential area in the immediate vicinity of Love Canal. This program required sensitive public relations. Work was conducted under Level C respiratory and dermal protection.

Montclair, NJ - Radon sampling team leaders for residential areas. Implemented air sampling programs to identify contamination and notify homeowners as to the proper course of action for remediation.

NJPDES PROGRAMS:

Experience includes hydrogeologic investigation for discharge to ground water permits, ground water sampling and extensive contact with regulatory agencies. Representative projects include:

New Brunswick, NJ:

- Supervised the installation of three monitoring wells, directed ground water sampling and conducted in-situ permeability tests. Responsible for the completion of all items required in the discharge to ground water permit. This project required negotiation and interaction with the regulatory agency regarding well construction installation and location.
- Project Manager for a NJPDES/DGW permit program at a former sanitary landfill. Responsibilities include monitoring well installation, sampling, in-situ permeability tests and submittal of quarterly monitoring reports. Following the first year of sampling negotiated the termination of sampling activities.

Hawthorne, NJ - Project Manager for a NJPDES/DGW permit program

at a RCRA underground waste storage tank. Responsibilities include monitoring well installation, sampling, documentation, and submittal of quarterly reports. Presently involved in negotiations to discontinue the permit requirements.

Moorestown, NJ - Project Manager for a ground water recovery reinjection program with discharge of treated ground water upgradient of the source area. Responsible for DGW permit acquisition and negotiation. This system was constructed on schedule and within budget and is currently operating within permit criteria.

Berkeley Heights, NJ - Assisted in a hydrogeologic assessment designed to determine if glacial till beneath a waste water storage reservoir met State requirements for a natural liner. The hydrogeologic assessment along with the quarterly ground water sampling program confirmed the till did not meet state requirements and was leaking contamination into the ground water. Responsible for the completion of all deliverables required in the discharge to ground water permit. Assisted in the development of an investigatory program to delineate the extent of contamination for subsequent remediation.

PROFESSIONAL AFFILIATIONS

American Institute of Professional Geologists
Association of Ground Water Scientists
International Association of Hydrogeologists
National Ground Water Association

SPECIAL TRAINING

OSHA 40-Hour Hazardous Waste Training Program
OSHA 8-Hour Supervisor's Course

O'BRIEN & GERE

Christine E. Murray

Design Scientist

PROJECT ASSIGNMENT

On-Site Health & Safety Designee

PROFESSIONAL PROFILE

(See Technical Expertise)

YEARS OF EXPERIENCE

With O'Brien & Gere: 1
With Other Firms: 1

EDUCATION

1998/BS/Environmental Science

TECHNICAL EXPERTISE

- Environmental compliance and management system audits and program development
- Environmental site assessments
- Hazardous waste management and UST programs
- Telecommunication development services

REPRESENTATIVE PROJECTS

ENVIRONMENTAL COMPLIANCE AND MANAGEMENT SYSTEM AUDITS AND PROGRAM DEVELOPMENT

Developed a Spill Prevention Control, and Countermeasure (SPCC) Plan for an aerospace electronics manufacturing company located in New Jersey to describe specifically how the facilitie's operations are affected by regulations and to outline the general reporting, recordkeeping, training, inspection, and notice requirements. The program included a review of Federal and State regulations, followed by an analysis of which regulations would apply to the facility based on their operations. The Plan includes a commitment for continual improvement and pollution prevention; a commitment to comply with relevant environmental legislation and regulations; and provides a framework for emergency response and pollution prevention. The compliance manual was prepared based on a site walkthrough and file review at the facility. Operations and equipment at these locations include: warehouses; hazardous waste storage areas; a ground water treatment building; and underground and aboveground storage tanks.

Managed an environmental monitoring and compliance plan for a major surgical supply manufacturing and research and development facility located in Somerville, New Jersey. Included with the compliance program was: stormwater pollution and air emissions permitting and prevention policies; management of hazardous, solid, and medical waste removal for facility; a plan for coordination with on-going remediation; and completion of annual reporting to the USEPA and NJDEP, including hazardous waste generator reporting. Other programs conducted at this facility include: maintaining regulatory compliance, including RCRA, ISRA, CERCLA, and DOT, throughout the implementation of environmental remediation, assessment of on-site waste and satellite storage areas while coordinating spill prevention, supervision of a groundwater monitoring/extraction system for four wells and monitoring of Ethylene Oxide Scrubbers for Toxic Release Compliance.

ENVIRONMENTAL SITE ASSESSMENTS:

Prepared Phase I & Phase II Environmental Site Assessments in accordance with ASTM Standard Practice E-1527-97 for several properties located in Wisconsin and Massachusetts, before title transfer. The properties included a fabrication facility for PVC piping, a research and development facility, a former distribution facility of medical products, a former sand and gravel quarry, and a former fabrication facility for automatic conveyor systems. Recognized environmental conditions included: soil contamination in areas surrounding above ground storage tanks and concentrations of metals, volatile, and semi-volatile organic compounds in soil and groundwater exceeding state clean-up criteria for non-residential areas. Phase II sampling of soil and groundwater was conducted for areas of potential environmental concern identified during the Phase I activities. The assessment consisted of: a review of past data for the subject property; a review of aerial photographs of the subject property; a review of state and federal environmental databases to identify nearby areas of potential environmental concern; and a site reconnaissance observations and findings (site interviews, building inspections, materials storage, facility equipment located on-site, and outdoor site walkthroughs) survey at the subject property.

Conducted Phase II Environmental Site Assessments and sampling programs for two automotive service stations located in New Jersey in accordance with ASTM Standard Practice E-1527-97, before title transfer. Recognized environmental conditions included: possible soil contamination in areas surrounding under ground storage tanks. Phase II sampling of soil and groundwater was conducted for areas of potential environmental concern identified during the Phase I activities. The assessment consisted of: a review of past data for the subject property; a review of state and federal environmental databases to identify nearby areas of potential environmental concern; and a site reconnaissance observations and findings (site interviews, building inspections, materials storage, facility equipment located on-site, and outdoor site walkthroughs) survey at the subject property.

Prepared an Environmental Assessment for a United State Military Arsenal located in New Jersey to evaluate the potential environmental impacts of constructing a Satellite Fire Station. The environmental consequences of the proposed action were reviewed under the National Environmental Policy Act (NEPA) and Army Regulations 200-2 (effective January 23, 1989) in order to determine whether the proposed project would result in a potential for significant environmental impact. The assessment consisted of: a review of past data for the subject property; a review of state and federal environmental databases;

and a site reconnaissance observations and findings (site interviews, building inspections, materials storage, facility equipment located on-site, and outdoor site walk throughs) survey at the subject property.

Prepared a Phase I Environmental Site Assessment in accordance with ASTM Standard Practice E-1527-97 of a telecommunications control center located in New Jersey. Recognized environmental conditions included: unknown location of storm water runoff, floor drains, and utility drainage discharge; cause of initial release of Freon and Halon; discrepancy of the presence of USTs; and status of a former septic leach field system. The assessment consisted of: a review of past data for the subject property; a review of aerial photographs of the subject property; a review of state and federal environmental databases to identify nearby areas of potential environmental concern; and a site reconnaissance observations and findings (site interviews, building inspections, materials storage, facility equipment located on-site, and outdoor site walk throughs) survey at the subject property.

Prepared a Phase I Environmental Site Assessment in accordance with ASTM Standard Practice E-1527-97 of a dry cleaning facility located in New Jersey before title transfer. The subject property was formerly an automotive dealership and service center and a portion of the building is used as a bakery manufacturing facility and thrift store. Recognized environmental conditions included: floor drains, integrity of sewer piping; and storage of hazardous materials. The assessment consisted of: a review of past data for the subject property; a review of aerial photographs of the subject property; a review of state and federal environmental databases to identify nearby areas of potential environmental concern; and a site reconnaissance observations and findings (site interviews, building inspections, materials storage, facility equipment located on-site, and outdoor site walk throughs) survey at the subject property.

Prepared a Phase I Environmental Site Assessment in accordance with ASTM Standard Practice E-1527-97 of an abandoned residence in a mixed industrial/commercial district located in New York City before title transfer. Recognized environmental conditions included: discrepancy of the presence of ASTs; discrepancy of the presence of a former U-Haul facility; presence of asbestos and lead; and potential contamination from surrounding LUSTs and autobody facilities. The assessment consisted of: a review of past data for the subject property; a review of fire insurance maps of the subject property; a review of aerial photographs of the subject property; a review of state and federal environmental databases to identify nearby areas of potential environmental concern; and a site

reconnaissance observations and findings (site interviews, building inspections, materials storage, facility equipment located on-site, and outdoor site walk throughs) survey at the subject property.

Prepared a Phase I Environmental Site Assessment in accordance with ASTM Standard Practice E-1527-97 of a vacant commercial property, before title transfer, located in New Jersey. The subject property has formerly been used as office and warehouse facilities. Recognized environmental conditions included discrepancy in past uses of hazardous substances at the facility. The assessment consisted of: a review of past data for the subject property; a review of aerial photographs of the subject property; a review of state and federal environmental databases to identify nearby areas of potential environmental concern; and a site reconnaissance observations and findings (site interviews, building inspections, materials storage, facility equipment located on-site, and outdoor site walk throughs) survey at the subject property.

Prepared a Phase I Environmental Site Assessment in accordance with ASTM Standard Practice E-1527-97 of a commercial property, used as an office and warehouse facility, located in New Jersey. Recognized environmental conditions included potential contamination from surrounding LUSTs and an adjoining site listed on the National Priority List. The assessment consisted of: a review of past data for the subject property; a review of aerial photographs of the subject property; a review of state and federal environmental databases to identify nearby areas of potential environmental concern; and a site reconnaissance observations and findings (site interviews, building inspections, materials storage, facility equipment located on-site, and outdoor site walk throughs) survey at the subject property.

HAZARDOUS WASTE MANAGEMENT AND UST PROGRAMS:

Experience includes the interpretation and evaluation of chemical quality data from groundwater and soil programs. Specific projects included: a soil and groundwater investigatory program for a vitamin manufacturer including a review of supplemental sampling data conducted by others prior to the assessment.

Developed a Field Sampling Plan for an industrial sludge RCRA lagoon at a facility on the National Priority List located in New Jersey The program included excavation and conditioning of the sludge on-site and included surface, hand-augered, soil boring sampling.

Developed an ISRA General Information Notice, Preliminary Assessment, and Site Investigation Report for a window manufacturing facility in New Jersey as part of a property transfer. The assessment consisted of: a review of past data for the subject property; a review of aerial photographs of the subject property; a review of state and federal environmental databases to identify nearby areas of potential environmental concern; site reconnaissance observations and findings (site interviews, building inspections, materials storage, facility equipment located on-site, and outdoor site walkthroughs) at the subject property; and a 40-year title search.

Developed an ISRA Preliminary Assessment Report for an inorganic pigment manufacturing facility in New Jersey as part of a property transfer. The assessment consisted of: a review of past data for the subject property; a review of aerial photographs of the subject property; a review of state and federal environmental databases to identify nearby areas of potential environmental concern; site reconnaissance observations and findings (site interviews, building inspections, materials storage, facility equipment located on-site, and outdoor site walkthroughs) at the subject property; and a 40-year title search.

Developed a Remedial Investigation Work Plan (RAWP) for a petroleum contaminated site, formerly a baking manufacturing facility located in New Jersey. The assessment consisted of: a review of past data for the subject property; development of a remedial alternative analysis; remediation plan; sampling plan; and site restoration. Remedial action entailed the excavation and off-site disposal of 2,000 cubic yards of soil and reuse of 4,000 cubic yards of non-hazardous material. The work plan incorporated an on-site soil reuse plan. Soil sampling was specified using in-field test kits and laboratory confirmation in accordance with various state guidance.

TELECOMMUNICATIONS DEVELOPMENT SERVICES:

Developed a zoning analysis program for a telecommunications site acquisition company located in Connecticut. The project area consisted of 90 sites, in the State of Connecticut, which were under evaluation for the feasibility of locating telecommunication equipment at these locations in order to expand the network and service area of a major PCS provider. The analysis process included: interviews and correspondence with local and city officials, evaluation of zoning ordinances, preparation of a preliminary zoning analyses based on zoning processes and regulations for each municipality, preparation and submittal of zoning and building permit applications, and preparation for Planning & Zoning Board public hearings.

Conducted numerous site evaluations and SHPO analyses for a major telecommunications company in New Jersey to determine the environmental impacts which may be caused by the placement of telecommunication equipment on those properties. These evaluations were reviewed under the provisions of the National Environmental Policy Act (NEPA) which include determination of floodplains, wetlands, Indian religious sites, historical districts, buildings, structures, or objects, wilderness areas and wildlife preserves, and threatened or endangered species or designated critical habitats. Correspondence was made with the New Jersey State Historic Preservation Office, the U.S. Fish and Wildlife Service, and the Office of Natural Lands Management to confirm our findings.

SPECIAL TRAINING

OSHA Hazardous Waste Operations (40 Hour Course) – 1999

O'Brien & Gere Engineers, Inc.

R. Scott Stoldt

Project Scientist

PROJECT ASSIGNMENT

On-Site Health & Safety Designee

PROFESSIONAL PROFILE

(See Technical Expertise)

YEARS OF EXPERIENCE

With O'Brien & Gere: 5
With Other Firms: 0

EDUCATION

MS/1994/Hydrogeology
BA/1992/Chemistry & Geology

CERTIFICATIONS

New Jersey Certified Subsurface Evaluator (# 0019697)

TECHNICAL EXPERTISE

- Regulatory requirements identification, including development of RI/FS and reports under CERCLA and RCRA, and NJDEP ECRA/ISRA programs.
- Evaluation of natural attenuation properties of aquifers; including, geochemical data collection, interpretation and sequential degradation analysis.
- Analytical and numerical hydrogeologic, fate and transport modeling including 2- and 3-dimensional analysis.
- Designed and installed several Air Sparging and Soil Vapor Extraction networks for the remediation of BTEX and volatile chlorinated compounds; including, pilot testing and full-scale implementation.
- Preparation of ground water Classification Exception Area (CEA) petitions for NJDEP submittal.
- Oversight of ground water monitoring and treatment programs including NJDEP and NJPDES report submittals.
- Geologic and hydrogeologic research and investigation, including design and installation of monitoring wells, level and geophysical surveys, characterization of aquifers, and coordination of environmental sampling programs.
- Geochemical evolution and classification of ground water.

REPRESENTATIVE PROJECTS

Experience includes client coordination, cleanup plan development and corrective measures implementation, coordination and implementation of soil and ground water sampling programs, report preparation, and background literature investigations. Preparation of proposals and cost estimates for soil and ground water investigations and remedial actions.

The following projects include sample collection, sample management including chain-of-custody and QA/QC procedures, research and development, site investigations, evaluation of direction and rate of ground water flow, and coordination of laboratory, drilling and surveying subcontractors.

Carteret, NJ - Project Manager for an ongoing Remedial Investigation (RI) and Remedial Action (RA) of a former chemical manufacturing company. Developed and implemented ground water, surface water and soil delineation sampling programs. Designed and installed Air Sparging network for the remediation of BTEX. Developed and provided oversight for a hot-spot excavation program. Prepared CEA petition for restricting ground water use and drafted a Deed Notice for soil contamination. Supervised and reported quarterly ground water sampling. Coordinated the above activities with various NJDEP departments and four different tenants.

Cranbury, NJ - Project Manager for a pharmaceutical company under voluntary remediation. Developed and implemented ground water investigation using temporary piezometers and monitoring wells. Collected stream sediment and surface water samples to evaluate possible ground water impact to nearby receptor. Prepared quarterly ground water reports for natural attenuation monitoring.

Bound Brook, NJ - Project Manager for a Phase I Preliminary Assessment (PA) of a former pigment and dye facility. Secured and reviewed title information and historical site data, prepared Remediation in Progress Waiver for those areas being addressed by current tenant, and prepared PA and Site Investigation (SI) plan.

Moorestown, NJ - Field and Office Supervisor for an ongoing ground water recovery and treatment system. Used 3-dimensional modeling to simulate ground water flow and the contaminant transport mechanism. Secured a ground water CEA using modeling data. Prepare quarterly ground water and monthly Discharge Monitoring Reports, as per the NJPDES permit.

Nutley, NJ - Field and Office Supervisor for a pigment and dye facility. Used 2-dimensional and 3-dimensional modeling to simulate ground water flow. Prepared a ground water CEA using modeling data and analytical degradation calculations. Collected stream sediment and surface water samples to evaluate possible ground water impact to nearby receptor. Supervised and reported quarterly ground water sampling.

Medford, NJ - Conducted an RI of a former coal gas manufacturing facility. Sensitivity to public relations was required in conducting the program as the site is located in a residential area. Responsible for the implementation of the RI program. Installed single and double cased monitoring wells, soil borings, and test excavation pits. Provided data validation for laboratory packages; utilized internal QA/QC mechanisms to maintain deliverables quality; and developed RI Report.

Philadelphia, PA - Assisted in an RA program at a former aircraft parts and assembly manufacturing facility. Responsible for the Phase II installation of air extraction and air inlet wells for a SVE system. Other tasks included extensive soil boring and associated soil sampling efforts.

Confidential, FL - Assisted in the data management of a CERCLA governed facility. Soil and ground/surface water samples were entered into a Geoscientific Information System (GIS) database in order to: (1) manage the enormous amount of data, and (2) comply with the specific QA/QC requirements of the client. Also, assisted in the collection of ground water samples and conducted an electro-magnetic survey of a suspected landfill.

Various Sites, NJ - Installed and logged geotechnical soil borings. Collected appropriate soil samples for geotechnical analysis in support of communication tower design. Performed terrain resistivity surveys. Prepared geotechnical report for subsequent design use.

Bridgeport, CT - Conducted an electro-magnetic survey and subsequent data reduction for an RI in an attempt to locate underground storage tanks. Also, sampled excavated soils from roll-off containers.

Edison, NJ - Assisted in an RA program at a fragrance and cosmetics facility. Tasks included were pressure transducer installation, data down-loading from these units via a portable PC, and water levels measurements were conducted in order to determine the hydrologic effects of the installed pump-and-treat air stripping system. Conducted ground water sampling to verify the remedial effectiveness.

Pittstown, NJ - Prepared a CEA petition for a major pharmaceutical company. Mann-Whitney statistical analyses and a desk top fate and transport evaluation were completed to finalize the CEA petition. Designed a ground water extraction network for purposes of water table suppression and ground water treatment.

Elizabeth, NJ - Assisted in an environmental assessment of a container storage and shipping facility. Tasks performed included monitoring well and soil boring installation, surface and subsurface soil sampling, ground water sampling, and level surveying.

Trenton, NJ- Assisted in an RI of a former coal gas manufacturing facility. Tasks included were ground water sampling efforts and water level measurements level. Assisted in preparing the RI Report and feasibility study (remedial alternative).

SPECIAL TRAINING

OSHA 40-hour Hazardous Waste Training Program
OSHA 8-hour Hazardous Waste Training Refresher Program
United States Environmental Protection Agency, *Monitored Natural Attenuation for Ground Water*
New Jersey Water Environment Association, *Monitored Natural Attenuation for Ground Water in New Jersey*
Cook College, *Using GIS for Environmental Evaluations*
Cook College, *Technical and Regulatory Training in Underground Storage Tanks*
National Ground Water Association, *Natural Attenuation for Remediation of Contaminated Sites*
Word-Wright, Inc., *Technical Writing: Strategies and Styles*
Bowling Green State University, *Geoscientific Information Systems*

PROFESSIONAL AFFILIATIONS

National Ground Water Association

PUBLICATIONS & RESEARCH

Stream Sediment Geochemical Surveying as an Indicator of Potential Contamination of Houghton Lake, Roscommon County, Michigan, Master's Thesis, Wright State University Library, Dayton, Ohio.

Comparison of Ground Water Sampling Techniques and Analytical Methods in Determining the Concentration of Dissolved Oxygen for Support of Natural Attenuation, In Progress.

O'Brien & Gere Engineers, Inc.

Neil R.L. Wilkinson

Project Associate

PROJECT ASSIGNMENT

On-Site Health & Safety Officer

PROFESSIONAL PROFILE

Mr. Wilkinson is a Toxicologist in the Firm's Edison, New Jersey office with 10 years experience.

YEARS OF EXPERIENCE

With O'Brien & Gere: 10
With Other Firms: 0

EDUCATION

BS/1988/Toxicology

REGISTRATIONS

Certified Environmental Specialist

Certified Hazardous Material Technician III

Certified Safety Technician

TECHNICAL EXPERIENCE

- Manufactured Gas Plant Remediations
- Industrial Site Remediation Act (ISRA) Programs
- Compliance Audits and ISO 14000
- Hazardous Site Characterization and Remediation
- Health and Safety Administration
- Risk Assessment

REPRESENTATIVE PROJECT EXPERIENCE

Mr. Wilkinson provides expertise for a number of environmental related activities. He is responsible for the completion of environmental documents related to the toxicological issues present at industrial sites. In addition, his duties include identification and documentation of occupational hazards associated with specific waste site remedial investigations.

Mr. Wilkinson's background in toxicology and environmental risk characterization is combined with over 7 years of direct project management. The combination of project management with an understanding of the associated risk has proven to yield a more focused investigation and defined consequence.

Mr. Wilkinson is intimately familiar with ISRA and NJDEP Technical Requirements for Site Remediation. He has developed numerous submissions under these and other regulations (such as DEC STARS, Massachusetts-MCP, Ontario-MOE) and he serves as a corporate resource for streamlining industrial transactions which fall under the ISRA requirements. Mr. Wilkinson is routinely called upon to provide assistance to many out-of-state law firms and corporate clients. Most recently, Mr Wilkinson has provided discussion on the consequence of methanol preservation methods for volatile organic analysis and the use of the NJDEP contaminated fill guidelines in risk characterization.

Mr. Wilkinson has extensive experience in hazardous waste remediation and risk based corrective actions. He has successfully defended alternate cleanup criteria for volatile organic constituents, polychlorinated biphenyls, polycyclic aromatic hydrocarbons, and arsenic, cadmium and beryllium among others. On behalf of O'Brien & Gere clients, Mr. Wilkinson has chaired negotiations with both the NJDEP Bureau of Responsible Party Site Remediation and Army Corps of Engineers.

Mr. Wilkinson has a diverse understanding of sampling technologies including screening methods using in-field gas chromatography (Photovac 10S70, and Hewlet Packard), enzyme linked immunoassay, UV light detection for petroleum, Spectrace 2000 X-ray Fluorescence and Gamma scintillation counting. Mr. Wilkinson has also directed geophysics programs utilizing electromagnetics, variable frequency

electromagnetics and tracer ions to define ground water flow patterns and constituent migration. He is also familiar with USEPA analytical methods and served as Data Validation coordinator with O'Brien & Gere for 3 years. With this understanding of sampling and analytical methodology, Mr. Wilkinson has completed a number of Quality Assurance/Quality Control Plans for industrial and military clients.

Mr. Wilkinson has participated in the following capacity on specific projects:

RISK ASSESSMENT:

Mystery Bridge Road Superfund Site, WY - Mr. Wilkinson developed the preliminary risk assessment to estimate the potential impact of petroleum releases on residents and wildlife at the Mystery Bridge Road Superfund Site. He developed and presented the alternate Hazard Ranking for the site which ultimately was used to remove the site from the NPL list. As a field manager for the project, Mr. Wilkinson conducted an extensive active soil gas program to delineate volatile contaminants at three active refineries.

Plastic Manufacturing Facility, NJ - Mr. Wilkinson conducted an endangerment assessment associated with releases of phenolic compounds to soil and ground water.

Major Pharmaceutical Corporation, MA - Mr. Wilkinson conducted a human health study associated with a Sodium Borohydride release to soil and groundwater.

Major Electrical Contractor, NY - Mr. Wilkinson conducted a preliminary endangerment assessment to identify and characterize the impacts resulting from historic landfilling material contaminated by polychlorinated biphenyls.

Cliffs Dow Superfund Site, MI - Mr Wilkinson completed an endangerment assessment associated with the landfilling of wood tar and associated impacts on the adjacent Lake Superior.

American Cyanimid, Boundbrook, NJ - Mr Wilkinson developed a human health risk assessment for a proposed parking lot at an active Superfund remediation site. The risk assessment proposed certain actions to inhibit the exposure of parking lot patrons to hazardous subtances that could migrate through the parking lot surface or through suspended air particles

MGP/HAZARDOUS WASTE MANAGEMENT:

Woodbury, NJ - Mr. Wilkinson was the responsible manager for the remedial investigation of a former coal gas manufacturing facility. Mr. Wilkinson was also the in-field coordinator for invasive operations. Mr. Wilkinson coordinated the development of a Phase I RI report and developed the Phase II Sampling Objectives. Mr. Wilkinson developed the remedial alternative analysis for this residential area and public parkland. The activities included splitting the property into two functional areas and addressing the individual remediation concerns.

ITT Whitby, ON - Mr. Wilkinson directed remedial activities associated with a chlorinated solvent release at this manufacturing plant. Soils were excavated and treated on-site in a three stage processing system. A mobile laboratory was operated on-site by Mr. Wilkinson to determine process efficiency and compliance with remediation criteria.

NL Industries Pedricktown, NJ - Mr. Wilkinson developed a radio nuclide investigation at former lead reclamation facility. The investigation required that remediation of lead contaminated sediments be proportioned among several responsible parties. Gamma radiation counting for sequential slices of a stream sediment column allowed aging of the sediments relative to the historic atmospherical nuclear testing conducted by the U.S. government. This aging was used to assign remediation costs based on years of site ownership and concentration of lead in the sediments.

Confidential Client Medford, NJ - Mr. Wilkinson was the project manager for the investigation and remediation of a one acre MGP facility in the Pine Barrons of southern NJ. Mr. Wilkinson coordinated all on- and off-site investigations and coordinated with NJDEP, local residents and pine-lands officials. Mr. Wilkinson developed a Remedial Action Selection Report and Remedial Action Work Plan. Due to the extreme hazards associated with residential exposure to excavated site constituents, all invasive remedial measures were conducted under Level B protective equipment within a 50' x 100' negative pressure enclosure. Complete remediation of soils was obtained during the remediation and client non-responsibility for the off-site ground water contamination was successfully negotiated with the township and NJDEP.

Confidential Client Jersey City, NJ - Mr. Wilkinson was the project manager and developed a remedial action work plan to take a 33 acre MGP site from initial assessment through to remediation. The project included site, ground water, surface water and sediment sampling. The project included the use of innovative sampling and analytical methodology to facility site characterization and single phase delineation.

RCI Pensauken, NJ - Mr. Wilkinson was the project manager for the investigation and remediation of this ink production facility. Mr.

Wilkinson managed the RI which included obtaining soil samples for priority pollutant metals, base neutral compounds and total petroleum hydrocarbons. Mr. Wilkinson developed and implemented the remedial Action Work Plan.

Texas Eastern Gas Pipeline Company, New Jersey - Mr. Wilkinson coordinated laboratory services for this extensive PCB sampling program. Mr. Wilkinson established data management system to catalog over 4 thousand soil samples.

Nabisco Biscuit Co. Jacksonville, Fl - Mr. Wilkinson conducted a screening program associated was a leaking underground storage tank. The screening included collection of ground water and soil samples and a soil vapor program. Soil vapor analysis was conducted on-site utilizing a portable gas chromatograph (Photovac 10S70).

Confidential Client Trenton, NJ - Mr. Wilkinson was project manager for the remedial investigation and remediation of a 10 acre MGP facility. The program included two phases of remedial investigation for soil, ground water, bedrock, and surface water. Mr. Wilkinson developed the remedial action selection report and implemented as imminent environmental impact of free phase tar migrating inside a public sewer system into the Delaware-Raritan Canal. Mr. Wilkinson provided direct and regular interaction with local regulatory officials.

Confidential Client, Gloucester, NJ - Mr. Wilkinson provided peer review for another consultant for the remediation of an MGP site. Mr. Wilkinson provided a preliminary cost assessment for the proposed remedial options and provided an analysis of technology feasibility.

Ralston Purina, Bronx NY - Mr. Wilkinson directed the removal of three 500-gal gasoline tanks with an active warehouse. The activities included installation of pilings and structural supports. An excavation to 18 feet below grade was conducted. The three leaking UST were removed and a biological agent was added to the contaminated soils. The excavation was then backfilled and returned to use.

ISRA PROGRAMS:

Tredegar Film Products, Flemington, NJ - Mr. Wilkinson was the project manager for a multi phase site wide investigation and compliance audit. The program included the remediation of an unregulated on-site landfill. Mr. Wilkinson provided intense negotiations with regulatory personnel and third party representatives regarding migration of chlorinated solvents in fractured bedrock. The program was compounded by multiple off-site sources of similar contaminants. Mr. Wilkinson obtained a No-further-action status granted for site soils, the unregulated landfill, site structures and bedrock issues. Mr. Wilkinson coordinated the development of CEA for ground water and on-going monitoring program.

Quaker State Oil, Whippany, NJ - Mr. Wilkinson was the project manager for a comprehensive site audit and site investigation. Due to a multi-billion dollar merger, the ISRA was completed and submitted within two weeks of O'Brien & Gere competitive award. Development of preliminary assessment and site investigation reports. A No-further-action was granted for entire site with an NJDEP covenant not to sue.

Flanders, NJ - Mr. Wilkinson was the project manager for a site wide investigation of property and three active structures. Mr. Wilkinson coordinated the removal and remediation of a fuel oil UST and contaminated soils. A No-further-action status was granted with an NJDEP covenant not to sue.

Cargill Salt - Mr. Wilkinson was the project manager for the development of ISRA filing documents and compliance audit. Mr, Wilkinson was the remediation manager for a leaking UST. Due to a multi-state property transfer, a rapid turn-around was required on all submittals. The submissions for this project are pending NJDEP approval since remediation is in progress by the initial responsible party.

Reichhold, Newark NJ - Mr. Wilkinson was the project manager for the preliminary assessment, site investigation, and remedial investigation of a two acre chemical facility. The investigations took place during the decommissioning of the facility. In-field analytical methods and geophysics were used to delineate separate plumes of fuel oil and solvents. Mr. Wilkinson directed remedial efforts associated with decommissioning sumps, tanks farms, and process equipment.

AUDITS:

Picatinny Arsenal, NJ - Mr. Wilkinson conducted an audit of several areas of the arsenal for citing a satellite fire station. Issues addressed in the audit consisted of: air and noise pollution, hazardous waste generation, acceptability of response time and distance requirements, wetlands, flood zones, sensitive and endangered species.

GE Americom Communications, Vernon, NJ - Mr. Wilkinson completed a complete environmental and safety audit of the satellite communications station.

JPI Development, Pennington, NJ - Mr. Wilkinson completed a phase I due diligence audit for a major development company. This audit was in accordance with ASTM standards.

ITT Various Locations - Mr. Wilkinson conducted several phase I and phase II audits for ITT. These audits were conducted in accordance with ASTM standards.

Quaker State Oil, Trenton, NJ - Mr. Wilkinson completed a third party phase I audit of a service station. This audit focused specifically on best

management practices.

RPS Consultants - Mr. Wilkinson provided assistance to this international affiliate in reviewing documentation associated with 60 American Airlines facilities across the US. Mr. Wilkinson was tasked with identifying any environmental conditions at the facilities which would inhibit a multi-million dollar merger.

Sprint Digital PCS, Various Locations - Mr. Wilkinson has directed several NEPA compliance audits for proposed cellular telephone tower sites.

HEALTH AND SAFETY PLANS:

U.S. Army Corps of Engineers - Mr. Wilkinson has participated in the completion of a number of Health and Safety Plans for COE sites including: missile bases, metal plating operations, and Army combat training facilities.

Confidential, NY - Health and Safety Plan for a facility which produced microwave components. Contamination at the site included compounds related to cleaning and plating operations.

Confidential - Health and Safety Design Analysis; identified site hazardous and explained the rationale behind specific safety precautions including the selection of personal protective devices and site monitoring.

In addition, Mr. Wilkinson has been Health & Safety Officer for the following clients:

BASF	KSM
Reichhold Chemical, Inc.	Magnesium Elektron
Texas Eastern	Miles, Inc.
Public Service Electric & Gas	NL Industries

EMERGENCY RESPONSE:

RCI Doremus, NJ - Mr. Wilkinson was the on-site coordinator for emergency response following a chemical facility explosion which caused the fatality of three individuals. Mr. Wilkinson established all safety procedures during emergency response. He maintained site security and established level B/C personal protection measures. Mr. Wilkinson managed safe disposal of expanded organic peroxide containers and conducted air monitoring for formaldehyde and other contaminants. Mr. Wilkinson also conducted on-site testing of standing water following initial fire. Mr. Wilkinson provided intense coordination with OHSA and EPA officials.

PROFESSIONAL AFFILIATIONS

Member - Environmental Assessment Association
Mid-Atlantic Society of Toxicologists
American Association for Laboratory Animal Science
Society of Environmental Toxicology and Chemistry
World Safety Organization

SPECIALIZED TRAINING

OSHA 40-hour Hazardous Waste Training Program
OSHA 8-hour Supervisor's Course
Radioactive Waste Handler
Portable Gas Chromatograph Operations
40 hour Project Manager Training
ISO 14000 Compliance Certified Auditor

O'Brien & Gere Engineers, Inc.

Saunders E. Wilson, Jr., CIH, CSP

Technical Associate

PROJECT ASSIGNMENT

Corporate Health & Safety Manager

PROFESSIONAL PROFILE

Mr. Wilson is manager of the Health and Safety Program for O'Brien & Gere Engineers, Inc. As manager of the Health and Safety Program, Mr. Wilson audits ongoing activities to identify health and/or safety hazards and recommends corrective actions. Mr. Wilson investigates occupational accidents and work related illnesses, identifies causes and recommends corrective and preventive measures. Mr. Wilson monitors the execution of the Medical Surveillance Program and the provision of regulatory based training, such as that required for general employee hazard communication training, hazardous waste operations training and asbestos worker training.

YEARS OF EXPERIENCE

With O'Brien & Gere: 10
With Other Firms: 20

EDUCATION

MS/1974/Hygiene, Industrial Hygiene

BS/1969/Sanitary Engineering

REGISTRATIONS

Certified Safety Professional

TECHNICAL EXPERTISE

Mr. Wilson has been a task or project manager on a number of multi-component environmental compliance projects for Fortune 100 and smaller companies, as well as for local governmental agencies. His accomplishments have included:

- developing and monitoring the implementation of health and safety plans and procedures at work sites, including sites containing hazardous wastes
- developing and conducting Hazardous Waste Operations Safety and Health training
- developing and conducting Hazard Communication and Laboratory Chemical Hygiene training
- conducting Confined Space Entry training
- performing health and safety program audits
- developing, supervising and performing industrial hygiene exposure monitoring
- developing, supervising and performing environmental and workplace noise and indoor air quality evaluations
- developing and evaluating the health and safety plans and procedures at client work sites, including sites containing hazardous wastes
- developing and implementing client requested health and safety programs
- developing a plan and procedure for compliance with DOT requirements for shipping and receiving hazardous materials.

Mr. Wilson's recent industrial hygiene and safety experience includes conducting health and safety audits at hazardous waste sites and in power generation facilities, foundries and manufacturing complexes, evaluating air sampling data, training employees and writing and/or reviewing health and safety plans for work on suspected or actual hazardous waste sites. Potential site hazards have included noise, confined spaces, welding and other construction activities, and exposures to infectious biological agents, heavy metals, radioactive substances, and volatile organic and inorganic compounds as liquids or vapors. Clients have included Fortune 500 chemical, electronics and manufacturing companies and small general contractors and land survey organizations. In addition, Mr. Wilson has supervised programs involving:

- workplace air monitoring
- health and safety training
- industrial hygiene data management
- facility audits
- indoor air quality evaluations
- ventilation systems evaluations
- industrial accident investigations
- asbestos exposure monitoring
- confined space entry training evaluations

Mr. Wilson also provides interpretations of occupational safety and health laws, regulations, and procedures. During chemical emergencies, he develops procedures to determine occupational exposures and recommends an appropriate level of protection during implementation of emergency response plans. As Technical Associate for Safety and Health, he is responsible for providing expert guidance to in-house staff and to clients on the recognition and evaluation of potential exposures to chemical and physical hazards and the development of appropriate hazard control strategies. Mr. Wilson develops procedures to perform health and environmental hazard evaluations at industrial work sites and at hazardous waste sites, and writes the appropriate sampling and auditing procedures and health and safety guidance.

REPRESENTATIVE PROJECTS

Heavy Equipment Manufacturer - Air sampling for combustion products. Recommended control measures to reduce exposures.

Electronics Component Manufacturer - Air sampling for solvents and dust. Noise monitoring, confined spaces evaluations and asbestos sampling and identification.

Electronic Components Manufacturer - Air sampling for cadmium during furnace brazing. Design consultation for emission controls on curing oven of electrostatic painting operation.

Electronic Components Manufacturer - Air sampling for isocyanates and methylene chloride during foam manufacturing.

Research Laboratory, HVAC Equipment Manufacturer - Wrote Ammonia Handling Safety Plan. Trained employees in hazard recognition and control.

Carbon Products Manufacturer - Health and safety compliance audit as an element of an environmental liability audit prior to purchase.

Electronics Components Manufacturer - Wrote health & safety plan meeting the requirements of 29 CFR 1910.120 for four hazardous waste sites containing PCBs.

Aircraft Engine Manufacturer - Performed health and safety program audit at facility.

Food Service Facility - Investigated suspected natural gas explosion to identify causes and potential for reoccurrence.

Warehouse Facility - Evaluated materials handling procedures, including loading and unloading facilities, for potential effects on indoor air quality.

Lighting Manufacturer - Evaluated materials handling procedures for potential employee exposure to chemicals used in bulb coatings.

Wastewater Treatment - Evaluated facility to identify potential safety and health hazards, including those related to chemical exposures, work procedures, materials handling, working surfaces and stairs.

Defense Facility - Wrote Health and Safety Plans meeting the requirements of 29 CFR 1910.120 for 10 remedial investigation activities.

Defense Facility - Wrote Health and Safety Plans meeting the requirements of 29 CFR 1910.120 for 18 remedial investigation activities.

Defense Facility - Wrote Health and Safety Plans meeting the requirements of 29 CFR 1910.120 for 8 remedial investigation activities.

Cogeneration Plant Operations - Conducted health and safety compliance audits in eight operating plants.

Cogeneration Plant - Wrote health and safety plan meeting the requirements of 29 CFR 1910.120 for construction activities in soils contaminated with PCBs.

