FINAL

INTERIM REMEDIAL MEASURES WORK PLAN

Approved for:

36 Sylvester Street Site
Site Code 1-30-043U
Westbury, New York

Prepared for:

The New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, New York

April 2002

IMPACT ENVIRONMENTAL

a division of impact environmental consulting, inc.

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Jim Allen
Project Manager

Kevin C. Kleaka
Quality Assurance Officer

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Grand Machinery Exchange, Inc.	1
Impact Environmental Consulting, Inc. Corporate Records	1

1. INTRODUCTION

This Draft Interim Remedial Measures (IRM) Work Plan documents the remedial activities proposed to address the pollution source identified on the property located at 36 Sylvester Street, Westbury, New York, herein identified as the Site. The scope of this work plan is based upon the results of the preliminary Focussed Remedial Investigation (FRI) activities conducted at the Site. This IRM Work Plan is submitted in accordance with the provisions of the Order on Consent # W1-0863-00-01 between the New York State Department of Environmental Conservation (NYSDEC) and Grand Machinery Exchange, Inc.

In 1999, the Site was listed on the New York State registry of Inactive Hazardous Waste Disposal Sites resulting from a NYSDEC investigation. The NYSDEC investigation indicated that the Site was potentially a contributing source of chlorinated organic groundwater contamination. Consequently, the Site was designated as site code 01-30-043U by the NYSDEC. In 2001, Impact Environmental Consulting, Inc. performed FRI activities to identify the nature, source and extent of any contamination at the Site. Specifically, the performance of the FRI was designed to acquire strategic data to confirm or refute the Site as a contributory source of groundwater contamination. An evaluation of the preliminary FRI results indicated that the Site is not a contributing source of the regional chlorinated organic groundwater contamination. However, soil contamination was confirmed at isolated areas of the Site that required remedial activities. These confirmed point pollution sources will be the focus of the IRM procedures implemented under the scope of this work plan.

The methodologies used of this work plan were based, in part, upon the following documents: the NYSDEC Technical and Administrative Guidance Memorandum # 4030, Selection of Remedial Action at Inactive Hazardous Waste Sites; the USEPA Compendium of Superfund Field Operations Methods, dated September 1987; and the USEPA Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERLA, dated October 1988.

The tasks to be performed under the scope of the IRM process have been summarized in this report in the following sections.

- **Site Background and Setting**
- **Interim Remedial Measures**
- **Health and Safety Plan**

Presented herein is the proposed Draft Interim Remedial Measures Work Plan to be implemented by Impact Environmental Consulting, Inc. for the Site.

2. SITE BACKGROUND AND SETTING

2.1 Site Location

The Site is located at 36 Sylvester Street, Westbury, New York and is designated by the Nassau County Tax Assessors Office as Section 11, Block 77, Lots 21-24 and 56-59 (see **Plate 1:** Site Location Map, Westbury, New York). This location is bordered by Sylvester Street to the west, New York Avenue to the east, and is situated between Main Street to the north and Old Country Road to the south. The areal extent of the Site is approximately 20,000 square feet. The Site contains one single-story, masonry building with a footprint of 12,125 square feet. The surface area of the Site consists of asphalt parking areas and concrete walkways. The Site exhibits low topographic relief (one to three percent slopes). Refer to **Plate** 2**:** Site Map, Westbury, New York.

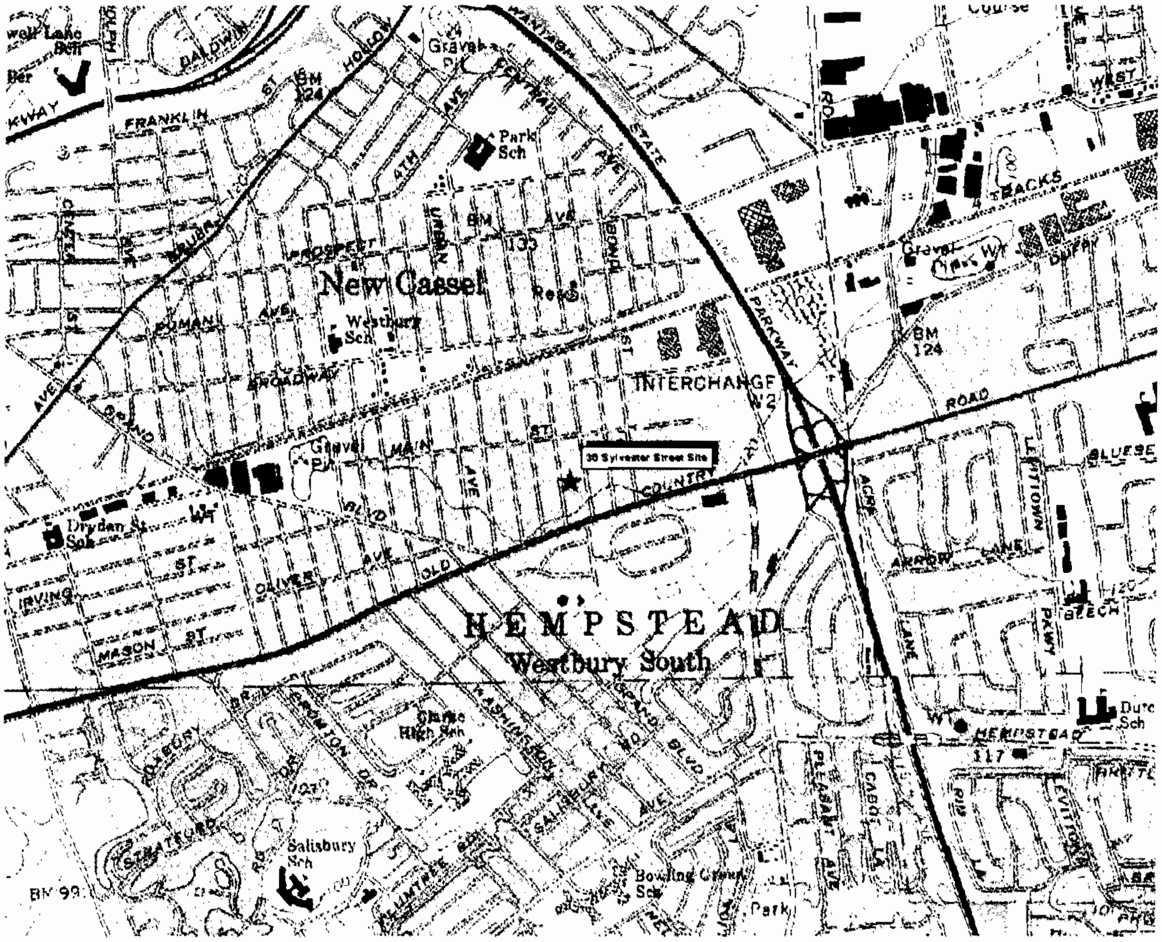
2.2 Site History

A review of local government records under the freedom of information law was conducted to provide information regarding historic Site conditions. This review has revealed the following relevant information regarding the Site.

The Site was initially developed circa 1952 with a one-story, masonry building. The building was improved with an addition onto the eastern portion of the building in June 1953. The footprint of the building was constructed over a majority of the lot, with the exception of alleys on the north and south portions of the Site. The building was historically used for industrial applications that included the manufacturing of precision machinery. Former occupants of the Site included American Express Field Warehousing Corp., Universal Transistor Products Corp. and National Gear Products.

The building interior facilitated plumbing fixtures that included several bathroom sinks and toilets, a slop sink and floor drains. The building was heated with an oil-fired burner system that was installed as part of the original construction. Said system was fueled from exterior underground fuel oil storage tanks. Circa 1991, the oil-fired heating system was converted to a natural gas-fired heating system and the exterior underground fuel oil storage tanks were removed to the satisfaction of the Nassau County Health Department. The building was serviced by an on-site sanitary disposal system that consisted of a septic tank and one cesspool at the time of construction. The building was connected to the municipal sewer system in January 1987. On-site chemical storage associated with the operations of previous occupants included cutting and lubricating oils, mineral spirits and waste oils. Presently, the Site is operated by Gel-Tec, a division of Tishcon Corp. The interior of the building is primarily utilized as a warehouse unit by Gel-Tec.

Plate 1: Site Location Map
Westbury, New York



Scale 1:24000
CONTOUR INTERVAL 10 FEET
DASHED LINES REPRESENT 5 – FOOT CONTOURS
DATUM IS MEAN SEA LEVEL
DEPTH CURVES AND SOUNDINGS IN FEET – DATUM IS MEAN LOW WATER

2.3 Geological Background Study

2.3.1 Subsurface Geology

The geology of Long Island consists of thick deposits of unconsolidated, water bearing sediments resting upon a relatively impermeable, crystalline bedrock surface. The sequence of events that shaped Long Island's geology is not known with certainty, but it probably began with the formation of the original basement rocks in early Paleozoic to Precambrian time more than 400 million years ago. These basement rocks were heated and compressed (metamorphosed) by folding and faulting, producing a rugged, mountainous topography. During the subsequent period ending with the late Cretaceous Epoch 100 million years ago, erosion reduced the land to a nearly planer surface that gently tilted to the southeast.

During the late Cretaceous Epoch (60-100 million years ago), streams brought sediments from the north and the west to the Long Island area on the continental margin, forming a permeable sand layer (Lloyd Sand Member of the Raritan Formation) and overlying clay member (clay member of the Raritan Formation) upon the bedrock surface. After a short period of erosion or non-deposition, thick, permeable beds of river delta clay, sand, and gravel were deposited on the Raritan Formation; these deposits comprise the Magothy Aquifer. Toward the close of the Late Cretaceous period (approximately 60 million years ago), a sand and clay unit (Monmouth Group) of low permeability was deposited in shallow marine waters in the area that now constitutes Long Island's south shore.