Printing Facility - Supervised industrial air monitoring and data review.

Research Laboratory, Pharmaceutical Manufacturer - Developed hazard inventory system. Trained employees in use of labeling system. Conducted Hazard Communication Training.

Glass Manufacturer - Wrote health and safety plan meeting 29 CFR 1910.120 requirements for hazardous waste site operations and maintenance program.

Research Laboratory, HVAC Equipment Manufacturer - Wrote Laboratory Chemical Hygiene Plan. Trained employees in hazard recognition and control.

Contractor - Presented OSHA required 40 hour hazardous waste operations course for work crews and New York State employees prior to start of work on hazardous waste site containing PCBs.

Personal Products Manufacturer - Developed regulatory impact estimate for proposed facility design changes requiring the use of highly hazardous materials.

Chemical Manufacturer - Developed environmental basis for legal

response to claims for reimbursement due to alleged mishandling of manufacturer's product (perchloroethylene).

Electronics Manufacturer - Wrote Hazard Communication Training Program. Trained supervisory trainers to present material.

Electronics Manufacturer - Evaluated newly installed process line to identify noise characteristics and provide basis for design of noise enclosure.

Electronics Manufacturer - Supervised health hazard evaluation of manufacturing facility.

Hospital - Evaluated ethylene oxide exposure of central material and supply employees.

Container Manufacturer - Evaluated plastics extrusion operation for exposure of operators to ammonia and tetrahydrofuran. Identified existing levels and recommended controls to reduce exposures.

School District - Evaluated air quality in classrooms to identify source and identity of particulate matter found on desks.

School District - Evaluated suspected potential sources of indoor air contaminants in school building bordering on closed landfill. Identified needs for further ground and air monitoring.

County Courthouse - Evaluated hearing room in response to indoor air quality. Provided findings on carbon dioxide, carbon monoxide, bacteria and fungi, and air movement. Recommended changes to air distribution system.

Aluminum Milling Facility - Health & Safety officer during removal of PCBs and oils from concrete within the facility. Trained contractor union employees to meet 29 CFR 1910.120 education requirements.

Aircraft Parts Manufacturer - Evaluated disposal site with potentially hazardous levels of waste radiological materials. Identified actual levels and locations, and defined protective equipment for wear during site preparation and cleanup activities.

Conducts OSHA required initial, refresher and supervisor health and safety training courses for workers at hazardous waste sites.

Mr. Wilson's military experience includes:

Supervising industrial hygienists and technicians providing comprehensive industrial hygiene services (work site surveys, hazard sampling and employee training) to US Army industrial hygiene and safety personnel at military installations and organizations in Germany.

Italy, Turkey, Belgium, England, the Netherlands, Japan and Korea.

Assisting military hospital and European area safety managers in industrial accident investigations.

Creating and evaluating industrial hygiene elements of occupational health programs throughout U.S. Army Europe and training technicians to use hazard evaluation equipment.

Evaluating the potential for asbestos exposure in work spaces during renovation of a military communications monitoring facility.

Evaluating exposures to gas and diesel engine combustion products during maintenance and issue of prepositioned military equipment.

Evaluating worker exposures to noise, wood dusts and volatile solvents generated during resurfacing of gymnasium floors and bowling lanes.

Supervising instructors presenting training in industrial hygiene, sanitary engineering, air pollution and food service sanitation to officers and enlisted US Army medical department soldiers during initial medical training.

Evaluating worker exposures to explosives and explosive precursors at US Army ammunition manufacturing facilities. Recommending corrective actions to minimize employee exposures and assisting in developing recommended standards for employee exposure.

Providing sanitary engineering and food service sanitation support to US Army forces in the southern half of the Republic of Viet Nam.

SPECIAL TRAINING

Health and Safety at Hazardous Waste Sites, 40 Hour Course, 1989
Supervisor of Hazardous Waste Operations Course, 1989 and Annually
Health and Safety at Hazardous Waste Sites Refresher Course, 1990 and Annually
New York State Asbestos Safety Training, Air Sampling Technician, 1992 and Annually
New York State Asbestos Safety Training, Building Inspector, 1992

PRESENTATIONS

"Industrial Hygiene and Safety Fundamentals for Certified Hazardous Materials Managers", Certified Hazardous Materials Manager Examination Preparation Course, Rochester, NY. August 1995.

"Indoor Air Quality Assurance Programs", Indoor Air Quality Seminar, Syracuse, NY.

"Industrial Hygiene Support for Installation Engineers", Deputy Chief of Staff for Engineering, U. S. Army, Europe, Heidelberg, FRG.

Two week courses in basic industrial health and safety topics for industrial hygiene technicians, 7th Medical Command, Heidelberg FRG.

"Industrial Hygiene for Safety Professionals", Deputy Chief of Staff for Personnel, U. S. Army, Europe, Heidelberg, FRG.

Health and Safety at Hazardous Waste Sites training courses (Initial, Refresher, Supervisor). 1989 to present.

PAPERS

"Training Workers for Hazardous Waste Sites", Pollution Engineering, Vol. 23, No.1 2, November 1991, pp. 80-84.

EXHIBIT 3

OSHA TRAINING COURSE SUMMARY

920890256

Health and Safety at Hazardous Waste Operations

Initial 24-hr and 40-hr course

29 CFR 1910.120

O'BRIEN & GERE ENGINEERS, INC.
P.O. Box 4873
Syracuse, New York 13221

January 1995

920890257

HAZARDOUS WASTE OPERATIONS HEALTH & SAFETY TRAINING COURSE
O'BRIEN & GERE ENGINEERS, INC.

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CHAPTER 13 SITE EMERGENCIES

CHAPTER 14 PROTECTIVE CLOTHING

CHAPTER 15 PERSONAL PROTECTIVE EQUIPMENT

CHAPTER 16 RESPIRATORY PROTECTION PROGRAM - OSHA REGULATIONS

CHAPTER 17 DECONTAMINATION

CHAPTER 18 DRUM HANDLING

HAZARDOUS WASTE OPERATIONS HEALTH & SAFETY TRAINING COURSE
O'Brien & Gere Engineers, Inc.

24 & 40 Hour Course Syllabus

DAY 1 - TYPICAL

Registration; Introduction to Course

Pre-Course Exam

Review of the Regulation
- 29 CFR 1910.120

Break

Entry and Action of Hazardous Materials

Overview of Relevant Chemical Hazards and Exposures

Lunch

Health and Safety Hazards at Sites

Work Practices (SOP's)

Break

Health and Safety Program Overview

Confined Space Entry

OSHA Rights and Responsibilities

Quiz # 1

HAZARDOUS WASTE OPERATIONS HEALTH & SAFETY TRAINING COURSE
O'Brien & Gere Engineers, Inc.

24 & 40 Hour Course Syllabus

DAY 2 - TYPICAL

Review of Quiz # 1

Hazard Evaluation - Sources of Information

Break

Monitoring Equipment
Employee and Site Monitoring Program

Hazard Management

Lunch

Personal Protective Equipment

Respirator
- Regulations
- Written Plans

Break

Respirator
- Selection
- Care and Cleaning
- Fit Testing and Fit Checks

Respirator Problem Session

Quiz # 2

HAZARDOUS WASTE OPERATIONS HEALTH & SAFETY TRAINING COURSE
O'Brien & Gere Engineers, Inc.

24 & 40 Hour Course Syllabus

DAY 3 - TYPICAL

First Aid Training

Lunch

Review of Quiz # 2

Donning and Doffing Procedures
- Personal Protection Equipment

Decontamination
- Overview

Break

Medical Surveillance

24 Hour Course Review

24 Hour Course Critique and Final Exam

40 Hour Course: Quiz # 3

HAZARDOUS WASTE OPERATIONS HEALTH & SAFETY TRAINING COURSE
O'Brien & Gere Engineers, Inc.

24 & 40 Hour Course Syllabus

DAY 4 - TYPICAL

Adult CPR Training

Lunch

Review of Quiz # 3

Problem Session: Overall Site Management

Break

Hazard Communication Overview
- MSDS
- Informational program

Emergency Response Planning

HAZARDOUS WASTE OPERATIONS HEALTH & SAFETY TRAINING COURSE
O'Brien & Gere Engineers, Inc.

24 & 40 Hour Course Syllabus

DAY 5 - TYPICAL

Drum Handling and Engineering Controls

Break

Hands-on Training

Suit-up Practices

Site Senario Set Up

Lunch

Site Senario - Practices

Critique of Scenario(s)

Course Review

Break

Final Exam/Course Critique

Questions and Answers

HAZARDOUS WASTE OPERATIONS HEALTH & SAFETY TRAINING
8-Hour Supervisor Course
O'Brien & Gere Engineers, Inc.

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920890264

EXHIBIT 4

MEDICAL SURVEY

920890265

CONCENTRA
MEDICAL CENTERS

AUTHORIZATION FOR EXAMINATION OR TREATMENT

Patient Name: _____ S.S. #: _____ - _____ - _____

Employer: _____ Date of Birth: _____

Work Related

☐ Injury ☐ Illness

Date of Injury _____

Substance Abuse Testing (check all that apply)

☐ Regulated Drug Screen ☐ Non-Regulated Drug Screen

☐ Collection Only ☐ Breath Alcohol

☐ Other _____

Type of Substance Abuse Testing

☐ Pre-Placement ☐ Reasonable Cause ☐ Post Accident

☐ Random ☐ Periodic ☐ Follow-Up

Physical Examination

☐ Preplacement ☐ Baseline ☐ Annual ☐ Exit

DOT Physical Examination

☐ Preplacement ☐ Recertification ☐ Exit

Special Examination

☐ Asbestos ☐ Respirator ☐ Audiogram ☐ HPE

☐ Other _____

Billing (check if applicable)

☐ Employee to pay charges

Special Instructions/Comments: _____

Authorized By: _____ Signature _____ Print

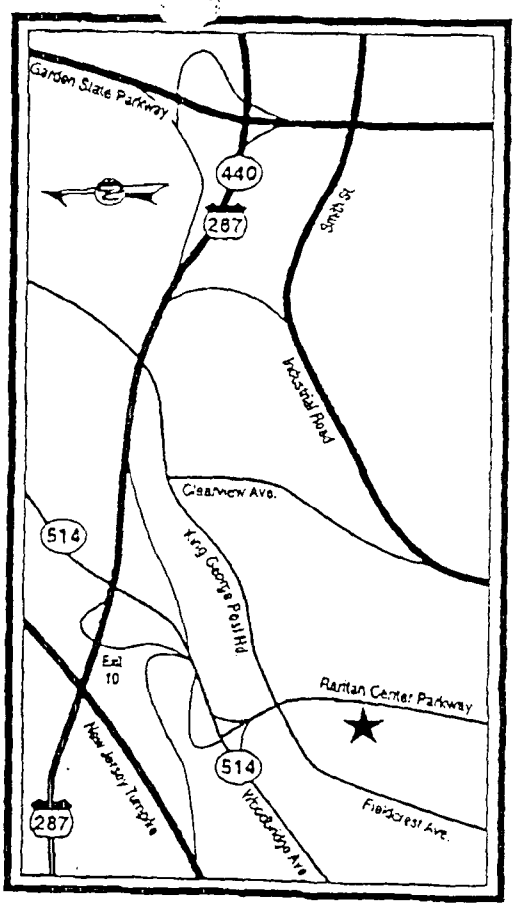
Phone: (_____) _____ _____ Date

Edison

135 Raritan Center Parkway
Edison, New Jersey 08837

Hours: 7:00 a.m. - 5:00 p.m.,
Monday - Friday

732-225-5454



920890266

Industrial Medical Associates, P.C.
961 Canal St., Syracuse, NY 13210-1287 (315) 478-1977 Fax: (315) 475-2909

DATE: _____

I HEREBY GIVE MY CONSENT TO INDUSTRIAL MEDICAL ASSOCIATES, P.C. TO RELEASE MY MEDICAL RECORDS/X-RAYS:

COMPANY NAME: _____
(if applicable)

NAME: _____

ADDRESS: _____

CITY/STATE/ZIP: _____

PATIENT'S SIGNATURE: _____

(PRINT): _____

SOCIAL SECURITY NO.: _____

WITNESS: _____

920890267

Cynthia B. Jones, M.D.
Ronald Miller, M.D.
Janice Scully, M.D.
David J. Seeley, M.D.
Kevin M. Walsh, M.D.
Ivan L. Wolf, M.D.

O'BRIEN & GERE ENGINEERS, INC.
5000 BRITTONFIELD PARKWAY, PO BOX 4873
SYRACUSE, NEW YORK 13221

HAZARDOUS WASTE EXAMINATION

TO BE COMPLETED BY PHYSICIAN

Employee Name: _____ Date of Exam _____
Social Security # _____

Height: _____ Weight: _____ Blood Pressure: _____
Pulse: _____ Resp.: _____ Temperature: _____

VISION: Uncorrected RT __/__ LT __/__ Color (Ishihara's): _____ Normal
Corrected RT __/__ LT __/__ _____ Abnormal

	Normal	Abnormal	Describe Abnormality
1. Head & Face	____	____	_____
2. Eyes & fundi	____	____	_____
3. Ears	____	____	_____
4. Nose & Sinuses	____	____	_____
5. Mouth, Throat	____	____	_____
6. Neck & Thyroid	____	____	_____
7. Lungs & Chest	____	____	_____
8. Heart	____	____	_____
9. Breasts	____	____	_____
10. Abdomen	____	____	_____
11. Genitals	____	____	_____
12. Hernia	____	____	_____
13. Rectal	____	____	_____
14. Spine	____	____	_____
15. Extrem. Upper	____	____	_____
16. Extrem. Lower	____	____	_____
17. Vascular Sys.	____	____	_____
18. Neurological	____	____	_____
19. Psychiatric	____	____	_____
20. Skin & Lymph	____	____	_____
21. Reflexes	____	____	_____
22. Urinalysis	____	____	_____
23. Blood Count	____	____	_____
24. Blood Chem(SMA 20)	____	____	_____
25. Pul Funct.Test (3x)	____	____	_____
26. Audiogram	____	____	_____
At MD's Discretion			
27. Rectal Exam(40+)	____	____	_____
28. Stool Guaiac(40+)	____	____	_____
29. EKG	____	____	_____
30. Chest X-Ray	____	____	_____

REMARKS: _____

Physician's Signature: _____ Date: _____

Send all forms and results to: **Industrial Medical Associates**
961 Canal Street
Syracuse, New York 13210

920890268

Industrial Medical Associates, P.C.
961 Canal Street, Syracuse, New York 13210-1287 (315) 476-1977

RESPIRATOR SUITABILITY

In compliance with OSHA regulation 29 CFR 1910.134,

_____ was examined on _____

and the above named individual's suitability for respirator use is as classified below:

_____ Class 1 -No restriction on respirator use.

_____ Class 2 -Respirator use restricted as outlined below:

Restrictions: _____

_____

_____

_____

_____ Class 3 -No respirator use under any circumstances.

Remarks: _____

_____

_____

_____

Physician: _____

Date: _____

920890269

Mark Barasz, M.D.
Russell Greenbaum, M.D.

920890270

Industrial Medical Associates, P.C.
961 Canal St., Syracuse, NY 13210-1287 (315) 478-1977 Fax (315) 475-2909

RESPIRATOR HISTORY

Employee: _____

S.S. #: _____

Employer: _____

Previous occupational exposures (i.e. dusts, fumes, mists, fibers, gas, vapors)

_____

_____

Present Occupation: _____

Previous Occupation: _____

Date of Last Respirator Fit Testing: _____

Do you have or have you ever had (Y for yes, N for No)

Hypertension	Y	N
Heart Disease	Y	N
Sinus or Lung Disease	Y	N
Cough or Shortness of Breath	Y	N
Seizures (epilepsy)	Y	N
Diabetes	Y	N
Anemia	Y	N
Punctured Eardrum	Y	N
Claustrophobia or Anxiety when wearing a respirator	Y	N
Do you wear glasses?	Y	N
Do you wear contact lenses?	Y	N
Do you wear dentures?	Y	N
Do you wear Skull cap?	Y	N
Do you grow a beard?	Y	N

Smoking History

1.) Have you ever smoked? Y N
2.) Do you smoke now? Y N
3.) How many packs of cigarettes do/did you smoke per day? _____
cigars per day? _____
pipe bowls per day? _____
4.) How many years ago did you stop smoking? _____
5.) How may years have you been smoking? _____

Russell Greenhalgh, M.D.
E. James Heimman, M.D.
Janice Scully, M.D.
Ronald Miller, M.D.
David J. Seeley, M.D.
Kevin M. Walsh, M.D.
Ivan L. Wolf, M.D.

920890271

Industrial Medical Associa , P.C.
961 Canal St., Syracuse, NY 13210-1287 (315) 478-1977 Fax (315) 475-2909

EMPLOYEE EXPOSURE INFORMATION
(To be completed by the employer prior to examination)

EMPLOYEE:_____ SS#:_____

EMPLOYER:_____

Reason for exam (circle one)

1. Pre-placement
2. Prior to assignment
3. Periodic
4. Termination of employment
5. Exposure in emergency situation
6. Other_____

Type of Exam (Please circle all that apply)

1. Respirator Surveillance
2. Hazardous Surveillance
3. Asbestos Surveillance
4. Heavy Metal Surveillance
5. Lead Surveillance
6. Cadmium Surveillance
7. Other:_____

Identification of contaminant (please list by chemical or generic name) A._____ B._____ C._____

Has air monitoring been conducted?.....( )Yes ( )No
If asbestos, employee's duration of past asbestos exposure _____

Is exposure level above or anticipated to be above PEL? Yes ( ) No ( ) Unknown( ).

Describe employee's duties as they relate to the employee's exposure:_____
_____

List types of personal protective equipment used or to be used by employee (i.e type of respirator, Tyvek suit, protective clothing, etc.):

Respirator Types (circle all that apply)

Atmosphere supplying
Continuous Flow
Air Purifying (non-powered)
Air Purifying (powered)
Supplied Air
Open circuit SCBA
Closed circuit SCBA

_____

Adverse work conditions (i.e. temperature/heat stress, high places, hazardous materials.)_____

Is the environment immediately dangerous to life? Yes ( ) No ( )
Level of work effort (circle one) Light Moderate Heavy Strenuous

OSHA mandates that any information from previous medical examination of the employee that is not otherwise available to the examining physician be forwarded to the examining physician.

This form shall accompany the employee to the examination or it may be faxed prior to the examination.

Completed by:_____ Title_____ Date:_____

O'BRIEN & GERE ENGINEERS, INC.
5000 BRITTONFIELD PARKWAY, BOX 4873
SYRACUSE, NY 13221
(315) 437-6100

BASELINE MEDICAL QUESTIONNAIRE

Date: _____

Name: _____ Home Phone: _____

Home Address: _____ Work Phone: _____

_____

Social Security No. _____ Birth Date: _____

In December 1986, OSHA issued an interim standard emphasizing the medical surveillance of workers exposed to hazardous wastes. This questionnaire follows those guidelines.

If you suspect or know of recent or remote exposures to the following, please check the appropriate box:

Have you ever been exposed to any of the following:	Yes	No
Dioxins	( )	( )
Hydrocarbons	( )	( )
Heavy Metals	( )	( )
Herbicides	( )	( )
Insecticides	( )	( )
PCBs	( )	( )
Carcinogens		
Noise	( )	( )
Asbestos	( )	( )
Radioactivity	( )	( )
Fumes	( )	( )
Dust	( )	( )

Other: _____

_____

_____

Alcohol

What is your approximate daily intake of alcohol? Please circle.

None
Occasional
Less than two 2 drinks
3 to 5 drinks
Over 5 drinks

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BASELINE MEDICAL QUESTIONNAIRE
(Continued)

Tobacco	Yes	No
Have you ever smoked cigarettes?	( )	( )
Do you smoke now?	( )	( )
How many cigarettes per day?	Less than 15 ( )	15-24 ( )
Most you have ever smoked per day?	Less than 15 ( ) 25-34 ( )	15-24 ( ) 35+ ( )
Total years you have smoked?	5 ( ) 15 ( ) 25 ( )	10 ( ) 20 ( ) 30 ( ) 35 ( )

If you have quit, how many years ago? _____

At what age did you start smoking? _____

At what age did you stop smoking? _____

How many per day? _____

Do you inhale pipe or cigar smoke? _____

Visual	Yes	No
Do you wear glasses?	( )	( )
Do you wear contact lenses?	( )	( )

Auditory	Yes	No
Do you suspect you have impaired hearing?	( )	( )

Allergies	Yes	No
Do you have any allergies?	( )	( )

Please list known allergies: _____

_____

_____

Temperature Tolerance	Yes	No
Do you consider yourself unusually sensitive to hot or cold temperatures	( )	( )

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BASELINE MEDICAL QUESTIONNAIRE
(Continued)

Other Health Problems	Yes	No
Do you have or have you ever had:		
Heart Disease	( )	( )
High Blood Pressure	( )	( )
Chest Pain	( )	( )
Heart Murmur	( )	( )
Lung Disease	( )	( )
Cough	( )	( )
Asthma	( )	( )
Sinusitis	( )	( )
Shortness of Breath	( )	( )
Headaches	( )	( )
Fatigue	( )	( )
Dizziness	( )	( )
Seizure Disorder	( )	( )
Numbness of Hands or Feet	( )	( )
Drowsiness	( )	( )
Anemia	( )	( )
Nausea	( )	( )
Vomiting	( )	( )
Jaundice	( )	( )
Abdominal Cramps	( )	( )
Kidney Disease	( )	( )
Skin Disease	( )	( )
Rash	( )	( )
Spine or Joint Disease	( )	( )

Comments: _____

_____

_____

Signature: _____ Date: _____

SUBMIT FORM TO PHYSICIAN ADMINISTERING EXAMINATION

920890274

INDUSTRIAL MEDICAL ASSOCIATES

AUDIOMETRIC EVALUATION RECORD

ADDRESS

NAME LAST	FIRST	INITIAL	SEX	AGE	SSN	Date Employed

DATE / TIME	AUDIO SER. # STANDARD MODEL	LAST DATE CALI-BRATED	PRESENT JOB TITLE YEARS ( )	NOISE EXPOSURE dBA RANGE	CONT. INT. IMP COMB	HOURS SINCE EX-POSED	PLUGS MUFFS	HEARING THRESHOLDS RIGHT 500	1000	2000	3000	4000	6000	8000	LEFT 500	1000	2000	3000	4000	6000	8000	SIGNATURE CERT. #	RECOMMENDATIONS
			( )																				
			( )																				
			( )																				
			( )																				
			( )																				
			( )																				
			( )																				

OLOGIC HX

Explain all "Yes" answers

Family Hx of hearing loss? No____ Yes _____

Difficulty hearing? No____ Yes _____

). One ear better than the other? No____ Yes _____

). Onset of Loss Gradual or Sudden? _____

Hx of ear infections? No____ Yes _____

ar surgery recommended or performed? No____ Yes _____

x of Ringing? No____ Yes _____

x of unusual dizziness? No____ Yes _____

x of (mycin) Antibiotics, Quinine, Excessive Aspirin? No____ Yes _____

x of head traumas or unconsciousness? No____ Yes _____

s. Military Service? _____ Branch _____ Job _____

id you ever hunt or shoot? No ___ Yes _____

COMMENTS

DATE	

920890275

920890276

STORE RECORD ACCORDING TO FEDERAL REGISTER 1910...

Industrial Medical Associates, P.C.

961 Canal St., Syracuse, NY 13210-1287 (315) 478-1977 Fax: (315) 475-2909

HAZARDOUS WASTES MEDICAL QUESTIONNAIRE

NAME: _____ HOME PHONE #: _____

STREET ADDRESS: _____ WORK PHONE #: _____

CITY: _____ BIRTH DATE: _____

SOCIAL SECURITY #: _____

IN DECEMBER 1986, OSHA ISSUED AN INTERIM STANDARD EMPHASIZING THE MEDICAL SURVEILLANCE OF WORKERS EXPOSED TO HAZARDOUS WASTES. THIS QUESTIONNAIRE FOLLOWS THOSE GUIDELINES.

If you suspect or know of recent or remote exposures to the following, please check the appropriate box:
(If you are not sure, please leave blank)
Have you been exposed to any of the following?

	Yes	No
Dioxins	[ ]	[ ]
Hydrocarbons	[ ]	[ ]
Heavy metals	[ ]	[ ]
Herbicides	[ ]	[ ]
Insecticides	[ ]	[ ]
PCB's	[ ]	[ ]
Carcinogens	[ ]	[ ]
Noise	[ ]	[ ]
Asbestos	[ ]	[ ]
Radioactivity	[ ]	[ ]
Fumes	[ ]	[ ]
Dust	[ ]	[ ]

Other _____

_____

_____

Alcohol

What is your approximate daily intake of alcohol?
Please underline.
None
Occasional
Less than 2
3 to 5
Over 5

Paul A. Day, M.D.
Russell Greenhalgh, M.D.
E. James Heitzman, M.D.
Richard Jaeger, M.D.
Ronald Miller, M.D.
David L. Seeley, M.D.
Edward Swift, M.D.
Kevin M. Walsh, M.D.

Tobacco

Have you ever smoked cigarettes? Yes [ ] No [ ]
Do you smoke now? Yes [ ] No [ ]

How many cigarettes per day? Less than 15 [ ] 15-24 [ ]
25-34 [ ] 35+ [ ]

Most you ever smoked per day? Less than 15 [ ] 15-24 [ ]
25-34 [ ] 35+ [ ]

Total years you have smoked? 5 [ ] 10 [ ]
15 [ ] 20 [ ]
25 [ ] 30 [ ] 35 [ ]

If you quit how many years ago? _____

At what age did you start smoking? _____

At what age did you stop smoking? _____

Do you smoke pipes or cigars? _____

How many per day? _____

Do you inhale pipe or cigar smoke? _____

Visual

Do you wear glasses? Yes [ ] No [ ]
Do you wear contact lenses? Yes [ ] No [ ]

Auditory

Do you suspect you have impaired hearing? Yes [ ] No [ ]

Allergies

Do you have any allergies? Yes [ ] No [ ]

920890277

Temperature Intolerance

Do you consider yourself unusually sensitive to hot or cold temperatures? Yes [ ] No [ ]

Do you have or have you ever had?

	Yes	No
Heart disease	[ ]	[ ]
High blood pressure	[ ]	[ ]
Chest pain	[ ]	[ ]
Heart murmur	[ ]	[ ]
Lung disease	[ ]	[ ]
Cough	[ ]	[ ]
Asthma	[ ]	[ ]
Sinusitis	[ ]	[ ]
Shortness of breath	[ ]	[ ]
Headaches	[ ]	[ ]
Fatigue	[ ]	[ ]
Dizziness	[ ]	[ ]
Seizure Disorder	[ ]	[ ]
Numbness of hands or feet	[ ]	[ ]
Drowsiness	[ ]	[ ]
Insomnia	[ ]	[ ]
Nausea	[ ]	[ ]
Vomiting	[ ]	[ ]
Jaundice	[ ]	[ ]
Abdominal cramps	[ ]	[ ]
Kidney disease	[ ]	[ ]
Skin disease	[ ]	[ ]
Rash	[ ]	[ ]
Spine or joint disease	[ ]	[ ]

Comments _____

920890278

Safety guidelines for excavation

Excavation equipment maintenance and safety is the responsibility of the excavation subcontractor. The following information is the provided as a general guideline for O'Brien & Gere personnel for safe excavation practices at the Site.

Underground utilities Extreme caution should be exercised whenever the possibility of encountering underground utilities exists. Prior to commencement of intrusive activities, utilities will be notified as to the scope of work activities and markouts will be requested. No excavation will commence until utilities have been marked. Where underground utilities are encountered, the excavation will be terminated and a new location will be started.

Perimeter safety A highly visible barricade shall be installed around all excavation areas. Tools, machinery, timber, excavated materials or other objects shall not be placed within 1 m from the edge of the excavation.

Access and egress Structural ramps designed solely for the purpose of employee access or egress from excavations will be installed. Runways constructed of two or more structural members shall have the members connected together to prevent displacement. Structural members will be of uniform thickness. Structural ramps shall be provided with cleats to prevent tripping and slipping. A stairway, ladder ramp or other safe means of egress shall be located in trench excavations that are 4 feet or more in depth so as to require no more than 25 feet of lateral travel for employees. Where employees or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails shall be provided.

Exposure to falling loads No employee shall be permitted underneath loads handled by lifting or digging equipment. Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators may remain in the cabs of vehicles being loaded or unloaded if the vehicles are equipped to provide adequate protection for the operator.

Testing and controls of hazardous atmospheres Where a hazardous atmosphere could reasonably be expected to exist, the atmospheres in the excavation shall be tested before employees enter excavations greater than 4 feet in depth. Adequate precautions shall be taken to prevent employee exposure to atmospheres containing less than 19.5 percent oxygen, atmospheres containing a concentration of a flammable gas in excess of 20 percent of the lower flammable limit

of the gas, and other hazardous atmospheres. These precautions include, but are not limited to, providing proper respiratory protection or ventilation. Testing of atmospheres shall be conducted as often as necessary to ensure that the atmosphere remains safe.

Protection from hazards associated with water accumulation Employees shall not work in excavations in which there is accumulated or accumulating water unless adequate precautions have been taken. These precautions include, but are not limited to, special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or the use of a safety harness and lifeline. If excavation work interrupts the natural drainage of surface water, diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation.

Stability of adjacent structures Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing or underpinning shall be provided to ensure the stability of such structures. Sidewalks, pavements, and appurtenant structure shall not be undermined unless a support system or another method of protection is provided to protect employees from their possible collapse.

Protection of employees from loose rock or soil Adequate protection shall be provided to protect employees from loose rock or soil that could pose a hazard by falling or rolling from an excavation face. Such protection shall consist of scaling to remove loose material; installation of protective barricades at intervals as necessary on the face to stop and contain falling material; or other means that provide equivalent protection.

Protection from cave-ins In an excavation that is more than 1.4 m deep and whose sides are sloped at an angle of 45 degrees or more to the horizontal, the walls of the excavation shall be supported by shoring and bracing that is installed as the excavation is being advanced. The installation and removal of the shoring and bracing shall be performed or supervised by a qualified person.

Individual members of support systems shall not be subjected to loads exceeding those which those loads were designed to withstand.

Individual members of support systems shall not be subjected to loads exceeding those which those loads were designed to withstand. Employees shall not be permitted to work on the faces of sloped or benched excavations at levels above other employees except when employees at the lower levels are adequately protected from the hazard of falling, rolling, or sliding material or equipment.

Design of sloping and benching systems The slopes and configurations of sloping and benching systems shall be selected and constructed in accordance with one of the following:

1. Excavations shall be sloped at an angle not steeper than one and one-half horizontal to one vertical.
2. Maximum allowable slopes, and allowable configurations for sloping and benching systems, shall be determined in accordance with a method of classifying soil and rock deposits based on site and environmental conditions, and on the structure and composition of the earth deposits.
3. Designs of sloping or benching systems shall be selected from and be in accordance with tabulated data, including parameter identification, identification of data limitations, and explanatory information.
4. Sloping or benching systems shall be designed by a registered professional engineer.

Design of support systems, shield systems, and other protective systems. Designs of support systems and other protective systems shall be selected and constructed in accordance with one of the following:

1. Designs for timber shoring in trenches shall be determined in accordance with a method of classifying soil and rock deposits based on site and environmental conditions, and on the structure and composition of the earth deposits.
2. Design of support systems, shield systems, or other protective systems shall be selected from and be in accordance with tabulated data, including parameter identification, identification of data limitations, and explanatory information.
3. Support systems, shield systems, and other protective systems shall be approved by a registered professional engineer.

Removal of support Removal shall begin at, and progress from, the bottom of the excavation. Members shall be released slowly so as to note any indication of possible failure of the remaining members of the structure of possible cave-in of the sides of the excavation. Backfilling shall progress together with the removal of support systems from excavations.

920890281

Inspections Inspections of excavations, adjacent areas, and protective systems shall be made for evidence of hazardous conditions. These inspections shall be made by a competent person and shall occur daily, and after every rainstorm or other hazard increasing occurrence.

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SITE SAFETY - EXCAVATION

1.0 INTRODUCTION

Probably the single most common operation on every construction project is excavation. It is also quite common for a hazardous waste remediation or cleanup operation to include excavation, since soil contamination is one of the common problems being addressed.

A good definition of excavation is provided by OSHA. An excavation is "any man-made cut, cavity, trench or depression in an earth surface, formed by earth removal." OSHA intended a broad definition, and this suits our purposes as well, since our focus is on the hazards of excavations, how to recognize them and do our best to keep excavation operations safe.

OSHA compiles statistical records of on-the-job accidents and has long recognized that construction excavations result in a high number of accidents and fatalities. The purpose of the excavation regulations (29 CFR Sections 1926.650, 1926.651, 1926.652, and Appendices A through F) is to reduce the incidence of these accidents and provide a safer workplace for construction workers. The regulation was most recently revised in 1989, and the number of fatalities has been reduced since then.

2.0 HAZARDS

The number one potential hazard of any excavation is a collapse or cave-in. It is the most common cause of excavation fatalities. Other significant hazards associated with construction excavations include: underground utilities, hazardous atmospheres, excavation equipment accidents, loading or unloading operations, overhead utilities, and falling objects. Each of these hazards has the potential for causing a fatal accident, but these hazards can be minimized through training, awareness and planning.

2.1 Collapse or Cave-In

An open excavation with vertical (or even near-vertical) sides is not a natural situation. Think about the landscape, and, aside from stable rock formations, you will not see any vertical or near-vertical slopes. Soil (often referred to as "dirt") is a dense, heavy material. A cubic foot commonly weighs between 110 and 120 pounds. Therefore, a cubic yard (equal to 27 cubic feet) weighs about 1.5 tons.

Consider a column of soil one foot square and several feet high. One foot down from the top a slice (or horizontal plane) must support the weight above it. Therefore it is subject to a pressure (defined as the force per unit area) of about 110 psf (pounds per square foot). Two

feet from the top the pressure is doubled, to about 220 psf. At five feet from the top the pressure is up to 550 psf (and remember that five feet is not considered a deep excavation). These earth pressures that develop do not act simply in a downward direction, but they push outward laterally as well (although the lateral pressures are of a lesser magnitude).

The column of soil described above would quickly collapse if not supported by the adjacent columns of soil. The adjacent soil provides the necessary support to resist the lateral earth pressures that occur. Undisturbed soil can be visualized as a series of adjacent columns of soil that support one another. This system of soil is in equilibrium and it is stable.

When an excavation is made or dug, the system is disturbed. The lateral support that was provided from adjacent soil columns is removed. The remaining soil column begins immediately to move (although it may be imperceptible) into the freshly excavated space.

As the soil in the adjacent column moves sideways toward the hole, the surface of the ground above begins to subside or settle, creating an unnatural situation. The removal of support from the ground surface puts the soil in tension. A portion of the stress in the no-longer supported column of soil is transferred back away from the wall of the excavation in the form of shear.

Like concrete, soil is strongest in compression and not strong at all in tension. Concrete design takes account of this property by incorporating steel reinforcement within the concrete to counteract the tensile stresses. There is no reinforcement in the soil to resist the tensile stresses.

The combination of tension in the ground surface and shear stress typically causes cracks to form along a line back from the edge of the excavation. These cracks are usually located a distance approximately 1/3 to 2/3 of the depth of the excavation from its edge. For example, if the excavation is 10 feet deep, the cracks would probably occur between three and seven feet away from the edge. There may be several cracks, which are usually vertical and up to 1/2 the depth of the excavation.

When cracks develop, the weight of the soil in the excavation wall has completely lost support from the soil back from the face of the excavation. This results in an increase in the stress upon the remaining soil at the bottom of the excavation adjacent to it. There is no longer any lateral support from the adjacent soil (it has been removed) to prevent a failure or collapse.

When the bottom of the excavation collapses into the hole, support for the soil above it disappears and it "hangs" there momentarily. However the shear and tensile stresses quickly overcome the remaining soil, and it too fails. Cave-ins like these generally come in multiples. If the first one doesn't cause a fatality or serious injury the second or third one may do so.

It is clear from the cave-in scenario described that the degree of hazard in an excavation increases as the depth of the excavation increases. The OSHA regulation accounts for it by establishing depth limits. Refer to Table 1 to review these limits.

This scenario involving the mechanics of a cave-in is a brief introduction to some of the common features of such accidents. It is by no means an exhaustive consideration of all of the factors that might be involved in such an occurrence. Other factors that often have important consequences with respect to cave-ins during excavation operations include weather, groundwater, vibration, and superimposed loads.

DEPTH	CONSEQUENCES
> 4 Feet	Must provide employee egress (maximum worker travel distance is 25 feet).
> 5 Feet	Must provide a protective system (unless the excavation is entirely in stable rock).
> 20 Feet	Excavation protection must be designed by a registered Professional Engineer (cannot use other options in the regulations).

Table 1. Different excavation depths and required actions.

2.2 Underground Utilities

Not all underground utilities are hazardous to workers involved in excavations, but there are deadly hazards associated with a some of them. Encountering a high-voltage electrical cable with the metal bucket of an excavating machine or damaging a high-pressure natural gas main subjects a lot of people to a hazardous situation. The first important principle to remember is a common one and it is applicable to many situations - plan ahead. Do not begin excavating without considering whether there is a possibility that underground utilities are present. Utilities are discussed in detail in the Site Safety - General Work Practices section.

2.3 Hazardous Atmosphere

If there is a potentially hazardous atmosphere in an excavation deeper than 4 feet, testing and controls are required prior to employee entry. When testing reveals the presence of a hazard, adequate precautions must be taken (typically in the form of respiratory protection and/or ventilation). The hazards referred to include an oxygen deficiency (<19.5% oxygen in the atmosphere), a flammable atmosphere (here defined as >20% of the LFL {lower flammable limit} of a flammable gas), or a toxicity level greater than the TLV {threshold limit value} for the substance as established in Appendix A to 1926.55 (refer also to section 1926.65 which duplicates 1910.120).

When controls such as forced-air ventilation are used to reduce atmospheric contaminants, testing is required as necessary to ensure that the atmosphere remains safe.

Where there is a hazardous atmosphere or where such an atmosphere may reasonably be expected to develop during excavation, emergency rescue equipment must be readily available. Such equipment includes breathing apparatus, a safety harness and line, and/or a basket stretcher. If an employee enters a deep and confined excavation (such as a bell-bottom pier hole), the employee shall wear a harness with a lifeline securely attached to it. The lifeline must be separate from any material-handling line, and it must be individually attended at all times while the employee is in the excavation.