A long period of non-deposition, or possibly deposition followed by erosion, occurred after the Cretaceous era. Geologic activities during this time left few sedimentary traces, but streams flowing across Long Island cut deep valleys into the Magothy. It was not until late Pleistocene (Wisconsinian) glaciation- some 20 to 200 thousand years ago- that there were any significant additions to Long Island's geologic record. Valleys were filled and the other deposits were almost completely buried by glacial deposits. Prior to the southward movement of the Pleistocene ice sheets to Long Island, an extensive clay unit (Gardiners Clay) was deposited in shallow marine and brackish waters along the shores of what is now Suffolk County. This unit rested upon the Magothy and Monmouth Group, and acted as a confining layer. The northern portions of the Gardiners were subsequently eroded by advancing ice and glacial meltwaters, and Gardiners Clay beds are now found only in the south shore area.

In the area of the Site the bedrock exists at an elevation of approximately seven hundred feet below sea level. The top of the Raritan confining unit exists at an elevation of five hundred feet below sea level (Smolensky and Feldman, 1988). The top of the Magothy Aquifer exists at an elevation of approximately 30 feet above sea level. There is no confining layer with extensive horizontal continuity overlying the Magothy Aquifer. In many areas of Westbury and Hicksville there is no confining layer between the Magothy and Glacial Aquifers. They are only differentiated by their hydraulic conductivities (50 vs. 270 ft/day) (Franke and Cohen, 1972). Localized clay lenses are present within this area of the Magothy Aquifer, but their location and extent have not been delineated.

2.3.2 Topography

The Pleistocene glaciation created the hilly Ronkonkoma moraine along Long Island's "spine" and south fork, and the Harbor Hill Moraine along the North shore and the North fork. Erosion of these morainal deposits (as the glacier melted away from Long Island) created extensive outwash plains of sand and gravel in the intermorainal area and south to the Atlantic Ocean. These highly permeable deposits comprise the upper glacial aquifer and represent the majority of Long Island's surficial sediments. Some local confining clay units were also formed from glacial materials in intermorainal lakes and tidal lagoons. Since the end of glaciation, about 12,000 years ago, Holocene beach and marsh deposits have been formed along the marine edge, and within stream corridors and ponds.

The elevation of the Site, as presented on the United States Geologic Survey (USGS), Hicksville Quadrangle Map, approximates one hundred twenty (120) feet above sea level. The USGS Map, which was base dated 1943, field checked in 1967, and photorevised in 1979, did not depict a structure on the Site (the property is within an area in which only landmark buildings were mapped).

2.3.3 Soil Component Identification

Nassau County is divided into ten general soil units, or groups of soils geographically associated in a characteristic repeating pattern, according to the Soil Survey of Nassau County, New York (U.S. Department of Agriculture, U.S. Soil Conservation Service). The general soil component of the Site, as defined by this publication, is the Urban Land Association. This Association consists of dominantly nearly level or gently sloping areas that are covered by buildings, roads, sidewalks, and parking lots on plains and low hills.

The Soil Survey also describes detailed soil units that each represent an area on the landscape consisting of one or more soils for which the unit is named. The detailed component of the Site is identified by this Survey as the Urban Land-Hempstead Complex (Uh). This soil type consists of urbanized areas and very deep, well-drained soils on nearly level plains. Slope ranges from 0 to 3 percent, and slope is less than 2 percent in most of the areas that are not near drainage-ways or depressions.

This unit is described as a soil complex because the urbanized areas and Hempstead soils are so intermingled that it was not practical to classify them separately. This soil complex is made up of about 75 percent urbanized areas, 20 percent Hempstead soils, and 5 percent other soils. The urbanized areas consist of buildings, roads, driveways, parking lots, and other man-made structures.

Typical sequence, depth and composition of the layers of Hempstead Series Soils are as follows:

Depth In Soil Profile	Soil Description
Surface to 11 inches	black silt loam
11 to 15 inches	dark brown silt loam
15 to 29 inches	yellowish brown silt loam
29 to 33 inches	strong brown very gravelly loamy sand
33 to 60 inches or more	very pale brown sand and gravel

2.3.4 Hydrology

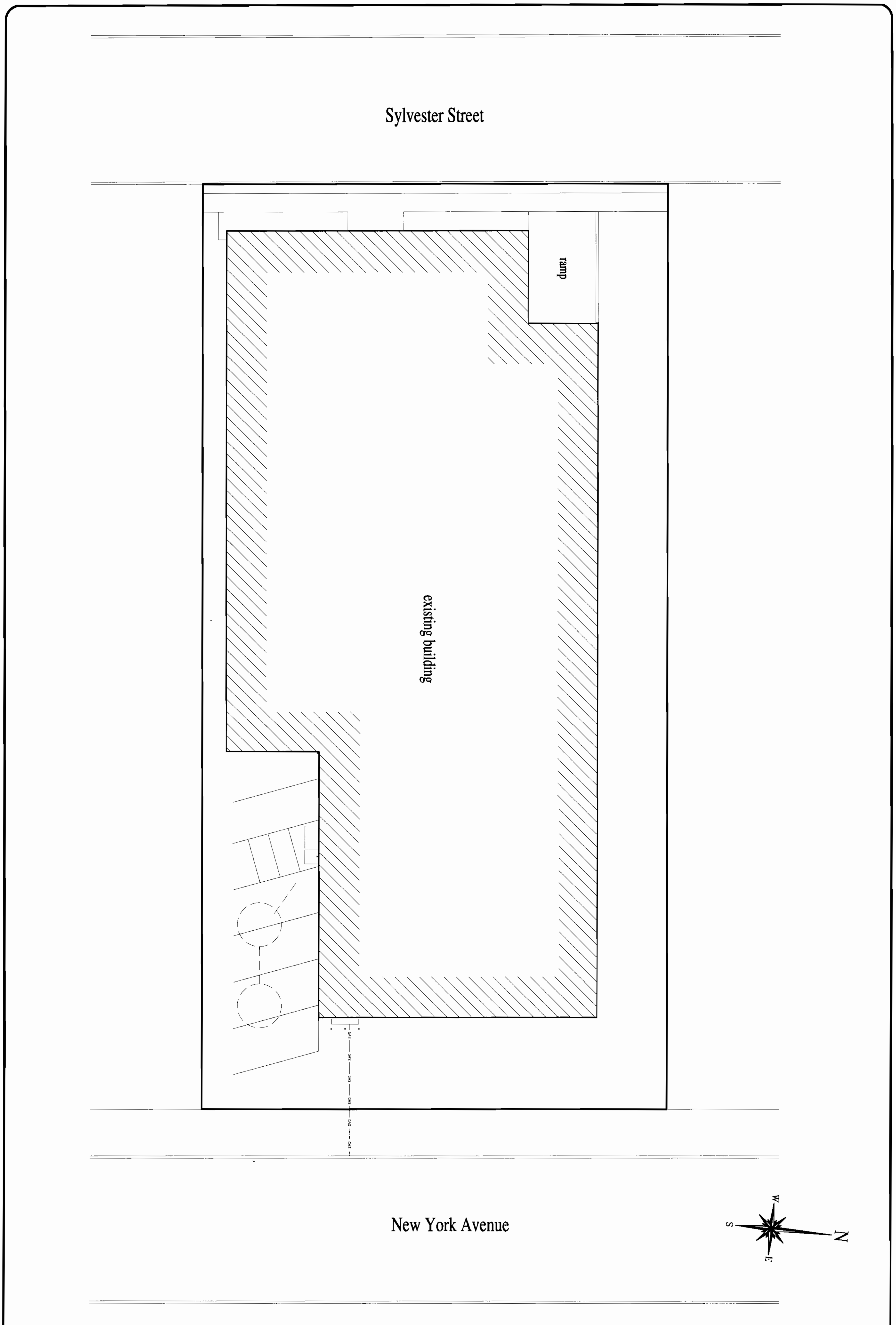
The Site lies within Hydrogeologic Zone I, The Deep Flow - Magothy Recharge Area (Nassau-Suffolk 208 Study - Water Management Zones in Nassau and Suffolk). Zone I is characterized by deep groundwater recharge and vertical groundwater flow.

2.3.5 Regional Groundwater Characteristics

Regional groundwater flow direction in the area of the Site is toward the southwest. The water table is encountered at approximately fifty-five feet below grade.

2.3.6 Site Groundwater Quality

The FRI activities conducted on the Site included a groundwater sampling and acquisition plan to define Site groundwater quality with respect to potential point and unidentified non-point pollution sources. Nineteen groundwater sampling locations were sited on and off-Site to implement the plan (see **Plate** 3: Sample Acquisition Plan, Westbury, New York). Groundwater sampling activities were conducted utilizing a Geoprobe operating system for the installation of temporary groundwater well points. Two groundwater sampling locations, identified as UIW-001 and UIW-002, were sited within the center of the two abandoned cesspools associated with the former on-site sanitary disposal system. These cesspools were classified as underground injection wells (UIWs) and were identified as a potential pollution source. Fifteen additional groundwater sampling locations were sited to represent groundwater quality hydraulically up-gradient and down-gradient of the Site pollution source. The hydraulically up-gradient groundwater sampling locations that were intended to intercept any groundwater contaminants entering the Site were identified as GP-003, GP-004, GP-005, GP-006 and GP-007. These sampling points were sited on the eastern border of the Site. In addition, five groundwater sampling locations were sited on the eastern side of New York Avenue (to the east of the Site) off-Site to represent groundwater hydraulically up-gradient of the Site. The hydraulically down-gradient sampling locations (relative to the Site pollution source) were identified as GP-008, GP-009 and GP-010. These sampling points were sited to the southwest of the Site pollution source.