Be aware also that there is some of overlap between this regulation and 1910.146, Permit-Required Confined Space.

3.0 COMPETENT PERSON

It is recognized that the hazards of an excavation are not easily recognized by the layperson. OSHA has determined that even individuals with experience in the subject may not have sufficient expertise to protect themselves (as well as others) from the hazards of excavations. This explains why the concept of "competent person" is used in the regulation.

A "competent person" is not only capable of identifying potential risks and recognizing hazards, but is one who "has authorization to take prompt corrective measures to correct them."

In one recently-contested OSHA citation (heard by the Occupational Safety and Health Review Commission) a contractor was given a serious citation for failure to have a "competent person" inspect the excavation. The individual who was present was the owner of the company (with plenty of authority) and he had 40 years of experience in pipeline installations, but he had allowed three workers to be present at the bottom of an unsloped, unshored 20 foot deep excavation. The Review Commission agreed with the Compliance Officer under these circumstances that the individual clearly could not have been a competent person, or he would not have allowed this to occur.

EXHIBIT 6

HEAT STRESS PREVENTION PLAN

Heat stress prevention plan

Due to the increase in ambient air temperatures and the effects of protective outer wear decreasing body ventilation, there exists an increase in the potential for injury, specifically, heat casualties. Site personnel will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim and the prevention of heat stress casualties.

Identification and Treatment

1. Heat Exhaustion
   a. **Symptoms:** Usually begins with muscular weakness, dizziness, nausea, and a staggering gait. Vomiting is frequent. The bowels may move involuntarily. The victim is very pale, the skin clammy, and perspiration may be profuse. The pulse is weak and fast, breathing is shallow. The victim may faint unless the victim lies down. The symptoms may pass, but can remain and death could occur.

   b. **First Aid:** Immediately remove the victim to the Decontamination Zone or to a shady or cool area with good air circulation. Remove all protective outer wear. Call a physician. Treat the victim for shock. (Make the victim lie down, elevate feet 6-12 inches and keep the victim warm, but loosen all clothing.) If the victim is conscious, it may be helpful to administer sips of a salt water solution (1 teaspoon of salt to 1 glass of water). Transport victim to a medical facility as soon as possible.

2. Heat Stroke
   a. **Symptoms:** This is the most serious of heat casualties due to the fact that the body excessively overheats. Body temperatures often are between 107° - 110°F. First there is often pain in the head, dizziness, nausea, oppression, and the skin is dry, red and hot. Unconsciousness follows quickly and death is imminent if exposure continues.

   b. **First Aid:** Immediately evacuate the victim to a cool and shady area in the Decontamination Zone. Remove all protective outer wear and all personal clothing. Lay victim on back with the head and shoulders slightly elevated. It is imperative that the body temperature be lowered immediately. This can be accomplished by applying cold wet towels, ice bags, etc., to the head. Sponge off the bare skin with cool water or rubbing alcohol, if available, or even place the victim in a tub of cool water. The main objective is to cool the

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victim without chilling. Give no stimulants. Transport the victim to a medical facility as soon as possible.

Prevention of Heat Stress

1. One of the major causes of heat casualties is the depletion of body fluids. At the Site there will be plenty of fluids available. Personnel should replace water and salt lost from sweating. Salts can be replaced by drinking a commercial mix of electrolytes and nutrients such as Gatorade. If Gatorade is consumed for extended periods of time, it should be mixed at 50 percent of normal strength.

2. A work schedule should be established so that the majority of the work day will be during the morning hours before ambient air temperature levels reach their highs.

3. A work/rest guideline will be implemented for personnel required to wear Level B protection. This guideline is as follows:

Ambient Temperatures	Maximum Wearing Time
Above 90°F	½ hour
80°-90°F	1 hour
70°-80°F	2 hours
60°-70°F	3 hours
60°F	4 hours

A sufficient period will be allowed for personnel to "cool down." This may require shifts of workers during operations. No work is to take place under Level B protection in this project without approval by Project Officer.

4. Work time may be increased by use of a body cooling suit such as a steel vest cooling system with ice pack thermostrips.

Heat Stress Monitoring For monitoring the body's recuperative ability to excess heat, one or more of the following techniques should be used as a screening mechanism. Monitoring of personnel wearing protective clothing should commence when the ambient temperature is 70 degrees Fahrenheit or above. Frequency of monitoring should increase as the ambient temperature increases or if slow recovery rates are indicated. When temperatures exceed 80 degrees Fahrenheit, workers must be monitored for heat stress after every work period.

- Heart rate ("HR") should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats

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per minute. If the HR is higher, the next work period should be shortened by 10 minutes (or 33%), while the length of the rest period stays the same. If the pulse rate is 100 beats per minute at the beginning of the next rest period, the following work cycle should be shortened by 33%.

- Body temperature should be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature ("OT") at the beginning of the rest period should not exceed 99 degree Fahrenheit. If it does, the next work period should be shortened by 10 minutes (or 33%), while the length of the rest period stays the same. However, if the OT exceeds 99.7 degrees Fahrenheit at the beginning of the next period, the following work cycle should be further shortened by 33%. OT should be measured again at the end of the rest period to make sure that it has dropped below 99 degree Fahrenheit.

- Body water loss ("BWL") due to sweating should be measured by weighing the worker in the morning and in the evening. The clothing worn should be similar at both weighings; preferably the worker should be nude. BWL should not exceed 1.596 of the total body weight. If it does, workers should be instructed to increase their daily intake of fluids by the weight loss.

Ideally, body fluids should be maintained at a constant level during the work day. This requires replacement of salt lost in sweat as well.

Good hygienic standards must be maintained by frequent change of clothing and daily showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

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EXHIBIT 7

TICKS AND TICK-BORNE DISEASES

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Ticks and tick-borne diseases

Field personnel should be aware of an increased occurrence of tick-borne disease. The most likely carriers are the white-footed mouse and the white-tailed deer. These animals are most prevalent in areas where suburban environments abut open fields or woodlands. Although exposure is increased in these areas, other carriers, such as dogs and horses, can be found in a variety of environments.

All field personnel should take proper precautions to limit exposure to ticks and tick-borne diseases. These include:

- Cinching and taping clothing at the ankles and wrists, especially the ankles. Ticks lie low on grass blades and shrubs. They encounter your feet, ankles or lower legs and then crawl upward;

- Wear light-colored clothing to facilitate spotting the ticks, and check your clothing periodically. Be especially careful in terrain with tall grass, bushes or woods;

- Use a tick repellent on skin or clothing. Always read the labels before using. Clothing repellents should never be used on the skin;

- Recognize the signs of a bite or an infection. It takes several hours for a tick to attach and feed; removing it promptly lessens the chance of being infected; and,

- Seal field clothes in plastic bags until cleaned. Do not take them into the house or office as a tick(s) may be attached.

Pregnant women should be particularly careful since the effects of the most common tick-borne disease in the northeast, Lyme disease, upon the fetus is unknown.

Lyme disease is caused by the spirochete bacterium *Borrelia borgdorferi*, which is carried on *Ixodes dammini* commonly known as the deer tick. The tick is about the size of a pin head or a freckle, hence one recommendation is to look for a moving freckle, since the tick may generally pass unnoticed.

If a tick is discovered on the skin, it is important to remove the entire insect as soon as possible. The most effective method is to grasp the tick as close as possible to the mouth with tweezers or thin, curved forceps. Then, without jerking, pull it upward steadily (a small amount of skin may be removed in the process).

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After removing the tick, disinfect the bite with rubbing alcohol plus Adolph's Meat Tenderizer (meat protein, not artificial) or povidone iodine (Betadine). Don't handle the tick, since spirochetes could enter the body through breaks in the skin. Dispose of it in alcohol or flush it down the drain. Check the bite occasionally for at least three weeks to see if a rash forms. If it does, you've been infected and should seek medical treatment promptly.

The rash generally appears at the bite location from two days to two weeks after the bite. It usually starts as a small red spot that expands as the spirochetes spread beyond the bite. Most commonly, the rash develops into a reddish circle or oval about two to three inches in diameter. It fades with or without treatment after a few weeks.

Much larger rashes - anywhere from 6 to 20 inches in diameters - may also occur, especially on the back. Despite their size, large rashes may be easy to miss because they're often very faint.

Other variants include a rash with a red perimeter and a clear center and the so-called bull's-eye rash, which consists of several concentric red rings. Rashes may vary in shape, depending on where they occur on the body. Frequent sites are the thigh, groin, and armpits. People often develop a rash in more than one place.

Early symptoms may include profound fatigue, a stiff neck, and flu-like symptoms such as headache, chills, fever, and muscle aches. Since tick bites don't always produce a rash, those symptoms alone may warrant a medical check for possible Lyme infection - especially if bites occur in summer and work is being done in an area in which Lyme disease is common.

Without treatment, the spirochetes usually multiply and the disease progressively worsens. The second stage, occurring within weeks to months of the bite, may affect the heart or nervous system. The third stage is the chronic arthritic stage, which begins up to a year or more after the bite.

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Required personal protective equipment

Level D Personal Protective Equipment

- Hard hat (if overhead hazard exists)
- Safety glasses (if splash or dust hazard exists)
- Steel-toes and steel shank work boots
- Nitrile - butadiene rubber outer gloves (to be worn over surgical gloves)(1)
- Latex surgical gloves(2)
- Regular Tyvek coveralls(1)
- Rubber overboots or disposable "booties"(1)

(1) Optional, at discretion of HSO.
(2) To be worn during drilling, excavating and sampling activities.

Modified Level D Personal Protective Equipment

- Hard hat (if overhead hazard exists)
- Safety glasses or goggles (if splash or dust hazard exists)
- Steel-toes and steel shank work boots
- Nitrile - butadiene rubber outer gloves (to be worn over surgical gloves)
- Latex surgical gloves
- Saranex impregnated Tyvek coveralls (taped at cuffs)
- Rubber overboots or disposable "booties"

Level C Personal Protective Equipment

- Hard hat
- Fullface MSA respirator with GMC-H combination cartridges
- Steel-toes and steel shank work boots
- Nitrile - butadiene rubber outer gloves (to be worn over surgical gloves)(1)
- Latex surgical gloves
- Rubber overboots or disposable "booties"
- Low profile "denim colored" regular Tyvek coveralls or Saranex impregnated Tyvek coveralls(2) (taped at cuffs)(1)

(1) Optional, at discretion of HSO.
(2) Choice at discretion of HSO.

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EXHIBIT 9

EMERGENCY TELEPHONE NUMBERS & DIRECTIONS TO HOSPITAL

Emergency telephone numbers and directions to hospital

This list of emergency services must either be posted on Site or carried by field personnel:

Emergency Service	Telephone Number
Ambulance	911
Fire Department	911
Police Department	911
Elizabeth Hospital	(908) 527-5000

DIRECTIONS TO ST. ELIZABETH GENERAL HOSPITAL

St. Elizabeth Hospital From the Site, proceed west on North Avenue East towards Newark Avenue and turn left onto Newark Avenue. Turn left onto South Broad Street and sharp left onto Pearl Street. Turn right onto Williamson Street. St. Elizabeth Hospital is #225 Williamson Street.

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EXHIBIT 10

EMERGENCY FIRST AID PROCEDURES

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Emergency first aid procedures

If an employee working in a contaminated area is physically injured, Red Cross first aid procedures will be followed. Depending on the severity of the injury, emergency medical response may be sought. If the employee can be moved, they will be taken to the work area (on a stretcher, if needed) where contaminated clothing will be removed (if possible), emergency first aid administered, and transportation to local emergency medical facility awaited.

If the injury to the worker is chemical in nature (e.g., overexposure), the following first aid procedures are to be instituted as soon as possible:

a. Eye Exposure - If contaminated solid or liquid gets into the eyes, wash eyes immediately at the emergency eyewash stations using large amounts of water and lifting the lower and upper lids occasionally. Obtain medical attention immediately. (Contact lenses are not permitted in the Exclusion Areas.)

b. Skin Exposure - If contaminated solid or liquid gets on the skin, promptly wash contaminated skin using soap or mild detergent and water. If solids or liquid penetrate through the clothing, remove the clothing immediately and wash the skin using soap or mild detergent and water. Obtain medical attention immediately if symptoms warrant.

c. Breathing - If a person breathes in large amounts of organic vapor, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Obtain medical attention as soon as possible.

d. Swallowing - If contaminated solid or liquid has been swallowed and the person is conscious, feed the person large quantities of salt water immediately and induce vomiting (unless the person is unconscious). Obtain medical attention immediately.

<u>First Aid Procedures</u>

- Remove the injured or exposed person(s) from immediate danger.
- Render first aid if necessary, and decontaminated affected person, if possible.
- Call an ambulance for transport to local hospital immediately. <u>This procedure should be followed even if their is no apparent serious injury</u>. Emergency numbers are in Exhibit 7.
- Evacuate other personnel on-Site to a safe place until the HSO determines that it is safe to resume work.

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EXHIBIT 11

HEALTH AND SAFETY INCIDENT REPORT FORM

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HEALTH AND SAFETY INCIDENT REPORT

Project Name _____

Project Number _____

Date of Incident _____

Time of Incident _____

Location _____

TYPE OF INCIDENT (Check all applicable items)

____ Illness ____ Injury ____ Fire, explosion, flash ____ Vehicular accident

____ Property Damage ____ Unexpected exposure ____ Health and Safety Infraction

____ Other (describe) _____

PROJECT NAME _____ LOCATION _____

Description of Incident (Describe what happened and possible cause, identify individuals involved, witnesses, and their affiliations, and describe emergency or corrective action taken).

_____

_____

_____

_____

_____

Reporter: _____ _____ _____

Print Name Signature Date

Reporter must deliver this report to the Operating Unit Health and Safety Officer within 24-hours of the reported incident for medical treatment cases and within five days for other incidents.

Reviewed by: _____ _____

Operating Unit Health and Safety Officer Date

Distribution:

_____ Corporate Health and Safety Manager
_____ Health and Safety Officer
_____ Project Manager
_____ Personnel Office (Medical Treatment Cases Only)

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EXHIBIT 12

HEALTH AND SAFETY REPORT

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HEALTH AND SAFETY REPORT

HSO: _____ Date: _____

Weather: _____

OBG Personnel Present: _____
(include times) _____
_____

Work Activities: _____
_____
_____
_____
_____

Level of Protection: _____
_____
_____

Summary of Ambient Measurement*: (Draeger)	_____ ppm (HNU PID)	_____ PPM (CGI/H_2S)
	_____ ppm (Foxboro OVA)	_____ ppm ___
	_____ % O_2 (CGI/02)	_____ ppm ___ (Draeger)
	_____ % LEL (CGI/% LEL)	_____ ppm ___ (Draeger)
Summary of Environmental Monitoring in Breathing Zone*:	_____ ppm (HNU PID)	_____ PPM (CGI/H_2S)
	_____ ppm (Foxboro OVA)	_____ ppm ___ (Draeger)
	_____ % O_2 (CGI/02)	_____ ppm ___ (Draeger)
	_____ % LEL (CGI/% LEL)	_____ ppm ___ (Draeger)

Notes, Incidents and Comments: _____
_____
_____
_____
_____

* Detailed record of measurements contained in Inspector's Field Inspection Reports.

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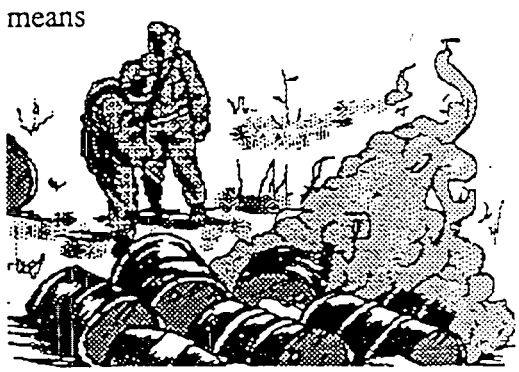
EXHIBIT 13

EMERGENCY RESPONSE - SPILLS

1.0 INTRODUCTION



Mitigating releases means controlling them. Measures to control a release involve those processes, methods, procedures, and techniques that are used to prevent or reduce the dispersement of the material or its by-products into the environment. These control measures may include fire extinguishment, controlled burning, neutralization, construction of temporary dams, berms, or dikes, plugging leaking containers, misting or fogging toxic vapors or gases, sorbent materials, and others.

2.0 CONTROL TECHNIQUES

Two general control techniques frequently used by first responders are confinement and containment.

2.1 Confinement

Confinement consists of methods used to limit the physical size of the area of the release. Hazardous materials can be released (directly or indirectly), to air, surface water, groundwater, or land surface.

2.2 Containment

Containment is defined as those methods used to restrict the material to its original container. It is important to contain the materials in order to limit the size of the area involved and minimize cleanup difficulties.

Controlling a release may be as simple as uprighting an overturned drum leaking from its bung or turning off a valve. It may be as difficult as patching a large tear in bulk storage tank of an unknown material. Many times, for small leaks, just shoving a wooden wedge into a hole can temporarily slow or stop a leak. Generally, highly volatile liquids and liquified gases are the most difficult to deal with. If a drum is uncovered from the site and integrity is questionable, then its contents may need to be transferred to another container. Fire might also be involved which further complicates the problem.

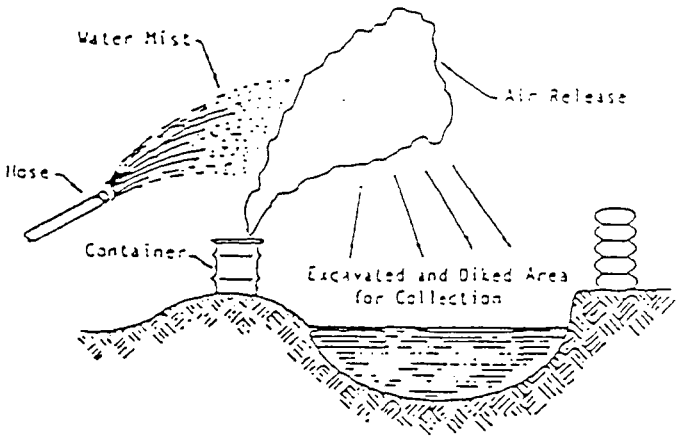
3.0 AIR RELEASES

Releases of gas, vapors, or particulates into air present a serious threat (depending particularly on the identity and quantity of chemical released). Once in the air, the material can move rapidly depending on wind and other weather conditions , and therefore has the capability of affection a large physical area. The cloud of material produced may be flammable, toxic, corrosive, or have other hazardous properties.

Controlling airborne materials is very difficult especially if large quantities are involved. The first step is to determine if it is possible to prevent or reduce the amount of materials from becoming airborne by containing or confining it. If this cannot be done then some vapor suppression or dispersion techniques may work depending of the quantity being released. Weather conditions such as humidity, temperature, and wind speed and direction can greatly affect cloud formation and dispersion. If the cloud is large, then initial consideration must be given to immediately evacuating the area which has the potential for being impacted.

With some materials the use of fog patterns to disperse the vapor cloud can work. When a fog stream is used, the material is condensed and a collecting area such as a dike should be used to capture the water. This collected material should be pumped into a container and disposed of properly. Responders must also be certain that the liquid does not revolatilize. This use of fog patterns to disperse a vapor cloud should be used judiciously because extensive groundwater contamination as well as excessive cleanup costs can be associated with this method.

MIST KNOCKDOWN



Air releases or suspected air releases should always be cautiously approached from the upwind direction whenever possible. Personnel must also be on the alert for changes in wind direction. Visual observations or direct-reading instruments may give some indication of the type and quantities of materials being released, and whether vapor suppression will work. Materials that are lighter than air (vapor density less than ambient atmosphere), will drift upwards into the atmosphere and be driven by the wind in a downwind direction. Heavier than air materials will tend to hug the ground, following the contours of the land from higher to lower elevations or be pushed by the wind movement.

4.0 LAND SPILLS

Generally, solids (even in the form of particulates) that spill on the land are the easiest materials to confine. Even if shipping containers rupture, solids ordinarily don't move far. The release area should be closed off to avoid having the materials tracked away from the site on shoes, clothing, or vehicles tires. It is also important not to increase the mobility of the material by the indiscriminate application of water or other liquids. Covering the material with plastic, tarps, or other means can help prevent it from becoming windborn.

Liquids spilled on the land may be somewhat more difficult to confine. In some cases, confinement may already be in place. For example, most tank farms have a berm around their periphery for confining major leaks. If a transfer line breaks or if an accident occurs in transporting or loading a liquid, there will be no "automatic" containment. On concrete, blacktop, or other hard surfaces, berms can be constructed with dirt, sand, adsorbents, or urethane foam packs specifically designed for this purpose. If the spill is on the ground, berms can be constructed by simply mounding the soil itself. In many cases, though, it may be more advantageous to "herd" the liquids by ditches, swales, and berms to an existing low point or construct a catch basin. This allows the material to pool and may make cleanup easier.

4.1 Control Techniques

There are three techniques for controlling spills on the land:

Diversion: The controlled movement of the liquid from one course or area to another where the effects to human health and the environment are substantially reduced.

Diking: The use of a barrier to confine or control the movement of liquids from an area of potential harm.

Retention: The temporary confinement of the liquid in an area (e.g., in a pond) where it can be absorbed, neutralized, diluted, or pumped out.

4.1.1
Diversion

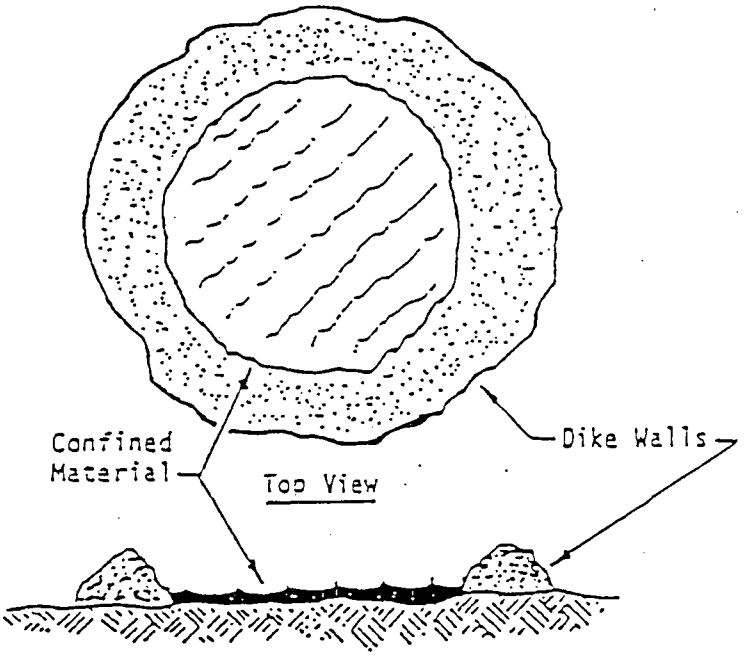
Usually dirt is used as a barrier to divert a spilled liquid. Because diversion requires that barriers be constructed in advance of the flow, using dirt from the area is practical because it is generally readily available, and a barrier can be quickly constructed. In order for diversion to be effective, response personnel should have a plan for constructing diversion walls or barriers. For example, for a small barrier, each participating response personnel should be equipped with a hand tool for digging and a pick for breaking ground . As the first responder breaks the ground with a pick, a second responder should place the soil on a pile, while a third responder packs the soil tightly. This process should continue until the diversion barrier is completed. In construction the diversion wall, the speed and the angle of the oncoming, flowing spill must be considered. (Construction equipment may be needed to build a diversion a barrier if large quantities of liquids are involved.)

4.1.2
Diking

Dikes can be constructed from practically any available materials. The materials and manpower to construct a typical dike are usually readily available and inexpensive. Several common items are: dirt, tree limbs, boards, ladders, poles, and tarps.

The process of constructing a dike is very similar to the process of constructing a diversion barrier. Response personnel must consider the time required to confine the land spill, the resources available (i.e., response personnel and equipment), and the quantity of the hazardous material. If it is determined that diking is practical option, response personnel should consider whether to construct a dike using hand tools or power equipment. Utility companies should be contacted concerning underground electrical cables or product piping to ensure that the equipment does not tear a hole in any cables or piping.

CIRCLE DIKE

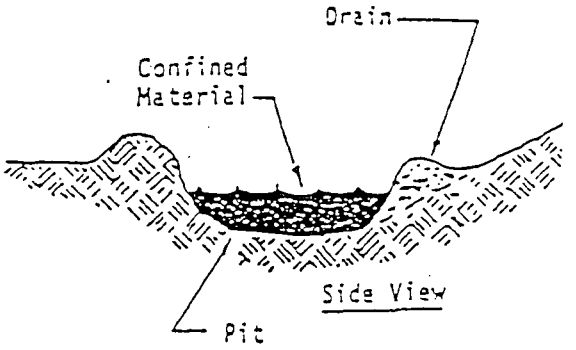


Response personnel should consider volatile liquids and protect against air hazards that may occur when using any confinement method. For example, if volatile liquids are spilled onto the ground, an air hazard may be created. If the spill is small, response personnel need only cover the material with a salvage cover or tarp to contain the material. If the spill is large, response personnel may have to spray the material with foam in order to prevent the formation of hazardous vapors.

4.1.3
Retention

In some cases, it may be more appropriate to retain hazardous materials in an excavated pit, pond, lagoon, or basin. Constructing a retention pit, pond or basin could mean simply placing a five-gallon bucket under a dripping valve or excavating a retaining structure using construction equipment.

RETAINING WITH EXCAVATION

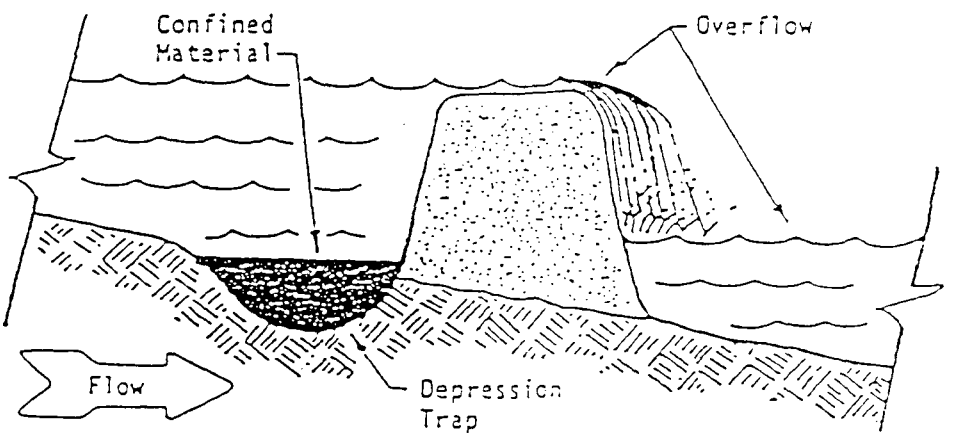


Like diversion barriers and dikes, whether a retaining structure maybe constructed depends primarily upon the time and the resources (i.e., personnel and equipment) available for construction, and the amount of construction needed. In an emergency, portable water tanks and "kiddy" swimming pools are alternatives that provide for a quick solution for blocking materials from entering storm drains, or for holding materials. Generally, any above ground structure offers a quicker solution than a below grade structure that must be built.

5.0 WATER RELEASES

Releases of materials into water may be controlled using several different measures. For example, if the material in the water is insoluble or slightly soluble in water, and its specific gravity is greater than that of water causing the material to sink, a method for confinement might be an overflow dam.

OVERFLOW DAM

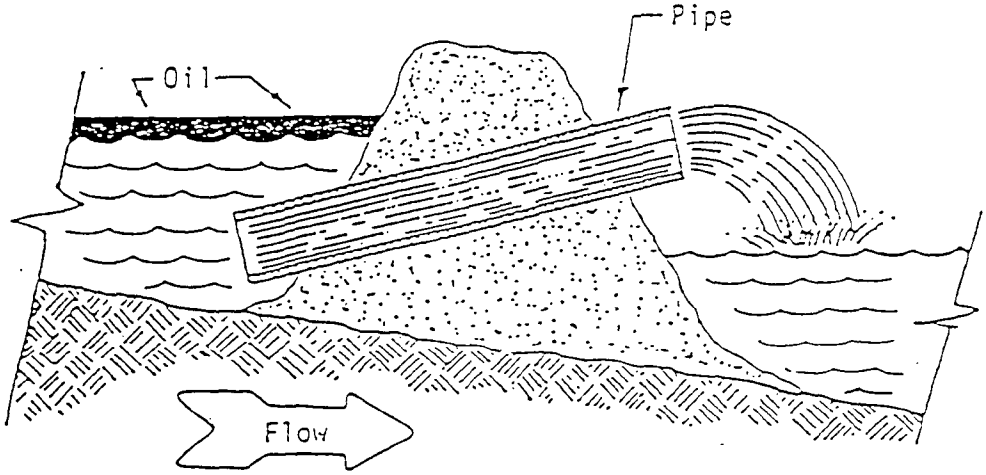


5.1
Dams

An overflow dam is used to trap heavier than water material by causing the material to sink to the bottom of the stream behind the dam. When the material is trapped, relatively uncontaminated water flows over the barrier. An overflow or confinement dam works best on slow moving and relatively narrow waterways. The faster the waterway, the less likely this method will work.

An underflow dam is a dike constructed with a pipe placed lower on the upstream side and higher on the downstream side. This creates a waterway through the piping and traps the contaminants on the upstream side. As with the overflow dam , it is necessary to have additional manpower and supplies downstream, just in case the dam breaks. An underflow dam is generally limited to smaller waterways, and is particularly useful for controlling and confining hazardous material that floats on the surface of the stream of water.

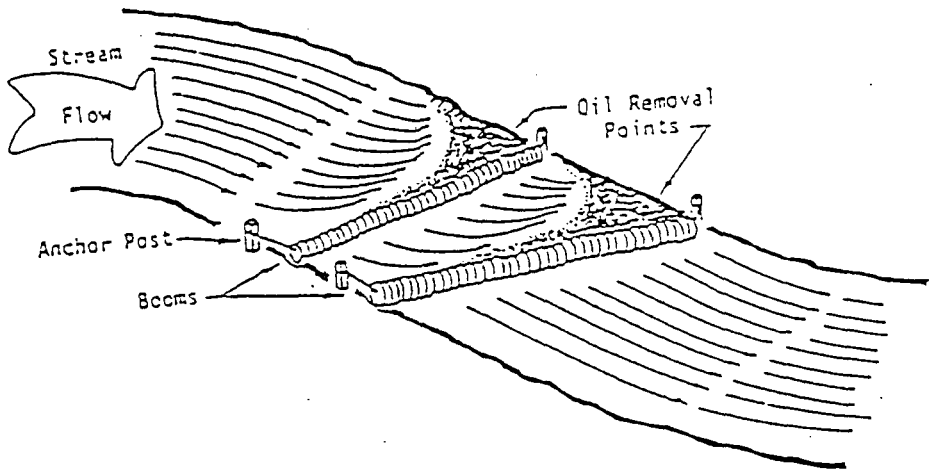
SIPHON DAM



5.2
Booms

A floating boom is a second confinement measure for a spilled material that floats and is insoluble or slightly soluble in water. Once the spill has been contained, it can be headed to a collection point. There it can be skimmed from the surface using several different types of skimmers. Alternatively, the spilled material can be collected for disposal by sorbents, which can be loose or in sheets or pads. In the case of a viscous liquid, straw may be used, There are several different types of booms on the market, including some which absorb the spill instead of confining it. Booms are not usually effective in rough water. Booms are usually the fastest method of containment in small, slow-moving streams.

BOOMS

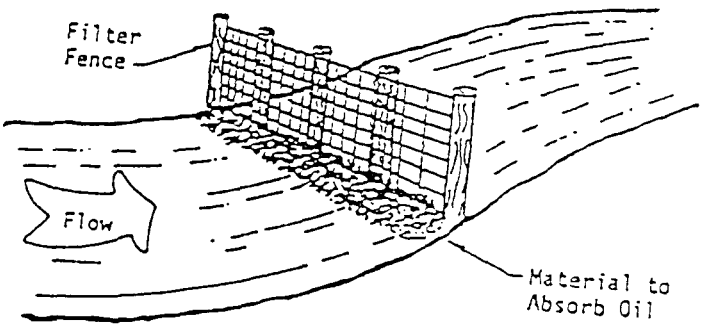


5.3
Filter Fence

A filter fence is a confinement option for water discharges involving oil. Generally, this type of fencing is difficult to set up. Items which may be used to construct a filter fence include chicken wire or any type of wire fencing and straw or hay. However, a great deal of saturated material is generated as a result of using straw or hay which can be costly to dispose. Filter fences are typically used on faster running streams, and are only partially successful in removing oily contaminants.

If the material spilled is soluble, there is very little that the first responder can do. If the waterway is small, the responder may install a dam which will help to recover or filter the water. The other option is to neutralize the chemical, rendering it inert. This will require the resources of the EPA and/or State environmental agency for technical assistance.

FILTER FENCE



KEY POINTS

- Releases may involve gases, liquids, or solids.
- Confinement and containment are the two general control techniques.
- Releases may involve air, land or water.

EXHIBIT 14

MSDS FORMS

ALLIED SIGNAL -- GENETRON 113 TRICHLOROTRIFLUOROETHANE
MATERIAL SAFETY DATA SHEET
NSN: 683000F050805
Manufacturer's CAGE: 1L164
Part No. Indicator: A
Part Number/Trade Name: GENETRON 113 TRICHLOROTRIFLUOROETHANE

General Information

Company's Name: ALLIED SIGNAL INC.
Company's Street: COLUMBIA & PARK AVE.
Company's P. O. Box: 1139
Company's City: MORRISTOWN
Company's State: NJ
Company's Country: US
Company's Zip Code: 07960-1139
Company's Emerg Ph #: 201-455-2000
Company's Info Ph #: 201-455-4157
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SE
Date MSDS Prepared: 01FEB92
Safety Data Review Date: 10SEP96
Preparer's Company: ALLIED SIGNAL INC.
Preparer's St Or P. O. Box: COLUMBIA & PARK AVE.
Preparer's City: MORRISTOWN
Preparer's State: NJ
Preparer's Zip Code: 07960-1139
MSDS Serial Number: CCCZV

Ingredients/Identity Information

Proprietary: NO
Ingredient: FREON 113, 1,1,2,-TRICHLORO-1,2,2,-TRIFLUOROETHANE, TRICHLOROTRIFLUROETHANE *96-3*
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: KJ4000000
CAS Number: 76-13-1
OSHA PEL: 1000 PPM
ACGIH TLV: 1000 PPM
Other Recommended Limit: 1000 PPM

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS LIQUID W/FAINT ETHERAL ODOR
Boiling Point: 117.68F
Melting Point: -31F
Vapor Pressure (MM Hg/70 F): 5.6
Vapor Density (Air=1): 6.5
Specific Gravity: 1.57
Decomposition Temperature: 482F
Evaporation Rate And Ref: (ETHER = 1): 1.3
Solubility In Water: 0.035%
Percent Volatiles By Volume: 100
pH: 7

Fire and Explosion Hazard Data

Extinguishing Media: USE AN EXTINGUISHING AGENT SUITABLE FOR SURROUNDING FIRE.
Special Fire Fighting Proc: WEAR NIOSH APPROVED PRESSURE DEMAND SCBA. USE WATER SPRAY TO KEEP CONTAINERS COOL.
Unusual Fire And Expl Hazrds: MATERIAL IS NONFLAMMABLE, WILL DECOMPOSE AT TEMPS >482F. AUTOIGNITION TEMP: 1256F.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): OPEN FLAMES, HOT SPOTS, WELDING.
Materials To Avoid: ALUMINUM POWDER, BARIUM, LITHIUM, POWDERED TITANIUM, ACITVE METALS, CALCIUM, POWDERED MAGNESIUM/ZINC, BERYLLIUM, ALLOYS.
Hazardous Decomp Products: THERMAL: TEMPS >482F, HYDROCHLORIC & HYDROFLUORIC ACIDS, PHOSGENE.
Hazardous Poly Occur: NO

Health Hazard Data

Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: INHALATION: CAN CAUSE IRRITATION OF THE RESPIRATORY TRACT, CNS DEPRESSANT, CARDIAC EFFECTS & DEATH. ASPHYXIATION HAZARD. INGESTION: RESPIRATORY FAILURE CAN OCCUR. SKIN: IRRITATION/ DERMATITIS, ABSORPTION CAN OCCUR. EYES: IRRITATION & MAY CAUSE CONJUNCTIVITIS.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NONE
Signs/Symptoms Of Overexp: HEADACHE, DIZZINESS, NAUSEA, LOSS OF COORDINATION, INTOXICATION, LOSS OF CONCENTRATION, RAPID SUFFOCATION, IRRITATION, DEFATTING, ERYTHEMA, DISCOMFORT, PAIN.
Emergency/First Aid Proc: INHALATION: REMOVE TO FRESH AIR. GIVE CPR, PREFERABLY MOUTH TO MOUTH/OXYGEN AS NECESSARY. DON'T GIVE ADRENALIN (EPINEPHRINE). EYES: IMMEDIATELY FLUSH W/LARGE AMOUNTS OF WATER FOR 15 MINS. SKIN: WASH PROMPTLY W/SOAP & WATER FOR 15 MINS. INGESTION: DON'T INDUCE VOMITING. DON'T GIVE STIMULANTS. OBTAIN MEDICAL ATTENTION IN ALL CASES.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: EVACUATE PERSONNEL. REMOVE FLAMES & SHUT OFF LEAK W/O RISK. ABSORB W/COMMERCIAL ABSORBENT, SHOVEL INTO METAL DRUMS, CLOSE & STORE. DIKE UP LARGE AREA W/COMMERCIAL ABSORBENT & PUMP INTO DRUMS, MAKING SURE PUMP DOESN'T OVERHEAT.
Waste Disposal Method: DISPOSE OF IAW/FEDERAL, STATE & LOCAL REGULATIONS.
Precautions-Handling/Storing: STORE IN A CLEAN, COOL, DRY & WELL VENTILATED AREA OF LOW FIRE RISK. PROTECT CONTAINERS FROM PHYSICAL DAMAGE & KEEP CLOSED.
Other Precautions: AVOID BREATHING VAPOR, LIQUID CONTACT W/EYES, SKIN/ CLOTHING. EMPTY CONTAINER MAY CONTAIN PRODUCT RESIDUES; OBSERVE LABELED HAZARD PRECAUTIONS. CLOSURES SHOULD BE REMOVED CAREFULLY & WHEN EMPTY AVOID ACCIDENTAL EXPOSURE TO ENTRAPPED VAPORS.

Control Measures

Respiratory Protection: FOR ACCIDENTAL/NON-VENTILATED AREAS, USE A SCBA/ SUPPLIED AIR RESPIRATOR, APPROVED BY NIOSH.
Ventilation: LOCAL EXHAUST WHERE LEAKAGE IS PROBABLE. MECHANICAL (GENERAL) FOR OPERATING & STORAGE AREAS.
Protective Gloves: IMPERVIOUS/POLY VINYL ALCOHOL/NEOPRENE
Eye Protection: CHEMICAL SAFETY GOGGLES/FACE SHIELD
Other Protective Equipment: PROTECTIVE CLOTHING, EYEWASH STATIONS & QUICK DRENCH SHOWER FACILITIES.
Work Hygienic Practices: REMOVE/LAUNDER CONTAMINATED CLOTHING & SHOES BEFORE REUSE/DISCARD. DON'T WEAR CONTACT LENSES.

Transportation Data

Disposal Data

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Label Data

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ALLIED SIGNAL -- GENETRON 123
MATERIAL SAFETY DATA SHEET
NSN: 683000N042689
Manufacturer's CAGE: 05VM8
Part No. Indicator: B
Part Number/Trade Name: GENETRON 123

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General Information

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Company's Name: ALLIED SIGNAL INC
Company's Street: 101 COLUMBIA RD
Company's P. O. Box: 1053
Company's City: MORRISTOWN
Company's State: NJ
Company's Country: US
Company's Zip Code: 07962
Company's Emerg Ph #: 201-455-2000
Company's Info Ph #: 201-455-4157
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 002
Status: SMJ
Date MSDS Prepared: 01SEP94
Safety Data Review Date: 23DEC96
MSDS Serial Number: CCWJN

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Ingredients/Identity Information

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Proprietary: NO
Ingredient: ETHANE, 2,2-DICHLORO-1,1,1-TRIFLUORO-; (DICHLOROTRIFLUOROETHANE) (SARA 313)
Ingredient Sequence Number: 01
Percent: 100
NIOSH (RTECS) Number: KI1108000
CAS Number: 306-83-2
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Proprietary: NO
Ingredient: SUPDAT: WELDING/BURNING ON EQUIPMENT CONTAINING G-123 WITH OR W/OUT OXYGEN MAY RESULT IN EXPLOSION.
Ingredient Sequence Number: 02
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: MATL TO AVOID: POTASSIUM, CALCIUM, L/C POWDERED ALUMINUM, MAGNESIUM OR ZINC.
Ingredient Sequence Number: 03
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: HAZ DECOMP PRODS: THESE ARE TOX & CORR. AFTER G-123 HAS BEEN EXPOS TO LUBRICATED OILS, ALCOHOLS, POLYOLS OR OTHER(ING 5)
Ingredient Sequence Number: 04
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 4: HYDROCARBS AT TEMPS >100F, MONITOR COMPOSITION FOR RXN PRODS, PARTICULARLY G-133A. RXN PRODS MAY BE TOXIC.
Ingredient Sequence Number: 05

NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: EFTS OF OVEREXP: IN RPTD EXPOS TESTS W/ANIMALS, CHGS WERE NOTED IN LIVER FUNCS & LIPID PRODUCTION AT LEVELS >100 (ING 7)
Ingredient Sequence Number: 06
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 6: PPM. AT HIGHER LEVELS, CARD ARRYTHMIA MAY OCCUR. INGEST:ALTHOUGH NOT LIKELY EXPOS ROUTE, DISCOMFORT IN GI (ING 8)
Ingredient Sequence Number: 07
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 7: TRACT WOULD RSLT FROM RAPID EVAP (BOILING) OF MATL & CONSEQUENT EVOLUTION OF GAS. IN ADDN, SOME EFTS OF (ING 9)
Ingredient Sequence Number: 08
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 8: INHAL WOULD BE EXPECTED. NO DELAYED EFTS OF SINGLE EXPOS IDENTIFIED. DELAYED EFTS OF MULTIPLE EXPOS ARE (ING 10)
Ingredient Sequence Number: 09
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 9:SEEN IN ANIMAL STUDIES BY FORM OF LATE DEVELOPING BENIGN TUMORS. AT 300PPM, BENIGN TESTICULAR & PANCREATIC(ING 11)
Ingredient Sequence Number: 10
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 10: TUMORS DEVELOPED IN STATISTICALLY SIGNIFICANT NUMBER OF ANIMALS AT/NEAR END OF STUDY. RETINAL ATROPHY (ING 12)
Ingredient Sequence Number: 11
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 11: WAS INCRD IN TEST ANIMALS. LIVER TUMORS WERE FOUND IN ANIMALS AT CONCS AT & ABOVE 300PPM. NONE OF EFTS (ING 13)
Ingredient Sequence Number: 12
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 12: WERE LIFE THREATENING/SHORTENING. RETARDED RATE OF WT GAIN & LOWER PUP WTS FOUND IN 2 GENERATION RAT (ING 14)
Ingredient Sequence Number: 13
NIOSH (RTECS) Number: 9999999ZZ

OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 13:REPRO STUDY. EFTS SEEN AT INHAL CONC >100PPM FOR ANIMALS EXPOS THRUOUT TEST. SIX GENETIC ASSAY WERE RUN, (ING 15)
Ingredient Sequence Number: 14
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 14: FIVE OF WHICH WERE NEGATIVE. THE SIXTH, CHROMOSOME ABERRATION OF HUMAN LYMPHOCYTES, WAS WEAKLY POSITIVE.
Ingredient Sequence Number: 15
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: FIRST AID: INGEST:DO NOT INDUCE VOMIT UNLESS DIRECTED BY MD. CONSULT MD. ADVICE TO MD:BECAUSE OF POSS DISTURBS (ING 17)
Ingredient Sequence Number: 16
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 16:OF CARD RHYTHM, CATECHOLAMINE DRUGS SUCH AS EPINEPHRINE SHOULD BE USED W/SPEC CAUTION ONLY IN SITUATIONS (ING 18)
Ingredient Sequence Number: 17
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 17: OF EMER LIFE SUPPORT. TREATMENT OF OVEREXP SHOULD BE DIRECTED AT CONTROL OF SYMPS & CLINICAL CNDTNS.
Ingredient Sequence Number: 18
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: SPILL PROC: AREAS. SPILLS & RELS MAY NEED TO BE REPORTED TO FED &/OR LOC AUTHS. SEE REGULATORY INFO ON REPORTING REQS.
Ingredient Sequence Number: 19
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: WASTE DISP: MATL. DISP BY LICENSED WASTE DISP COMPANY MAY BE NEC. INFO GIVEN IS FOR PROD AS SHIPPED. USE &/OR (ING 21)
Ingredient Sequence Number: 20
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 20: ALTERATIONS TO PROD SUCH AS MIX W/OTHER MATLS MAY CHG CHARACTS OF MATL & ALTER RCRA CLASSIFICATION & DISP METH.
Ingredient Sequence Number: 21
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE

ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: HNDLG/STOR PRECS: EXCEEDS BOILING POINT OF 82F THE CONTAINER WILL DEVELOP PRESSURE. COOL BEFORE REMOVING PRODUCT.
Ingredient Sequence Number: 22
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: OTHER PRECS: CNTCT W/EYES, SKIN OR CLTHG. DO NOT PUNCTURE/DROP CYLS OR EXPOSE TO OPEN FLAME/EXCESS HEAT. USE (ING 24)
Ingredient Sequence Number: 23
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 23: AUTHORIZED CONTAINERS ONLY. FOLLOW STANDARD SAFETY PRECS FOR HANDLING & USE OF DRUMS.
Ingredient Sequence Number: 24
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: VENT: OPERATING & STORAGE AREAS. CONC OF G-123 SHOULD BE MONITORED & KEPT BELOW RECOMD LEVELS IN WORK AREAS.
Ingredient Sequence Number: 25
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE
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Physical/Chemical Characteristics

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Appearance And Odor: CLEAR, COLORLESS LIQUID AND VAPOR; FAINT ETHEREAL ODOR.
Boiling Point: 82.2F,27.9C
Melting Point: -161F,-107C
Vapor Pressure (MM Hg/70 F): SUPDAT
Vapor Density (Air=1): 5.3
Specific Gravity: 1.47 (H*2O=1)
Evaporation Rate And Ref: >1 COMPARED TO CCL4
Solubility In Water: 0.21% (WT) @ 70F
Percent Volatiles By Volume: 100
pH: NEUT
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Fire and Explosion Hazard Data

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Flash Point: N/A
Lower Explosive Limit: NONE
Upper Explosive Limit: NONE
Extinguishing Media: USE ANY STANDARD AGENT - CHOOSE THE ONE MOST APPROPRIATE FOR TYPE OF SURROUNDING FIRE (MATL ITSELF IS NOT FLAMMABLE).
Special Fire Fighting Proc: WEAR NIOSH APPROVED PRESSURE DEMAND SCBA AND FULL PROTECTIVE EQUIPMENT (FP N). USE WATER SPRAY TO KEEP FIRE-EXPOSED CONTAINERS COOL & TO SUPPRESS VAPORIZATION.
Unusual Fire And Expl Hazrds: THERMAL DECOMP PRODS MAY INCL FLUORIDES & CHLORIDES (FP N). CNTCT W/CERTAIN REACTIVE METALS MAY RSLT IN EXPLO OR EXOTHERMIC RXNS UNDER SPECIFIC CNDTNS (SUPDAT)
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Reactivity Data

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Stability: YES

Cond To Avoid (Stability): SOURCES OF HIGH TEMP SUCH AS LIGHTED CIGARETTES, FLAMES, WELDING CUTTING TORCHES OR UNIT HEATERS SHOULD BE (SUPDAT)
Materials To Avoid: FRESHLY ABRADED ALUMINUM SURFS (MAY CAUSE STRONG EXOTHERMIC RXN). CHEMICALLY ACTIVE METALS, FOR EX SODIUM, (ING 3)
Hazardous Decomp Products: CHLORIDES & FLUORIDES (FP N). HALOGENS, HALOGEN ACIDS & POSS CARBONYL HALIDES SUCH AS PHOSGENE MAY BE FORMED. (ING 4)
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT

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Health Hazard Data

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LD50-LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: NO
Health Haz Acute And Chronic: CHLOROFLUOROCARBON (CFC) MATLS HAVE PRDCED SENSIT OF MYOCARDIUM TO EPINEPHRINE IN LAB ANIMALS & COULD HAVE SIMILAR EFT IN HUMANS. ADRENOMIMETICS (IE, EPINEPHRINE) MAY BE CONTRA-INDICATED EXCEPT FOR LIFE-SUSTAINING USES IN HUMANS ACUTELY/CHRONICALLY EXPOSED TO CFCS (FP N). SKIN: IRRIT WOULD RSLT FROM (EFTS OF OVEREXP)
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NOT RELEVANT
Signs/Symptoms Of Overexp: HLTH HAZ:DEFAT ACTION ON TISS. EYES:LIQ CNTCT CAN CAUSE IRRIT WHICH MAY BE SEV. MIST MAY IRRITATE. INHAL:GENETRON 123 HAS RELATIVELY LOW ORDER OF ACUTE TOX. WHEN OXYGEN LEVELS IN AIR ARE REDUCED TO 12-14% BY DISPLACEMENT, SYMPS OF ASPHY, LOSS OF COORDINATION, INCRD PULSE RATE & DEEPER RESPIRATION WILL OCCUR. (ING 6)
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: SKIN:PROMPTLY FLUSH W/WATER UNTIL ALL CHEM IS REMOVED. GET MED ATTN IF IRRIT IS PRESENT. EYE:IMMED FLUSH W/LG AMTS OF WATER FOR AT LEAST 15 MIN LIFTING EYELIDS TO FACILITATE IRRIGATION. GET MED ATTN IF SYMPS PERSIST. INHAL:IMMED REMOVE TO FRESH AIR. IF BRTHG HAS STOPPED GIVE ARTF RESP. USE OXYGEN AS REQD PROVIDED QUALIFIED OPERATOR IS AVAIL. CALL MD. DO NOT GIVE EPINEPHRINE (ADRENALINE). (ING 16)
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Transfer interrupted!

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Precautions for Safe Handling and Use

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Steps If Matl Released/Spill: ALWAYS WEAR RECOMD PERSONAL PROT EQUIP. EVACUATE UNPROT PERS. PROTECTED PERS SHOULD REMOVE IGNIT SOURCES & SHUT OFF LEAK IF W/OUT RISK & PROVIDE VENT. UNPROT PERS SHOULD NOT RETURN UNTIL AIR HAS BEEN TESTED & DETERMD SAFE, INCL LOW-LYING (ING 19)
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: NOT HAZ WASTE. DISPOSER MUST COMPLY W/FED, STATE & LOC DISP/DISCHARGE LAWS. DISP OF WASTE G-123 MAY BE SUBJECT TO FED REGS. USERS SHOULD REVIEW THEIR OPERATIONS THEN CONSULT W/APPROP REGULATORY AGENCIES BEFORE DISCHARGING/DISPOSING OF WASTE (ING 20)
Precautions-Handling/Storing: STORE IN COOL, WELL-VENTD AREA OF LOW FIRE RISK. STOR IN SUBSURF LOCATIONS SHOULD BE AVOIDED. KEEP CNTNRS OUT OF DIRECT SUN. IF STORAGE TEMP (ING 21)
Other Precautions: NO SMKNG IN AREA OF USE. DO NOT USE IN GEN VICIN OF ARC WELDING, OPEN FLAMES OR HOT SURFS. HEAT &/OR UV RADIA MAY CAUSE FORM OF CHLORIDES, FLUORIDES OR PHOSGENE (FP N). ALWAYS WEAR RECOMD PERSONAL PROT EQUIP. AVOID BRTHG VAPS & LIQ (ING 23)

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Control Measures

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Respiratory Protection: NONE GENERALLY REQD FOR ADEQ VENTD WORK

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SITUATIONS. FOR ACCIDENTAL/NON-VENTD SITUATIONS WHERE CONCS ARE ABOVE RECOMD PEL (10PPM) USE NIOSH APPRVD SCBA OR SUPPLIED AIR RESP. FOR ESCAPE USE FORMER OR NIOSH APPROVD GAS MASK W/ORG VAP CANISTER.
Ventilation: PROVIDE LOC EXHST AT FILLING ZONES & AREAS WHERE LEAK IS PROBABLE. MECH (GEN) VENT MAY BE ADEQ FOR OTHER (ING 25)
Protective Gloves: IMPERVIOUS GLOVES.
Eye Protection: ANSI APPRVD CHEM WORKERS GOGGLES (FP N).
Other Protective Equipment: ANSI APPRVD EYE WASH & DELUGE SHOWER (FP N). CLTHG W/OUTER LAYER OF MYLAR-COATED DURAFAB (2ND CHOICES:PVA OR NEOPRENE.)
Work Hygienic Practices: REMOVE & WASH CLTHG PROMPTLY. ANY NON-IMPERVIOUS CLTHG SHOULD BE PROMPTLY REMOVED WHEN CONTAMD & WASHED BEFORE REUSE.
Suppl. Safety & Health Data: VP: 11 PSIA @ 20C. EXPLO HAZ: (EG VERY HIGH TEMPS &/OR APPROP PRESS & IN PRESENCE OF OXYGEN). HIGH TEMPS MAY RSLT IN FORM OF TOX/CORR PRODS SUCH AS HALOGEN ACIDS, CARBONYL HALIDES (EG PHOSGENE). SEE REACTIVITY SECTION. CNDTNS TO AVOID:AVOIDED TO PVNT FORM OF TOX &/OR CORR BY-PRODS. BY ANALOGY W/OTHER HCFC'S (ING 2)

Transportation Data

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 23DEC96
Label Date: 19DEC96
Label Status: G
Common Name: GENETRON 123
Chronic Hazard: YES
Signal Word: WARNING!
Acute Health Hazard-Moderate: X
Contact Hazard-Moderate: X
Fire Hazard-None: X
Reactivity Hazard-None: X
Special Hazard Precautions: ACUTE: INHALATION OF VAPORS MAY CONTRIBUTE TO SEVERE IRRITATION. INHALATION: WHEN OXYGEN LEVELS ARE REDUCED TO 12-14% BY DISPLACEMENT, SYMPTOMS OF ASPHYXIATION, LOSS OF COORDINATION, INCREASED PULSE RATE AND DEEPER RESPIRATION OCCUR. IN REPEATED EXPOSURE TESTS WITH ANIMALS AT LEVELS ABOVE 100 PPM, CHANGES WERE NOTED IN LIVER FUNCTIONS AND GI TRACT DISCOMFORT, INHALATION EFFECTS. CHRONIC: LATE DEVELOPING BENIGN TUMORS WERE SEEN IN ANIMAL STUDIES.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: ALLIED SIGNAL INC
Label Street: 101 COLUMBIA RD
Label P.O. Box: 1053
Label City: MORRISTOWN
Label State: NJ
Label Zip Code: 07962
Label Country: US
Label Emergency Number: 201-455-2000

ALLIED CHEMICAL ALLIED -- GENETRON 11 (TRICHLOROFLUOROMETHANE) - TRICHLOROMONOFLUORO
MATERIAL SAFETY DATA SHEET
NSN: 6830000794694
Manufacturer's CAGE: 70308
Part No. Indicator: A
Part Number/Trade Name: GENETRON 11 (TRICHLOROFLUOROMETHANE)

General Information

Item Name: TRICHLOROMONOFLUOROMETHANE, TECHNICAL
Company's Name: ALLIED CHEMICAL,ALLIED CORP
Company's Street: COLUMBIA RD AND PARK AVE
Company's P. O. Box: 1087R
Company's City: MORRISTOWN
Company's State: NJ
Company's Country: US
Company's Zip Code: 07960
Company's Emerg Ph #: 201-455-3073, 201-455-2000
Company's Info Ph #: 201-455-3073
Record No. For Safety Entry: 006
Tot Safety Entries This Stk#: 007
Status: SE
Date MSDS Prepared: 01SEP94
Safety Data Review Date: 24OCT96
Supply Item Manager: CX
MSDS Serial Number: CCBXT
Specification Number: BB-F-1421B
Spec Type, Grade, Class: TYPE 11
Hazard Characteristic Code: T6
Unit Of Issue: DR
Unit Of Issue Container Qty: 100 LBS
Type Of Container: DRUM
Net Unit Weight: 100 LBS

Ingredients/Identity Information

Proprietary: NO
Ingredient: TRICHLOROFLUOROMETHANE (CFC-11) (SARA 313) (CERCLA)
Ingredient Sequence Number: 01
Percent: 100
NIOSH (RTECS) Number: PB6125000
CAS Number: 75-69-4
OSHA PEL: 1000 PPM
ACGIH TLV: C 1000 PPM; 9596
Other Recommended Limit: NONE SPECIFIED

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS LIQUID WITH FAINT ETHEREAL ODOR
Boiling Point: 74.5F,23.6C
Melting Point: -168F,-111C
Vapor Pressure (MM Hg/70 F): NOT GIVEN
Vapor Density (Air=1): 4.8 @ 86F
Specific Gravity: 1.47
Decomposition Temperature: NOT GIVEN
Evaporation Rate And Ref: >1 (N-BUTYL ACETATE=1)
Solubility In Water: 0.11% @ 77F (25C)
Percent Volatiles By Volume: 100
Viscosity: NOT KNOWN
Corrosion Rate (IPY): UNKNOWN

Fire and Explosion Hazard Data

Flash Point: NONE
Lower Explosive Limit: NOT GIVEN

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Upper Explosive Limit: NOT GIVEN
Extinguishing Media: NONFLAMMABLE. USE EXTINGUISHING MEDIA SUITABLE FOR SURROUNDING FIRE.
Special Fire Fighting Proc: FIRE FIGHTERS SHOULD WEAR SELF CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE GEAR. COOL TANKS AND CONTAINERS EXPOSED TO FIRE WITH WATER.
Unusual Fire And Expl Hazrds: THOUGH NOT COMBUSTIBLE ITSELF, CONTACT WITH CERTAIN METALS PRODUCES RAPID EXOTHERMIC REACTIONS OR POTENTIALLY EXPLOSIVE COMBINATIONS.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): SOURCES OF HIGH TEMPERATURES SUCH AS CIGARETTES, FLAMES, WELDING CUTTING TORCHES OR UNIT HEATERS SHOULD BE AVOIDED.
Materials To Avoid: ALUMINUM POWDER/FRESHLY ABRADED SURFACE, GRANULAR BARIUM, LITHIUM SHAVING, CHEMICALLY ACTIVE METALS SUCH AS NA, K, CA.
Hazardous Decomp Products: HALOGNES, HALOGEN ACIDS AND POSSIBLY CARBONYL HALIDES SUCH AS PHOSGENE
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NONE. WILL NOT OCCUR.

Health Hazard Data

LD50-LC50 Mixture: TLV 1000 PPM (C)
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: NO
Health Haz Acute And Chronic: ACUTE- INHALING VAPORS ARE SLIGHTLY IRRITATING TO LUNGS. HIGH CONCENTRATIONS (10%) MAY HAVE NARCOTIC EFFECTS. MODERATELY TOXIC IF INGESTED. EXCESSIVE SKIN CONTACT MAY CAUSE DEFATTING AND POSSIBLE FROSTBITE. VAPORS ARE MILD EYE IRRITANT. LIQUID CONTACT WILL IRRITATE EYES. CHRONIC- SKIN DEFATTING AND POSSIBLY DERMATITIS.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: THIS COMPOUND CONTAINS NO INGREDIENTS AT CONCENTRATIONS OF 0.1% OR GREATER THAT ARE CARCINOGENS OR SUSPECT CARCINOGENS.
Signs/Symptoms Of Overexp: VAPORS ARE SLIGHTLY IRRITATING TO LUNGS. BREATHING CONCENTRATIONS APPROACHING 10% IN AIR CAN CAUSE DIZZINESS, DIFFICULT BREATHING, DROWSINESS. INGESTION WILL UPSET AND IRRITATE GI TRACT. MAY CAUSE SKIN AND EYE IRRITATION AND FROSTBITE. INHALATION OR MISUSE OF PRODUCT CAN RESULT IN SERIOUS PERSONAL INJURY OR DEATH.
Med Cond Aggravated By Exp: PRE-EXISTING SKIN DISORDERS MAY BE MORE SUSCEPTIBLE TO THIS MATERIAL.
Emergency/First Aid Proc: GET MEDICAL ATTENTION IF SYMPTOMS PERSIST. SKIN:WASH WITH SOAP & WATER. THEN FLUSH WITH WATER. EYE:FLUSH WITH WATER FOR 15 MINUTES, HOLDING EYELIDS OPEN. INHALED:REMOVE TO FRESH AIR & PROVIDE OXYGEN/CPR IF NEEDED. ORAL:DO NOT INDUCE VOMITING UNLESS INSTRUCTED TO DO SO BY A PHYSICIAN. DO NOT ADMINSTER EPINEPHRINE (ADRENALIN). THIS DRUG INCREASES THE PROBABILITY OF INCURRING CARDIAC ARRHYTHMIA.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: WEAR PROTECTIVE EQUIPMENTS. PROVIDE VENTILATION. STOP LEAK IF POSSIBLE. DIKE UP WITH INERT MATERIAL AND PUMP INTO DRUMS AND CLOSE. MAKE SURE PUMP DOES NOT OVERHEAT. KEEP OUT OF SEWER.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: CONSULT LOCAL, STATE AND FEDERAL REGULATIONS. DO NOT VENT TO THE ATMOSPHERE.
Precautions-Handling/Storing: STORE IN WELL VENTILATED AREA AWAY FROM HEAT OR DIRECT SUNLIGHT. VENTILATE LOW-LYING AREAS OR SMALL ENCLOSURES TO PREVENT ASPHYXIATION.

Other Precautions: AVOID BREATHING VAPORS AND LIQUID CONTACT WITH EYES, SKIN OR CLOTHING. DO NOT PUNCTURE OR DROP CYLINDERS OR EXPOSE THEM TO OPEN FLAME OR EXCESSIVE HEAT. USE AUTHORIZED CONTAINERS ONLY.

Control Measures

Respiratory Protection: NONE REQUIRED FOR NORMALLY-VENTED WORK SITUATIONS. FOR ACCIDENTAL OR NON-VENTILATED SITUATIONS, WHERE CONCENTRATION OF VAPORS MAY BE HIGH, USE NIOSH-APPROVED SELF-CONTAINED BREATHING APPARATUS OR SUPPLIED-AIR RESPIRATOR.
Ventilation: MECHANICAL (GENERAL AND/OR LOCAL EXHAUST) VENTILATION TO MAINTAIN EXPOSURE BELOW TLV(S).
Protective Gloves: NEOPRENE OR PVA
Eye Protection: SPLASH-PROOF SAFETY GOGGLES OR GLASSES
Other Protective Equipment: CHEMICAL RESISTANT CLOTHING AS NECESSARY TO PREVENT SKIN CONTACT. AN EMERGENCY EYEWASH AND SHOWER SHOULD BE AVAILABLE.
Work Hygienic Practices: WASH HANDS THOROUGHLY WITH SOAP AND WATER BEFORE EATING, DRINKING, SMOKING OR USING TOILET FACILITIES.
Suppl. Safety & Health Data: "EMPTY" CONTAINERS MAY CONTAIN HAZARDOUS RESIDUES. SEE DIRECTIONS ON LABEL. THIS PRODUCT CAN CAUSE DEATH FROM INHALATION IF MISUSED OR IF NOT HANDLED PROPERLY.

Transportation Data

Trans Data Review Date: 96298
DOT PSN Code: ZZZ
DOT Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
IMO PSN Code: ZZZ
IMO Proper Shipping Name: NOT REGULATED FOR THIS MODE OF TRANSPORTATION
IATA PSN Code: ZZZ
IATA Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
AFI PSN Code: ZZZ
AFI Prop. Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 24OCT96
MFR Label Number: NOT KNOWN
Label Status: G
Common Name: GENETRON 11 (TRICHLOROFLUOROMETHANE)
Chronic Hazard: YES
Signal Word: WARNING!
Acute Health Hazard-Moderate: X
Contact Hazard-Slight: X
Fire Hazard-None: X
Reactivity Hazard-None: X
Special Hazard Precautions: ACUTE- INHALATION OF HIGH CONCENTRATIONS (10%) MAY HAVE NARCOTIC EFFECTS. MODERATELY TOXIC IF INGESTED. EXCESSIVE SKIN CONTACT MAY CAUSE DEFATTING & POSSIBLE FROSTBITE. VAPORS ARE MILD EYE IRRITANT. LIQUID CONTACT WILL IRRITATE EYES. CHRONIC- SKIN DEFATTING & POSSIBLY DERMATITIS. STORE IN WELL VENTILATED AREA AWAY FROM HEAT/DIRECT SUNLIGHT & INCOMPATIBLES. IF SPILLED, DIKE & PUMP INTO DRUMS. FIRST AID- GET MEDICAL ATTENTION IF SYMPTOMS PERSIST. SKIN:WASH WITH SOAP & WATER. EYE:FLUSH WITH WATER FOR 15 MINUTES, HOLDING EYELIDS OPEN. INHALED:REMOVE TO FRESH AIR & PROVIDE OXYGEN/CPR IF NEEDED. ORAL:DO NOT INDUCE VOMITING UNLESS INSTRUCTED BY DR.
Protect Eye: Y
Protect Skin: Y
Label Name: ALLIED CORP., ALLIED CHEMICAL,CSS DEPT.
Label Street: COLUMBIA RD & PARK AVE
Label P.O. Box: 1087R

Label City: MORRISTOWN
Label State: NJ
Label Zip Code: 07960
Label Country: US
Label Emergency Number: 201-455-2000

ALLIED CHEMICAL ALLIED -- GENETRON 114 DICHLOROTETRAFLUOROETHANE - DICHLOROTETRAFLUO
MATERIAL SAFETY DATA SHEET
NSN: 6830007853306
Manufacturer's CAGE: 70308
Part No. Indicator: A
Part Number/Trade Name: GENETRON 114 DICHLOROTETRAFLUOROETHANE

General Information

Item Name: DICHLOROTETRAFLUOROETHANE,TECHNICAL
Company's Name: ALLIED CHEMICAL,ALLIED CORP
Company's Street: COLUMBIA RD AND PARK AVE
Company's P. O. Box: 1087R
Company's City: MORRISTOWN
Company's State: NJ
Company's Country: US
Company's Zip Code: 07960
Company's Emerg Ph #: 201-455-3073, 201-455-4157
Company's Info Ph #: 201-455-3073
Record No. For Safety Entry: 003
Tot Safety Entries This Stk#: 004
Status: SE
Date MSDS Prepared: 01MAY88
Safety Data Review Date: 18NOV92
Supply Item Manager: 75
MSDS Serial Number: BPJFH
Specification Number: BB-F-1421
Spec Type, Grade, Class: TYPE 114
Hazard Characteristic Code: N1
Unit Of Issue: LB
Unit Of Issue Container Qty: 2200.0 LBS
Type Of Container: TANK
Net Unit Weight: 2200.0 LBS

Ingredients/Identity Information

Proprietary: NO
Ingredient: GENETRON 114, DICHLOROTETRAFLUOROETHANE (SARA III)
Ingredient Sequence Number: 01
Percent: 100
NIOSH (RTECS) Number: KI1101000
CAS Number: 76-14-2
OSHA PEL: 1000 PPM
ACGIH TLV: 1000 PPM; 9192
Other Recommended Limit: NONE SPECIFIED

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS LIQUID WHICH RAPIDLY EVAPORATES. ODORLESS.
Boiling Point: 38.4F,3.6C
Melting Point: -119F,-84C
Vapor Pressure (MM Hg/70 F): 12.9 PSIG
Vapor Density (Air=1): 5.9
Specific Gravity: 1.465
Decomposition Temperature: UNKNOWN
Evaporation Rate And Ref: <1.0 (ETHER=1)
Solubility In Water: NEGLIGIBLE
Percent Volatiles By Volume: 100
Corrosion Rate (IPY): UNKNOWN

Fire and Explosion Hazard Data

Flash Point: NON-FLAMMABLE
Extinguishing Media: MATERIAL IS NON-FLAMMABLE. CHOOSE ANY STANDARD AGENT APPROPRIATE FOR THE TYPE OF SURROUNDING FIRE.

Special Fire Fighting Proc: WEAR NIOSH APPROVED SCBA FOR PROTECTION AGAINST SUFFOCATION AND TOXIC DECOMPOSITION PRODUCTS. USE WATER SPRAY TO KEEP FIRE-EXPOSED CONTAINERS COOL.
Unusual Fire And Expl Hazrds: CONTAINERS MAY RUPTURE VIOLENTLY IN FIRE DUE TO OVERPRESSURE,RELEASING LARGE QUANTITIES OF GASES. CONTACT WITH OTHER CHEMICALS MAY RESULT IN EXPLOSIVE MIXTURES.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): HIGH TEMPERATURE,CIGARETTES,FLAMES,HOT SPOTS,WELDING.THESE CONDITIONS CAUSE DECOMPOSITION TO FORM TOXIC,CORROSIVE GASES.
Materials To Avoid: SODIUM,POTASSIUM,CALCIUM. POWDERED ALUMINUM,ZINC, MAGNESIUM. ABRADED ALUMINUM SURFACES CAUSE STRONG EXOTHERMIC REACTION.
Hazardous Decomp Products: HALOGENS,HALOGEN ACIDS AND POSSIBLY CARBONYL HALIDES, SUCH AS PHOSGENE. THESE ARE TOXIC AND CORROSIVE.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): WILL NOT OCCUR.

Health Hazard Data

LD50-LC50 Mixture: IHL (RAT) LC50 IS 72 PPH/30 MINUTES
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: NO
LIQUID MAY CAUSE FROSTBITE. INHALATION: VAPORS ARE RELATIVELY NONTOXIC BUT MAY ACT AS A NARCOTIC AND CNS DEPRESSANT AT HIGH CONCENTRATIONS (WHEN OXYGEN LEVELS IN AIR ARE REDUCED TO 12-14%). EPINEPHRINE MAY SENSITIZE THE MYOCARDIUM TO THIS SUBSTANCE. INGESTION: NOT PERTINENT.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Signs/Symptoms Of Overexp: EYES: FROSTBITE. SKIN: FROSTBITE, PALLOR OR REDNESS, LOSS OF SENSATION AND SWELLING. INHALATION: LOSS OF COORDINATION, NOT PERTINENT, SINCE MATERIAL IS GASEOUS AT NORMAL TEMPERATURE AND PRESSURE.
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: EYES/SKIN: BATH FROSTBITE WITH LUKEWARM WATER. IN ABSENCE OF WATER, COVER WITH SOFT WOOL OR OTHER SUITABLE MATERIAL.. GET MEDICAL ATTENTION. INHALATION: MOVE TO FRESH AIR. IF BREATHING STOPPED GIVE CPR. IF BREATHING DIFFICULT GIVE OXYGEN. GET MEDICAL ATTENTION. DO NOT GIVE EPINEPHRINE (ADRENALINE). INGESTION: UNLIKELY DUE TO LOW BOILING POINT AND GASEOUS STATE AT NORMAL TEMPERATURE AND PRESSURE.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: USE SELF-CONTAINED AIR SUPPLY AND PROTECTION AGAINST FROSTBITE WHEN ATTEMPTING TO CLOSE VALVES OR REPAIR SOURCE OF LEAK. IF A LARGE QUANTITY IS RELEASED, EVACUATE PERSONNEL AND ALLOW PRODUCT TO DISSIPATE.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: ANY RELEASE TO THE ENVIRONMENT OF THIS MATERIAL MAY BE SUBJECT TO FEDERAL AND/OR STATE REPORTING REQUIREMENTS. CHECK WITH YOUR LOCAL ENVIRONMENTAL OFFICER.
Precautions-Handling/Storing: STORE IN A COOL, DRY, WELL VENTILATED AREA AWAY FROM HEAT AND FLAME. PROTECT CYLINDER AND ITS FITTINGS FROM PHYSICAL DAMAGE.AVOID SUBSURFACE LOCATION.
Other Precautions: AVOID LIQUID CONTACT WITH EYES, SKIN, OR CLOTHING. DO NOT PUNCTURE OR DROP CYLINDERS OR EXPOSE THEM TO OPEN FLAME OR EXCESSIVE HEAT.

Control Measures

Respiratory Protection: NONE NORMALLY REQUIRED FOR ADEQUATELY VENTED

SITUATIONS. FOR SITUATIONS, WHERE CONCENTRATIONS EXCEED TWA/TV, WEAR A SELF-CONTAINED BREATHING APPARATUS OR SUPPLIED-AIR RESPIRATOR APPROVED BY NIOSH.ADD A FULL FACEPIECE AT HIGH CONCENTRATIONS.
Ventilation: ADEQUATE VENTILATION TO MEET TWA/TLV REQUIREMENTS. LOCAL EXHAUST AT FILLING ZONES.GENERAL IS ADEQUATE FOR STORAGE AREAS.
Protective Gloves: PVA, NEOPRENE WHERE CONTACT IS PROBABLE.
Eye Protection: SAFETY GLASSES. GOGGLES FOR LEAKS.
Other Protective Equipment: INPERVIOUS SHOES AND CLOTHING WHERE LEAKAGE AND LIQUID CONTACT IS PROBABLE. THERMAL INSULATION TO PREVENT FROSTBITE.
Work Hygienic Practices: NONE SPECIFIED BY MANUFACTURER.
Suppl. Safety & Health Data: CONTACT LENSES SHOULD NOT BE WORN WHERE THERE IS PROBABILITY OF LIQUID CONTACT. PROVIDE WATER SOURCE FOR FIRST-AID TREATMENT IN CASE OF FROSTBITE. THE HAZARD CLASSIFICATION CODE N1 WAS ASSIGNED BASED ON THE VAPOR PRESSURE OF 27.6 PSIA AT 21.1C.WHICH IS UNDER THE SPECIFIED PRESSURE OF 40 PSIA FOR G3 CLASSIFICATION.