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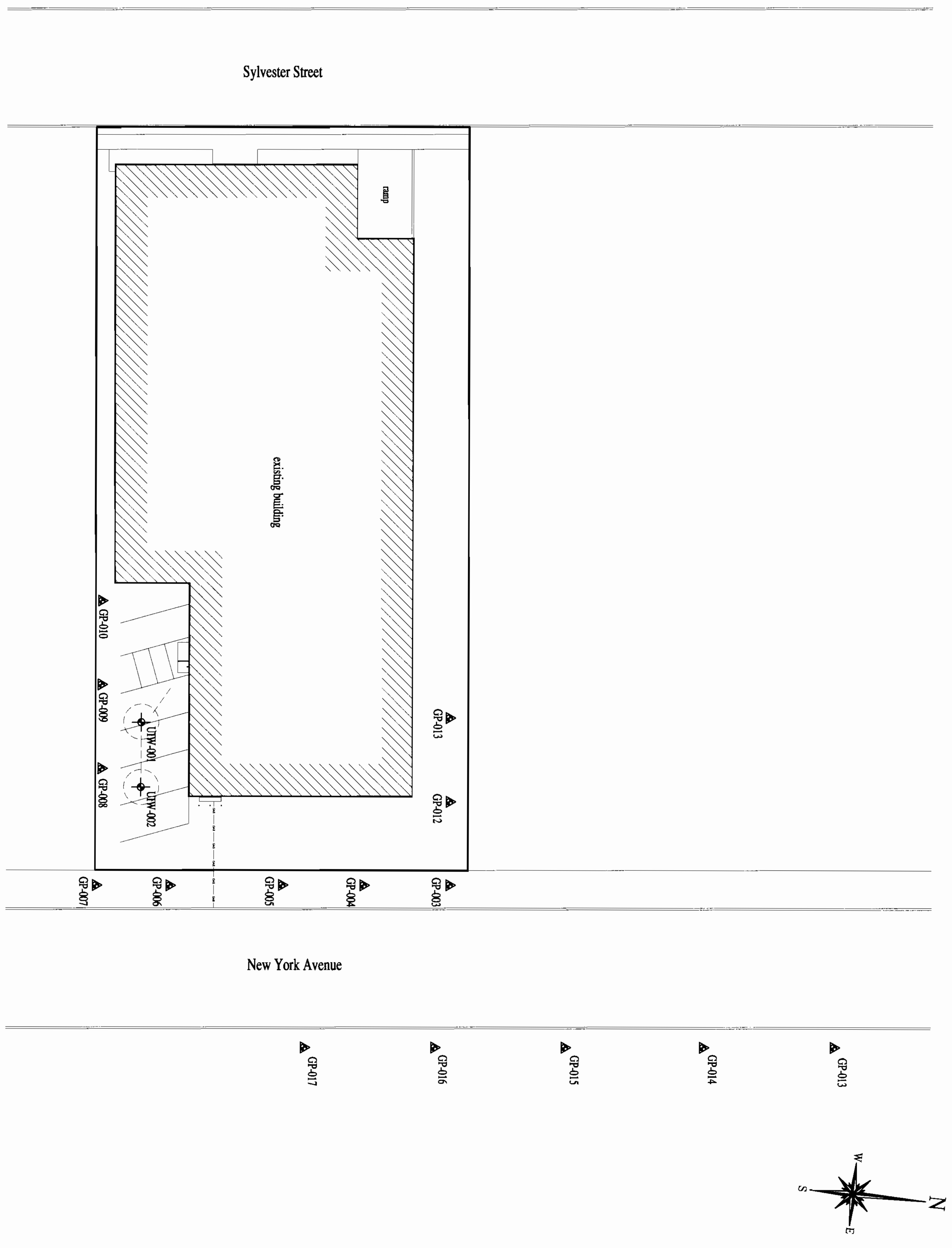
36 Sylvester Street Site 01-30-043U

Plate 2: Site Map

Westbury, New York

Legend

scale: 1" = 20'



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36 Sylvester Street Site 01-30-043U

Plate 3: Sample Acquisition Plan

Westbury, New York

Legend

- ⌖ soil and groundwater probe node
- ▲ groundwater probe node

scale: 1" = 30'

Three water samples were obtained from each temporary groundwater well point. The groundwater samples secured from each temporary well point were acquired at depths intervals of 56'-60', 66'-70' and 76'-80' below existing grade. The laboratory analysis of the groundwater samples (see Table 1: Non-Point Data Summary, Westbury, New York) obtained from the investigation was consistent with the specifications outlined in the Final FRI Work Plan. Compliance with the data quality objectives scoped for the laboratory analysis of the representative samples will be discussed in the FRI report.

The groundwater analytical results indicated that a hydraulically up-gradient groundwater contaminant plume exists from an off-site source. The off-site source was not determined under the scope of the FRI activities. In general, a comparative analysis of the hydraulically up-gradient and down-gradient groundwater data failed to indicate any significant changes in the contaminant concentrations. The contaminant concentrations were within an order of magnitude. A further detailed discussion of the contaminant concentrations and distribution will be provided in the FRI report.

Table 1: Non-Point Data Summary (1 of 5)

Volatile Organic Groundwater Analysis Results
36 Sylvester Street Site 01-30-043U

Sample ID	FLD BLK (7-9-01)	GP-003-GW60	GP-003-GW70	GP-003-GW80	GP-004-GW60	GP-004-GW70	GP-004-GW80	GP-005-GW60	GP-005-GW70	GP-005-GW80
Unit	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg
Volatile Organic Analytes:										
Chloromethane	U	U	U	U	U	U	U	U	U	U
Vinyl Chloride	U	U	U	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U	U	U	U
Chloroethane	U	U	U	U	U	U	U	U	U	U
Trichlorofluoromethane	U	U	U	U	U	U	U	U	U	U
1,1-Dichloroethene	U	34	12	5.6	130E	33	21	200E	53	17
Methylene Chloride	1.2	U	U	U	U	U	U	U	U	U
Trans-1,2-Dichloroethene	U	U	U	U	U	U	U	U	U	U
1,1-Dichloroethane	U	68	15	U	220E	82	26	570E	76	8.2
Chloroform	U	U	U	U	U	U	U	U	U	U
1,1,1-Trichloroethane	3.9	180E	43	17	850E	140E	59B	940E	200E	45B
Carbon Tetrachloride	U	U	U	U	U	U	U	U	U	U
Benzene	U	U	U	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U	U	U	U
Trichloroethene	U	320E	44	14	1100E	420E	93	240E	960E	600E
1,2-Dichloropropane	U	U	U	U	U	U	U	U	U	U
Bromodichloromethane	U	U	U	U	U	U	U	U	U	U
2-Chloroethyl Vinyl Ether	U	U	U	U	U	U	U	U	U	U
t-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U	U
Toluene	U	U	U	5.2	U	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U	U	U	U
Tetrachloroethene	U	33	U	U	37	17	4.7	13	41	16
Dibromochloromethane	U	U	U	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U	U	U	U
Ethylbenzene	U	U	U	1.9	U	U	U	U	U	U
o-Xylene	U	U	U	2.4	U	U	U	U	U	U
m+p Xylenes	U	U	U	5.9	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	U	U	U
1,3-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U
1,4-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U
1,2-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U

U: Indicates the comound was analyzed for, but was not detected.
J: Indicates an estimated value detected below the MDL.
E: Indicates the analyte concentration exceeds the instrument calibration limits.
B: Indicates the analyte was identified in the sample blank and the actual sample.

Table 1: Non-Point Data Summary (2 of 5)

Volatile Organic Groundwater Analysis Results

36 Sylvester Street Site 01-30-043U

Sample ID	GP-006-GW60	GP-006-GW70	GP-006-GW80	FLD BLK (7-10-01)	GP-007-GW60	GP-007-GW70	GP-007-GW80	GP-008-GW60	GP-008-GW70	GP-008-GW80
Unit	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg
Volatile Organic Analytes:										
Chloromethane	U	U	U	U	U	U	U	U	U	U
Vinyl Chloride	U	U	U	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U	U	U	U
Chloroethane	U	U	U	U	U	U	U	U	U	U
Trichlorofluoromethane	U	U	U	U	U	U	U	U	U	U
1,1-Dichloroethene	550E	52	42	U	600E	82	77	290E	380E	78
Methylene Chloride	U	U	U	U	U	U	U	U	U	U
Trans-1,2-Dichloroethene	U	U	U	U	U	U	U	U	U	U
1,1-Dichloroethane	580E	47	37	U	930E	54	68	420E	450E	62
Chloroform	U	U	U	U	U	U	U	U	U	U
1,1,1-Trichloroethane	1900E	230E	140E	U	2500E	280E	290E	1500E	1900E	240E
Carbon Tetrachloride	U	U	U	U	U	U	U	U	U	U
Benzene	U	U	U	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U	U	U	U
Trichloroethene	360E	610E	450E	U	310E	870E	1200E	410E	660E	1300E
1,2-Dichloropropane	U	U	U	U	U	U	U	U	U	U
Bromodichloromethane	U	U	U	U	U	U	U	U	U	U
2-Chloroethyl Vinyl Ether	U	U	U	U	U	U	U	U	U	U
t-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U	U
Toluene	U	U	U	U	U	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U	U	U	U
Tetrachloroethene	38	42	14	U	32	50	72	21	44	60
Dibromochloromethane	U	U	U	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	U	U	U	U
o-Xylene	U	U	U	U	U	U	U	U	U	U
m+p Xylenes	U	U	U	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	U	U	U
1,3-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U
1,4-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U
1,2-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U

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E: Indicates the analyte concentration exceeds the instrument calibration limits.
B: Indicates the analyte was identified in the sample blank and the actual sample.

Table 1: Non-Point Data Summary (3 of 5)

Volatile Organic Groundwater Analysis Results
36 Sylvester Street Site 01-30-043U

Sample ID	GP-009-GW60	GP-009-GW70	GP-009-GW80	GP-010-GW60	GP-010-GW70	GP-010-GW80	FLD BLK (7-11-01)	GP-011-GW60	GP-011-GW70	GP-011-GW80
Unit	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg
Volatile Organic Analytes:										
Chloromethane	U	U	U	U	U	U	U	U	U	U
Vinyl Chloride	U	U	U	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U	U	U	U
Chloroethane	13	12	U	U	U	U	U	U	U	U
Trichlorofluoromethane	U	U	U	U	U	U	U	U	U	U
1,1-Dichloroethene	390E	400E	170E	130	92	77	U	16	13	14
Methylene Chloride	12B	11B	9.7B	43B	9.4B	9.9B	11B	10B	8.7B	8.9B
Trans-1,2-Dichloroethene	U	U	U	U	U	U	U	U	U	U
1,1-Dichloroethane	480E	400E	140E	340	170E	130E	U	21	21	21
Chloroform	U	U	U	U	U	U	U	U	U	U
1,1,1-Trichloroethane	770E	710E	440E	110B	260E	250E	1.9B	59B	53B	55
Carbon Tetrachloride	U	U	U	U	U	U	U	U	U	U
Benzene	U	U	U	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U	U	U	U
Trichloroethene	380E	500E	700E	150	120E	13	U	4	3.7	4.8
1,2-Dichloropropane	U	U	U	U	U	U	U	U	U	U
Bromodichloromethane	U	U	U	U	U	U	U	U	U	U
2-Chloroethyl Vinyl Ether	U	U	U	U	U	U	U	U	U	U
t-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U	U
Toluene	U	U	U	U	U	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	2.7	U	3.3	2.4	U	U	U	U
Tetrachloroethene	34	48	66	21	18	15	U	4.7	3.3	4
Dibromochloromethane	U	U	U	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	U	U	U	U
o-Xylene	U	U	U	U	U	U	U	U	U	U
m+p Xylenes	U	U	U	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	U	U	U
1,3-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U
1,4-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U
1,2-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U

U: Indicates the comound was analyzed for, but was not detected.
J: Indicates an estimated value detected below the MDL.
E: Indicates the analyte concentration exceeds the instrument calibration limits.
B: Indicates the analyte was identified in the sample blank and the actual sample.

Table 1: Non-Point Data Summary (4 of 5)

Volatile Organic Groundwater Analysis Results
36 Sylvester Street Site 01-30-043U

Sample ID	GP-012-GW60	GP-012-GW70	GP-012-GW80	GP-013-GW60	GP-013-GW70	GP-013-GW80	GP-014-GW60	GP-014-GW70	GP-014-GW80	FLD BLK (7-12-01)
Unit	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg
Volatile Organic Analytes:										
Chloromethane	U	U	U	U	U	U	U	U	U	U
Vinyl Chloride	U	U	U	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U	U	U	U
Chloroethane	U	U	U	U	U	U	U	U	U	U
Trichlorofluoromethane	U	U	U	U	U	U	U	U	U	U
1,1-Dichloroethene	10	8.5	9.4	16	4.9	U	9.6	6.2	9.4	U
Methylene Chloride	5.1B	8.7B	8.7B	3.4B	3B	9B	4.2B	2.9B	3.2B	5.9B
Trans-1,2-Dichloroethene	U	U	U	U	U	U	U	U	U	U
1,1-Dichloroethane	43	8.4	3.3	73	U	U	22	U	U	U
Chloroform	U	U	U	U	U	U	U	U	U	U
1,1,1-Trichloroethane	13B	8B	16B	45B	5.2B	4.4B	15B	9.3B	10B	2.6B
Carbon Tetrachloride	U	U	U	U	U	U	U	U	U	U
Benzene	U	U	U	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U	U	U	U
Trichloroethene	U	U	1.1	3.6	1.6	U	12	9.5	11	U
1,2-Dichloropropane	U	U	U	U	U	U	U	U	U	U
Bromodichloromethane	U	U	U	U	U	U	U	U	U	U
2-Chloroethyl Vinyl Ether	U	U	U	U	U	U	U	U	U	U
t-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U	U
Toluene	U	U	U	U	U	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U	U	U	U
Tetrachloroethene	U	U	1.4	3.3	U	U	1.4	1	1.3	U
Dibromochloromethane	U	U	U	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	U	U	U	U
o-Xylene	U	U	U	U	U	U	U	U	U	U
m+p Xylenes	U	U	U	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	U	U	U
1,3-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U
1,4-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U
1,2-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U

U: Indicates the comound was analyzed for, but was not detected.
J: Indicates an estimated value detected below the MDL.
E: Indicates the analyte concentration exceeds the instrument calibration limits.
B: Indicates the analyte was identified in the sample blank and the actual sample.

Table 1: Non-Point Data Summary (5 of 5)

Volatile Organic Groundwater Analysis Results
36 Sylvester Street Site 01-30-043U

Sample ID	GP-015-GW60	GP-015-GW70	GP-015-GW80	GP-016-GW60	GP-016-GW70	GP-016-GW80	GP-017-GW60	GP-017-GW70	GP-017-GW80	Trip Blk (7-12-01)
Unit	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg
Volatile Organic Analytes:										
Chloromethane	U	U	U	U	U	U	U	U	U	U
Vinyl Chloride	U	U	U	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U	U	U	U
Chloroethane	U	U	U	U	U	U	U	U	U	U
Trichlorofluoromethane	U	U	U	U	U	U	U	U	U	U
1,1-Dichloroethene	32	26	14	33	32	31	22	26	23	U
Methylene Chloride	5.1B	4.5B	4.1B	5.7B	6.6B	5B	4.8B	6.8B	6.9B	10B
Trans-1,2-Dichloroethene	U	U	U	U	U	U	U	U	U	U
1,1-Dichloroethane	60	29	5.4	31	48	34	21	17	12	U
Chloroform	U	U	U	U	U	U	U	U	U	U
1,1,1-Trichloroethane	80B	100B	31B	130E	160E	150E	120E	60B	51B	2.3B
Carbon Tetrachloride	U	U	U	U	U	U	U	U	U	U
Benzene	U	U	U	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U	U	U	U
Trichloroethene	560E	490E	140E	230E	190E	190E	100E	140E	220E	U
1,2-Dichloropropane	U	U	U	U	U	U	U	U	U	U
Bromodichloromethane	U	U	U	U	U	U	U	U	U	U
2-Chloroethyl Vinyl Ether	U	U	U	U	U	U	U	U	U	U
t-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U	U
Toluene	U	U	U	U	U	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U	U	U	U
Tetrachloroethene	36	20	6.3	29	21	24	25	12	13	U
Dibromochloromethane	U	U	U	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	U	U	U	U
o-Xylene	U	U	U	U	U	U	U	U	U	U
m+p Xylenes	U	U	U	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	U	U	U
1,3-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U
1,4-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U
1,2-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U

U: Indicates the comound was analyzed for, but was not detected.
J: Indicates an estimated value detected below the MDL.
E: Indicates the analyte concentration exceeds the instrument calibration limits.
B: Indicates the analyte was identified in the sample blank and the actual sample.

3. INTERIM REMEDIAL MEASURES

The IRM activities proposed for the Site were designed to address the pollution source identified during the performance of the FRI activities. The extent of the pollution source was determined to be isolated to the unsaturated subsurface soil of the Site. Accordingly, the treatment technologies developed for the pollution source at the Site have been designed to permanently remove or significantly decrease the toxicity, mobility and volume of contaminants to the maximum extent practicable. An evaluation of the effectiveness of the IRM activities will be implemented through the performance of a sampling and analysis plan to assure compliance with applicable New York State Standards, Criteria and Guidelines (SCGs).

3.1 Pollution Source Summary

All of the information presented in this section of the report was compiled during the performance of the FRI activities.

The performance of the Site survey that included an exterior inspection, interior inspection, remote sensing survey and destructive survey identified the presence of one Site pollution source. This pollution source was identified as the former on-site sanitary disposal system. The former on-site sanitary disposal system was identified to consist of two cesspools, which were classified as Class V underground injection wells. The components of the former on-site sanitary disposal system were subjected to investigative activities under the scope of the FRI activities to determine the nature and extent of any contaminants to Site soil and groundwater.

3.1.1 Pollution Sources UIW-001 and UIW-002

A remote sensing survey was performed over the entire exterior surface of the Site to identify any subsurface structures that may represent point or non-point pollution sources. The survey was performed with a GSSI SIR System-2 ground penetrating radar unit. An analysis of the data acquired from the survey detected two significant subsurface dielectric anomalies representative of potential pollution sources. The subsurface patterns identified in the ground penetrating radar images were consistent with the size and shape of concrete domes associated with underground injection wells. Based on the location of these detected anomalies, it was suspected that these subsurface features represented sanitary cesspools.

Accordingly, a destructive survey was preformed with respect to these suspected sanitary cesspools. The destructive survey included the installation of direct sensing probes to identify the presence of any subsurface structures (i.e. the pre-cast walls and domes). Said probes confirmed the presence of two subsurface structures corresponding with the location of the detected anomalies. Accordingly, excavation activities were conducted to expose the subsurface structures. The excavation revealed the presence of two abandoned underground injection wells (cesspools) associated with the former on-site sanitary disposal system. Said UIWs had not been backfilled. These UIWs were observed during all dye tracing activities. None of the dye tracing activities detected any evidence that indicated interior plumbing features were actively connected with these UIWs. Furthermore, a septic tank was not suspected as being present based on the close proximity and direction of subsurface piping within the primary UIW in reference to the sanitary trap. Although, the site plans at the time of construction depicted a septic tank and one cesspool, it was expected that the septic tank was never installed and an additional cesspool was utilized in lieu of the septic tank. As such, the UIWs were identified as point-pollution sources.