Transportation Data

Trans Data Review Date: 92356
DOT PSN Code: EVY
DOT Proper Shipping Name: 1,2- DICHLORO-1,1,2,2-TETRAFLUOROETHANE OR REFRIGERANT GAS R 114 *
DOT Class: 2.2
DOT ID Number: UN1958
DOT Label: NONFLAMMABLE GAS
IMO PSN Code: FML
IMO Proper Shipping Name: 1,2- DICHLORO-1,1,2,2-TETRAFLUOROETHANE *
IMO Regulations Page Number: 2131
IMO UN Number: 1958
IMO UN Class: 2(2.2)
IMO Subsidiary Risk Label: -
IATA PSN Code: JBJ
IATA UN ID Number: 1958
IATA Proper Shipping Name: 1,2- DICHLORO-1,1,2,2-TETRAFLUOROETHANE *
IATA UN Class: 2.2
IATA Label: NON-FLAMMABLE GAS
AFI PSN Code: JBJ
AFI Prop. Shipping Name: DICHLOROTETRAFLUOROETHANE
AFI Class: 2.2
AFI ID Number: UN1958
AFI Basic Pac Ref: 6-6,6-8

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 18NOV92
Label Status: F
Common Name: GENETRON 114,DICHLOROTETRAFLUOROETHANE
Chronic Hazard: NO
Signal Word: WARNING!
Acute Health Hazard-Moderate: X
Contact Hazard-Moderate: X
Fire Hazard-None: X
Reactivity Hazard-None: X
Special Hazard Precautions: EYES: LIQUID MAY CAUSE FROSTBITE. SKIN: LIQUID MAY CAUSE FROSTBITE. INHALATION: VAPORS ARE RELATIVELY NONTOXIC BUT MAY ACT AS A NARCOTIC AND CNS DEPRESSANT AT HIGH CONCENTRATIONS (WHEN OXYGEN LEVELS BATHE FROSTBITE WITH LUKEWARM WATER. IN ABSENCE OF WATER, COVER WITH SOFT WOOL OR OTHER SUITABLE MATERIAL.. GET MEDICAL ATTENTION. INHALATION: MOVE TO FRESH AIR. IF BREATHING STOPPED GIVE CPR. IF BREATHING DIFFICULT GIVE OXYGEN. GET MEDICAL ATTENTION. DO NOT GIVE EPINEPHRINE (ADRENALINE). INGESTION: UNLIKELY SINCE PRODUCT IS IN GASEOUS STATE AT NORMAL TEMPERATURE

AND PRESSURE.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: ALLIED CHEMICAL, ALLIED CORP.
Label Street: COLUMBIA RD AND PARK AVE
Label P.O. Box: 1087R
Label City: MORRISTOWN
Label State: NJ
Label Zip Code: 07960
Label Country: US
Label Emergency Number: 201-455-3073

ALLIED -- GENETRON 142B
MATERIAL SAFETY DATA SHEET
NSN: 683000N042688
Manufacturer's CAGE: 70308
Part No. Indicator: A
Part Number/Trade Name: GENETRON 142B

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General Information

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Company's Name: ALLIED CORP
Company's P. O. Box: 1139R
Company's City: MORRISTOWN
Company's State: NJ
Company's Country: US
Company's Zip Code: 07960
Company's Emerg Ph #: 201-455-4157; 201-455-2000
Company's Info Ph #: 201-455-4157
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 01MAY91
Safety Data Review Date: 11SEP95
MSDS Serial Number: BRNDM
Hazard Characteristic Code: J7

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Ingredients/Identity Information

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Proprietary: NO
Ingredient: ETHANE, 1-CHLORO-1,1-DIFLUORO-; (1-CHLORO-1,1-DIFLUOROETHANE)
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: KH7650000
CAS Number: 75-68-3
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)
Other Recommended Limit: 10000 PPM (MFR)

Proprietary: NO
Ingredient: SUPDAT:SHOULD NOT BE MIXED W/AIR AT PRESS EXCEEDING 14.7 PSIA.
Ingredient Sequence Number: 02
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: MATLS TO AVOID:RXN. CHEM ACTIVE METALS:SODIUM, POTASSIUM, CALCIUM, PWDR ALUMINUM, MAGNESIUM & ZINC. SOME (ING 4)
Ingredient Sequence Number: 03
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 3:DESICCANTS MAY REACT W/PRODUCT.
Ingredient Sequence Number: 04
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: CNDTN (POLYM):TEMP & PRESS, MAY BE DANGEROUS IF SUBJECTED TO HIGH TEMP &/OR IGNIT SOURCES.
Ingredient Sequence Number: 05
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: FIRST AID PROC:LIQ CNTCT. IF NO FROSTBT, IMMED FLUSH CNTCT AREAS W/LG AMTS WATER. IN CASE OF EYE CNTCT, LIFT (ING 7)
Ingredient Sequence Number: 06
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 6:EYELIDS OCCAS DURING WASHING TO ASSIST IRRIGATION. INGEST:CALL MD IMMED (FP N).
Ingredient Sequence Number: 07
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: HNDLG/STOR PREC:SHLD USE ONLY FORMAL TANK ENTRY PROC BASED ON RECOGNIZED SFTY PRINCIPLES. STORE IN COOL, WELL- (ING 9)
Ingredient Sequence Number: 08
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 8:VENT AREA OF LOW FIRE RISK. PROTECT CNTNR & ITS FITTINGS FROM PHYSICAL DMG. STOR IN SUBSURF LOCATIONS (ING 10)
Ingredient Sequence Number: 09
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 9:SHLD BE AVOIDED. CLOSE VALVE TIGHTLY & REPLACE CNTNR GUARD AFTER USE & WHEN EMPTY.
Ingredient Sequence Number: 10
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: OTHER PREC:HANDLED PROPERLY. TANKS CANNOT BE EFTIVELY FLUSHED OF VAP IF SUMPS CONTAIN LIQ PROD.OBSERVE ALL LABELED PREC.
Ingredient Sequence Number: 11
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: PROT GLOVES:MYLAR-COATED DURAFAB (2ND CHOICES:PVA/NEOPRENE) IF CNTCT W/LIQ IS ANTICIPATED.
Ingredient Sequence Number: 12
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: EYE PROT:SHOULD NOT BE WORN UNDER SUCH CONDITIONS.
Ingredient Sequence Number: 13
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO

Ingredient: OTHER PROT EQUIP:PROMPTLY ANY WET NON-IMPERVIOUS CLTHG & WASH BEFORE REUSE. HIGH DOSE-LEVEL WARNING SIGNS ARE (ING 15)
Ingredient Sequence Number: 14
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 14:RECOMMENDED FOR AREAS OF PRINCIPAL EXPOS. PROVIDE EYEWASH STATIONS & QUICK DRENCH SHOWER FACILITIES AT (ING 16)
Ingredient Sequence Number: 15
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 15:CONVENIENT LOCATIONS. FOR TANK CLEANING OPERATIONS, SEE OSHA REGULATIONS.
Ingredient Sequence Number: 16
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: VENT:STOR AREAS. DO NOT VENT TO ATMOSPHERE. TO COMPLY W/US CLEAN AIR ACT, ANY RESIDUAL MUST BE COVERED.
Ingredient Sequence Number: 17
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: EFTS OF OVEREXP:BY DESTROYING OZONE IN UPPER ATM. DESTRUCTION OF OZONE LAYER CAN LEAD TO INCR ULTRAVIOLET RADIA (ING 19)
Ingredient Sequence Number: 18
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 18:WHICH, W/EXCESS EXPOS TO SUNLIGHT, CAN LEAD TO INCR IN SKIN CANCER & EYE CATARACTS.
Ingredient Sequence Number: 19
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Physical/Chemical Characteristics

Appearance And Odor: CLEAR COLORLESS GAS WITH FAINT ETHEREAL ODOR.
Boiling Point: 204F, -131C
Melting Point: 14.4F,-9.8C
Vapor Pressure (MM Hg/70 F): 43.5 PSIA
Vapor Density (Air=1): 3.5
Specific Gravity: 1.1(H2O=1)@86F
Solubility In Water: SUPDAT
Percent Volatiles By Volume: 100

Fire and Explosion Hazard Data

Flash Point: N/A
Lower Explosive Limit: 8.0%
Upper Explosive Limit: 15.2%
Extinguishing Media: USE ANY STANDARD AGENT--CHOOSE THE ONE MOST APPROPRIATE FOR TYPE OF SURROUNDING FIRE.

Special Fire Fighting Proc: WEAR NIOSH/MSHA APPRVD PRESS DMD SCBA FULL PROT EQUIP (FP N). PROPER EYE & SKIN PROT SHLD BE PROVIDED. USE H2O SPRAY TO KEEP FIRE-EXPOS CNTNRS COOL & (SUPDAT)
Unusual Fire And Expl Hazrds: THERMAL DECOMP PRODS MAY INCL FLUORIDES, CHLORIDES & PHOSGENE (FP N). CNTCT W/CERTAIN FINELY DIVIDED REACTIVE METALS MAY CAUSE EXOTHERMIC RXNS &/OR (SUPDAT)

Reactivity Data

Stability: YES
Cond To Avoid (Stability): ANY SOURCE OF IGNIT, SUCH AS LIGHTED CIGARETTES, FLAMES, HOT SPOTS, WELDING. EXPLO MAY RSLT IN FLAMM RANGE. (SUPDAT)
Materials To Avoid: (UNDER SPECIFIC CNDTN:EG VERY HIGH TEMP &/OR PRESS.) FRESHLY ABRADED ALUMINUM SURF MAY CAUSE STRONG EXOTHERMIC (ING 3)
Hazardous Decomp Products: CHLORIDES, FLUORIDES & PHOSGENE (FP N). HALOGENS, HALOGEN ACIDS & POSSIBLY CARBONYL HALIDES. THESE ARE TOX & CORR.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): BY ANALOGY W/OTHER HYDROCHLOROFLUOROCARBONS, CONC W/IN FLAM RANGE LMT OF PROD IN AIR, UNDER CERTAIN CNDTN OF (ING 5)

Health Hazard Data

LD50-LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: NO
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: CHLOROFLUOROCARBON (CFC) MATLS HAVE PRDCE SENSIT OF MYOCARDIUM TO EPINEPHRINE IN LAB ANIMALS & COULD HAVE SIMILAR EFT IN HUMANS. ADRENOMIMETICS (IE, EPINEPHRINE) MAY BE CONTRA-INDICATED EXCEPT FOR LIFE-SUSTAINING USES IN HUMANS ACUTELY OR CHRONICALLY EXPOS TO CFCS (FP N). ACUTE:INHAL:MIST/VAPOR IN LOW (EFTS OF OVEREX)
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NOT RELEVANT
Signs/Symptoms Of Overexp: HLTH HAZ:CONC MAY CAUSE IRRIT. AT HIGH LEVELS, ASPHYX, NARCOS, (SLEEPINESS, DROW)/CARD ARRHY MAY RSLT FROM VAP INHAL. INGEST:NOT PROBABLE SINCE MATL IS GAS @ NORM TEMP & PRESS. SKIN: CNTCT W/LIQ MAY CAUSE SEV FROSTBT. EYES:CNTCT W/LIQ OR MIST MAY CAUSE IRRIT. CONTAINS SUBSTANCE WHICH HARMS PUBLIC HLTH & ENVIR (ING 18)
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: INHAL:REMOVE PATIENT IMMED TO FRESH AIR. IF BRTHG STOPPED, GIVE ARTF RESP, PREFERABLY MOUTH-TO-MOUTH. USE O2 AS REQD, PROVIDED QUALIFIED OPERATOR IS AVAIL. DO NOT GIVE EPINEPHRINE (ADRENALINE). CNTCT MD. SKIN/EYES:IMMED BATHE (DO NOT RUB) ANY FROSTBT W/LUKEWARM (NOT HOT) H2O. IN ABSENCE OF H2O COVER W/CLEAN, SOFT WOOL/OTHER SUITABLE MATL. CNTCT MD FOR ANY LOW TEMP BURNS FROM (ING 6)

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: ALWAYS WEAR PERSONAL PROT EQUIP. EVACUATE ALL UNPROTECTED PERS. PERS USING SCBA & OTHER PROT EQUIP SHLD TRY TO ELIM ANY POSSIBLE IGNIT SOURCE & CLOSE VALVES OR REPAIR SOURCE OF LEAK.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: DISPOSAL OF PRODUCT MAY BE SUBJECT TO STATE & LOCAL REGS. USERS SHOULD REVIEW THEIR OPERATIONS IN TERMS OF APPLIC FEDERAL, STATE & LOCAL LAWS & REGS, THEN CONSULT W/APPROP REGULATORY AGENCIES BEFORE DISCHARING OR DISPOSING OF WASTE MATERIAL.
Precautions-Handling/Storing: AVOID BRTHG VAP/LIQ CNTCT W/EYES, SKIN/CLTHG. DO NOT PUNCTURE/DROP CNTNRS, EXPOSE TO OPEN FLAME/EXCESSIVE HEAT/DRILLING. TANK CLEANING PERS (ING 8)
Other Precautions: NO SMKNG IN AREA OF USE. DO NOT USE IN GEN VICIN OF ARC WELDING, OPEN FLAMES/HOT SURF. HEAT &/OR UV RADIA MAY CAUSE FORM OF CHLORIDES, FLUORIDES/PHOSGENE (FP N). THIS PROD CAN CAUSE DEATH BY INHAL/

OTHER PERSONAL INJURY IF NOT (ING 11)

Control Measures

Respiratory Protection: NONE GENERALLY REQUIRED FOR ADEQUATELY VENTED WORK SITUATIONS. FOR ACCIDENTAL/NON-VENT SITUATIONS, USE NIOSH/MSHA APPROVED SCBA.
Ventilation: LOC EXHAUST @ FILLING ZONES & AREAS WHERE LEAKAGE PROBABLE. MECH (GEN) VENT MAY BE ADEQ FOR OTHER OPERATING & (ING 17)
Protective Gloves: IMPERVIOUS GLOVES W/OUTER LAYER (ING 12)
Eye Protection: CHEM SAFETY GOGG. CNTCT LENSES (ING 13)
Other Protective Equipment: PROT CLTHG W/OUTER LAYER OF MYLAR-COATED DURAFAB (2ND CHOICES:PVA/NEOPRENE) IF CNTCT W/LIQ ANTIC. REMOVE (ING 14)
Work Hygienic Practices: WASH THOROUGHLY AFTER HANDLING.
Suppl. Safety & Health Data: SOL IN H2O:BELIEVED SLIGHT; APPROX 0.15 WT % @ 25C(77F). FIRE FIGHT PROC:TO KNOCK DOWN VAP WHICH MAY RSLT FROM PROD DECOMP. EXPLO HAZ:EXPLO COMBINATIONS. DECOMP PROD MAY BE HAZ. CNDTNS (STAB) :NON-EXPLO CNDTNS MAY YIELD TOX &/OR CORR DECOMP PROD. BASED ON ANALOGY W/ OTHER HYDROGEN CONTAINING HALOCARBONS, PROD (ING 2)

Transportation Data

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 24AUG93
Label Date: 11AUG93
Label Status: G
Common Name: GENETRON 142B
Chronic Hazard: NO
Signal Word: DANGER!
Acute Health Hazard-Slight: X
Contact Hazard-Severe: X
Fire Hazard-None: X
Reactivity Hazard-None: X
Special Hazard Precautions: EXPLOSIONS MAY RESULT IF IN FLAMMABLE RANGE. PRODUCT SHOULD NOT BE MIXED WITH AIR AT PRESSURES > 14.7 PSIA. AVOID INGITION SOURCES. HIGH TEMPERATURES MAY FORM HAZARDOUS DECOMPOSITION PRODUCTS. ACUTE: INHALATION OF VAPORS MAY CONTRIBUTE TO OCCURRENCE OF IRREGULAR HEARTBEAT (FP N). MAY CAUSE IRRITATION, ASPHYXIATION, SLEEPINESS. CONTACT WITH LIQUID MAY CAUSE SEVERE FROSTBITE. MIST MAY CAUSE IRRITATION. CHRONIC: NONE SPECIFIED BY MANUFACTURER.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: ALLIED CORP
Label P.O. Box: 1139R
Label City: MORRISTOWN
Label State: NJ
Label Zip Code: 07960
Label Country: US
Label Emergency Number: 201-455-4157; 201-455-2000

ALLIED-SIGNAL ENGINEERED MATERIALS SECTOR -- GENETRON 12 DICHLORODIFLUOROMETHANE - D
MATERIAL SAFETY DATA SHEET
NSN: 6830001061656
Manufacturer's CAGE: 1L164
Part No. Indicator: A
Part Number/Trade Name: GENETRON 12 DICHLORODIFLUOROMETHANE

General Information

Item Name: DICHLORODIFLUOROMETHANE,TECHNICAL
Company's Name: ALLIED-SIGNAL INC, ENGINEERED MATERIALS SECTOR
Company's Street: 101 COLUMBIA ROAD
Company's P. O. Box: 1053
Company's City: MORRISTOWN
Company's State: NJ
Company's Country: US
Company's Zip Code: 07962
Company's Emerg Ph #: 201-455-2000
Company's Info Ph #: 201-455-4157
Record No. For Safety Entry: 004
Tot Safety Entries This Stk#: 017
Status: SE
Date MSDS Prepared: 01SEP94
Safety Data Review Date: 08NOV96
Supply Item Manager: CX
MSDS Preparer's Name: UNKNOWN
Preparer's Company: (MSDS#:GTRN-0018)
MSDS Serial Number: BCYVV
Specification Number: BB-F-1421
Spec Type, Grade, Class: 12 TYPE
Hazard Characteristic Code: G3
Unit Of Issue: CY
Unit Of Issue Container Qty: 50 LBS
Type Of Container: CYLINDER
Net Unit Weight: 50 LBS

Ingredients/Identity Information

Proprietary: NO
Ingredient: DICHLORODIFLUOROMETHANE (SARA 313) (CERCLA)
Ingredient Sequence Number: 01
Percent: 100
NIOSH (RTECS) Number: PA8200000
CAS Number: 75-71-8
OSHA PEL: 1000 PPM
ACGIH TLV: 1000 PPM; 9596
Other Recommended Limit: NONE RECOMMENDED

Physical/Chemical Characteristics

Appearance And Odor: CLEAR COLORLESS LIQUID/VAPOR, GAS @NORMAL TEMP, FAINT ETHEREAL ODOR.
Boiling Point: -22F,-30C
Melting Point: -252F,-158C
Vapor Pressure (MM Hg/70 F): 84.9 @70F
Vapor Density (Air=1): 4.2
Specific Gravity: 1.34 @30C
Decomposition Temperature: NP
Evaporation Rate And Ref: >1 COMPARED TO CCL4.
Solubility In Water: UNKNOWN.
Percent Volatiles By Volume: 100
Viscosity: NP
pH: NEUTRA
Corrosion Rate (IPY): NP

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Fire and Explosion Hazard Data

Flash Point: NO FLASH POINT
Flash Point Method: TOC
Lower Explosive Limit: NA
Upper Explosive Limit: NA
Extinguishing Media: USE ANY STD AGENT-CHOOSE ONE MOST APPROPRIATE FOR TYPE OF SURROUNDING FIRE(MATL ITSELF NOT FLAMMABLE).
Special Fire Fighting Proc: WEAR NIOSH-APPROVE SCBA FOR PROT AGAINST POSSIBLE TOX DECOMPO PROD.PROPER EYE/SKIN PROT SHOULD BE PROVIDED. WATERSPRAY TO KEEP FIRE-EXPO CNTNR COOL/SUPPRESS VAP.
Unusual Fire And Expl Hazrds: CONTACT W/CERTAIN REACTIVE METALS MAY RESULT IN FORMATION OF EXPLO/EXO RX UNDER SPECIFIC CONDITIONS(EF VERY HI TEMP &/OR APPROPRIATE PRESSURE).

Reactivity Data

Stability: YES
Cond To Avoid (Stability): SOURCES OF IGN.MAY YIELD TOXIC &/OR CORR DECOMPO PROD.AVOID MIX W/AIR/OXY ABOVE ATM PRESSURE.
Materials To Avoid: FRESHLY ABRADED AL SURFACES,CHEMICAL ACTIVE METALS:NA, K,CA,POWDERED AL,MG,ZN.
Hazardous Decomp Products: HALOGENS,HALOGEN ACIDS & POSSIBLY CARBONYL HALIDES. THESE ARE TOXIC & CORROSIVE.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT APPLICABLE

Health Hazard Data

LD50-LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: SKIN:IRRIT RESULT FORM DEFATTING ACTION ON TISSUE.LIQUID CONTACT W/SKIN COULD CAUSE FROSTBITE. EYE:LIQUID CONTACT FROSTBITE,MAY BE SEVERE.MIST MAY IRRIT. INHAL:LOW IN TOXICITY IN ANIMALS, WHEN OXY LEVELS REDUCED TO 12-14% BY DISPLACEMENT SYMPTOMS:ASPHYXIATION, LOSS OF COORDINATION,INCR PULSE RATE,DEEPER RESP.@HIGHER(SUP)
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: PER MSDS:NO INGREDS LISTED IN SECTION.
Signs/Symptoms Of Overexp: SKIN IRRIT, DEFATTING ACTION. FROSTBITE. SEVERE EYE FROSTBITE, IRRIT EYE. ASPHXIATION, LOSS OF COORDINATION, INCREASE PULSE RATE, DEEPER RESPIRATION, ARRHYTHMIA, DISCOMFORT GASTROINTESTINAL TRACT, NECROSIS.
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: SKIN:IMED FLUSH W/WATER TIL CHEM REMOVE. FROSTBITE,BATHE(DON'T RUB)W/LUKEWARM WATER.NO WATER COVER W/CLEAN SOFT WOOL/SIMILAR.CALL DR.EYE:IMMED FLUSH W/LG AMTS OF WATER @LEAST 15MINS. FROSTBITE USE LUKEWARM WATER,LIFT EYELIDS.SYMPTOMS PERSIST GET MED ATTN. INHAL:IMMED REMOVE TO FRESH AIR.STOP BREATH GIVE ART RESP.USE OXY FROM QUAL OPERATOR.CALL DR.DON'T GIVE EPINEPHRINE(ADRENALINE).INGEST:(SUPPLEMEN)

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: ALWAYS WEAR RECOMMENDED PPE.EVACUATE UNPROT PEOPLE.REMOVE IGN SOURCE/SHUT OFF LEAK W/O RISK.PROVIDE VENTI.UNPROT PEOPLE SHOULDN'T RETURN TIL AIR TESTED/DETERMIN SAFE INCLUDE LOW-LYING AREAS.MAY HAVE TO BE REPORTED TO FED/LOC AUTHOR.RQ:5000LBS.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: RCRA HAZ WASTE-U075.COMPLY W/FED/STATE/LOC DISPO/ DISCHARGE LAWS.USERS REVIEW OPERATIONS CONSULT W/APPROPRIATE REG AGENCY BEF DISCHARGE/DISPO OF WASTE MATL.DISPO BY LIC WASTE DISPO COMPANY.INFO OFFERED AS SHIPPED.USE/ETC SIGN CHANGE CHARACT ALTER CLAS

Precautions-Handling/Storing: ALWAYS WEAR RECOMMENDED PPE.AVOID BREATH VAP/LIQ CONTACT W/EYE/SKIN/CLOTH.DON'T PUNCTURE/DROP CYL/EXPO TO OPN FLAME/ EXCESS HEAT.USE AUTHOR CNTNR ONLY.
Other Precautions: FOLLOW STD SAFETY PRECAUT FOR HNDLG/USE CYL OF COMPRESSED GAS.STORE IN COOL WELL-VENTI AREA OF LOW FIRE RISK.PROTECT CNTNR/FITTINGS FROM PHY DMG.STORAGE IN SUBSURFACE LOCATIONS SHOULD BE AVOIDED.CLS VAL TIHTLY/REPLACE BUNG AFT USE/EMPTY.

Control Measures

Respiratory Protection: NONE GEN REQUIRED FOR ADEQUATELY VENTI WORK SITUATIONS.ACCIDENTAL/NON-VENTI SITUATIONS ABOVE RECOMMENDED PEL(1000PPM) USE NIOSH APPROVED SELF-CONTAINED BREATHING APPARATUS OR SUPPLIED AIR RESPIRATOR.
Ventilation: PROVIDE LOC EXHAU @FILLING ZONES/AREAS WHERE LEAKAGE PROBABLE.MECH(GEN)VENTI MAY BE ADQUA FOR OTEHR OPERATION/STORAGE.
Protective Gloves: MYLAR COAT DURAFAB,PVA,NEOPRENE GLOVES.
Eye Protection: SAFT GLASSES, CHEM SAFETY GOGGLES.
Other Protective Equipment: PROT IMPERV CLOTH W/OUTER MYLAR COATED DURAFAB LAYER,PVC OR NEOPRENE.IMPERV BOOTS,HI DOSE-LEVEL WARN SIGN,EYEWASH,SHOWER
Work Hygienic Practices: REMOVE/WASH IMMED WET/CONTAMIN CLOTH BEF REUSE. FOR TK CLEANING OPERATIONS SEE OSHA REGS.
Suppl. Safety & Health Data: HEALTH HAZ:LEVELS CARDIAC ARRHYTHMIA MAY OCCUR.INGEST:UNLIKELY EXPO ROUTE BECAUSE OF LOW BOILING PT,DISCOMFORT IN GI TRACT RESULT FROM RAPID EVAPORATION OF LIQ.NECROSIS FROM FREEZING OF TISSUE COULD OCCUR. 1STAID:DON'T INDUCE VOMIT UNLESS INSTRUCTED BY DR.DR:CAUTION USE OF CATECHOLAMINE DRUGS-DISTURB CARDIAC RHYTHM.

Transportation Data

Trans Data Review Date: 96313
DOT PSN Code: ETJ
DOT Proper Shipping Name: DICHLORODIFLUOROMETHANE OR REFRIGERANT GAS R 12
DOT Class: 2.2
DOT ID Number: UN1028
DOT Label: NONFLAMMABLE GAS
IMO PSN Code: FKB
IMO Proper Shipping Name: DICHLORODIFLUOROMETHANE
IMO Regulations Page Number: 2129
IMO UN Number: 1028
IMO UN Class: 2(2.2)
IMO Subsidiary Risk Label: -
IATA PSN Code: IWJ
IATA UN ID Number: 1028
IATA Proper Shipping Name: DICHLORODIFLUOROMETHANE
IATA UN Class: 2.2
IATA Label: NON-FLAMMABLE GAS
AFI PSN Code: IWJ
AFI Prop. Shipping Name: DICHLORODIFLUOROMETHANE
AFI Class: 2.2
AFI ID Number: UN1028
AFI Basic Pac Ref: A6.3,A6.5
Additional Trans Data: PER MSDS:DOT:DICHLORODIFLUOROMETHANE (R12), 2,2, NON-FLAMM GAS, UN 1028.

Disposal Data

Disposal Data Review Date: 88074
Rec # For This Disp Entry: 01
Tot Disp Entries Per NSN: 004
Landfill Ban Item: YES
Disposal Supplemental Data: MSDS REVISED DATE:AUGUST 1985. IN CASE OF ACCIDENTAL EXPOSURE OR DISCHARGE, CONSULT HEALTH AND SAFETY FILE FOR PRECAUTIONS.
1st EPA Haz Wst Code New: U075

1st EPA Haz Wst Name New: DICHLORODIFLUOROMETHANE
1st EPA Haz Wst Char New: TOXIC (T)
1st EPA Acute Hazard New: NO

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Label Data

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Label Required: YES
Technical Review Date: 08NOV96
MFR Label Number: NONE
Label Status: F
Common Name: GENETRON 12 DICHLORODIFLUOROMETHANE
Chronic Hazard: YES
Signal Word: WARNING!
Acute Health Hazard-Moderate: X
Contact Hazard-Slight: X
Fire Hazard-None: X
Reactivity Hazard-None: X
Special Hazard Precautions: SKIN:IRRIT FROM DEFAT ON TISSUE.EYE/SKIN:LIQ CONTACT CAUSE FROSTBITE,MAY BE SEVER.EEYE:MIST IRRIT.INHAL:OXY LEVELS REDUCE TO 12-14% BY DISPLACEMENT SYMPT:ASPHYXIATION,LOSS OF COORDIN,INCR PULSE RATE,DEEPER RESP.@HIGHER LEVELS CARDIAC ARRHY.INGEST:GI TRACT BATHE(DON'T RUB)W/LUKEWARM H2O/COVER W/BLANKET.CALL DR.EYE:IMMED FLUSH W/ LOTS OF H2O @LEAST 15MINS.FROSTBITE USE LUKEWARM H2O,LIFT EYELIDS.SYMPTOMS PERSIST GET MED ATTN.INHAL:IMMED REMOVE TO FRESH AIR.STOP BREATH GIVE ART RESP.USE OXY FROM QUAL OPERATOR.CALL DR.DON'T GIVE EPINEPHRINE(ADRENALINE). INGEST:DON'T INDUCE VOMIT.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: ALLIED-SIGNAL INC, ENGINEERED MATERIALS SECTOR
Label Street: 101 COLUMBIA ROAD
Label P.O. Box: 1053
Label City: MORRISTOWN
Label State: NJ
Label Zip Code: 07962
Label Country: US
Label Emergency Number: 201-455-2000

ALLIEDSIGNAL FLUROCARBONS -- GENETRON 134A
MATERIAL SAFETY DATA SHEET
NSN: 685000F052336
Manufacturer's CAGE: 72658
Part No. Indicator: A
Part Number/Trade Name: GENETRON 134A

General Information

Company's Name: ALLIEDSIGNAL INC/FLUROCARBONS
Company's Street: 101 COLUMBIA RD
Company's P. O. Box: 1053
Company's City: MORRISTOWN
Company's State: NJ
Company's Country: US
Company's Zip Code: 07962-5000
Company's Emerg Ph #: 201-455-4157
Company's Info Ph #: 201-455-4157
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SE
Date MSDS Prepared: 01AUG95
Safety Data Review Date: 19DEC96
Preparer's Company: ALLIEDSIGNAL INC/FLUROCARBONS
Preparer's St Or P. O. Box: 101 COLUMBIA RD
Preparer's City: MORRISTOWN
Preparer's State: NJ
Preparer's Zip Code: 07962-5000
MSDS Serial Number: CDBKL

Ingredients/Identity Information

Proprietary: NO
Ingredient: 1,1,1,2-TETRAFLUOROETHANE (R134A)
Ingredient Sequence Number: 01
Percent: 100
NIOSH (RTECS) Number: 1010932TF
CAS Number: 811-97-2

Physical/Chemical Characteristics

Appearance And Odor: CLEAR COLORLESS LIQUID GAS & VAPOR W/FAINT ETHEREAL ODOR
Boiling Point: -15.1F
Melting Point: -149.8F
Vapor Pressure (MM Hg/70 F): 85.8
Vapor Density (Air=1): 3.5
Specific Gravity: <1.22
Evaporation Rate And Ref: (SEE SUPP)
Solubility In Water: 0.15%
Percent Volatiles By Volume: 100
pH: 7

Fire and Explosion Hazard Data

Flash Point Method: TCC
Extinguishing Media: USE ANY STANDARD AGENT APPROPRIATE FOR TYPE OF SURROUNDING FIRE.
Special Fire Fighting Proc: WEAR NIOSH APPROVED SCBA & PROTECTIVE EQUIPMENT. USE WATER SPRAY TO KEEP FIRE EXPOSED CONTAINERS COOL.
Unusual Fire And Expl Hazrds: FLAMMABLE WHEN MIXED W/AIR UNDER PRESSURE/ STRONG IGNITION SOURCES. REACTIVE METALS MAY FORM OF EXPLOSIVE/EXOTHERMIC REACTIONS. AUTOIGNITION TEMP: 1382F.

Reactivity Data

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Stability: YES
Cond To Avoid (Stability): HIGH TEMPS, FLAMES, HOT SPOTS, DIRECT SUNLIGHT.
Materials To Avoid: ALUMINUM SURFACES, ACTIVE METALS, POTASSIUM, CALCIUM, POWDERED ALUMINUM, MAGNESIUM & ZINC.
Hazardous Decomp Products: HALOGENS, HALOGEN ACIDS & CARBONYL HALIDES.
Hazardous Poly Occur: NO

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Health Hazard Data

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Route Of Entry - Inhalation: YES
Route Of Entry - Skin: NO
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: SKIN: IRRITATION. EYES: SEVERE IRRITATION. INHALATION: ASPHYXIATION. INGESTION: NECROSIS FROM FREEZING OF TISSUE COULD OCCUR.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NONE
Signs/Symptoms Of Overexp: IRRITATION, DEFATTING, LOSS OF COORDINATION, INCREASED PULSE RATE, DEEPER RESPIRATION, CARDIAC ARRHYTHMIA, DISCOMFORT, RAPID EVAPORATION.
Emergency/First Aid Proc: SKIN: FLUSH W/WATER. IF FROSTBITE OCCURS, BATHE(DON'T RUB)W/LUKEWARM WATER. IF NO WATER, COVER W/A CLEAN SOFT CLOTH/ COVERING. EYES: FLUSH W/LARGE AMOUNTS OF WATER FOR 15 MINS. IF FROSTBITE OCCURS, USE LUKEWARM WATER. INHALATION: REMOVE TO FRESH AIR. GIVE CPR/ OXYGEN, PROVIDED BY A QUALIFIED PERSON. DON'T GIVE EPINEPHRINE(ADRENALINE). INGESTION: DON'T INDUCE VOMITING UNLESS INSTRUCTED TO DO SO.(SUPP

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Precautions for Safe Handling and Use

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Steps If Matl Released/Spill: WEAR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT & EVACUATE. REMOVE IGNITION SOURCES & SHUT OFF LEAK W/O RISK & PROVIDE VENTILATION. UNPROTECTED PERSONNEL SHOULDN'T RETURN UNTIL AIR HAS BEEN TESTED & DETERMINED SAFE IN LOW LYING AREAS.
Waste Disposal Method: DISPOSED BY A LICENSED WASTE DISPOSAL IAW/FEDERAL, STATE & LOCAL REGULATIONS. UN3159.
Precautions-Handling/Storing: STORE IN A COOL, WELL VENTILATED AREA & OUT OF DIRECT SUNLIGHT. PROTECT CYLINDER FROM PHYSICAL DAMAGE. CLOSE VALVE TIGHTLY AFTER USE & WHEN EMPTY.
Other Precautions: AVOID BREATHING VAPORS & LIQUIDS CONTACT W/EYES, SKIN/ CLOTHING. DON'T PUNCTURE/DROP CYLINDERS, EXPOSE THEM TO OPEN FLAMES/ EXCESSIVE HEAT. USE AUTHORIZED CYLINDERS ONLY. FOLLOW STANDARD SAFETY PRECAUTIONS FOR HANDLING CYLINDER LIQUIFIED GAS.

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Control Measures

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Respiratory Protection: IN CONFINED SPACE WHERE CONCENTRATION MAY BE ABOVE PEL, USE A NIOSH APPROVED SCBA/SUPPLIED AIR RESPIRATOR. FOR ESCAPE: USE THE FORMER/A NIOSH APPROVED GAS MASK W/ORGANIC VAPOR CANISTER.
Ventilation: LOCAL EXHAUST AT AREAS WHERE LEAKAGE IS PROBABLE. MECHANICAL(GENERAL): FOR OPERATING & STORAGE AREAS.
Protective Gloves: IMPERVIOUS/POLY VINYL ALCOHOL/NEOPRENE
Eye Protection: CHEMICAL SAFETY GOGGLES
Other Protective Equipment: IMPERVIOUS BOOTS & CLOTHING, EYEWASH STATIONS & QUICK DRENCH SHOWER FACILITIES.
Work Hygienic Practices: REMOVE/LAUNDER CONTAMINATED CLOTHING BEFORE REUSE.
Suppl. Safety & Health Data: PHYSICAL DATA CONT'D: EVAPORATION RATE- (CARBON TETRACHLORIDE = 1): >1. FIRST AID CONT'D: OBTAIN MEDICAL ATTENTION IN ALL CASES. NOTE TO PHYSICIAN: POSSIBLE DISTURBANCES OF CARDIAC RHYTHM, CATECHOLAMINE DRUGS(EPINEHRINE) MUST BE USED W/SPECIAL CAUTION. TREATMENT MUST BE CONTROLLED OF SYMPTOMS & CLINICAL CONDITIONS.

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Transportation Data

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Disposal Data

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Label Data

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ALLIED CHEMICAL ALLIED -- GENETRON 22, CHLORODIFLUOROMETHANE - MONOCHLORODIFLUOROMET
MATERIAL SAFETY DATA SHEET
NSN: 6830007823930
Manufacturer's CAGE: 70308
Part No. Indicator: A
Part Number/Trade Name: GENETRON 22, CHLORODIFLUOROMETHANE

General Information

Item Name: MONOCHLORODIFLUOROMETHANE, TECHNICAL
Company's Name: ALLIED CHEMICAL,ALLIED CORP
Company's Street: COLUMBIA RD AND PARK AVE
Company's P. O. Box: 1087R
Company's City: MORRISTOWN
Company's State: NJ
Company's Country: US
Company's Zip Code: 07960
Company's Emerg Ph #: 201-455-3073, 201-455-2000
Company's Info Ph #: 201-455-3073
Distributor/Vendor # 1: REFRIGERANT RECLAIM SERVICES INC, DBA FU
Distributor/Vendor # 1 Cage: 0YD89
Record No. For Safety Entry: 007
Tot Safety Entries This Stk#: 007
Status: SE
Date MSDS Prepared: 01NOV94
Safety Data Review Date: 11SEP96
Supply Item Manager: CX
MSDS Serial Number: BKCFS
Specification Number: BB-F-1421
Spec Type, Grade, Class: TYPE 22
Hazard Characteristic Code: G3
Unit Of Issue: CY
Unit Of Issue Container Qty: UNKNOWN
Type Of Container: UNKNOWN
Net Unit Weight: 44 LBS GAS
NRC/State License Number: NONE
Net Propellant Weight-Ammo: NONE

Ingredients/Identity Information

Proprietary: NO
Ingredient: CHLORODIFLUOROMETHANE
Ingredient Sequence Number: 01
Percent: 100
NIOSH (RTECS) Number: PA6390000
CAS Number: 75-45-6
OSHA PEL: 1000 PPM
ACGIH TLV: 1000PPM; 9192
Other Recommended Limit: NONE SPECIFIED

Physical/Chemical Characteristics

Appearance And Odor: CLEAR COLORLESS LIQUID & VAPOR (GAS AT NORMAL TEMPERATURE) FAINT ETHEREAL ODOR
Boiling Point: -41F,-41C
Melting Point: -256F,-160C
Vapor Pressure (MM Hg/70 F): 136 PSIA
Vapor Density (Air=1): 3.0
Specific Gravity: 1.21
Decomposition Temperature: UNKNOWN
Evaporation Rate And Ref: >1 (CARBON TET = 1)
Solubility In Water: 0.3%
Percent Volatiles By Volume: 100
Viscosity: UNKNOWN
pH: NEUT.

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Corrosion Rate (IPY): UNKNOWN

Fire and Explosion Hazard Data

Flash Point: N.A.
Lower Explosive Limit: NONE
Upper Explosive Limit: NONE
Extinguishing Media: ANY STANDARD AGENT, AS APPROPRIATE FOR SURROUNDING FIRE. THE MATERIAL ITSELF IS NOT FLAMMABLE.
Special Fire Fighting Proc: FIREFIGHTERS SHOULD WEAR SELF-CONTAINED BREATHING APPARATUS & PROTECTIVE CLOTHING. USE WATER SPRAY TO KEEP FIRE-EXPOSED CONTAINERS COOL & SUPPRESS VAPORS.
Unusual Fire And Expl Hazrds: CONTACT WITH CERTAIN REACTIVE METALS MAY PRODUCE EXPLOSIVE & EXOTHERMIC REACTIONS UNDER SPECIFIC CONDITIONS.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): ANY SOURCE OF IGNITION, FLAMES, LIGHTED CIGARETTES, HOT SPOTS, WELDING. DO NOT MIX W/OXYGEN AT >ATMOSPHERIC PRESSURES.
Materials To Avoid: STRONG OXIDANTS, ALKALI METALS, ALKALI EARTH METALS, AND FESHLY EXPOSED ALUMINUM SURFACES.
Hazardous Decomp Products: HALOGENS, HALOGEN ACIDS, CARBON DIOXIDE, CARBON MONOXIDE, AND POSSIBLY HALIDES SUCH AS PHOSGENE.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): WILL NOT OCCUR.