To evaluate the impact of these pollution sources on Site soil quality, soil samples were secured within the center of each UIW structure. Continuous soil sampling was performed from the invert of each structure (approximately 13’ BEG for UIW-001 and 18’ BEG for UIW-002) to ten feet below the invert of each structure. Discrete soil samples were subsequently obtained at depth intervals of thirty to thirty-two and forty-three to forty-five feet BEG. Six subsurface soil samples were selected for subsequent laboratory analysis from each UIW as per the Final FRI Work Plan.

The laboratory analysis of the soil samples secured from within the underground injection well, identified as UIW-001, detected concentrations of target volatile, semi-volatile organic and inorganic (heavy metal) analytes (see Table 2: Point Summary Data, Westbury, New York). The concentrations of target volatile organic analytes were below the applicable SCGs in the invert sample (13.5 to 18 feet BEG), thirty to thirty-two and forty three to forty-five feet BEG. The

Table 2: Point Data Summary (1 of 5)

Volatile Organic Soil Analysis Results
36 Sylvester Street Site 01-30-043U

Sample ID	UIW-001-SSC18	UIW-001-SS20	UIW-001-SS22	UIW-001-SS24	UIW-001-SS32	UIW-001-SS45	UIW-002-SSC22	UIW-002-SS24	UIW-002-SS26	UIW-002-SS28	UIW-002-SS32	UIW-002-SS45
Unit	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg
Volatile Organic Analytes:												
Dichlorodiflurομethane	U	U	U	U	U	U	U	U	U	U	U	U
1,1,1-Trichloroethane	U	U	U	U	U	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U	U	U	U	U	U
1,1-Dichloroethene	U	U	U	U	U	U	U	U	U	U	U	U
1,1-Dichloropropene	U	U	U	U	U	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U	U	U	U	U	U
1,2-Dichloropropane	U	U	U	U	U	U	U	U	U	U	U	U
2,2-Dichloropropane	U	U	U	U	U	U	U	U	U	U	U	U
2-Butanone	U	U	U	U	U	U	U	U	U	U	U	U
2-Chloroethyl Vinyl Ether	U	U	U	U	U	U	U	U	U	U	U	U
4-Methyl-2-Pentanone	U	U	U	U	U	U	U	U	U	U	U	U
Acetone	U	8.5B	6.1U	4.3JB	U	U	16JB	U	U	U	6B	7.7B
Benzene	U	U	U	U	U	U	U	U	U	U	U	U
Bromochloromethane	U	U	U	U	U	U	U	U	U	U	U	U
Bromodichloromethane	U	U	U	U	U	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U	U	U	U	U	U
Carbon Disulfide	U	U	U	U	U	U	U	U	U	U	U	U
Carbon Tetrachloride	U	U	U	U	U	U	U	U	U	U	U	U
Chloroethane	U	U	U	U	U	U	U	U	U	U	U	U
Chloroform	U	U	U	U	U	U	U	U	U	U	U	U
Chloromethane	U	U	U	U	U	U	U	U	U	U	U	U
cis-1,2-Dichloroethene	U	U	U	U	U	U	U	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U	U	U	U
Dibromoethane	U	U	U	U	U	U	U	U	U	U	U	U
Methylene Chloride	3.9J	U	U	3J	1.2J	1.3J	12J	2.5J	2.5J	2.8J	U	3J
Toluene	U	U	U	U	U	U	U	U	U	U	U	U
Trans-1,2-Dichloroethene	U	U	U	U	U	U	U	U	U	U	U	U
trans-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U	U	U	U
Trichloroethene	U	U	U	U	U	U	U	U	U	U	U	U
Trichlorofluoromethane	U	U	U	U	U	U	U	U	U	U	U	U
Vinyl Acetate	U	U	U	U	U	U	U	U	U	U	U	U
Vinyl Chloride	U	U	U	U	U	U	U	U	U	U	U	U

U: Indicates the comound was analyzed for, but was not detected.
J: Indicates an estimated value detected below the MDL.
E: Indicates the analyte concentration exceeds the instrument calibration limits.
B: Indicates the analyte was identified in the sample blank and the actual sample.

Table 2: Point Data Summary (2 of 5)
Volatile Organic Soil Analysis Results
36 Sylvester Street Site 01-30-043U

Sample ID	UIW-001-SSC18	UIW-001-SS20	UIW-001-SS22	UIW-001-SS24	UIW-001-SS32	UIW-001-SS45	UIW-002-SSC22	UIW-002-SS24	UIW-002-SS26	UIW-002-SS28	UIW-002-SS32	UIW-002-SS45
Unit	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg
Volatile Organic Analytes:												
1,1,1,2-Tetrachloroethane	U	U	U	U	U	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	U	U	U	U	U
1,2,3-Trichlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U
1,2,3-Trichloropropane	U	U	U	U	U	U	U	U	U	U	U	U
1,2,4-Trichlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U
1,2,4-Trimethylbenzene	140	U	U	U	U	U	U	U	U	U	U	U
1,2-Dibromo-3-chloropropane	U	U	U	U	U	U	U	U	U	U	U	U
1,2-Dibromoethane	U	U	U	U	U	U	U	U	U	U	U	U
1,2-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U
1,3,5-Trimethylbenzene	93	U	U	U	U	U	U	U	U	U	U	U
1,3-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U
1,3-Dichloropropane	U	U	U	U	U	U	U	U	U	U	U	U
1,4-Dichlorobenzene	900	U	U	U	U	U	U	U	U	U	U	U
2-Chlorotoluene	U	U	U	U	U	U	U	U	U	U	U	U
2-Hexanone	U	U	U	U	U	U	U	U	U	U	U	U
4-Chlorotoluene	U	U	U	U	U	U	U	U	U	U	U	U
p-Isopropyltoluene	U	U	U	U	U	U	U	U	U	U	U	U
Bromobenzene	U	U	U	U	U	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U
Dibromochloromethane	U	U	U	U	U	U	U	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	U	U	U	U	U	U
Hexachlorobutadiene	U	U	U	U	U	U	U	U	U	U	U	U
Isopropylbenzene	U	U	U	U	U	U	U	U	U	U	U	U
m+p-Xylenes	U	U	U	U	U	U	U	U	U	U	U	U
Methyl-tert-butyl Ether	U	U	U	U	U	U	U	U	U	U	U	U
Napthanlene	U	U	U	U	U	U	U	U	U	U	U	U
n-Butylbenzene	U	U	U	U	U	U	U	U	U	U	U	U
n-Propylbenzene	U	U	U	U	U	U	U	U	U	U	U	U
o-Xylene	U	U	U	U	U	U	U	U	U	U	U	U
sec-Butylbenzene	U	U	U	U	U	U	U	U	U	U	U	U
Styrene	U	U	U	U	U	U	U	U	U	U	U	U
tert-Butylbenzene	U	U	U	U	U	U	U	U	U	U	U	U
Tetrachloroethene	55	U	1.7J	1.3J	U	3.3J	19J	U	U	U	U	4.5J

U: Indicates the comound was analyzed for, but was not detected.
J: Indicates an estimated value detected below the MDL.
E: Indicates the analyte concentration exceeds the instrument calibration limits.
B: Indicates the analyte was identified in the sample blank and the actual sample.

Table 2: Point Data Summary (3 of 5)

Semi-Volatile Organic Soil Analysis Results
36 Sylvester Street Site 01-30-043U

Sample ID	UIW-001-SSC18	UIW-002-SSC22
Unit	µg/Kg	µg/Kg
Semi-Volatile Organic Analytes:		
1,2,4-Trichlorobenzene	U	U
1,2-Dichlorobenzene	U	U
1,3-Dichlorobenzene	U	U
1,4-Dichlorobenzene	300J	U
2,4-Dinitrotoluene	U	U
2,6-Dinitrotoluene	U	U
2-Chloronapthalene	U	U
2-Methylnaphthalene	U	U
2-Nitroaniline	U	U
3-Nitroaniline	U	U
4-Chloroaniline	140J	U
4-Chlorophenyl ether	U	U
Acenaphthene	U	U
Acenapthene	U	U
Bis(2-Chloroethoxy)methane	U	U
Bis(2-Chloroethyl)ether	U	U
Bis(2-Chloroisopropyl)ether	U	U
Dibenzofuran	U	U
Diethylphtalate	U	U
Dimethylphtalate	U	U
Hexachlorobutadiene	U	U
Hexachloroethane	U	U
Hexaclorocyclopentadiene	U	U
Isophorone	U	U
Naphthalene	U	U
Nitrobenzene	U	U
N-Nitroso-di-n-Propylamine	U	U

Sample ID	UIW-001-SSC18	UIW-002-SSC22
Unit	µg/Kg	µg/Kg
Semi-Volatile Organic Analytes:		
Fluorene	51J	U
1,2-Diphenylhydrazine	U	U
3,3-Dichlorobenzidine	U	U
4-Bromophenyl-phenylether	U	U
4-Nitroaniline	U	U
Anthracene	69J	U
Benzo-a-Anthracene	U	U
Benzo-a-Pyrene	U	U
Benzo-b-Fluoroanthene	U	U
Benzo-g,h,i-Perylene	U	U
Benzo-k-Fluoroanthene	U	U
Bis(2-Ethylhexyl)Phthalate	310J	570
Butylbenzylphthalate	U	U
Carbazole	U	U
Chrysene	U	U
Dibenzo-a,h-Anthracene	U	U
Di-n-Butylphthalate	U	U
Di-n-Octylphthalate	U	U
Fluoranthene	250J	U
Hexaclorobenzene	U	U
Indeno(1,2,3-c,d)Pyrene	U	U
m.p-Cresol	U	U
N-Nitrosodiphenylamine	U	U
o-Cresol	U	U
Phenanthrene	310J	U
Pyrene	290J	U

U: Indicates the comound was analyzed for, but was not detected.