Health Hazard Data

LD50-LC50 Mixture: LC50-4 HOUR (RAT) = >300,000 PPM
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: NO
Health Haz Acute And Chronic: SKIN:IRRITATION FROM DEFATTING, LIQUID CONTACT CAUSES FROSTBITE. EYES:IRRITATION, LIQUID;FROSTBITE. INHALATION:LOW TOXICITY. REDUCES OXYGEN LEVELS CAUSING SYMPTOMS OF ASPHYXIATION. INGESTION:UNLIKELY DUE TO LOW BOILING POINT. CHRONIC-NONE KNOWN.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NO INGREDIENTS LISTED ON ONE OF THE OSHA DESIGNATED CARCINOGEN LISTS.
IRRITATION, FROSTBITE. INHALATION:ASPHYXIATION, LOSS OF COORDINATION, UNLIKELY EXPOSURE.
Med Cond Aggravated By Exp: MFR GAVE NO INFORMATION OF MSDS.
Emergency/First Aid Proc: IF IRRITATION PERSISTS OR IS SEVERE, GET MEDICAL ATTENTION. EYE:FLUSH W/WATER FOR 15 MIN. SKIN:FLUSH AFFECTED AREA W/WATER. TREAT FOR FROSTBITE BY GENTLY WARMING AFFECTED AREA. INHALED: REMOVE FROM EXPOSURE. KEEP VICTIM CALM. AID OR RESTORE BREATHING AS NEEDED. INGESTED:NOT CONSIDERED A POTENTIAL ROUTE OF EXPOSURE.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: WEAR PROPER PROTECTIVE EQUIPMENT. EVACUATE & VENTILATE AREA. ELIMINATE IGNITION SOURCES & STOP LEAK IF W/O RISK. REPORT SPILL/LEAK IF APPROPRIATE.
Neutralizing Agent: MFR GAVE NO INFORMATION OF MSDS.
Waste Disposal Method: NOT A RCRA HAZARDOUS WASTE. DISPOSAL MUST BE I/A/W FEDERAL, STATE & LOCAL REGULATIONS. DISPOSAL BY A LICENSED WASTE DISPOSAL COMPANY MAY BE NECESSARY.
Precautions-Handling/Storing: STORE IN A COOL, WELL- VENTILATED AREA OF LOW FIRE RISK. PROTECT FROM PHYSICAL DAMAGE. KEEP TIGHTLY CLOSED. AVOID BELOW GRADE STORAGE.
Other Precautions: AVOID BREATHING VAPOR, LIQUID CONTACT W/EYES, SKIN OR

CLOTHING. DO NOT DROP OR PUNCTURE CYLINDER OR EXPOSE TO EXCESS HEAT. USE AUTHORIZED CONTAINERS ONLY. FOLLOW STANDARD SAFETY PROCEDURES WHEN HANDLING COMPRESSED GAS CYLINDERS.

Control Measures

Respiratory Protection: NONE REQUIRED FOR ADEQUATELY VENTED WORK SITUATIONS. FOR ACCIDENTAL OR NON-VENTILATED SITUATIONS ABOVE PEL, USE A SELF-CONTAINED BREATHING APPARATUS OR SUPPLIED-AIR RESPIRATOR, APPROVED BY NIOSH.
Ventilation: PROVIDE LOCAL EXHAUST AT FILLING STATIONS. USE MECHANICAL (GENERAL) VENTILATION MAY BE ADEQUATE ELSEWHERE.
Protective Gloves: PROTECTIVE IMPERVIOUS GLOVES
Eye Protection: SAFETY GLASSES OR CHEMICAL SPLASH GOGGLE
Other Protective Equipment: USE IMPERVIOUS CLOTHING TO PROTECT EXPOSED SKIN FROM LIQUID CONTACT. EYE WASH STATION & QUICK DRENCH SHOWER IN AREA.
Work Hygienic Practices: MFR GAVE NO INFORMATION OF MSDS.
Suppl. Safety & Health Data: NONE

Transportation Data

Trans Data Review Date: 96255
DOT PSN Code: DHC
DOT Proper Shipping Name: CHLORODIFLUOROMETHANE OR REFRIGERANT GAS R 22.
DOT Class: 2.2
DOT ID Number: UN1018
DOT Label: NONFLAMMABLE GAS
IMO PSN Code: EDB
IMO Proper Shipping Name: CHLORODIFLUOROMETHANE
IMO Regulations Page Number: 2118
IMO UN Number: 1018
IMO UN Class: 2(2.2)
IMO Subsidiary Risk Label: -
IATA PSN Code: GHQ
IATA UN ID Number: 1018
IATA Proper Shipping Name: CHLORODIFLUOROMETHANE
IATA UN Class: 2.2
IATA Label: NON-FLAMMABLE GAS
AFI PSN Code: GHQ
AFI Prop. Shipping Name: CHLORODIFLUOROMETHANE
AFI Class: 2.2
AFI ID Number: UN1018
AFI Basic Pac Ref: A6.3,A6.5
MMAC Code: NK
N.O.S. Shipping Name: NONE
Additional Trans Data: WEIGHT OF GAS IS 44 LBS.

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 26JUN96
MFR Label Number: NONE
Label Status: F
Common Name: GENETRON 22, CHLORODIFLUOROMETHANE
Chronic Hazard: NO
Signal Word: CAUTION!
Acute Health Hazard-Slight: X
Contact Hazard-Slight: X
Fire Hazard-None: X
Reactivity Hazard-None: X
IRRITATION, LIQUID;FROSTBITE. INHALATION:LOW TOXICITY. REDUCES OXYGEN LEVELS CAUSING SYMPTOMS OF ASPHYXIATION. INGESTION:UNLIKELY DUE TO LOW

BOILING POINT. CHRONIC-NONE KNOWN. STORE IN A COOL, WELL- VENTILATED AREA OF LOW FIRE RISK. PROTECT FROM PHYSICAL DAMAGE. KEEP TIGHTLY CLOSED. AVOID BELOW GRADE STORAGE.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: ALLIED CHEMICAL,ALLIED CORP
Label Street: COLUMBIA RD AND PARK AVE
Label P.O. Box: 1087R
Label City: MORRISTOWN
Label State: NJ
Label Zip Code: 07960
Label Country: US
Label Emergency Number: 201-455-3073, 201-455-2000
Year Procured: 1996

ALLIED CHEMICAL ALLIED -- GENETRON 502 AZEOTROPE - MONOCHLORODIFLUOROMETHANE AND MOM
MATERIAL SAFETY DATA SHEET
NSN: 6830001382482
Manufacturer's CAGE: 70308
Part No. Indicator: A
Part Number/Trade Name: GENETRON 502 AZEOTROPE

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General Information

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Item Name: MONOCHLORODIFLUOROMETHANE AND MOMOCHLOROPENTAFLUOROETHANE,AZ
Company's Name: ALLIED CHEMICAL,ALLIED CORP
Company's Street: COLUMBIA RD AND PARK AVE
Company's P. O. Box: 1087R
Company's City: MORRISTOWN
Company's State: NJ
Company's Country: US
Company's Zip Code: 07960
Company's Emerg Ph #: 201-455-3073
Company's Info Ph #: 201-455-3073
Distributor/Vendor # 1: ALLIED CORP., ALLIED CHEMICAL,CSS DEPT.
Distributor/Vendor # 1 Cage: 1L164
Record No. For Safety Entry: 003
Tot Safety Entries This Stk#: 005
Status: SE
Date MSDS Prepared: 01FEB93
Safety Data Review Date: 10MAY93
Supply Item Manager: CX
MSDS Serial Number: BQQCZ
Specification Number: BB-F-1421
Spec Type, Grade, Class: UNKNOWN
Hazard Characteristic Code: G3
Unit Of Issue: CY
Unit Of Issue Container Qty: 1
Type Of Container: CYLINDER
Net Unit Weight: 125 POUNDS

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Ingredients/Identity Information

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Proprietary: NO
Ingredient: CHLORODIFLUOROMETHANE
Ingredient Sequence Number: 01
Percent: 48.8
NIOSH (RTECS) Number: PA6390000
CAS Number: 75-45-6
OSHA PEL: 1000 PPM
ACGIH TLV: 1000PPM; 9293
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: CHLOROPENTAFLUOROETHANE (SARA III)
Ingredient Sequence Number: 02
Percent: 51.2
NIOSH (RTECS) Number: KH7877500
CAS Number: 76-15-3
OSHA PEL: 1000 PPM
ACGIH TLV: 1000 PPM; 9293
Other Recommended Limit: NONE RECOMMENDED

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Physical/Chemical Characteristics

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Appearance And Odor: COLORLESS LIQUIFIED GAS WITH FAINT ETHEREAL ODOR.
Boiling Point: -49F,-45C
Melting Point: UNKNOWN
Vapor Pressure (MM Hg/70 F): 7176 MM HG
Vapor Density (Air=1): 3.9(AIR=1)

Specific Gravity: 1.258 (WATER=1)
Decomposition Temperature: UNKNOWN
Evaporation Rate And Ref: UNKNOWN
Solubility In Water: NEGLIGIBLE
Percent Volatiles By Volume: 100
Corrosion Rate (IPY): UNKNOWN

Fire and Explosion Hazard Data

Extinguishing Media: MEDIA APPROPRIATE FOR SURROUNDING FIRE.
Special Fire Fighting Proc: WEAR SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING.
Unusual Fire And Expl Hazrds: LIQUIFIED GASES IN CONTACT WITH WATER CAN CAUSE VIOLENT EXPLOSIONS. FIRE EXPOSURE MAY CAUSE FORMATION OF TOXIC VAPORS OR GASES.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): HIGH TEMPERATURES. CONTACT WITH INCOMPATIBLE MATERIALS.
Materials To Avoid: HOT REACTIVE METALS.
Hazardous Decomp Products: HALOGENS, HALIDE ACIDS, PHOSGENE, CARBONYL HALIDES AT HIGH TEMPERATURES
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NONE

Health Hazard Data

LD50-LC50 Mixture: ORAL LD50 (RAT) IS UNKNOWN
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: NO
Route Of Entry - Ingestion: NO
Health Haz Acute And Chronic: ACUTE: INHALATION MAY CAUSE RESPIRATORY IRRITATION AND NARCOSIS AT HIGH CONCENTRATIONS. CONTACT WITH SKIN OR EYES MAY CAUSE FROSTBITE. CHRONIC: NONE KNOWN.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NO INGREDIENT OF A CONCENTRATION OF 0.1% IS LISTED AS A CARCINOGEN BY NTP, IARC OR PSHA.
Signs/Symptoms Of Overexp: INHALATION (HIGH CONCENTRATIONS): LOSS OF COORDINATION, INCREASED PULS RATE, DEEP RESPIRATIONS. EYES/SKIN: REDNESS, SWELLING, LOSS OF SENSATION.
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: SKIN/EYES: FLUSH WITH WARM WATER FOR AT LEAST 15 MINUTES. COVER AND GET IMMEDIATE MEDICAL ATTENTION. INHALED: MOVE TO FRESH AIR. GIVE ARTIFICIAL RESPIRATION IF BREATHING STOPPED. GIVE OXYGEN IF BREATHING DIFFICULT. SEE DOCTOR. DO NOT GIVE EPINEPHRINE.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: WEAR PROPER PROTECTIVE EQUIPMENT AND CLOTHING. STOP LEAK IF POSSIBLE. IF NOT EVACUATE AREA, ISOLATE AND DENY ENTRY; ALLOW TO DISSIPATE.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: DISPOSE OF IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.
Precautions-Handling/Storing: STORE IN A COOL, DRY, WELL-VENTED PLACE AWAY FROM SOURCES OF OPEN FLAME OR HIGH TEMPERATURES.
Other Precautions: PROTECT FROM PHYSICAL DAMAGE. HALOCARBONS IN CLOSED/ CONFINED AREAS REQUIRE WELL-VENTILATED DRAFT, AS THEY DEPLETE OXYGEN NECESSARY FOR BREATHING.

Control Measures

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Respiratory Protection: NONE NORMALLY REQUIRED. FOR UNUSUAL SITUATIONS; WEAR SELF-CONTAINED BREATHING APPARATUS. USE IN ACCORDANCE WITH 29 CFR 1910.134.
Ventilation: LOCAL EXHAUST AT FILLING ZONES. MECHANICAL AT STORAGE AREAS.
Protective Gloves: PVA OR NEOPRENE
Eye Protection: SAFETY GLASSES
Other Protective Equipment: WATER SOURCE FOR TREATMENT OF FROSTBITE.
Work Hygienic Practices: WASH HANDS AFTER USE AND BEFORE EATING, DRINKING, OR SMOKING.
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Transportation Data

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Trans Data Review Date: 93130
DOT PSN Code: MPU
DOT Proper Shipping Name: REFRIGERANT GASES, N.O.S.
DOT Class: 2.2
DOT ID Number: UN1078
DOT Label: NONFLAMMABLE GAS
IMO PSN Code: NAP
IMO Proper Shipping Name: REFRIGERANT GAS, N.O.S. o
IMO Regulations Page Number: 2176
IMO UN Number: 1078
IMO UN Class: 2(2.2)
IMO Subsidiary Risk Label: -
IATA PSN Code: VQM
IATA UN ID Number: 1078
IATA Proper Shipping Name: REFRIGERANT GAS, N.O.S. *
IATA UN Class: 2.2
IATA Label: NON-FLAMMABLE GAS
AFI PSN Code: VQM
AFI Prop. Shipping Name: REFRIGERANT GASES, N.O.S.
AFI Class: 2.2
AFI ID Number: UN1078
AFI Basic Pac Ref: 6-6,6-8
N.O.S. Shipping Name: CHLORODIFLUOROMETHANE AND CHLOROPENTAFLUOROETHANE MIXTURE
6830-00-137-7970.
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Disposal Data

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Label Data

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Label Required: YES
Technical Review Date: 10MAY93
Label Status: F
Common Name: GENETRON 502 AZEOTROPE
Chronic Hazard: NO
Signal Word: CAUTION!
Acute Health Hazard-Slight: X
Contact Hazard-Slight: X
Fire Hazard-None: X
Reactivity Hazard-None: X
Special Hazard Precautions: COMPRESSED GAS. ACUTE: INHALATION MAY CAUSE RESPIRATORY IRRITATION AND NARCOSIS AT HIGH CONCENTRATIONS. CONTACT WITH SKIN OR EYES MAY CAUSE FROSTBITE. CHRONIC: NONE KNOWN. STORE IN A COOL, DRY, WELL-VENTED PLACE AWAY FROM SOURCES OF OPEN FLAME OR HIGH TEMPERATURES. FIRST AID: SKIN/EYES: FLUSH WITH WARM WATER FOR AT LEAST 15 MINUTES. COVER AND GET IMMEDIATE MEDICAL ATTENTION. INHALED: MOVE TO FRESH AIR. GIVE ARTIFICIAL RESPIRATION IF BREATHING STOPPED. GIVE OXYGEN IF BREATHING DIFFICULT. SEE DOCTOR. DO NOT GIVE EPINEPHRINE.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y

Label Name: ALLIED CHEMICAL,ALLIED CORP
Label Street: COLUMBIA RD AND PARK AVE
Label P.O. Box: 1087R
Label City: MORRISTOWN
Label State: NJ
Label Zip Code: 07960
Label Country: US
Label Emergency Number: 201-455-3073

ALLIED SIGNAL -- GENETRON AZ-20
MATERIAL SAFETY DATA SHEET
NSN: 683000N081071
Manufacturer's CAGE: 05VM8
Part No. Indicator: A
Part Number/Trade Name: GENETRON AZ-20

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General Information

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Company's Name: ALLIED SIGNAL INC
Company's Street: 101 COLUMBIA RD
Company's P. O. Box: 1053
Company's City: MORRISTOWN
Company's State: NJ
Company's Country: US
Company's Zip Code: 07962
Company's Emerg Ph #: 201-455-2000
Company's Info Ph #: 201-455-4157
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 01JAN97
Safety Data Review Date: 18DEC97
MSDS Serial Number: CFWKX

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Ingredients/Identity Information

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Proprietary: NO
Ingredient: METHANE, DIFLUORO-; (DIFLUOROMETHANE)
Ingredient Sequence Number: 01
Percent: 50
NIOSH (RTECS) Number: PA8537500
CAS Number: 75-10-5
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Proprietary: NO
Ingredient: ETHANE, PENTAFLUORO-; (PENTAFLUOROETHANE)
Ingredient Sequence Number: 02
Percent: 50
NIOSH (RTECS) Number: KI6365000
CAS Number: 354-33-6
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Proprietary: NO
Ingredient: FIRST AID PROC: MED ATTN IF SYMPS PERSIT. INHAL: IMMED REMOVE TO FRESH AIR. IF BRTHG STOPS, GIVE ARTF RESP. USE (ING 4)
Ingredient Sequence Number: 03
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 3: OXYGEN AS REQD, PROVIDED QUALIFIED OPERATOR IS AVAIL. CALL MD. DO NOT GIVE EPINEPHRINE (ADRENALINE). (ING 5)
Ingredient Sequence Number: 04
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 4: INGEST: UNLIKELY BECAUSE OF PHYSICAL PROPERTIES OF AZ-20 & NOT EXPECTED TO BE HAZ. DO NOT INDUCE VOMIT (ING 6)
Ingredient Sequence Number: 05

NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 5: UNLESS INSTRUCTED TO DO SO BY MD. ADVICE TO MD: BECAUSE OF POSS DISTURBS OF CARD RHYTHM, CATECHOLAMINE (ING 7)
Ingredient Sequence Number: 06
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 6: DRUGS SUCH AS EPINEPHRINE SHOULD BE USED W/SPEC CAUTION ONLY IN SITUATIONS OF EMER LIFE SUPPORT. TREATMENT(ING 8)
Ingredient Sequence Number: 07
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 7: OF OVEREXP SHOULD BE DIRECTED AT CONTROL OF SYMPS & THE CLINICIAL CONDITIONS.
Ingredient Sequence Number: 08
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: SPILL PROC: AREAS. SPILLS & RELEASES MAY HAVE TO BE REPORTED TO FED &/OR LOCAL AUTHS. SEE REGULATORY INFO (ING 10)
Ingredient Sequence Number: 09
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 9: REGARDING REPORTING REQUIREMENTS.
Ingredient Sequence Number: 10
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: WASTE DISP METH: BY LICENSED WASTE DISP COMPANY MAY BE NEC. INFO OFFERED IS FOR PROD AS SHIPPED. USE &/OR (ING 12)
Ingredient Sequence Number: 11
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 11: ALTERATIONS TO PROD SUCH AS MIXING W/OTHER MATLS MAY SIGNIFICANTLY CHANGE CHARACTS OF MATL & ALTER (ING 13)
Ingredient Sequence Number: 12
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 12: RCRA CLASSIFICATION & PROPER DISPOSAL METHOD.
Ingredient Sequence Number: 13
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: HNDLG/STOR PRECS: LOCATIONS SHOULD BE AVOIDED. CLOSE VALVE TIGHTLY AFTER USE & WHEN EMPTY.
Ingredient Sequence Number: 14
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: OTHER PRECS: COMPRESSED GASES. GENETROZ AZ-20 SHOULD NOT BE MIXED W/AIR ABOVE ATM PRESS FOR LEAK TESTING OR (ING 16)
Ingredient Sequence Number: 15
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 15: ANY OTHER PURPOSE. SEE FIRE AND EXPLOSION HAZARD SECTION.
Ingredient Sequence Number: 16
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: PROT GLOVES: CONDITIONS. IF PRLNGD CONTACT W/LIQUID OR GAS IS ANTICIPATED, INSULATED GLOVES CONSTRUCTED OF PVA (ING 18)
Ingredient Sequence Number: 17
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 17: NEOPRENE OR BUTYL RUBBER SHOULD BE USED.
Ingredient Sequence Number: 18
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: OTHER PROT EQUIP: CHARACTS OF AZEOTROPE, CONTACT W/LIQUID IS UNLIKELY. IMPERVIOUS BOOTS & CLTHG SHOULD BE USED (ING 20)
Ingredient Sequence Number: 19
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 19: IN CASES OF SPILLAGE OR LEAKAGE OR IF THERE IS PROBABILITY OF RPTD/PRLNGD CONTACT W/LIQUID PROD. HIGH (ING 21)
Ingredient Sequence Number: 20
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 20: DOSE-LEVEL WARNING SIGNS ARE RECOMMENDED FOR AREAS OF PRINCIPLE EXPOSURE. FOR TANK CLEANING OPERATIONS, (ING 22)
Ingredient Sequence Number: 21
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO

Ingredient: ING 21: SEE OSHA REGULATIONS.
Ingredient Sequence Number: 22
NIOSH (RTECS) Number: 99999992Z
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Physical/Chemical Characteristics

Appearance And Odor: CLEAR COLORLESS LIQUID AND VAPOR; FAINT ETHEREAL ODOR. GAS AT NORMAL TEMPS.
Boiling Point: -63F,-53C
Vapor Pressure (MM Hg/70 F): SUPDAT
Vapor Density (Air=1): 3.0
Specific Gravity: 1.08 (H*2O=1)
Evaporation Rate And Ref: >1 COMPARED TO CCL*4
Percent Volatiles By Volume: 100
pH: NEUT

Fire and Explosion Hazard Data

Flash Point: N/A
Lower Explosive Limit: NONE
Upper Explosive Limit: NONE
Extinguishing Media: USE ANY STANDARD AGENT - CHOOSE THE ONE MOST APPROPRIATE FOR THE TYPE OF SURROUNDING FIRE.
Special Fire Fighting Proc: USE NIOSH APPRVD SCBA & FULL PROTECTIVE EQUIPMENT (FP N). PROPER EYE & SKIN PROTECTION SHOULD BE PROVIDED. USE WATER SPRAY TO KEEP FIRE-EXPOSED CONTAINERS COOL.
Unusual Fire And Expl Hazrds: GENETRON AZ-20 IS NOT FLAM AT AMBIENT TEMPS & ATM PRESS. HOWEVER, MATL WILL BECOME COMBUST WHEN MIXED W/AIR UNDER PRESS & EXPOS TO STRONG IGNIT SOURCES.(SUPDAT)

Reactivity Data

Stability: YES
Cond To Avoid (Stability): DO NOT MIX W/OXYGEN OR AIR ABOVE ATMOSPHERIC PRESS. ANY SOURCE OF HIGH TEMP, SUCH AS LIGHTED CIGARETTES, FLAMES,(SUPDAT)
Materials To Avoid: FRESHLY ABRADED ALUMINUM SURFS (MAY CAUSE STRONG EXOTHERMIC RXN). CHEMICALLY ACTIVE METALS: SODIUM, POTASSIUM, (SUPDAT)
Hazardous Decomp Products: HALOGENS, HALOGEN ACIDS AND POSSIBLE CARBONYL HALIDES SUCH AS PHOSGENE. THESE ARE TOXIC AND CORROSIVE.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT

Health Hazard Data

LD50-LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: SKIN: IRRIT WOULD RSLT FROM DEFAT ACTION ON TISS. LIQ CNTCT MAY CAUSE FROSTBITE. EYES: LIQ CNTCT CAN CAUSE IRRIT, WHICH MAY BE SEV. MIST MAY IRRIT. INHAL: AZ-20 IS OF LOW ORDER ACUTE TOX IN ANIMALS. WHEN OXYGEN LEVELS IN AIR ARE REDUCED TO 12-14% BY DISPLACEMENT, SYMPS OF ASPHY, LOSS OF COORD, INCRD (EFTS OF OVEREXP)
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NOT RELEVANT
Signs/Symptoms Of Overexp: HLTH HAZ: PULSE RATE & DEEPER RESP WILL OCCUR. AT HIGH LEVELS, CARD ARRHY MAY OCCUR. INGEST: ALTHOUGH UNLIKELY, DISCOMFORT IN GI TRACT WOULD RSLT FROM RAPID EVAP (BOILING) OF MATL & CONSEQUENT EVOLUTION OF GAS. IN ADDN, SOME INHAL EFTS WOULD BE EXPECTED. NECROSIS FROM FREEZING OF TISS COULD OCCUR. CHRONIC: NONE KNOWN.
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.

Emergency/First Aid Proc: SKIN: PROMPTLY FLUSH SKIN W/WATER UNTIL ALL CHEM IS REMOVED. IF THERE IS EVID OF FROSTBITE, BATHE (DO NOT RUB) W/ LUKEWARM (NOT HOT) WATER. IN ABSENCE OF WATER, COVER W/CLEAN, SOFT CLOTH/ SIMILAR COVERING. CALL MD. EYES: IMMED FLUSH EYES W/LARGE AMTS OF WATER FOR AT LEAST 15 MIN (IN CASE OF FROSTBITE, WATER SHOULD BE LUKEWARM - NOT HOT), LIFTING LIDS OCCASNLY TO FACILITATE IRRIGATION. GET (ING 3)

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: (ALWAYS WEAR RECOMD PPE.) EVACUATE UNPROTECTED PERS. PROTECTED PERS SHOULD REMOVE ANY IGNIT SOURCES & SHUT OFF LEAK, IF W/OUT RISK, & PROVIDE VENT. UNPROTECTED PERS SHOULD NOT RETURN UNTIL AIR HAS BEEN TESTED & DETERMD SAFE, INCL UNDERLYING (ING 9)
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: DISP MUST COMPLY W/FED, STATE & LOCAL DISP/ DISCHARGE LAWS. DISP OF WASTE AZEOTROPE MAY BE SUBJECT TO FED REG. USERS SHOULD REVIEW THEIR OPERATIONS, THEN CONSULT W/APPROP REGULATORY AGENCIES BEFORE DISCHARGING OR DISPOSING OF WASTE MATL. DISP (ING 11)
Precautions-Handling/Storing: STORE IN COOL, WELL-VENTD AREA OF LOW FIRE RISK & OUT OF DIRECT SUNLIGHT. PROTECT CYL & ITS FITTINGS FROM PHYSICAL DMG. STORAGE IN SUBSURFACE (ING 14)
Other Precautions: (ALWAYS WEAR RECOMD PPE.). AVOID BRTHG VAPS & LIQ CNTCT W/EYES, SKIN/CLTHG. DO NOT PUNCTURE/DROP CYLS OR EXPOSE THEM TO OPEN FLAME OR EXCESS HEAT. USE AUTHORIZED CYLS ONLY. FOLLOW STD SAFETY PRECS FOR HNDLG & USE OF CYLS OF (ING 15)

Control Measures

Respiratory Protection: NONE GEN REQD FOR ADEQ VENT WORK STATIONS. FOR ACCIDENTAL RELS/NON-VENTD SITUATIONS, WHERE CONC MAY RISE ABOVE PEL OF 1000 PPM, USE NIOSH APPRVD SCBA OR SUPPLIED AIR RESP. FOR ESCAPE USE FORMER OR NIOSH APPRVD GAS MASK W/ORG VAP CANISTER.
Ventilation: LOC EXHST AT FILLING ZONE & AREAS WHERE LEAK IS PROBABLE. MECH (GEN) VENT MAY BE ADEQ FOR OTHER OPERATING & STOR AREAS.
Protective Gloves: LEATHER GLOVES UNDER ROUTINE (ING 17)
Eye Protection: ANSI APPRVD CHEM WORKERS GOGGLES (FP N).
Other Protective Equipment: ANSI APPRVD EYE WASH & DELUGE SHOWER (FP N). GENERAL WORK CLTHG UNDER ROUTINE CNDTNS. BECAUSE OF PHYSICAL (ING 19)
Work Hygienic Practices: ANY CONTAMINATED CLOTHING SHOULD BE PROMPTLY REMOVED AND WASHED BEFORE REUSE.
Suppl. Safety & Health Data: VP: 215.3 PSIA @ 70F; 490.2 PSIA @ 130F. EXPLO HAZ:CNTCT W/CERTAIN REACTIVE METALS MAY RSLT IN FORM OF EXPLOS/ EXOTHERMIC RXNS UNDER SPECIFIC CNDTNS (EG, VERY HIGH TEMPS &/OR APPROP PRESS). CNDTNS TO AVOID:HOT SPOTS, WELDING MAY YIELD TOX &/OR CORR DECOMP PRODS. MATL TO AVOID:CALCIUM, POWDERED ALUMINUM, MAGNESIUM, ZINC.

Transportation Data

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 18DEC97
Label Date: 11DEC97
Label Status: G
Common Name: GENETRON AZ-20
Chronic Hazard: NO
Signal Word: DANGER!
Acute Health Hazard-Severe: X
Contact Hazard-Severe: X
Fire Hazard-Slight: X
Reactivity Hazard-None: X

Special Hazard Precautions: COMBUSTIBLE. ACUTE: DEFATTING, IRRITATION. LIQUID CONTACT MAY CAUSE FROSTBITE. EYES: IRRITATION, POSSIBLY SEVERE. INHALATION: WHEN OXYGEN LEVELS IN ARE ARE REDUCED TO 12-14% BY DISPLACEMENT, SYMPTOMS OF ASPHYXIATION, LOSS OF COORDINATION, INCREASED PULSE RATE AND DEEPER RESPIRATION OCCUR. AT HIGH LEVELS, CARDIAC ARRHYTHMIA MAY OCCUR. INGESTION: GI TRACT DISCOMFORT, INHALATION EFFECTS, NECROSIS. CHRONIC: NONE LISTED BY MANUFACTURER.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: ALLIED SIGNAL INC
Label Street: 101 COLUMBIA RD
Label P.O. Box: 1053
Label City: MORRISTOWN
Label State: NJ
Label Zip Code: 07962
Label Country: US
Label Emergency Number: 201-455-2000

ALLIED SIGNAL -- GENETRON 23
MATERIAL SAFETY DATA SHEET
NSN: 683000N052766
Manufacturer's CAGE: 0PK95
Part No. Indicator: A
Part Number/Trade Name: GENETRON 23

General Information

Company's Name: ALLIED SIGNAL
Company's P. O. Box: 1053
Company's City: MORRISTOWN
Company's State: NJ
Company's Country: US
Company's Zip Code: 08962
Company's Emerg Ph #: 800-631-8138
Company's Info Ph #: 800-631-8138
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 002
Status: SMJ
Date MSDS Prepared: 01NOV93
Safety Data Review Date: 05OCT94
MSDS Serial Number: BVVKJ
Hazard Characteristic Code: NK

Ingredients/Identity Information

Proprietary: NO
Ingredient: METHANE, TRIFLUORO-; (TRIFLUOROMETHANE)
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: PB6900000
CAS Number: 75-46-7
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Proprietary: NO
Ingredient: SUPDAT: CLOTH OR SIMILAR COVERING. CALL MD. INGEST: UNLIKELY BECAUSE OF PHYSICAL PROPERTIES OF PROD & IS NOT (ING 3)
Ingredient Sequence Number: 02
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 2: EXPECTED TO BE HAZ. DO NOT INDUCE VOMIT UNLESS INSTRUCTED TO DO SO BY A MD.
Ingredient Sequence Number: 03
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: HNDLG/STOR PREC: DMG. STORAGE IN SUBSURFACE LOCATIONS SHOULD BE AVOIDED. CLOSE VALVE TIGHTLY AFTER USE & WHEN (ING 5)
Ingredient Sequence Number: 04
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 4: EMPTY. AVOID BRTHG VAPS & AVOID LIQ CNTCT W/EYES, SKIN/CLTHG. DO NOT PUNCTURE/DROP CYLS, EXPOSE THEM TO (ING 6)
Ingredient Sequence Number: 05
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE

ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 5: OPEN FLAME/EXCESSIVE HEAT. USE AUTH CYLS ONLY. FOLLOW STD SFTY PREC FOR HNDLG & USE OF CYLS OF LIQUEFIED GASES.
Ingredient Sequence Number: 06
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: OTHER PREC: CANNOT BE EFFECTIVELY FLUSHED OF VAPOR IF SUMPS CONTAIN LIQUID PRODUCT.
Ingredient Sequence Number: 07
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: RESP PROT: USE THE FORMER OR A NIOSH/MSHA APPROVED GAS MASK WITH ORGANIC VAPOR CANISTER.
Ingredient Sequence Number: 08
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: OTHER PROT EQUIP: PROBABLE. HIGH DOSE-LEVEL WARNING SIGNS ARE RECOM FOR AREAS OF PRINCIPAL EXPOS. EMERG EYE (ING 10)
Ingredient Sequence Number: 09
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 9: WASH AND DELUGE SHOWER WHICH MEETS ANSI DESIGN CRITERIA (FP N) LOCATED AT CONVENIENT LOCATIONS. FOR TANK (ING 11)
Ingredient Sequence Number: 10
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 10: CLEANING OPERATIONS SEE OSHA REGULATIONS.
Ingredient Sequence Number: 11
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE
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Physical/Chemical Characteristics

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Appearance And Odor: CLEAR COLORLESS LIQUID AND VAPOR WITH A FAINT ETHEREAL ODOR.
Boiling Point: -116F,-82C
Vapor Pressure (MM Hg/70 F): 623.4 PSIA
Vapor Density (Air=1): 2.4
Solubility In Water: 0.1 WT% @ 25C (77F)
Percent Volatiles By Volume: 100
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Fire and Explosion Hazard Data

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Flash Point: N/A
Lower Explosive Limit: NONE
Upper Explosive Limit: NONE
Extinguishing Media: USE ANY STANDARD AGENT; CHOOSE THE ONE MOST

APPROPRIATE FOR TYPE OF SURROUNDING FIRE (MATERIAL ITSELF IS NOT FLAMMABLE)
Special Fire Fighting Proc: USE NIOSH/MSHA APPROVED SCBA AND FULL PROTECTIVE EQUIPMENT (FP N). USE WATER SPRAY TO KEEP FIRE-EXPOSED CONTAINERS COOL.
Unusual Fire And Expl Hazrds: CONTACT W/CERTAIN REACTIVE METALS MAY RSLT IN FORM OF EXPLO/EXOTHERMIC RXNS UNDER SPECIFIC CONDITIONS (E.G. VERY HIGH TEMPERATURES &/OR APPROPRIATE PRESSURES).