J: Indicates an estimated value detected below the MDL.

E: Indicates the analyte concentration exceeds the instrument calibration limits.

B: Indicates the analyte was identified in the sample blank and the actual sample.

Table 2: Point Data Summary (4 of 5)

Inorganic Soil Analysis Results
36 Sylvester Street Site 01-30-043U

Sample ID	UIW-001-SSC18	UIW-002-SSC22
Unit	*mg/Kg*	*mg/Kg*
Inorganic Analytes:		
Alumimium	2870.0	683
Antimony	1.9B	0.62U
Arsenic	1.5	0.57U
Barium	46.4	17.5B
Beryllium	0.22B	0.16U
Cadmium	6.8	0.11U
Calcium	2090.0	347B
Chromium	81.3	2.40
Cobalt	1.9B	0.27B
Copper	961.0	17.1
Iron	3410.0	2150.0
Lead	255.0	7.9
Magnesium	967.0	107B
Manganese	113.0	4.4
Mercury	1.75	0.04U
Nickel	10.3	0.88U
Potassium	126B	46.1B
Selenium	0.84	0.34U
Silver	7.3	0.21B
Sodium	148B	62.1B
Thallium	0.71U	0.55U
Vanadium	6.2B	2.0B
Zinc	331.0	9.2

U: Indicates the comound was analyzed for, but was not detected.

J: Indicates an estimated value detected below the MDL.

E: Indicates the analyte concentration exceeds the instrument calibration limits.

B: Indicates the analyte was identified in the sample blank and the actual sample.

Table 2: Point Data Summary (5 of 5)

Volatile Organic Groundwater Analysis Results
36 Sylvester Street Site 01-30-043U

Sample ID	UIW-001-GW60	UIW-001-GW70	UIW-001-GW80	UIW-001-GWFLD	UIW-002-GW60	UIW-002-GW70	UIW-002-GW80	UIW-002-GWFLD	Trip Blank
Unit	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg
Volatile Organic Analytes:									
1,1,1-Trichloroethane	2400E	1800E	330E	1.8	2500E	2400E	330E	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	U	U
1,1,2-Trichloroethane	0.9	U	3.7	U	U	2.4	U	U	U
1,1-Dichloroethane	520E	1000E	130E	U	710E	450E	61	U	U
1,1-Dichloroethene	320E	740E	90	U	240E	430E	79	U	U
1,2-Dichlorobenzene	U	U	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U	U	U
cis-1,2-Dichloroethene	U	U	U	U	U	U	U	U	U
1,2-Dichloropropane	U	U	U	U	U	U	U	U	U
1,3-Dichlorobenzene	U	U	U	U	U	U	U	U	U
1,4-Dichlorobenzene	U	U	U	U	U	U	U	U	U
2-Chloroethyl Vinyl Ether	U	U	U	U	U	U	U	U	U
Benzene	U	U	U	U	U	U	U	U	U
Bromochloromethane	U	U	U	U	U	U	U	U	U
Bromodichloromethane	U	U	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U	U	U
Carbon Tetrachloride	U	U	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U	U	U
Chloroethane	7.7	13	21	U	9	3.9	U	U	U
Chloroform	U	U	U	U	U	U	U	U	U
Chloromethane	U	U	U	U	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	U	U	U
m+p Xylenes	U	U	U	U	U	U	U	U	U
Methylene Chloride	U	U	U	U	U	U	U	2	U
o-Xylene	U	U	U	U	U	U	U	U	U
Tetrachloroethene	15	61	U	U	8	49	57	U	U
Toluene	U	U	U	U	U	U	U	U	U
Trans-1,2-Dichloroethene	U	U	U	U	U	U	U	U	U
trans-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U
Trichloroethene	170E	520E	240E	U	120E	470E	1100E	U	U
Trichlorofluoromethane	U	U	U	U	U	U	U	U	U
Vinyl Chloride	U	U	U	U	U	U	U	U	U

U: Indicates the comound was analyzed for, but was not detected.
J: Indicates an estimated value detected below the MDL.
E: Indicates the analyte concentration exceeds the instrument calibration limits.
B: Indicates the analyte was identified in the sample blank and the actual sample.

concentrations of target semi-volatile organic analytes were below the applicable SCGs in the invert sample (13.5 to 18 feet BEG). The concentrations of several target inorganic analytes from the invert sample, specifically chromium, copper, mercury and zinc, were above the applicable SCGs (see Table 3: Contaminant Concentrations in Soil and Applicable SCGs, Westbury, New York).

The laboratory analysis of the soil samples secured from within the underground injection well, identified as UIW-002, failed to detect any concentrations of target volatile organic analytes above minimum detection limits from the invert sample (18 to 22 feet BEG), thirty to thirty-two or forty one to forty-three feet BEG. The laboratory analysis detected one target semi-volatile organic anlayte (bis-2-ethylhexyl-phthalate) at the invert sample (see Table 2). The detected concentration was below the applicable SCG. The laboratory analysis detected target inorganic analytes at the invert sample. The detected concentrations were below the applicable SCGs (see Table 3). The original laboratory analysis report (data package for results summary) as prepared by Chemtech is presented in Appendix G of this document.

3.2 Development, Screening and Selection of Remedial Alternatives

3.2.1 Remedial Action Objectives

The remedial action objectives for the IRM activities proposed for the pollution source at the Site are to permanently remove or significantly decrease the toxicity, mobility and volume of contaminants in accordance with the applicable New York State Standards, Criteria and Guidelines (SCGs). The purpose of meeting these objectives shall be for the overall protection of human health and the environment. The applicable SCGs for Site soil quality is defined under the New York State Department of Environmental Conservation Technical and Administrative Guidance Memorandum (TAGM) #4046, Determination of Soil Cleanup Objectives.

3.2.2 Development and Screening of Remedial Alternatives

The development of remedial alternatives will consider four fundamental options based on the nature and extent of contaminants identified at the Site pollution sources. The primary

Table 3: Contaminant Concentrations in Soil and Applicable SCGs (Page 1 of 2)

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Sample ID	UIW-001-SSC18	UIW-001-SS20	UIW-001-SS22	UIW-001-SS24	UIW-001-SS32	UIW-001-SS45	UIW-002-SSC22	UIW-002-SS24	UIW-002-SS26	UIW-002-SS28	UIW-002-SS32	UIW-002-SS45	**Applicable SCG**
Unit	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg
Volatile Organic Analytes:													
Acetone	U	8.5B	6.1U	4.3JB	U	U	16JB	U	U	U	6B	7.7B	200
Methylene Chloride	3.9J	U	U	3J	1.2J	1.3J	12J	2.5J	2.5J	2.8J	U	3J	100
1,2,4-Trimethylbenzene	140	U	U	U	U	U	U	U	U	U	U	U	13,000
1,3,5-Trimethylbenzene	93	U	U	U	U	U	U	U	U	U	U	U	3,300
1,4-Dichlorobenzene	900	U	U	U	U	U	U	U	U	U	U	U	8,500
Tetrachloroethene	55	U	1.7J	1.3J	U	3.3J	19J	U	U	U	U	4.5J	1,400

U: Indicates the comound was analyzed for, but was not detected.

J: Indicates an estimated value detected below the MDL.

E: Indicates the analyte concentration exceeds the instrument calibration limits.

B: Indicates the analyte was identified in the sample blank and the actual sample.

Red concentration repersents an SCG excedence.

Table 3:Contaminant Concentrations and Applicable SCGs (Page 2 of 2)

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Sample ID	UIW-001-SSC18	UIW-002-SSC22	**Applicable SCG**
Unit	µg/Kg	µg/Kg	µg/Kg
Semi-Volatile Organic Analytes:			
1,4-Dichlorobenzene	300J	U	NA
4-Chloroaniline	140J	U	220
Fluorene	51J	U	50,000
Anthracene	69J	U	50,000
Bis(2-Ethylhexyl)Phthalate	310J	570	50,000
Fluoranthene	250J	U	50,000
Phenanthrene	310J	U	50,000
Pyrene	290J	U	50,000

U: Indicates the comound was analyzed for, but was not detected.
J: Indicates an estimated value detected below the MDL.
E: Indicates the analyte concentration exceeds the instrument calibration limits.
B: Indicates the analyte was identified in the sample blank and the actual sample.
Red concentration repersents an SCG excedence.

Sample ID	UIW-001-SSC18	UIW-002-SSC22	**Applicable SCG**	**Background Levels**
Unit	*mg/Kg*	*mg/Kg*	*mg/Kg*	*mg/Kg*
Inorganic Analytes:				
Alumimium	2870.0	683	SB	33000
Antimony	1.9B	0.62U	SB	NA
Arsenic	1.5	0.57U	7.5 or SB	12
Barium	46.4	17.5B	300 or SB	600
Beryllium	0.22B	0.16U	0.16 or SB	1.75
Cadmium	6.8	0.11U	10 or SB	1
Calcium	2090.0	347B	SB	35,000
Chromium	81.3	2.40	10 or SB	40
Cobalt	1.9B	0.27B	30 or SB	60
Copper	961.0	17.1	25 or SB	50
Iron	3410.0	2150.0	2000 or SB	550,000
Lead	255.0	7.9	SB	500
Magnesium	967.0	107B	SB	5000
Manganese	113.0	4.4	SB	5,000
Mercury	1.75	0.04U	0	0.2
Nickel	10.3	0.88U	13 or SB	25
Potassium	126B	46.1B	SB	43000
Selenium	0.84	0.34U	2 or SB	3.9
Silver	7.3	0.21B	SB	NA
Sodium	148B	62.1B	SB	8000
Thallium	0.71U	0.55U	SB	NA
Vanadium	6.2B	2.0B	150 or SB	300
Zinc	331.0	9.2	20 or SB	50

contaminants identified at the Site from the performance of the FRI consisted of industrial organic and inorganic contaminants. The remedial alternatives to be considered for the Site pollution sources include: 1) removal and off-site disposal; 2) in-situ treatment or extraction; 3) isolation; and 4) no action, and are discussed below.