Reactivity Data

Stability: YES
Cond To Avoid (Stability): DO NOT MIX W/OXYGEN OR AIR ABOVE ATM PRESS. ANY SOURCE OF HIGH TEMP, SUCH AS LIGHTED CIGARETTES, FLAMES, HOT (SUPDAT)
Materials To Avoid: FRESHLY ABRADED ALUMINUM SURFS (MAY CAUSE STRONG EXOTHERMIC RXN). CHEMICALLY ACTIVE METALS: SODIUM, POTASSIUM, (SUPDAT)
Hazardous Decomp Products: HALOGENS, HALOGEN ACIDS, AND POSSIBLY CARBONYL FLUORIDE.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT

Health Hazard Data

LD50-LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: NO
Health Haz Acute And Chronic: INHAL: PROD IS OF LOW ORDER ACUTE TOX IN ANIMALS. WHEN OXYGEN LEVELS IN AIR ARE REDUCED TO 12-14% BY DISPLACEMENT, SYMPS OF ASPHY, LOSS OF COORDINATION, INCR PULSE RATE & DEEPER RESP WILL OCCUR. AT HIGH LEVELS, CARD ARRHY MAY OCCUR. INGEST: ALTHOUGH UNLIKELY, DISCOMFORT IN GI TRACT WOULD RSLT FROM (EFTS OF OVEREXP)
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NOT RELEVANT
Signs/Symptoms Of Overexp: HLTH HAZ: RAPID EVAP (BOILING) OF MATL & CONSEQUENT EVOLUTION OF GAS. IN ADDN, SOME OF INHAL EFT WOULD BE EXPECTED. NECROS FROM FREEZING OF TISS COULD OCCUR. SKIN: IRRIT WOULD RSLT FROM DEFAT ACTION ON TISS. LIQ CNTCT CAN CAUSE FROSTBITE. EYES: LIQ CNTCT CAN CAUSE IRRIT, WHICH MAY BE SEV. MIST MAY IRRIT.
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: INHAL: IMMED REMOVE TO FRESH AIR. IF BRTHG HAS STOPPED, GIVE ARTF RESP. USE OXYGEN AS REQD, PROVIDED QUALIFIED OPERATOR IS AVAIL. CALL MD. DO NOT GIVE EPINEPHRINE(ADRENALINE). EYES: IMMED FLUSH W/LG AMTS OF WATER FOR AT LEAST 15 MIN (IN CASE OF FROSTBITE, WATER SHOULD BE LUKEWARM, NOT HOT), LIFTING EYELIDS OCCAS TO FACILITATE IRRIGATION. GET MED ATTN IF SYMPS PERSIST. SKIN: PROMPTLY FLUSH (SUPDAT)

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: ALWAYS WEAR PERSONAL PROT EQUIP. EVACUATE UNPROT PERS. PROTECTED PERS SHOULD REMOVE ANY FLAMES & SHUT OFF LEAK IF W/OUT RISK & PROVIDE VENT. UNPROTECTED PERS SHOULD NOT RETURN UNTIL AIR HAS BEEN TESTED & DETERM SAFE, INCLUDING LOW-LYING AREAS.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: DISP MUST COMPLY W/FED, STATE & LOC DISP/DISCHARGE LAWS. MAY BE SUBJECT TO FED REGS. USERS SHOULD REVIEW OPERATIONS, THEN CONSULT W/APPROP REGULATORY AGENCIES BEFORE DISCHARGING/DISPOSING OF WASTE MATL. DISP BY LICENSED WASTE DISP COMPANY MAY BE NEC.
Precautions-Handling/Storing: STORE IN COOL, WELL-VENT AREA OF LOW FIRE RISK & OUT OF DIRECT SUNLIGHT. DO NOT STORE >125F(52C). PROTECT CYL & ITS FITTINGS FROM PHYSICAL (ING 4)
Other Precautions: OBSERVE ALL LABELED PRECS. PROD CAN CAUSE DEATH BY INHAL, MAY CAUSE HEART IRREGULARITIES & PERSONAL INJURY IF NOT HANDLED PROPERLY. TANK CLEANING PERS SHOULD USE ONLY FORMAL ENTRY PROC, BASED ON

RECOGNIZED SFTY PRINCIPLES. TANKS (ING 7)

Control Measures

Respiratory Protection: NONE GENERALLY REQD FOR ADEQ VENT WORK SITUATIONS. FOR ACCIDENTAL RELS OR NON-VENT SITUATIONS OR RELS INTO CONFINED SPACE WHERE CONC MAY BE ABOVE EST PEL OF 1000 PPM, USE NIOSH/MSHA APPRVD SCBA OR SUPPLIED AIR RESP. FOR ESCAPE, (ING 8)
Ventilation: LOC EXHST AT FILLING ZONES & AREAS WHERE LEAK IS PROBABLE. MECH (GEN) VENT MAY BE ADEQ FOR OTHER OPERATING & STOR AREAS.
Protective Gloves: IMPERVIOUS GLOVES.
Eye Protection: ANSI APPRVD CHEM WORKER GOGGLES (FP N).
Other Protective Equipment: WHERE CNTCT W/LIQ IS LIKELY, IMPERVIOUS BOOTS & CLTHG SHOULD BE USED IN CASE OF SPILL/LEAK/IF CNTCT W/LIQ PROD (ING 9)
Work Hygienic Practices: ANY CLOTHING SHOULD BE PROMPTLY REMOVED WHEN WET/ CONTAMINATED & WASHED BEFORE REUSE. CONTACT LENSES SHOULD NOT BE WORN.
Suppl. Safety & Health Data: CNDTNS TO AVOID: SPOTS, WELDING MAY YIELD TOX &/OR CORR DECOMP PRODS. MATLS TO AVOID: CALCIUM, POWDERED ALUMINUM, MAGNESIUM & ZINC. FIRST AID PROC: SKIN W/WATER UNTIL ALL CHEM IS REMOVED. IF THERE IS EVID OF FROSTBITE, BATHE (DO NOT RUB) W/LUKEWARM (NOT HOT) WATER. IN ABSENCE OF WATER, COVER W/CLEAN, SOFT (ING 2)

Transportation Data

Trans Data Review Date: 94276

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 05OCT94
Label Date: 03OCT94
Label Status: G
Common Name: GENETRON 23
Chronic Hazard: NO
Signal Word: WARNING!
Acute Health Hazard-Moderate: X
Contact Hazard-Moderate: X
Fire Hazard-None: X
Reactivity Hazard-None: X
Special Hazard Precautions: ACUTE: INHAL: WHEN OXYGEN LEVELS IN AIR ARE REDUCED TO 12-14% BY DISPLACEMENT, SYMPTOMS OF ASPHYXIATION, LOSS OF COORDINATION, INCREASED PULSE RATE & DEEPER RESPIRATION WILL OCCUR. AT HIGH LEVELS, CARDIAC ARRHYTHMIA MAY OCCUR. INGEST: GASTROINTESTINAL TRACT DISCOMFORT, SOME OF EFFECT OF INHALATION. NECROSIS FROM FREEZING OF TISSUE LIQUID CONTACT/MIST CAN CAUSE IRRITATION. CHRONIC: NONE LISTED BY MANUFACTURER.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: ALLIED SIGNAL
Label P.O. Box: 1053
Label City: MORRISTOWN
Label State: NJ
Label Zip Code: 08962
Label Country: US
Label Emergency Number: 800-631-8138

ABSOLUTE STANDARDS -- METHYLENE CHLORIDE
MATERIAL SAFETY DATA SHEET
NSN: 681000N061718
Manufacturer's CAGE: 0UCN3
Part No. Indicator: A
Part Number/Trade Name: METHYLENE CHLORIDE

General Information

Company's Name: ABSOLUTE STANDARDS INC
Company's Street: 44 ROSSOTTO DR
Company's City: HAMDEN
Company's State: CT
Company's Country: CT
Company's Zip Code: 06514
Company's Emerg Ph #: 800-368-1131
Company's Info Ph #: 203-281-2917
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 01JUL94
Safety Data Review Date: 24JUL95
MSDS Preparer's Name: JACK CRISCIO
Preparer's Company: SAME
MSDS Serial Number: BYFSB

Ingredients/Identity Information

Proprietary: NO
Ingredient: METHANE, DICHLORO-; (METHYLENE CHLORIDE) (SARA 313) (CERCLA)
Ingredient Sequence Number: 01
Percent: >97
NIOSH (RTECS) Number: PA8050000
CAS Number: 75-09-2
OSHA PEL: 500 PPM; Z-2
ACGIH TLV: 50 PPM, A2; 9495

Proprietary: NO
Ingredient: FIRE FIGHT PROC: EXPOSED CONTAINERS COOL.
Ingredient Sequence Number: 02
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: SPILL PROC: DISPOSAL. FLUSH AREA WITH WATER.
Ingredient Sequence Number: 03
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Physical/Chemical Characteristics

Appearance And Odor: CLEAR, COLORLESS LIQUID WITH CHARACTERISTIC PENETRATING ETHER-LIKE ODOR.
Boiling Point: 104F,40C
Melting Point: -139F,-95C
Vapor Pressure (MM Hg/70 F): 350
Vapor Density (Air=1): 2.9
Specific Gravity: 1.32 (H*2O = 1)
Evaporation Rate And Ref: 27.5 (BUTYL ACETATE = 1)
Solubility In Water: MODERATE (1-10%)

Fire and Explosion Hazard Data

920890362

Flash Point: NOT APPLICABLE
Flash Point Method: CC
Lower Explosive Limit: 19%
Upper Explosive Limit: 12%
Extinguishing Media: USE ALCOHOL, FOAM, DRY CHEMICAL OR CARBON DIOXIDE.
Special Fire Fighting Proc: USE NIOSH/MSHA APPRVD PRESSURE DEMAND SCBA & FULL PROT EQUIP (FP N). MOVE CONTAINER FROM FIRE AREA IF IT CAN BE DONE W/ OUT RISK. USE H*2O TO KEEP FIRE-(ING 2)
Unusual Fire And Expl Hazrds: VAP MAY FORM FLAM MIX IN ATMOSPHERE THAT CNTNS HIGH PERCENTAGE OF OXYG. CLSD CNTNRS EXPOS TO HEAT MAY EXPLODE. CNTCT W/STRONG OXIDIZERS MAY CAUSE FIRE. (SUPDAT)

Reactivity Data

Stability: YES
Cond To Avoid (Stability): HEAT, FLAME, OTHER IGNITION SOURCES.
Materials To Avoid: STRONG OXIDIZING AGENTS, STRONG ACIDS, ZINC, ALUMINUM, MAGNESIUM.
Hazardous Decomp Products: CARBON MONOXIDE, CARBON DIOXIDE, FORMALDAHYDE. PHOSGENE, HCL (FP N).
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT.

Health Hazard Data

LD50-LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: CHLOROCARBON MATLS HAVE PRODUCED SENSIT OF THE MYOCARDIUM TO EPINEPHRINE IN LAB ANIMALS & COULD HAVE SIMILAR EFT IN HUMANS. ADRENOMIMETICS (EG. EPINEPHRINE) MAY BE CONTRA-INDICATED EXCEPT FOR LIFE-SUSTAINING USES IN HUMANS ACUTELY/CHRONICALLY EXPOS TO CHLOROCARBONS (FP N). ACUTE: INHAL & INGEST ARE (EFTS OF OVEREXP)
Carcinogenicity - NTP: YES
Carcinogenicity - IARC: YES
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: METHYLENE CHLORIDE:IARC MONOGRAPHS SUPPLEMENT, VOL 7, PG 194, 1987: GROUP 2B. NTP 7TH ANNUAL RPT ON CARCINOGENS,(SUPDAT)
Signs/Symptoms Of Overexp: HLTH HAZ: HARMFUL & MAY BE FATAL. INHAL & INGEST MAY CAUSE SUFFOCATION. LOW BLOOD PRESS, CNS DEPRESS. CNTCT W/SKIN/ EYES MAY CAUSE IRRIT. PRLNGD SKIN MAY RSLT IN DERMATITIS. EYE CONTACT: MAY RESULT IN TEMPORARY CORNEAL DAMAGE. CHRONIC: MAY INCLUDE KIDNEY AND/OR LIVER DAMAGE, LUNGS, BLOOD OR CENTRAL NERVOUS SYSTEM.
Med Cond Aggravated By Exp: EYE DISORDERS, SKIN DISORDERS, LIVER OR KIDNEY DISORDERES, CARDIOVASCULAR DISORDERS, HEAT DISORDERS, CENTRAL NERVOUS SYSTEM DISORDERS, HEAVY DRINKERS, AND HEAVY SMOKERS.
Emergency/First Aid Proc: CALL A PHYSICIAN. INGEST: IF SWALLOWED, DO NOT INDUCE VOMITING. INHAL: IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN. EYE OR SKIN: IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MIN. WARNING: THIS PRODUCT IS A CHEMICAL KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: WEAR NIOSH/MSHA APPRVD SCBA & FULL PROT CLTHG. SHUT OFF IGNIT SOURCES:NO FLARES, SMKNG/FLAMES IN AREA. STOP LEAK IF YOU CAN DO SO W/OUT RISK. USE H*2O SPRAY TO REDUCE VAPS. TAKE UP W/SAND/ OTHER NON-COMBUST MATL & PLACE INTO CNTN FOR LATER (ING 3)
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: DISPOSAL IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL ENVIRONMENTAL REGULATIONS. EPA HAZARDOUS WASTE NUMBER: U080 (TOXIC WASTE).

Precautions-Handling/Storing: BOND & GROUND CONTAINERS WHEN TRANSFERRING LIQ. KEEP CONTAINERS TIGHTLY CLOSED. STORE IN A COOL, DRY, WELL-VENTILATED, FLAMMABLE LIQUID STORAGE AREA.
Other Precautions: USE GEN/LOCAL EXHST VENT TO MEET TLV REQUIREMENTS. STORAGE COLOR CODE BLUE HLTH. NO SMKNG IN AREA OF USE. DO NOT USE IN GEN VICINITY OF ARC WELDING, OPEN FLAMES/HOT SURFS. HEAT &/UV RADIA MAY CAUSE THE FORMATION OF HCL &/PHOSGENE (FP N).

Control Measures

Respiratory Protection: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS ABOVE 200 PPM, A NIOSH/MSHA APPROVED SELF CONTAINED BREATHING APPARATUS IS ADVISED.
Ventilation: MECHANICAL GENERAL.
Protective Gloves: IMPERVIOUS GLOVES (FP N).
Eye Protection: ANSI APPROVED CHEM WORKERS GOGGS (FP N).
Other Protective Equipment: EYE WASH FOUNTAIN & DELUGE SHOWER WHICH MEET ANSI DESIGN CRITERIA (FP N).
Work Hygienic Practices: GOOD LABORATORY PRACTICES.
Suppl. Safety & Health Data: EXPLAN OF CARCIN:1994:ANTICIPATED TO BE CARCIN ANIMAL:LUNG, LIV, SALIVARY, MAMMARY GLAND (TUMORS). EXPLO HAZ:BURNS W/CLEAR, ALMOST INVISIBLE FLAME. CONCENTRATED VAPOR CAN BE IGNITED BY A HIGH INTENSITY INGEST SOURCE. TOXIC GASES PRODUCE MAY INCLUDE:HYDROGEN CHLORIDE, PHOSGENE, CHLORINE, CARBON MONOXIDE, CARBON DIOXIDE.

Transportation Data

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 24JUL95
Label Date: 24JUL95
Label Status: G
Common Name: METHYLENE CHLORIDE
Chronic Hazard: YES
Signal Word: WARNING!
Acute Health Hazard-Moderate: X
Contact Hazard-Moderate: X
Fire Hazard-None: X
Reactivity Hazard-None: X
Special Hazard Precautions: ACUTE: INHALATION OF VAPORS MAY CONTRIBUTE TO THE OCCURRENCE OF IRREGULAR HEARTBEAT (FP N). INHALATION AND INGESTION ARE HARMFUL AND MAY BE FATAL. INHALATION AND INGESTION MAY CAUSE HEADACHE, NAUSEA, VOMITING, DIZZINESS, NARCOSIS, SUFFOCATION, LOWER BLOOD PRESSURE, CENTRAL NERVOUS SYSTEM DEPRESSION. CONTACT WITH SKIN OR EYES MAY CAUSE CANCER HAZARD. CONTAINS METHYLENE CHLORIDE, WHICH IS LISTED AS AN ANIMAL LUNG AND LIVER CARCINOGEN (FP N). MAY DAMAGE KIDNEYS, LUNG, LIVER, BLOOD OR CENTRAL NERVOUS SYSTEM. SKIN: DERMATITIS.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: ABSOLUTE STANDARDS INC
Label Street: 44 ROSSOTTO DR
Label City: HAMDEN
Label State: CT
Label Zip Code: 06514
Label Country: CT
Label Emergency Number: 800-368-1131

CHEM SERVICE -- F29 1,1-DICHLOROETHENE
MATERIAL SAFETY DATA SHEET
NSN: 655000F037520
Manufacturer's CAGE: 8Y898
Part No. Indicator: A
Part Number/Trade Name: F29 1,1-DICHLOROETHENE

General Information

Company's Name: CHEM SERVICE INC
Company's Street: 660 TOWER LN
Company's P. O. Box: 3108
Company's City: WEST CHESTER
Company's State: PA
Company's Country: US
Company's Zip Code: 19381-3108
Company's Emerg Ph #: 215-692-3026/800-452-9994
Company's Info Ph #: 215-692-3026/800-452-9994
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 002
Status: SE
Date MSDS Prepared: 13OCT92
Safety Data Review Date: 14DEC94
Preparer's Company: CHEM SERVICE INC
Preparer's St Or P. O. Box: 660 TOWER LN
Preparer's City: WEST CHESTER
Preparer's State: PA
Preparer's Zip Code: 19381-3108
MSDS Serial Number: BWJGQ

Ingredients/Identity Information

Proprietary: NO
Ingredient: VINYLIDENE CHLORIDE, 1,1-DICHLOROETHENE, 1,1-DICHLOROETHYLENE, VDC
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: KV9275000
CAS Number: 75-35-4
OSHA PEL: 1 PPM
ACGIH TLV: 5 PPM
Other Recommended Limit: 5 PPM

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS LIQUID W/FRUITY/PLEASANT ODOR.
Boiling Point: 87.06F
Melting Point: -188.5F
Solubility In Water: INSOLUBLE

Fire and Explosion Hazard Data

Flash Point: 5F
Extinguishing Media: CO2, DRY CHEMICAL POWDER. DON'T USE WATER.
Unusual Fire And Expl Hazrds: FLAMMABLE CHEMICAL. EXPLOSIVE. TENDS TO DEVELOP PRESSUE ON STANDING. SENSITIVE TO HEAT & AIR. MAY POLYMERIZE UPON STANDING.

Reactivity Data

Stability: NO
Cond To Avoid (Stability): HEAT, AIR, UPON STANDING.
Hazardous Poly Occur: YES
Conditions To Avoid (Poly): UPON STANDING.

Health Hazard Data

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LD50-LC50 Mixture: ORAL LD50 (RAT/MOUSE): 200 MG/KG
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: NO
Route Of Entry - Ingestion: YES
IRRITATION/ALLERGIC REACTIION/SENSITIZATION. INHALATION: MUCOUS MEMBRANE IRRITATION. EXPOSURE CAN CAUSE LIVER & KIDNEY DAMAGE/NERVOUS & CARDIOVASCULAR SYSTEM INJURY/DELAYED ADVERS HEALTH EFFECTS. NARCOTIC AT HIGH CONCENTRATIONS.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NONE
Signs/Symptoms Of Overexp: IRRITATION.
Emergency/First Aid Proc: EYES: FLUSH CONTINUOUSLY W/WATER FOR 15-20 MINS. SKIN: FLUSH W/WATER FOR 15-20 MINS. IF NOT BURNED, WASH W/SOAP & WATER. INHALATION: REMOVE TO FRESH AIR. GIVE CPR/OXYGEN IF NEEDED. KEEP WARM & QUIET. INGESTION: DON'T INDUCE VOMITING/GIVE LIQUIDS IF UNCONSCIOUS/ CONVULSING. IF VOMITING OCCURS, WATCH CLOSELY FOR ANY AIRWAY OBSTRUCTION. OBTAIN MEDICAL ATTENTION IN ALL CASES.
==========

Precautions for Safe Handling and Use

==========
Steps If Matl Released/Spill: EVACUATE AREA. WEAR APPRORPRIATE OSHA REGULATED EQUIPMENT. VENTILATE AREA. ABSORB ON VERMICULITE/SIMILAR MATERIAL. SWEEP UP & PLACE IN APPROPRIATE CONTAINER/HOLD FOR DISPOSAL. WASH CONTAMINATED SURFACES TO REMOVE ANY RESIDUES.
Waste Disposal Method: BURN IN A CHEMICAL INCINERATOR EQUIPPED W/AN AFTERBURNER & SCRUBBER IAW/FEDERAL, STATE & LOCAL REGULATIONS.
Precautions-Handling/Storing: STORE IN A COOL DRY PLACE ONLY W/COMPATIBLE CHEMICALS. KEEP TIGHTLY CLOSED. STORE UNDER NITROGEN & REFRIGERATION. FOR LABORATORY USE ONLY.
Other Precautions: AVOID CONTACT W/SKIN, EYES & CLOTHING. DON'T BREATH VAPORS. CONTACT LENSES SHOULDN'T BE WORN IN THE LABORATORY. ALL CHEMICALS SHOULD BE CONSIDERED HAZARDOUS. AVOID DIRECT PHYSICAL CONTACT.
==========

Control Measures

==========
Respiratory Protection: WEAR APPROPRIATE OSHA/MSHA APPROVED SAFETY EQUIPMENT.
Ventilation: CHEMICAL SHOULD BE HANDLED ONLY IN A HOOD.
Eye Protection: EYE SHIELDS
Work Hygienic Practices: REMOVE/LAUNDER CONTAMINATED CLOTHING BEFORE REUSE.
==========

Transportation Data

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Disposal Data

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Label Data

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Label Required: YES
Label Status: G
Common Name: F29 1,1-DICHLOROETHENE
IRRITATION/ALLERGIC REACTIION/SENSITIZATION. INHALATION: MUCOUS MEMBRANE IRRITATION. EXPOSURE CAN CAUSE LIVER & KIDNEY DAMAGE/NERVOUS & CARDIOVASCULAR SYSTEM INJURY/DELAYED ADVERS HEALTH EFFECTS. NARCOTIC AT HIGH CONCENTRATIONS. IRRITATION.
Label Name: CHEM SERVICE INC
Label Street: 660 TOWER LN
Label P.O. Box: 3108
Label City: WEST CHESTER
Label State: PA

920890366

Label Zip Code: 19381-3108
Label Country: US
Label Emergency Number: 215-692-3026/800-452-9994

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MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

MALLINCKRODT J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

CHLOROFORM

MSDS Number: C2915 — *Effective Date: 09/08/97*

1. Product Identification

Synonyms: Trichloromethane; Methyl trichloride; Methane trichloride
CAS No.: 67-66-3
Molecular Weight: 119.38
Chemical Formula: CHCl3
Product Codes:
J.T. Baker: 9174, 9175, 9180, 9181, 9182, 9183, 9186, 9257
Mallinckrodt: 1473, 2175, 4432, 4434, 4439, 4440, 4441, 4443, 4444, H407, V551

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Chloroform	67-66-3	98 - 100%	Yes
Ethyl Alcohol	64-17-5	0 - 1%	Yes

3. Hazards Identification

Emergency Overview

DANGER! MAY BE FATAL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. MAY AFFECT CENTRAL NERVOUS SYSTEM, CARDIOVASCULAR SYSTEM, LIVER AND KIDNEYS. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. **Risk of cancer depends on level and duration of exposure.**

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Cancer Causing)

920890368

Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:
Acts as a relatively potent anesthetic. Irritates respiratory tract and causes central nervous system effects, including headache, drowsiness, dizziness. Exposure to higher concentrations may result in unconsciousness and even death. May cause liver injury and blood disorders. Prolonged exposure may lead to death due to irregular heart beat and kidney and liver disorders.
Ingestion:
Causes severe burning in mouth and throat, pain in the chest and vomiting. Large quantities may cause symptoms similar to inhalation.
Skin Contact:
Causes skin irritation resulting in redness and pain. Removes natural oils. May be absorbed through skin.
Eye Contact:
Vapors causes pain and irritation to eyes. Splashes may cause severe irritation and possible eye damage.
Chronic Exposure:
Prolonged or repeated exposure to vapors may cause damage to the nervous system, the heart and the liver and kidneys. Contact with liquid has defatting effect and may cause chronic irritation of skin with cracking and drying, and corresponding dermatitis. Chloroform is a suspected human carcinogen.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:
Because kidney and liver effects may be delayed, keep victim under observation for 24 to 48 hr. Administration of fluids may help to prevent kidney failure. Obtain blood glucose,

urinalysis, liver function tests, chest x-ray, and monitor cardiac function and fluid/electrolyte status. Monitor liver and kidney function for 4 to 5 days after exposure. Disulfiram, its metabolites, and a high carbohydrate diet appear to protect somewhat against chloroform toxicity. Do not give adrenalin! Tests may show increased bilirubin, ketosis, lowered blood prothombin, and fibrogen.

5. Fire Fighting Measures

Fire:
Slight fire hazard when exposed to high heat; otherwise, practically not flammable.
Explosion:
Sealed containers may rupture when heated.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB(tm) solvent adsorbent is recommended for spills of this product.

7. Handling and Storage

Keep in a tightly closed light-resistant container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Wear special protective equipment (Sec. 8) for maintenance break-in or where exposures may exceed established exposure levels. Wash hands, face, forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or smoke in workplace. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Chloroform odor threshold: 250 mg/m3. The odor threshold only serves as a warning of exposure; not smelling it does not mean you are not being exposed.

8. Exposure Controls/Personal Protection

920890370

Airborne Exposure Limits:
Chloroform:
-OSHA Permissible Exposure Limit (PEL):
50 ppm (TWA) Ceiling
-ACGIH Threshold Limit Value (TLV):
10 ppm (TWA), Listed as A3 animal carcinogen
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. This substance has poor warning properties.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.
Odor:
Characteristic ethereal odor.
Solubility:
0.8g/100g water @ 20C (68F).
Specific Gravity:
1.48 @ 20C/4C
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
62C (144F)
Melting Point:
-63.5C (-83F)
Vapor Density (Air=1):
4.1
Vapor Pressure (mm Hg):
160 @ 20C (68F)
Evaporation Rate (BuAc=1):
11.6

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. pH decreases on prolonged exposure to

light and air due to formation of HCl.
Hazardous Decomposition Products:
May produce carbon monoxide, carbon dioxide, hydrogen chloride and phosgene when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong caustics and chemically active metals such as aluminum, magnesium powder, sodium, or potassium; acetone, fluorine, methanol, sodium methoxide, dinitrogen tetroxide, tert-butoxide, triisopropylphosphine.
Conditions to Avoid:
Light, heat, air and incompatibles.

11. Toxicological Information

Toxicological Data:
Chloroform: oral rat LD50: 908 mg/kg; skin rabbit LD50: > 20 gm/kg; inhalation rat LC50: 47702 mg/m3/4H; irritation data: skin rabbit 10 mg/24H open mild; eye rabbit: 20 mg/24H moderate; investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
Birth defects have been seen in rats and mice exposed by inhalation of chloroform at concentrations greater than 100 ppm in air. Ingestion of chloroform by pregnant laboratory animals has resulted in fetotoxicity but not birth defects, and only at levels causing severe maternal effects.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Chloroform (67-66-3)	No	Yes	2B
Ethyl Alcohol (64-17-5)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released to water, this material is expected to quickly evaporate. When released into the water, this material is expected to have a half-life between 1 and 10 days. This material has a log octanol-water partition coefficient of less than 3.0. This material is not expected to significantly bioaccumulate. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material may be moderately degraded by photolysis. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition. When released into the air, this material is expected to have a half-life of greater than 30 days.
Environmental Toxicity:
This material is not expected to be toxic to aquatic life. The LC50/96-hour values for fish are over 100 mg/l.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: RQ, CHLOROFORM
Hazard Class: 6.1
UN/NA: UN1888
Packing Group: III
Information reported for product/size: 24.5L

International (Water, I.M.O.)

Proper Shipping Name: CHLOROFORM
Hazard Class: 6.1
UN/NA: UN1888
Packing Group: III
Information reported for product/size: 24.5L

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
Chloroform (67-66-3)	Yes	Yes	Yes	Yes
Ethyl Alcohol (64-17-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Chloroform (67-66-3)	Yes	Yes	No	Yes
Ethyl Alcohol (64-17-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Chloroform (67-66-3)	10	10000	Yes	No
Ethyl Alcohol (64-17-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\--------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Chloroform (67-66-3)	10	U044	No
Ethyl Alcohol (64-17-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Australian Hazchem Code: 2Z
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: 2 Flammability: 0 Reactivity: 0
Label Hazard Warning:
DANGER! MAY BE FATAL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. MAY AFFECT CENTRAL NERVOUS SYSTEM, CARDIOVASCULAR SYSTEM, LIVER AND KIDNEYS. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure.
Label Precautions:
Do not breathe vapor.
Do not get in eyes, on skin, or on clothing.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:

Disclaimer:
****

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INFORMATION.
****

Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

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MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

MALLINCKRODT J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

1,2-DICHLOROETHANE

MSDS Number: D2440 — *Effective Date: 09/08/97*

1. Product Identification

Synonyms: Ethylene dichloride; dichloroethylene; 1,2-Bichloroethane
CAS No.: 107-06-2
Molecular Weight: 98.96
Chemical Formula: ClCH2CH2Cl
Product Codes:
J.T. Baker: 9302, H076
Mallinckrodt: 4966, 5338, 6422

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Ethylene Dichloride	107-06-2	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

WARNING! FLAMMABLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER, KIDNEYS, AND CARDIOVASCULAR SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. POSSIBLE CANCER HAZARD. MAY CAUSE CANCER BASED ON ANIMAL DATA. Risk of cancer depends on duration and level of exposure.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Cancer Causing)

Flammability Rating: 3 - Severe (Flammable)
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation of vapors irritates the respiratory tract. May cause headache, weakness, cyanosis, nausea, vomiting, and diarrhea. These symptoms may be followed by central nervous system effects, liver damage, kidney damage, adrenal gland damage, cyanosis, weak and rapid pulse and unconsciousness. Death can occur from respiratory and circulatory failure.
Ingestion:
Causes irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea. Toxic effects parallel those of inhalation. Doses of 0.5 - 1.0 g/kg can be fatal.
Skin Contact:
Causes irritation, rash and blister formation. Prolonged contact can cause skin burns. Can be absorbed through skin with toxic effects.
Eye Contact:
Vapors cause eye irritation. Splashes cause severe irritation, possible corneal burns and eye damage.
Chronic Exposure:
Repeated or prolonged exposure may cause weight loss, low blood pressure, jaundice, reduced urinary output, dermatitis, eye damage and anemia. Dichloroethane is a suspected human carcinogen based on animal data.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney, cardiovascular, neurological or respiratory function may be more susceptible to the effects of the substance.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Wash skin with soap or mild detergent and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:

Flash point: 13C (55F) CC
Autoignition temperature: 413C (775F)
Flammable limits in air % by volume:
lel: 6.2; uel: 15.9
Flammable.
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Sealed containers may rupture when heated. Contact with strong oxidizers may cause fire. Vapors can flow along surfaces to distant ignition source and flash back. Sensitive to static discharge.
Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Combustion by-products include phosgene and hydrogen chloride gases.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB(tm) solvent adsorbent is recommended for spills of this product.

---

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Wear special protective equipment (Sec. 8) for maintenance break-in or where exposures may exceed established exposure levels. Wash hands, face, forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or smoke in workplace. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
- OSHA Permissible Exposure Limit (PEL):
50 ppm (TWA), 100 ppm (ceiling)
200 ppm (max)/5 min/3 hour

- ACGIH Threshold Limit Value (TLV):
10 ppm (TWA), A4 - not classifiable as a human carcinogen

- NIOSH IDLH:
50 ppm

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. This substance has poor warning properties.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Polyvinyl alcohol (PVA) and Viton are recommended materials for personal protective equipment.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
Colorless heavy liquid.

Odor:
Chloroform-like odor.

Solubility:
0.81g/100g water @ 20C (68F).

Specific Gravity:
1.24 @ 20C

pH:
No information found.

% Volatiles by volume @ 21C (70F):
100

Boiling Point:
83.4C (181F)

Melting Point:
-35.4C (-31F)

Vapor Density (Air=1):
3.42

Vapor Pressure (mm Hg):
87 @ 25C (77F)

Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Darkens on exposure to air or light.
Hazardous Decomposition Products:
Emits toxic fumes of phosgene, hydrogen chloride, acetylene, and vinyl chloride when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Aluminum or magnesium powder, oxidizing agents, reducing agents, organic peroxides, alkali and alkali earth metals, nitric acid, caustics, nitrogen tetraoxide, ammonia, and dimethylaminopropylamine.
Conditions to Avoid:
Heat, flame, sources of ignition, light and incompatibles.

11. Toxicological Information

Oral rat LD50: 670 mg/kg; inhalation rat LC50: 1000 ppm.7H; skin rabbit LD50: 2800 mg/kg; irritation eye rabbit, Standard Draize, 63 mg severe; skin rabbit, Open Draize, 625 mg mild; investigated as a tumorigen, mutagen, reproductive effector.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Ethylene Dichloride (107-06-2)	No	Yes	2B

12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to quickly evaporate. When released into the soil, this material may leach into groundwater. When released to water, this material is expected to quickly evaporate. When released into the water, this material is expected to have a half-life between 1 and 10 days. This material has a log octanol-water partition coefficient of less than 3.0. This material is not expected to significantly bioaccumulate. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of greater than 30 days. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition.
Environmental Toxicity:
This material is not expected to be toxic to aquatic life. The LC50/96-hour values for fish are over 100 mg/l. The EC50/48-hour values for daphnia are over 100 mg/l.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and

sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: ETHYLENE DICHLORIDE
Hazard Class: 3, 6.1
UN/NA: UN1184
Packing Group: II
Information reported for product/size: 4L

International (Water, I.M.O.)

Proper Shipping Name: ETHYLENE DICHLORIDE
Hazard Class: 3.2, 6.1
UN/NA: UN1184
Packing Group: II
Information reported for product/size: 4L

International (Air, I.C.A.O.)

Proper Shipping Name: ETHYLENE DICHLORIDE
Hazard Class: 3.2, 6.1
UN/NA: UN1184
Packing Group: II
Information reported for product/size: 4L

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
Ethylene Dichloride (107-06-2)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Ethylene Dichloride (107-06-2)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Ethylene Dichloride (107-06-2)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\--------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)

Ethylene Dichloride (107-06-2)	100	U077	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Pure / Liquid)

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Australian Hazchem Code: 2YE
Poison Schedule: No information found.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: 2 Flammability: 3 Reactivity: 0
Label Hazard Warning:
WARNING! FLAMMABLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER, KIDNEYS, AND CARDIOVASCULAR SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. POSSIBLE CANCER HAZARD. MAY CAUSE CANCER BASED ON ANIMAL DATA. Risk of cancer depends on duration and level of exposure.
Label Precautions:
Wash thoroughly after handling.
Do not breathe vapor.
Keep container closed.
Use only with adequate ventilation.
Do not get in eyes, on skin, or on clothing.
Keep away from heat, sparks and flame.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases call a physician.
Product Use:
Laboratory Reagent.
Revision Information:

Disclaimer:
****

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Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

International Chemical Safety Cards

TRICHLOROETHYLENE

ICSC: 0081

TRICHLOROETHYLENE
1,1,2-Trichloroethylene
Trichloroethene
Ethylene trichloride
$C_2HCl_3/ClCH=CCl_2$
Molecular mass: 131.4

CAS # 79-01-6
RTECS # KX4550000
ICSC # 0081
UN # 1710
EC # 602-027-00-9

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible under specific conditions. See Notes.		In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION	Risk of fire and explosion (see Chemical Dangers).		In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE			
INHALATION	Dizziness. Drowsiness. 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. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
INGESTION	Abdominal pain (further see Inhalation).	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Do NOT induce vomiting. Give plenty of water to drink. Rest.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. 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 (extra personal protection: self-contained breathing apparatus).	Separated from metals (see Chemical Dangers), strong bases, food and feedstuffs. Dry. Keep in the dark. Ventilation along the floor.	Do not transport with food and feedstuffs. IMO: Marine Pollutant Xn symbol R: 40 S: 23-36/37 UN Hazard Class: 6.1 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0081

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920890384

International Chemical Safety Cards

TRICHLOROETHYLENE

ICSC: 0081

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID, WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
The vapour is heavier than air. As a result of flow, agitation, etc., electrostatic charges can be generated.

CHEMICAL DANGERS:
On contact with hot surfaces or flames this substance decomposes forming toxic and corrosive fumes (phosgene, hydrogen chloride, chlorine). The substance decomposes on contact with strong alkali producing dichloroacetylene, which increases fire hazard. Reacts violently with metals such as lithium, magnesium aluminium, titanium, barium and sodium. Slowly decomposed by light in presence of moisture, with formulation of corrosive hydrochloric acid.

OCCUPATIONAL EXPOSURE LIMITS (OELs):
TLV: 50 ppm; 269 mg/m^3 (STEL): 200 ppm; 1070 mg/m^3 (ACGIH 1992-1993).

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 irritates the eyes and the skin. 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 could cause lowering of consciousness.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver and kidney (see notes).

PHYSICAL PROPERTIES

Boiling point: 87°C
Melting point: -73°C
Relative density (water = 1): 1.5
Solubility in water, g/100 ml at 20°C: 0.1
Vapour pressure, kPa at 20°C: 7.8

Relative vapour density (air = 1): 4.5
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.3
Auto-ignition temperature: 410°C
Explosive limits, vol% in air: 8-10.5
Octanol/water partition coefficient as log Pow: 2.42

ENVIRONMENTAL DATA

This substance may be hazardous to the environment; special attention should be given to water organisms.

NOTES

Combustible vapour/air mixtures difficult to ignite, may be developed under certain conditions. 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. Do NOT use in the vicinity of a fire or a hot surface, or during welding. Technical grades may contain small amounts of carcinogenic stabilizers.

Transport Emergency Card: TEC (R)-723
NFPA Code: H2; F1; R0;

ADDITIONAL INFORMATION

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International Chemical Safety Cards

1,1,2-TRICHLOROETHANE

ICSC: 0080

1,1,2-TRICHLOROETHANE
Vinyl trichloride
Beta-trichloroethane
$C_2H_3Cl_3$ / $CHCl_2CH_2Cl$
Molecular mass: 133.4

CAS # 79-00-5
RTECS # KJ3150000
ICSC # 0080
UN # 3082
EC # 602-014-00-8

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible under specific conditions. Heating will cause rise in pressure with risk of bursting. See Notes.	NO open flames. NO contact with hot surfaces.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	See Notes.		In case of fire: cool drums, etc., by spraying with water but avoid contact of the substance with water.
EXPOSURE		PREVENT GENERATION OF MISTS!	
INHALATION	Dizziness. Drowsiness. Headache. Nausea. Shortness of breath. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
SKIN	MAY BE ABSORBED! Dry skin.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
EYES		Safety spectacles, or face shield.	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. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	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 let this chemical enter the environment (extra personal protection: self-contained breathing apparatus).	Provision to contain effluent from fire extinguishing. Separated from strong oxidants, strong bases, many metals. Well closed. Ventilation along the floor.	Xn symbol R: 20/21/22 S: (2-)9 UN Hazard Class: 9 UN Packing Group: III Marine pollutant.

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0080

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International Chemical Safety Cards

1,1,2-TRICHLOROETHANE

ICSC: 0080

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
The vapour is heavier than air.

CHEMICAL DANGERS:
On contact with hot surfaces or flames this substance decomposes forming hydrogen chloride (see ICSC # 0163), phosgene (see ICSC # 0007), and other toxic gases. Reacts with strong oxidizers, strong bases and metals such as sodium, potassium, magnesium and powdered aluminium. Attacks many plastics, rubber, steel and zinc.

OCCUPATIONAL EXPOSURE LIMITS (OELs):
TLV: 10 ppm; 55 mg/m^3 (as TWA) (skin) (ACGIH 1993-1994).

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 can be reached rather quickly on evaporation of this substance at 20°C .

EFFECTS OF SHORT-TERM EXPOSURE:
The substance may cause effects on the central nervous system, kidneys, liver , resulting in central nervous depression, liver impairment and kidney impairment. Exposure at high levels may result in unconsciousness.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The liquid defats the skin.

PHYSICAL PROPERTIES

Boiling point: 114°C
Melting point: -36°C
Relative density (water = 1): 1.44
Solubility in water: none
Vapour pressure, kPa at 20°C: 2.5
Relative vapour density (air = 1): 4.6
Relative density of the vapour/air-mixture at 20°C (air = 1): 4.6
Explosive limits, vol% in air: 6-15.5
Octanol/water partition coefficient as log Pow: 2.35

ENVIRONMENTAL DATA

The substance is harmful to aquatic organisms.

NOTES

Flash point unknown in literature. Combustible vapour/air mixtures difficult to ignite, may be developed under certain conditions. Use of alcoholic beverages enhances the harmful effect. The relation between odour and the occupational exposure limit cannot be indicated. Do NOT use in the vicinity of a fire or a hot surface, or during welding.

NFPA Code: H 3; F 1; R 0;

ADDITIONAL INFORMATION

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920890388

International Chemical Safety Cards

1,1,2,2-TETRACHLOROETHANE

ICSC: 0332

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID, WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
The vapour is heavier than air.

CHEMICAL DANGERS:
The substance decomposes on burning under influence of air, moisture and UV light, producing toxic and corrosive gases including hydrogen chloride and phosgene. Reacts violently with alkali metals, strong bases and many powdered metals producing toxic and explosive gases. Attacks plastic and rubber.

OCCUPATIONAL EXPOSURE LIMITS (OELs):
TLV: 1 ppm; 6.9 mg/m^3 (as TWA) (skin) (ACGIH 1994-1995).
MAK: 1 ppm; 7 mg/m^3; skin, B (1992).

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 can be reached rather quickly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance irritates the eyes and the respiratory tract. The substance may cause effects on the central nervous system, kidneys and liver, resulting in depression of the central nervous system, kidney impairment and liver impairment. Exposure may result in unconsciousness. Exposure may result in death.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The liquid defats the skin. The substance may have effects on the central nervous system and liver , resulting in impaired functions.

PHYSICAL PROPERTIES

Boiling point: 146°C
Melting point: -44°C
Relative density (water = 1): 1.6
Solubility in water, g/100 ml at 20°C: 0.29
Vapour pressure, kPa at 20°C: 0.647
Vapour pressure, Pa at 25°C: 780
Relative vapour density (air = 1): 5.8
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.031
Octanol/water partition coefficient as log Pow: 2.39

ENVIRONMENTAL DATA

The substance is toxic to aquatic organisms. This substance may be hazardous to the environment; special attention should be given to its impact on the ozone layer.