Removal and Off-Site Disposal

The remedial alternative identified as removal and off-site disposal involves the physical removal of contaminated media from a known pollution source and the off-site disposal of the contaminated media at a proper waste disposal facility. This type of remedial action is limited by the nature and extent of the contaminants, and the capabilities of the construction equipment performing the work. The nature of the contaminants, which includes type and concentrations, must be within acceptable limits for waste disposal facilities to receive and properly dispose of the waste. The location and extent of the contaminants may limit the ability of conventional construction equipment to adequately remove the soil contamination. Therefore, an assessment of the horizontal and vertical extent of Site contaminants requiring remedial action must be determined. This includes determining the accessibility of the construction equipment into the location of source area (i.e. within a building). This type of remedial action will sufficiently meet the remedial action objectives to permanently remove contaminants (in a timely fashion) when performed on pollution sources that are limited or isolated in extent. To assess the effectiveness of this type of remedial action, it is necessary to design and implement a sampling and analysis program subsequent to the performance of the remedial activities. This program will include securing representative samples for analysis to determine if any residual contamination exists at the pollution source. If residual contaminants are identified at a pollution source exceeding the applicable SCGs subsequent to the performance of remedial activities, it may be necessary to consider further remedial alternatives to meet remedial action objectives.

In-Situ Treatment or Extraction (Non-Biological)

The remedial alternative identified as in-situ extraction involves the in-place treatment of contaminated media by technological processes without the physical removal of the affected media. The contaminants are stripped or volatilized from the contaminated media by altering subsurface conditions to that which induces the removal of contaminants. This type of remedial action will mitigate or permanently remove contaminants from the affected media over a certain time period. The time period and effectiveness for which the contaminants are removed or extracted is dependent on the nature and extent of the contaminants at the pollution sources and the subsurface geology at the Site. The nature of the contaminants must be primarily composed of compounds with relatively light molecular weights. Such compounds typically consist of volatile organic compounds and are readily volatilized upon introducing vacuum pressures into the subsurface. The extent of the contaminants at the pollution sources must be significantly beyond the capabilities of the removal and disposal remedial alternative. The extent of the contamination is typically greater than ten feet below grade and has a significant volume. When applying this type of remedial action, Site-specific factors such as geology and hydrology must be considered. The soil type that is being treated must have an adequate porosity and permeability for the contaminants to desorb and/or volatilize. In addition, the groundwater elevations must be typically greater than five feet below grade. To assess the effectiveness of this type of remedial action, it may be necessary to secure representative samples of the affected media in the future to monitor the progress or completeness of the action for meeting the applicable SCGs.

The contaminants stripped from the affected media using this type of remedial action are typically released into the atmosphere. Remedial action objectives for this type of remedial action must consider potential risks of human exposure from contaminants leaving one media (soil) and entering another media (air). For this reason, it is necessary to assess the contaminant concentrations entering the atmosphere to protect human health. This assessment includes gauging the air quality at a release point from the treatment or extraction technology system. In addition, these activities will determine, in part, the effectiveness of the remedial action technology. Based on the rate of contaminant concentrations extracted from the pollution source, it may be necessary to filter or treat the air effluent to meet comprehensive remedial action objectives. To assess the air quality entering the atmosphere, it is necessary to design and implement an operation and maintenance plan during the operation of the remedial technology. This program will include securing representative air samples for analysis to determine what level, if any, of air treatment is necessary. If required, the treatment of air may be implemented using carbon charcoal filters. The waste retained in the filters will require subsequent removal and proper disposal at an off-site disposal facility.

Bio-Inoculation

In-situ groundwater bioremediation is a technology that encourages growth and reproduction of indigenous microorganisms to enhance biodegradation of organic compounds in the saturated zone. In-situ groundwater bioremediation can effectively degrade organic compounds that are dissolved in groundwater. In-situ groundwater bioremediation can be effective for the full range of petroleum hydrocarbons. The low-molecular-weight, more water soluble compounds are degraded more rapidly and to lower residual levels than are high-molecular-weight, less soluble compounds.

Bioremediation generally requires a mechanism for stimulating and maintaining the activity of these microorganisms. This mechanism is usually an inoculation for providing one or more of the following: An electron acceptor (oxygen, nitrate); nutrients (nitrogen, phosphorus); and an energy source (carbon). Generally, electron acceptors and nutrients are the two most critical components of any bio-inoculation.

The key parameters that determine the effectiveness of in-situ groundwater bioremediation are:

- hydraulic conductivity of the aquifer, which controls the distribution of electron acceptors and nutrients in the subsurface.
- biodegradability of the petroleum constituents, which determines both the rate and degree to which constituents will be degraded by microorganisms.
- location of contamination in the subsurface.
- Contaminants must be dissolved in groundwater or adsorbed onto more permeable sediments within the aquifer.

In general, the aquifer medium will determine hydraulic conductivity. Fine-grained media (e.g., clays, silts) have lower permeability than coarse-grained media (e.g., sands, gravels). Bioremediation is generally effective in permeable (e.g., sandy, gravelly) aquifer media.

However, depending on the extent of contamination, bioremediation also can be effective in less permeable silty or clayey media. In general, an aquifer medium of lower permeability will require longer to clean up than a more permeable medium. Soil structure and stratification are important to in-situ groundwater bioremediation because they affect groundwater flow rates and patterns when water is extracted or injected. Structural characteristics such as microfracturing can result in higher permeabilities than expected for certain soils (e.g., clays). In this case, however, flow will increase in the fractured media but not in the unfractured media. The stratification of soils with different permeabilities can dramatically increase the lateral flow of groundwater in the more permeable strata while reducing the flow through less permeable strata. This preferential flow behavior can lead to reduced effectiveness and extended remedial times for less-permeable strata.

The biodegradability of a petroleum compound is a measure of its ability to be metabolized by hydrocarbon-degrading bacteria or other microorganisms. The chemical characteristics of the contaminants will dictate their biodegradability. For example, heavy metals are not degraded by bioremediation. The biodegradability of organic compounds depends on their chemical structures and physical/chemical properties (e.g., water solubility, water partition coefficient). Highly soluble organic compounds with low molecular weights will tend to be more rapidly degraded than slightly soluble compounds with high molecular weights. The low water solubilities of the more complex compounds render them less bioavailable to petroleum-degrading organisms. Consequently, the larger, more complex chemical compounds may be slow to degrade or may even be recalcitrant to biological degradation.

The location, distribution, and disposition of petroleum contamination in the subsurface can significantly influence the likelihood of success for bioremediation. This technology generally works well for dissolved contaminants and contamination adsorbed onto higher permeability sediments (sands and gravels). However, if the majority of contamination is (1) in the unsaturated zone; (2) trapped in lower permeability sediments, or (3) outside the "flow path" for nutrients and electron acceptors, this technology will have reduced impact or no impact.

Nutrient injection systems may not be necessary at all, if the groundwater contains adequate amounts of nutrients, such as nitrogen and phosphorus. Microorganisms require inorganic nutrients such as nitrogen and phosphate to support cell growth and sustain biodegradation processes. Nutrients may be available in sufficient quantities in the aquifer but, more frequently, nutrients need to be added to maintain adequate bacterial populations.

Isolation or Capsulation

The remedial alternative identified as isolation involves the controlled containment or capsulation of contaminants at Site pollution sources. The contaminants at the pollution sources are isolated in mobility by designing barriers or containment structures that prevent or limit migration pathways. This alternative is effective in the short-term by reducing human health exposure risks. However, this alternative does not decrease the toxicity or volume of the contaminated media for long-term effectiveness and therefore will not meet the applicable SCGs. The pollution source remains persistent in the environment and may be exposed in the future during property redevelopment or demolition activities.

Natural Attenuation

The remedial alternative identified as no action involves the natural attenuation or breakdown of contaminants at pollution sources without any remedial action. This type of remedy will not permanently remove or significantly decrease the toxicity, mobility and volume of contaminants in the short-term. This type of remedy is typically limited to pollution sources that pose nominal risk to human health and the environment. The long-term effectiveness is dependant on the nature and extent of the contaminants at the Site pollution sources. Site pollution sources that are relatively persistent in the environment will typically exhibit residual traces of contaminants over prolonged time and present future exposure and pathway risks.

3.2.3 Selection of Remedial Alternatives

Based on an understanding of the nature and extent of the pollution source identified from the performance of the FRI, the remedial alternative selected for the Site include removal / off-site disposal. The pollution source was determined to be isolated to Site soil. Further, the vertical extent of the pollution source was determined to be limited in depth, which can be effectively removed by conventional construction equipment. The nature of the pollution source consists of industrial heavy metals contaminated soil. This selection should sufficiently meet the remedial action objectives and the applicable SCGs.

3.3 Detailed Analysis of Remedial Alternatives

3.3.1 Removal and Off-Site Disposal

Pollution Source UIW-001

The underground injection well, identified as UIW-001 during the FRI activities, will be uncovered and accessed utilizing an excavator. The contaminated media contained within the UIW will be classified pursuant to Title 6 NYCRR Part 371. The contaminated sediment contained within the underground injection well will be evacuated utilizing an industrial vacuum truck and pressurized water-spraying device to the appropriate depth feasible (no liquids exist in the UIW). The objective of the evacuation activities will be to remove contaminated sediment to approximately five feet below the invert or base of the structure. The underground injection well structure will remain unaffected from the removal activities to efficiently remove the contaminated sediment. The contaminated sediment removed from the underground injection well will be transferred and contained in the vacuum truck for proper off-site disposal. No on-site storage of the contaminated media will be necessary. A sampling and analysis plan will be implemented preceding the backfilling of the excavation.