NOTES

Use of alcoholic beverages enhances the harmful effect. The odour warning when the exposure limit value is exceeded is insufficient. Do NOT use in the vicinity of a fire or a hot surface, or during welding.

Transport Emergency Card: TEC (R)-719
NFPA Code: H3; F0; R1

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International Chemical Safety Cards

TETRACHLOROETHYLENE

ICSC: 0076

TETRACHLOROETHYLENE
1,1,2,2-Tetrachloroethylene
Perchloroethylene
Tetrachloroethene
$C_2Cl_4/Cl_2C{=}CCl_2$
Molecular mass: 165.8

CAS # 127-18-4
RTECS # KX3850000
ICSC # 0076
UN # 1897
EC # 602-028-00-4

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION			
EXPOSURE		STRICT HYGIENE!	
INHALATION	Incoordination. Exhilaration. Dizziness. Drowsiness. Headache. Nausea. Weakness. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
SKIN	Dry skin. Redness. Skin burns. Blisters.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
EYES	Redness. Pain.	Safety goggles, 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 (further see Inhalation).	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Do NOT induce vomiting. Give plenty of water to drink. Rest.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. 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.	Separated from metals (see Chemical Dangers), food and feedstuffs. Keep in the dark. Ventilation along the floor.	Do not transport with food and feedstuffs. IMO: Marine Pollutant Xn symbol R: 40 S: 23-36/37 UN Hazard Class: 6.1 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0076

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920890390

International Chemical Safety Cards

TETRACHLOROETHYLENE

ICSC: 0076

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID, WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
The vapour is heavier than air.

CHEMICAL DANGERS:
On contact with hot surfaces or flames this substance decomposes forming toxic and corrosive fumes (hydrogen chloride, phosgene, chlorine). The substance decomposes slowly on contact with moisture producing trichloroacetic acid and hydrochloric acid. Reacts with metals such as aluminium, lithium, barium, berrylium.

OCCUPATIONAL EXPOSURE LIMITS (OELs):
TLV: 50 ppm; 339 mg/m^3 (STEL): 200 ppm; 1357 mg/m^3 (ACGIH 1992-1993).

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 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.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver and kidney. Tumours have been detected in experimental animals but may not be relevant to humans (see Notes).

PHYSICAL PROPERTIES

Boiling point: 121°C
Melting point: -22°C
Relative density (water = 1): 1.6
Solubility in water, g/100 ml at 20°C: 0.015

Vapour pressure, kPa at 20°C: 1.9
Relative vapour density (air = 1): 5.8
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.09
Octanol/water partition coefficient as log Pow: 2.6

ENVIRONMENTAL DATA

This substance may be hazardous to the environment; special attention should be given to indoor air and water.

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. Do NOT use in the vicinity of a fire or a hot surface, or during welding. Technical grades may contain small amounts of carcinogenic stabilizers.

Transport Emergency Card: TEC (R)-722
NFPA Code: H2; F0; R0;

ADDITIONAL INFORMATION

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Hazardous Poly Occur: NO

Health Hazard Data

Signs/Symptoms Of Overexp: EYES/SKIN/INHAL: DUST IRRITATES;SOLID: WILL BURN & HARMFULIF SWALLOWED.
Emergency/First Aid Proc: EYES/SKIN: FLUSH WITH COPIOUS AMOUNTS OF WATER-CALL FOR MEDICAL AID; REMOVE CONTAMINATED CLOTHING & SHOES; INGEST: IF SWALLOWED & VICTIM IS CONSCIOUS,HAVE VICTIM DRINK WATER OR MILK -DONOT INDUCE VOMITING.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: SWEEP UP SPILLED SUBSTANCE; WASH REMAINDER AWAY WITH LARGE AMOUNTS OF WATER.
Waste Disposal Method: PRETREATMENT: NEUTRALIZE W/HYDROCHLORIC ACID TO GIVE CALCIUM CHLORIDE; TREAT CALCIUM CHLORIDE W/SODA ASH TO YIELD INSOLUBL CALCIUM CARBONATE. THE REMAINING BRINE SOLUTION(WHEN NACL CONC. <250 MG/L) MAY BE DISCHARGED INTO AUTHORIZED DRAIN
Precautions-Handling/Storing: STORE IN DRY PLACE & SEPARATE FROM ACIDS OR WATER; WEAR APPROPRIATE CLOTHING & EYE PROTECTION TO AVOID POSSIBLECONTACT.

Control Measures

Respiratory Protection: Q 25 MG/CUM:USE DUST MASK; 50 MG/CUM: DMXSQ/ FUHIEP/SA/SCBA;
Ventilation: SUFFICENT TO MAINTAIN AIR QUALITY BELOW TLV
Protective Gloves: REQUIRED
Eye Protection: SAFETY GOGGLES
Other Protective Equipment: AS APPROPR. TO PREVNT. ANY REASONBLE PROBABILTY OF SKN CONTC

Transportation Data

Trans Data Review Date: 83138
DOT PSN Code: CRE
DOT Proper Shipping Name: CALCIUM OXIDE
DOT Class: 8
DOT ID Number: UN1910
DOT Pack Group: III
DOT Label: CORROSIVE
IMO PSN Code: ZZZ
IMO Proper Shipping Name: NOT REGULATED FOR THIS MODE OF TRANSPORTATION
IATA PSN Code: EZP
IATA UN ID Number: 1910
IATA Proper Shipping Name: CALCIUM OXIDE
IATA UN Class: 8
IATA Label: CORROSIVE
AFI PSN Code: EZP
AFI Prop. Shipping Name: CALCIUM OXIDE
AFI Class: 8
AFI ID Number: UN1910
AFI Pack Group: III
AFI Label: CORROSIVE
AFI Basic Pac Ref: 12-7

Disposal Data

Disposal Data Review Date: 88085
Rec # For This Disp Entry: 02
Tot Disp Entries Per NSN: 003
Landfill Ban Item: YES
Disposal Supplemental Data: IN CASE OF ACCIDENTAL EXPOSURE OR DISCHARGE, cONSULT HEALTH AND SAFETY FILE FOR PRECAUTIONS.
1st EPA Haz Wst Name New: NOT REGULATED

SHAPE PRODUCTS -- CALCIUM OXIDE - CALCIUM OXIDE, TECHNICAL
MATERIAL SAFETY DATA SHEET
FSC: 6810
NIIN: 005972351
Manufacturer's CAGE: 3D869
Part No. Indicator: A
Part Number/Trade Name: CALCIUM OXIDE

General Information

Item Name: CALCIUM OXIDE, TECHNICAL
Company's Name: SHAPE PRODUCTS CO.
Company's Street: 1127 57TH AVE.
Company's City: OAKLAND
Company's State: CA
Company's Country: US
Company's Zip Code: 94621-4427
Company's Emerg Ph #: 415-534-1186
Company's Info Ph #: 415-534-1186
Record No. For Safety Entry: 002
Tot Safety Entries This Stk#: 003
Date MSDS Prepared: 01JAN85
Safety Data Review Date: 18MAY83
Supply Item Manager: CX
MSDS Serial Number: BFGXR
Hazard Characteristic Code: C3
Unit Of Issue: BG
Unit Of Issue Container Qty: 100 LB

Ingredients/Identity Information

Proprietary: NO
Ingredient: CALCIUM OXIDE
Ingredient Sequence Number: 01
Percent: >98
NIOSH (RTECS) Number: EW3100000
CAS Number: 1305-78-8
OSHA PEL: 5 MG/M3
ACGIH TLV: 2 MG/M3; 9192

Physical/Chemical Characteristics

Appearance And Odor: WHITE HYGROSCOPIC POWDER
Boiling Point: 5162F/28500
Vapor Pressure (MM Hg/70 F): N/A
Specific Gravity: 304
Solubility In Water: REACTION
Percent Volatiles By Volume: N/A

Fire and Explosion Hazard Data

Flash Point: N/A
Extinguishing Media: ITEM IS NOT COMBUSTIBLE
Special Fire Fighting Proc: MAY CAUSE FIRE ON CONTACT W/WATER & COMBUSTIBLES
Unusual Fire And Expl Hazrds: EXTINGUISH ADJACENT FIRES W/DRY CHEMICAL OR CARBON DIOXIDES; DONOT USE WATER ON ADJACENT FIRES

Reactivity Data

Stability: YES
Cond To Avoid (Stability): SITUATIONS WHERE ITEM MAY COME IN CONTACT W/ ACID OR WATER.
Materials To Avoid: WATER OR ACIDS -REACTS STRONGLY GENERATING HEAT
Hazardous Decomp Products: N/A

920890393

1st EPA Haz Wst Char New: NOT REGULATED BY RCRA
1st EPA Acute Hazard New: NO

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Label Data

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Label Required: YES
Label Status: F
Special Hazard Precautions: CONTACT CAUSES BURNS TO SKIN AND EYES. IF INHALED, MAY BE HARMFUL. FIRE MAY PRODUCE IRRITATING OR POISONOUS GASES. RUNOFF FROM FIRE CONTROL OR DILUTION WATER MAY CAUSE POLLUTION.
Label Name: SHAPE PRODUCTS
Label Street: 1127 57TH AVE.
Label City: OAKLAND
Label State: CA
Label Zip Code: 94621-4427
Label Country: US
Label Emergency Number: 415-534-1186

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920890394

EXHIBIT 15

SITE SAFETY - CONFINED SPACES

1.0 INTRODUCTION

It is well recognized that confined space activities, by nature, are hazardous operations.

A 1994 NIOSH study[1] identified that approximately 670 fatalities occur each year in confined space related incidents. During the ten year study, manufacturing employees were at greatest risk of dying in a confined space incident, followed by workers in agriculture, construction, transportation and mining. Of the 670 confined space fatalities, 45% were caused by asphyxiation, 41% were caused by poisoning, and 14% were caused by drowning. Thirty-six percent of the deaths occurred to rescuers when they tried to save an endangered co-worker.

A 1986 NIOSH study[2] found that more than 60% of confined space fatalities occurred among "would-be" rescuers. That is, rescue personnel who were well-intentioned, but ill-prepared for the tasks.

The OSHA standard for entry into permit required confined spaces (29 CFR 1910.146) addresses these hazards. This standard applies to general industry but does not currently apply to agriculture, construction, or to shipyard employment.

2.0 DEFINITIONS

All hazardous work areas are not confined spaces. The OSHA definitions for confined spaces are as follows.

1. "Workers Deaths in Confined Spaces: A Summary of Surveillance Findings and Investigative Case Reports" NIOSH Pub. No. 94-103, 1994.

2. NIOSH Alert: "Request for Assistance in Preventing Occupational Fatalities in Confined Spaces." U.S. Dept. of Health and Human Services NIOSH Pub. No. 86-110, 1986.

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2.1 Confined Space

1. Is large enough and so configured that an employee can bodily enter and perform assigned work;

2. Has limited or restricted means for entry or exit (for example tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry);

3. Is not designed for continuous employee occupancy.

2.2 Entry

The action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

2.3 Permit Required Confined Space

A confined space that has one or more of the following characteristics:

1. Contains or has a potential to contain a hazardous atmosphere;

2. Contains a material that has the potential for engulfing an entrant;

3. Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or

4. Contains any other recognized serious safety or health hazard.

2.4 Alternate Space Requirements

If the employer can demonstrate that the only hazard posed by the confined space is an actual or potential hazardous atmosphere, that space would be considered a non permit space if the following conditions are met:

a. Continuous forced air ventilation is provided and is sufficient to maintain the permit space safe for entry.

b. Monitoring and inspection data is available which supports the hazard has been abated.

c. Initial entry into the space to characterize it requires compliance with all the requirements of the standard.

d. Entrants must be trained in the potential hazards of the space.

e. Prior to entry the space must be tested for oxygen content, flammable gases and vapors, potential toxic air contaminants.

f. If a hazardous atmosphere is detected entrants must evacuate the space, and the space becomes a permit required confined space.

3.0 GENERAL REQUIREMENTS OF THE STANDARD

The standard requires employers to implement the following:

1. Conduct workplace evaluation to identify permit required confined spaces.

2. Post danger signs in the workplace where confined spaces exist.

3. If employees will be required to enter confined spaces a written confined space entry program must be developed. The program must include:

   a. Measures to prevent unauthorized entry.
   b. Identification and evaluation of the hazards of permit spaces before entry.
   c. Specific Operating Procedure for safe entry.
   d. Provision of personal protective, retrieval, and other equipment necessary to perform the work safely.
   e. An evaluation of permit space conditions.
   f. Provision of an attendant outside permit required space entries.
   g. Where multiple spaces are monitored by one

attendant, procedures must be in place to enable effective response and attendant responsibilities simultaneously.

i. Designation of persons who are to have active roles.

j. Rescue procedures.

k. System for development and implementation of permits.

l. Procedures to coordinate activities of multiple employers in the permit required confined space.

m. Procedures to conclude the entry after operations are completed.

n. Procedures to revise permit and operations as conditions change during entry activities.

o. Annual review of entries based on permits. (Permits must be saved for at least one year).

4. Develop and utilize a permit system.

5. Train employees.

6. Coordinate with contractors.

3.1 Team Concepts and Responsibilities

Entry into a permit-required confined space requires the coordination of the entire entry team. There are four roles that must be accomplished each time an entry is made. These roles are entry supervisor, attendant, and authorized entrants.

3.1.1 Entry Supervisor

The entries supervisor is the person authorizing or in charge of entry. That individual is responsible for the following:

1. Ensuring that the permit contains the required information.

2. Ensuring that the proper procedures, practices, and equipment are available before allowing entry.

3. Determining that the conditions of the permit are being met, and that acceptable entry conditions are present throughout the course of the work.

4. Canceling the entry authorization and terminate entry whenever acceptable entry conditions are not present.

5. Ensuring that the permit space has been closed off, or other actions necessary to conclude the confined space entry operation. This includes canceling the permit.

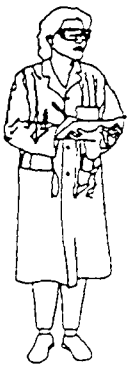
6. Ensuring that unauthorized personnel are kept out the confined space areas.

7. Verifying that rescue services are available and that the means for summoning them are operable

The supervisor may also serve as an entrant or attendant if trained to perform these duties.

3.1.2 Attendant

An attendant shall be stationed and remain outside the permit space at all times during entry operations. The attendant shall perform the following duties:



1. Continuously maintain an accurate count of all persons in the confined space.

2. Be aware of and recognize potential permit space hazards and the possible behavioral effects.

3. Monitor activities inside and outside the permit space to determine if it is safe for entrants to remain in the space.

4. Maintain effective, continuous contact with entrants during entry.

5. Order authorized entrants to evacuate the permit space immediately when:

   a. The attendant observes a condition which is not allowed in the entry permit.
   b. The attendant observes behavioral effects of hazard exposure.

c. The attendant detects a situation outside the space which could endanger the entrants.

d. The attendant detects an uncontrolled hazard within the permit space.

e. The attendant is monitoring more than one space, and must attempt rescue of entrants from one of those spaces.

f. The attendant must leave the work station.

6. Summon rescue and other emergency services as soon as the attendant determines that authorized entrants need to escape from the permit space.

7. Request unauthorized persons to leave the permit space area, and warn authorized entrants of the presence of unauthorized persons in the permit space.

8. Do not enter the permit space to attempt rescue. Properly use any rescue equipment provided for their use and perform any other assigned rescue and emergency duties.

3.1.3 Authorized Entrants

Authorized entrants shall perform the following duties:

1. Know the hazards which may be faced during entry.

2. Recognize the signs and symptoms of exposure to a hazard.

3. Understand the consequences of exposure to a hazard.

4. Maintain contact with the attendant.

5. Notify the attendant when the entrants self-initiate evacuation of a permit space.

6. Maintain awareness of the personal protective equipment needed for safe entry and exit. Use this protective equipment properly.

7. Maintain awareness of external barriers needed to protect entrants from external hazards.

8. Exit the permit space when the attendant orders evacuation, an evacuation alarm is activated, or the entrants perceive that they are in danger.

3.2 Rescue and Emergency Services

Rescue services must be available from either an in-house rescue team or an arrangement with an outside rescue team.

1. In-house rescue team responsibilities include:

   a. Must receive the training of authorized entrants and that for rescue.

   b. Must practice making simulated rescue operations at least once every 12 months. These simulations should approximate permit spaces from which rescues may be required.

   c. Each member of the rescue service must be trained in basic first-aid and CPR. At least one member of the rescue service holding current certification in first-aid and CPR shall be available.

2. Outside rescue teams:

   a. Outside rescue teams must be made aware of the hazards they may confront when called upon to perform rescues.

3. Non-entry rescue

   a. To facilitate non-entry rescue, retrieval systems or methods shall be used whenever an authorized entrant enters a permit space, unless the retrieval equipment increases the overall risk of the entry.

b. Each authorized entrant shall use a chest or full body harness, with a retrieval line attached at the center of the entrant's back or above the head.

c. Wristlets may be used in lieu of the chest or full body harness if the employer can demonstrate that the use of a chest or full body harness is infeasible or creates a greater hazard.

d. A mechanical device shall be available to retrieve personnel from vertical type permit spaces more than 5 feet deep.

4. If an injured entrant is exposed to a substance for which a Material Safety Data Sheet (MSDS) or other similar written information is required to kept at the worksite, that MSDS or written information shall be made available to the medical facility treating the exposed entrant.

3.3. Employer-Contractor Relationship

The host employer must provide information to the contractor on all hazards of the space and coordinate operations with the host employer. The contractor must train their employees and must follow all procedures identified by the host employer.

3.4 Permit System

Once a decision has been made to enter a confined space, a permit must be completed. The permit serves as written approval and authorization for an entry of a specific space for a specific task. The permit certifies that existing and potential hazards have been evaluated and identifies the protective measures specified to ensure worker safety. The entry permit, when completed, will serve as a final safety briefing outline before entry and will be reviewed with the entry team and standby personnel. The entry permit will identify:

1. The location of the confined space and the purpose of the entry.

2. The supervisor in charge of the entry.

3. The date, time, and duration of the permit.

4. Personnel serving as authorized entrants, eligible attendants, supervisors of entrants, and individual authorizing the entry.

5. Isolation and other procedures used to control hazards:

   a. Blanking and/or disconnecting of all lines.
   b. Electrical lockout and tagout (both).
   c. Mechanical isolation and tagout (both).
   d. Mechanical ventilation (volumes).

6. Known and potential hazards that may be encountered in the confined space.

7. Acceptable environmental conditions, quantified with regard to the hazards identified in the permit space, which must be maintained during entry.

8. Safety and personal protective equipment required:

   a. Personal protective equipment.
   b. Safety harness and/or lifelines.
   c. Extraction devices.
   d. Tools and electrical equipment approvals (including lighting and communications devices).

9. Atmospheric monitoring:

   a. Oxygen level.
   b. Combustible gas/vapor level.
   c. Toxic substances level.

10. Emergency procedures and rescue equipment.

11. Other required permits, such as hot work.

3.5
Training

Training shall be provided before the employee is first assigned duties, whenever there is a change in permit space operations that presents a hazard for the employee has not been trained, whenever the employee believes that there are inadequacies in procedures or

knowledge. The employer must certify the training was completed. The certification shall include a list of the students, the signatures of the instructors, and the dates of the training.

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KEY POINTS

- Confined spaces are:
  - Large enough and configured so employees can enter and perform work.
  - Have limited means of entry or exit.
  - Not designed for continuous occupancy.
- The OSHA standard requires monitoring, use of permit system, team work, employee training and rescue provisions.

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State of New Jersey

DEPARTMENT OF ENVIRONMENTAL
PROTECTION AND ENERGY

CHRISTINE TODD WHITMAN
Governor

ROBERT C. SHINN, JR.
Commissioner

JUL 13 1994

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Leon Mattioli
Allied Signal, Inc.
P.O. Box 1017
Markus Hook, PA 19061

RE: Administrative Consent Order (ACO) In the Matter of Allied-Signal, Inc.
Elizabeth City, Union County
Remedial Investigation Report and Conceptual Remedial Action Plan Dated:
February 18, 1994
ISRA Case #86103

Dear Mr. Mattioli:

This is to advise you that the New Jersey Department of Environmental Protection and Energy (NJDEPE) has completed a review of the Remedial Investigation Report and Conceptual Remedial Action Plan dated February 18, 1994. Based on the review, the proposal is unacceptable.

Allied-Signal, Inc. shall submit a Revised Remedial Action Workplan pursuant to N.J.A.C. 7:26E, the Technical Requirements for Site Remediation, and the referenced ACO, which shall contain, at a minimum, a proposal that addresses all of the conditions stated below. The Remedial Action Workplan shall be submitted within 60 calendar days of the receipt of this letter pursuant to the referenced ACO. If Allied-Signal, Inc. fails to submit the required Remedial Action Workplan within the referenced time frame, this case will be referred to the Bureau of Applicability and Compliance for review. This letter does not represent an extension or modification of the time frames for compliance.

On February 22, 1994, the New Jersey Department of Environmental Protection and Energy (NJDEPE) promulgated the ISRA Fee Rule amendments at 26 N.J.R. 1142, which were proposed on April 5, 1993 at 25 N.J.R. 1375. Pursuant to the fee rule amendments, the NJDEPE will bill an owner or operator according to the direct billing formula at N.J.A.C. 7:26B-1.10(f)2. At this time, the NJDEPE intends to process bills on a semi-annual basis. The NJDEPE encourages responsible parties to use the "Technical Requirements for Site Remediation" (N.J.A.C. 7:26E) as well as any other NJDEPE guidance documents to assist in remediation activities and thereby minimize NJDEPE review time. The complexity of the environmental contamination at the site and the quality of the workplans and reports submitted to the NJDEPE will dictate the oversight costs to the regulated community.

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I GROUND WATER

The ground water Remedial Action Workplan (RAW) proposal within the above referenced document is unacceptable. A revised RAW, which addresses all of the conditions below, shall be submitted.

OVERALL GROUND WATER REQUIREMENTS

Allied Signal shall submit a proposal for active remediation and hydraulic control. Allied Signal shall propose a ground water recovery method, a ground water treatment method, a discharge point for treated ground water, compliance point wells, source area wells, a quarterly sampling program and a hydraulic monitoring program. Allied Signal may want to take a phased approach, and submit a proposal for the delineation required below, a proposal for any aquifer testing necessary to develop a ground water recovery plan, a proposal for the work required in other conditions of this letter, and a conceptual ground water recovery and treatment plan, then submit a final Remedial Action Workplan with the results. Allied Signal shall also begin evaluating options for disposal of recovered ground water as soon as possible.

Unless Allied Signal provides a more detailed interpretation of ground water contamination in which individual contaminant plumes are identified and correlated to specific source areas, the Department will treat the site as if it were underlain by a single dissolved phase plume that requires remediation. Allied Signal will be required to establish compliance wells around the perimeter of the contaminant plume, up-gradient of surface water receptors. Allied Signal will be required to achieve hydraulic control of the contaminant plume to the extent that the ground water cleanup standards are maintained at the compliance wells throughout the duration of the cleanup. Quarterly sampling of compliance wells and hydraulic monitoring will be required to demonstrate that hydraulic control is adequate.

Allied Signal will not necessarily be required to remediate all ground water up-gradient of the compliance points to cleanup standards. Rather, Allied will be required to remove all DNAPL and LNAPL (see Conditions No. 1 and No. 2 below) and to remove as much dissolved phase contamination as feasible, and will then be allowed a post-remediation monitoring period to demonstrate that contamination has been reduced to the extent that it will naturally attenuate without causing an exceedance of cleanup standards at the compliance wells in the absence of hydraulic control. Quarterly monitoring at contaminated wells (source area wells) will be required to assess the progress of the cleanup.

Compliance wells should be wells that are clean, or wells that are only slightly contaminated and that will become clean once contaminant source areas have been hydraulically isolated through ground water recovery. Given the Phase III results, wells (moving clockwise) 24, 1, 14, 6, 4, 27 and 22 may all be suitable as compliance points. However, more detailed delineation appears necessary in areas shown on the attached map in order to identify the extent of contamination that requires capture and in order to establish a sufficient number of compliance wells.

While Allied Signal may petition the Department for reclassification of ground water at the site to IIB status, Allied is advised that according to the Ground Water Quality Standards, ground water areas subject to petition for reclassification shall constitute at least a significant portion of one or more geologic units or formations. That is, the Department will not reclassify on a site-by-site basis. Furthermore, reclassification from IIA to IIB status would not change the standards applicable to the site as, according to the Ground Water Quality Standards, the IIB criteria "shall be the Class-IIA criteria." Regarding the IIIB Classification, the Department finds that the shallow ground water zone does not qualify for IIIB status, given the failure of all of the wells to meet the minimum chloride and TDS criteria (ground water quality in the lower aquifer does meet these IIIB criteria.)

Additionally, the Ground Water Quality Standards, N.J.A.C. 7:9-6.7(g), state "Where ground water that receives pollutants from a discharge(s) subsequently flows to surface waters, the Department shall regulate such discharges as necessary so as not to exceed the Surface Water Quality Standards applicable to that body of surface water. The discharger may request application of only the ground water quality standards by showing, to the satisfaction of the Department, and in the context of the applicable regulatory procedure, that the flow of ground water pollutants into the surface water will not cause a violation of the Surface Water Quality Standards."

AREA SPECIFIC GROUND WATER REQUIREMENTS

1. MW23 contained DNAPL during Phase II (apparently none was observed in the well during Phase III), and wells MW16, MW17 and MW28 contain dissolved phase concentrations indicative of DNAPL (a concentration of 1% the solubility of a substance or greater is believed indicative of separate phase). Allied Signal shall submit a proposal to recover the DNAPL that is presumed present in at least the immediate area of MW23, and shall submit a proposal to investigate the presence of product in each of the other three wells. Allied shall also propose to check each significantly contaminated well for DNAPL during future sampling events.

2. LNAPL was found in new well MW30 in Phase III at a thickness of 3" - 1'. Allied sampled the LNAPL for VOs. The LNAPL was found to contain 443,500 ppb VOs, including largely 2,3-dihydro-1H-indene and various benzene compounds with smaller amounts of fluorocarbons, xylene and chlorinated compounds. Allied Signal shall submit a proposal for delineation and recovery of this LNAPL because MW27 is not sufficient for delineation of the product in MW30. MW27 appears to be down-gradient of MW30 but also appears to be located over 150' away. Significant product could still be present down-gradient of MW30. Additional wells shall be proposed down-gradient of MW30 as shown on the attached map.

Also, while Allied Signal believes that product in MW30 may be from the nearby fuel oil ASTs, the TPHC concentrations in soil in Area 2B suggest that an extensive area side-gradient of MW30 and the ASTs might be underlain by product, possibly due to the "Old Oil Spill." Therefore, Allied Signal shall propose installation of at least one well within the spill area, as shown on the attached map.

3. MW22, installed to investigate ground water quality at Area 1A (Former Gasoline and Diesel Tanks) is located on the up-gradient side of the area. A new well must be installed down-gradient of the area. The well shall be screened through the water table. The well shall be checked for floating product and shall be sampled for VO+15.

4. Soil in boring B126 in Area 3F (Fuel Oil ASTs) contained TPHC at up to 12,000 ppm and vertical delineation has not been required (VOs and BNs were not associated with the TPHC). The boring log did not indicate free product but a hydrocarbon odor was noted. The Department is concerned about free product on the water table in this area. Allied Signal shall inspect the drainage ditch water down-gradient of Area 3F for a product sheen and shall report the distance between boring B126 and the drainage ditch. Installation of a well may be required based on Allied Signal's response.

5. Allied Signal shall clarify the status of W-3. Allied Signal shall indicate whether this well needs to be abandoned and replaced.

6. Figure 3.1 , Locations and Contents of Storage Tanks, submitted in the March, 1992 report, shows a "chlorocarbon terminal" east of the Genesolv Blends and Warehouse building. According to the figure, the terminal contained ten storage units, with a total capacity of 44,000 gallons, that stored various chlorinated compounds. This area was apparently never identified as an area of concern. Allied shall provide a detailed description/history of this area and submit a remedial investigation workplan proposal.

II SOILS

The above referenced document reports the results of a phase III sampling activities, and offers proposals for all areas of concern. The proposals are acceptable for some areas and unacceptable for others. Allied seemed to change directions for several areas of concern resulting in the need for further investigation at those areas.

The Department acknowledges that Allied Signal plans to remediate some of the soils to the Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC).

Allied Signal shall inform the Department, per Section 4i of P.L. 1993. c139., as to the basis upon which the decision was made to remediate soils to the Non-Residential Direct Contact Soil Cleanup Criteria. Allied Signal shall submit to the Department, per P.L. 1993. c139. Section 4i paragraph 6, the cost difference between implementing the residential criteria and non-residential criteria.

Allied Signal is also advised that Section 36 of P.L. 1993. c139., has specific requirements when a property is remediated to the Non-Residential Direct Contact Soil Cleanup Criteria (i.e. **the area(s) to be included in the Declaration of Environmental Restriction must be delineated to the Residential Direct Contact Soil Cleanup Criteria**). Allied Signal may refer to N.J.A.C. 7:26E-4.1(b) for establishing a contaminant gradient. The Department's most recent version of a Declaration of Environmental Restriction is attached.

This information as well as, a map delineating the area(s) to be included in the Declaration of Environmental Restriction to the Residential Direct Contact Soil Cleanup Criteria (RDCSCC) at all depths where contamination was found and a proposal for implementing engineering/institutional controls shall be included in the next submittal.

INDIVIDUAL AREAS OF CONCERN

1. AOC 1A - Former Gasoline and Diesel UST's: Several USTs and an AST were removed in this area. Elevated levels of hexachlorobenzene and PHC were detected in the area. The hexachlorobenzene was found at the surface and at the water table at levels exceeding nonresidential health based levels. Arsenic and Beryllium are also present at elevated levels. PHC concentrations exceeded 10,000 ppm at one location.

Proposal: Allied proposes no further remedial action because the risk is reduced due to paving.

Requirement: The proposal is unacceptable. The Department has requested characterization and delineation in this area for years. The request was waived because Allied proposed to investigate the efficacy of VES/bioventing (6/28/93 correspondence G&M to DEPE) remediation in the area. The Department believed that characterization and/or remediation would be achieved through this activity. It is necessary to delineate and characterize the PHC and hexachlorobenzene contamination in the area in accordance with the Technical Requirements for Site Remediation. The metals levels found may be due to fill and should be treated accordingly. An expansion of the area to be included in the Declaration of Environmental Restriction (DER) may be acceptable in lieu of further sampling.

2. AOC's 1B, 1C & 1D - Former Truck Parking Area, UST Adjacent to the Administration & Alleged Drum Storage Area: No further action was accepted for these areas however, levels exist above the Residential Direct Contact Soil Cleanup Criteria at AOC's 1B and 1C. Allied shall submit a proposal for a Declaration of Environmental Restrictions in these areas.

3. AOC 2A and 2B - Former Sulfuric Acid Production and Old Oil Spill Areas: There were two areas investigated because of oil spills. Levels of PHC to 70,000 ppm and BAP at 1.1 ppm were detected in the area. Only one location had BAP above the current cleanup criteria however, most of the samples had very elevated MDL's for the BN analyses. Free product was detected in a well in the spill area.

Proposal: Pave and implement a Declaration of Environmental Restriction.

Requirement: Allied states that no delineation is required since the worst case areas have been sampled. This is unacceptable, at a minimum it is necessary to delineate the contamination in this area to the Residential Direct Contact Soil Cleanup Criteria to establish the area to be included in the DER. Furthermore soil remediation shall be tied to groundwater remediation. Allied had proposed to investigate the efficacy of VES/bioventing in this area, but did not pursue this.

4. AOC 3A - Drum Storage Area Adjacent to Boring B-11: Several locations have elevated levels of BN and one had elevated Be levels.

Proposal: Pave and implement institutional controls.

Requirement: The proposal is conditionally acceptable. Allied Signal shall implement a Declaration of Environmental Restriction which requires delineation to the Residential Direct Contact Soil Cleanup Criteria.

5. AOC's 3B and 3C - Drum Storage Area Adjacent to Boring B-12 and Drum Storage Area Adjacent to Boring B-21: The one exceedance of the Residential Direct Contact Soil Cleanup Criteria in each of these areas (Pb=129 ppm and Sb=16.2 ppm, respectively) meets the compliance averaging criteria. Therefore, no further action has been approved for these areas.

6. AOC 3D - Process Structures: Metal and BN contamination has been detected at levels exceeding the Non-Residential Direct Contact Soil Cleanup Criteria.

Proposal: Pave the area and implement institutional controls.

Requirement: The proposal is conditionally acceptable. A Declaration of Environmental Restriction shall be implemented which requires delineation to the Residential Direct Contact Soil Cleanup Criteria as well as, provisions for maintenance of cap.

7. AOC 3E - Chloroform Tanks: No further action was previously approved because levels are below the Residential Direct Contact Soil Cleanup Criteria.

8. AOC 3F - Fuel Oil Tanks: A sample collected within this area had PHC levels of 12,000 ppm. The Department requested sampling below a drain pipe in this area. Allied indicates that this pipe does not exist.

Proposal: Pave the area and implement institutional controls.

Requirement: The proposal is conditionally acceptable. A Declaration of Environmental Restriction shall be implemented which requires delineation to the Residential Direct Contact Soil Cleanup Criteria. Also, if later it is verified in the field that the drain pipe exists sampling may be required.

9. AOC 3G - G-11 Tanks: No further action is required because levels are below the Residential Direct Contact Soil Cleanup Criteria.

10. AOC 3H - Former Lagoon Area: This area was a former lagoon. Numerous samples were collected for metal and VO analyses. Elevated levels of contaminants were found in different parts of the AOC and groundwater has been impacted.

Proposal: Allied states "No further action is recommended for the former lagoon area because the excess lifetime cancer risk (ELCR) for 1,1,2,2-tetrachloroethane (4E-6) was lower than 1E-5, which is the ELCR standard for a Class C carcinogen."

Requirement: The proposal is unacceptable. **Pursuant to P.L. 1993. c139. Section 35f.(1) a person performing a remediation may submit to the Department a request to use alternative residential use and non-residential use soil remediation standard and based on the proposed standard propose a remedial action. The reference to using a site specific risk assessment (35f.(1)) involves generating the alternate standard, not to determine the need for a remedial action as stated in Allied's baseline risk assessment. The alternate soil remediation standard can use site specific risk assessment protocol consistent with CERCLA to generate a level to compare site data by area of concern (AOC) as pursuant to the *Technical Requirements for Site Remediation*, N.J.A.C. 7:26E.**

A "risk assessment" is not used to determine the need for remedial action. Additionally, the risk assessment is not acceptable because of the way the Department defines an AOC.

Therefore, as indicated in previous correspondence, Allied shall delineate the contamination, and propose an appropriate remediation. Soil remediation shall be done with consideration for the fate of groundwater.

11. AOC 4A - Boring B-24 Area: Elevated metals levels were found at a location during the Phase I investigation. The contaminants included Be and Zn at 9.1 and 1850 ppm respectively, exceeding the Non-Residential Direct Contact Soil Cleanup Criteria, and Cd and Pb at 4.5 and 365 ppm.

Proposal: Allied proposes no further action.

Requirement: Allied shall remove the contaminated soil from this area or include it as part of areas to be paved and implement a Declaration of Environmental Restriction, which requires delineation to the Residential Direct Contact Soil Cleanup Criteria.

12. AOC 4B and 4C - Drum Storage Areas and Temporary Drum Staging Area: No further action is acceptable because levels are below the Residential Direct Contact Soil Cleanup Criteria.

13. AOC 4D - Alleged Drum Storage Area: No further action is required because levels are below the Residential Direct Contact Soil Cleanup Criteria.

14. AOC 5 - Electrical Substations: Two locations had PCB concentrations right at the non-residential cleanup criteria and one location exceeded the residential level. NFA was approved in the Department's 7/11/91 letter to Allied. *Therefore, the NFA shall stand however,* Allied shall implement a Declaration of Environmental Restriction, which requires delineation to the

Residential Direct Contact Soil Cleanup Criteria, and institutional controls in this area because PCB levels exceed the Non-Residential Direct Contact Soil Cleanup Criteria.

15. AOC 6 - Drainage Ditches: Contamination has been detected in the ditches around the site.

Proposal: Allied proposes no further action for the drainage ditches.

Requirement: The Department required the following sampling in the Remedial Investigation Workplan approval issued July 22, 1993 in order to do an assessment: Allied shall collect several additional samples within the public ditch. A sample shall be collected from the surface of the sediment at the mouth of the ditch, at SS-4, at two locations 400 and 800 feet upstream from SS-4 and at SS-6. The previous samples were collected 6-12" below the sediment surface. It shall be noted that the highest elevation of contamination for many of the contaminants were directly downgradient of outfall 002. The contamination within the site drainage ditch shall be treated as surface contamination. Vertical delineation samples shall be collected from 18-24" and analyzed for target metals at SS-3 and SS-7. Allied shall refer to the Department's Draft Guidance for Sediment Quality Evaluations, for Allied's use in evaluating the sediment quality. Further investigation regarding the Newark Bay may also be required. Allied shall conduct this sampling as outlined above.

In addition Allied had proposed to conduct a study to determine the history of discharges from other facilities into the drainage ditch. Allied shall also conduct this study.

16. AOC 7 - Background and Random Soil Borings: The Department requested a sample be collected to determine if levels of Pb and As were isolated hits or associated with a discharge. The delineation samples showed that the original hit was isolated.

Proposal: Allied proposes no further action.

Requirement: This proposal is acceptable because contaminants meet the compliance averaging criteria.

17. AOC 8 - Stressed Vegetation: Areas of stressed vegetation were sampled in the Phase III investigation, samples were analyzed for VO's, pH, PPM, TOC, and particle grain size. No contaminants were detected above cleanup criteria, however, the pH at 7 out of 10 locations was below 3.

Proposal: Allied proposes no further action.

Requirement: Allied shall remediate the pH in the areas of stressed vegetation. This remediation should be inexpensive and will improve the environmental quality of the area.

If you have any questions regarding this letter, please contact the Case Manager, Stephen Myers, at (609) 633-7141.

Sincerely,

for Bryan Moore

Douglas Stuart, Chief
Bureau of Environmental Evaluation and
Cleanup Responsibility Assessment

c: Nicholas Valkenburg, Geraghty & Miller, Inc.
Samuel Ezekwo, USEPA Region II
Kenneth Sandor, Health Officer
Kris Geller, BEERA
Beverly Phillips, BGWPA