One endpoint sample will be secured from the excavated invert of the underground injection well. The sample will be analyzed utilizing USEPA Test Method 8260 for target volatile organic analytes, USEPA Test Method 8270 for target base-neutral semi-volatile organic analytes and USEPA Test Method 6010 for priority pollutant inorganic analytes. The data quality objectives for the analysis of this sample will be consistent with those outlined under the final FRI Work Plan. The open excavation will be backfilled with clean fill (sand) to grade and restored. The contaminated media will be transported by a licensed waste hauler to an approved waste disposal facility. In addition, the secondary underground injection well, identified as UIW-002 during the FRI activities, will be backfilled with clean fill (sand) to grade and restored to meet local compliance requirements. The results of the endpoint sampling and analysis plan will be presented in the FRI report.

3.4 Solid Waste Management

3.4.1 Estimation of Contaminated Media Volume

The estimated volume of contaminated media at the pollution source was used as a determining factor for the feasibility of selecting a remedial alternative. The following table provides an estimation of the volume of contaminated soil based on performance of the FRI activities at the Site pollution source.

Pollution Source	Area	Depth	In-Place Estimated Volume of Contaminated Media
UIW-001	50 ft^2	5 ft	Soil - 250 ft^3

3.4.2 Transport and Disposal

The selection of the waste disposal facilities for the contaminated soil will be determined by the analysis of representative samples from the pollution source for waste classification prior to disposal. The two general types of waste classifications are hazardous and non-hazardous waste. The following presents the selected waste disposal facilities corresponding to the waste classification (to be determined) of the contaminated media.

If the solid waste media from the pollution source is classified as a hazardous F-waste, it will be handled pursuant to Title 6 NYCRR Part 371 and EPA 40 CFR 261 regulations, transported with waste manifests and disposed in accordance with Title 6 NYCRR Part 360 regulations. Solid waste classified as a hazardous waste shall be transported to and disposed of at the following disposal facility:

Horizon Environmental, Inc.
120 Route 155
Grandes-Piles (Champlain), Canada
USEPA ID Number NYR000078964

If the solid waste media from the pollution source is classified as a non-hazardous waste, it will be handled, transported with waste charters and disposed in accordance with Title 6 NYCRR Part 371 and EPA 40 CFR 261 Criteria. Solid waste classified as a non-hazardous waste shall be transported to and disposed of at the following disposal facility:

RGM, Inc.
972 Nicolls Road
Deer Park, New York

4. HEALTH AND SAFETY PLAN

This Health and Safety Plan (HASP) describes the procedures to be followed in order to reduce employee exposure to potential health and safety hazards that may be present at the project site. The emergency response procedures necessary to respond to such hazards are also described within this HASP. All activities performed under this HASP comply with Occupational Safety and Health Administration (OSHA) Regulations 29 CFR Parts 1910, 1925 and 1926 as amended.

4.1 Purpose

This Health and Safety Plan is required according to OSHA 29 CFR 1910.120. The purpose of this HASP is to provide the contractor's field personnel, subcontractors, and other visitors with an understanding of the potential chemical and physical hazards that exist or may arise while the tasks of this project are being performed.

The primary objective is to ensure the well being of all field personnel and the community surrounding this site. In order to accomplish this, project staff and approved subcontractors shall acknowledge and adhere to the policies and procedures established herein. Accordingly, all personnel assigned to this project shall read this HASP to certify that they have read, understood, and agree to abide by its provisions.

The contractor's personnel have the authority to stop work performed by our sub-contractors at this site if said work is not performed in accordance with the requirements of this HASP.

4.2 Contaminants of Concern

The following organic chemical analytes are present or have the potential to be present in the soil at the Site.

- 1,1,2,2-tetrachloroethane

- Vinyl Chloride
- Cis-1,2-dichloroethylene
- Trans-1,2-dichloroethylene
- Trichloroethylene
- Tetracholoroethene
- 1,1,1-trichloroethane
- 1,1,2-trichloroethane
- 1,1-dichloroethane
- 1,2-dichloroethane
- 1,1,1,2-tetrachloroethane
- Benzene

4.3 Amendments

This plan is based on an initial assessment of health and safety risks associated with the site. The plan will be updated as additional information is obtained regarding the nature and extent of on-site contamination and the associated health and safety risks. Any changes in the scope of work of this project and/or site conditions must be amended in writing and approved by the Regional Health and Safety Manager.

4.4 Key Personnel / Identification of Health & Safety Personnel

4.4.1 Key Personnel

A list of the pertinent personnel authorized to be present on site is as follows:

Title	Name	Telephone Number
Project Manager	Jim Allen	(631) 269-8800
Field Operations Leader	Richard Parrish	(631) 269-8800
Site Health and Safety Officer	Kristin Scroope	(631) 269-8800

Quality Assurance Officer	Kevin Kleaka	(631) 269-8800
Site Contact	Jim Allen	(631) 269-8800
State Agency Contact (NYSDEC)	Joe Jones	(518) 402-9621

4.5 Organizational Responsibility

4.5.1 Project Manager

The Project Manager will be responsible for implementing the project and obtaining any necessary personnel or resources for the completion of the project.

Specific duties will include:

- Coordinating the activities of all subcontractors, to include informing them of the required PPE and insuring their signature acknowledging this Site Safety Plan;
- Selecting a Site Health and Safety Officer and field personnel for the work to be undertaken on site;
- Ensuring that the tasks assigned are being completed as planned and on schedule;
- Providing authority and resources to ensure that the Site Health and Safety Officer is able to implement and manage safety procedures;
- Preparing reports and recommendations about the project to clients and affected personnel;
- Ensuring that all persons allowed to enter the site (i.e., EPA, contractors, state officials, visitors are made aware of the potential hazards associated with the substances known or suspected to be on site, and are knowledgeable as to the on-site copy of the specific site safety plan;
- Ensuring that the Site Health and Safety Officer is aware of all of the provisions of this site safety plan and is instructing all personnel on site about the safety practices and emergency procedures defined in the plan;
- Ensuring that the Site Health and Safety Officer is making an effort to monitor site safety, and has designated a Field Operations Leader to assist with the responsibility when necessary.

4.5.2 Field Operations Leader

The Field Operations Leader will be responsible for field operations and safety. Specific duties will include, but are not limited to:

- Managing field operations;
- Executing the work plan and schedule;
- Enforcing safety procedures;
- Coordinating with the Site Health and Safety Officer in determining protection levels;
- Enforcing site control;
- Documenting field activities, including sample collection;
- Serving as liaison with public officials where there is no Public Affairs official designated.

In the event that the Project Manager and the Site Health and Safety Officer are not on site, the Project Field Manger will assume all responsibility of the Site Health and Safety Officer.

4.5.3 Site Health and Safety Officer

The Site Health and Safety Officer shall be responsible for the implementation of the site safety plan on site. Specific duties will include:

- Monitoring the compliance of field personnel for the routine and proper use of the PPE that has been designated for each task;
- Routinely inspecting PPE and clothing to ensure that it is in good condition and is being stored and maintained properly;
- Stopping work on the site or changing work assignments or procedures if any operation threatens the health and safety of workers or the public;
- Monitoring personnel who enter and exit the site and all controlled access points.
- Reporting any signs of fatigue, work-related stress, or chemical exposures to the Project Manager;
- Dismissing field personnel from the site if their actions or negligence endangers themselves, co-workers, or the public, and reporting the same to the Project Manager;
- Reporting any accidents or violations of the site safety plan to the Project Manager and

documenting the same for the project in the records;

- Knowing emergency procedures, evacuation routes, and the telephone numbers of the ambulance, local hospital, poison control center, fire and police departments;
- Ensuring that all project-relating personnel have signed the personnel agreement and acknowledgments form contained in this site safety plan;
- Coordinate upgrading and downgrading PPE as necessary due to changes in exposure levels, monitoring results, weather, and other site conditions;
- Perform air monitoring with approved instruments in accordance with requirements stated in this Site Safety Plan.

4.5.4 Quality Assurance Officer

The Quality Assurance Officer (QAO) is an employee of the same consulting firm generating the work plan and acts in conjunction with the project manager to develop a site-specific quality assurance plan. The QAO must not have another position on the project, such as a project or task manager, that involves project productivity or profitability as job-performance criteria.

The QAO will assist the project manager in the development of the sampling and analytical portion of the Quality Assurance Project Plan. The QAO or his/her designee shall conduct periodic field and sampling audits, interface with the analytical laboratory to make requests and resolve problems, interface with the data validator and develop a project-specific data usability report.

4.5.5 Field Personnel

All field personnel shall be responsible for acting in compliance with all safety procedures outlined in the Site Safety Plan. Any hazardous work situations or procedures should be reported to the Site Safety Officer so that corrective steps can be taken.

4.6 Task / Operation Health and Safety Risk Analysis

The field tasks covered by the HASP may include well installation, development, gauging, and bailing; soil & groundwater handling/sampling; and confined space (excavation) entry and job task hazards. The following hazards may be encountered:

4.7 Oxygen Deficiency

Oxygen deficiency may result from the displacement of oxygen by another gas, or the consumption of oxygen by a chemical reaction.

4.7.1 Organic Vapors

The inhalation of volatile organic vapors during all operations can pose a potential health hazard. Hazard reduction procedures include monitoring the ambient air with a flame ionization detector (FID) and the use of appropriate Personal Protective Equipment (PPE). Workers should stand upwind of the source of contamination whenever possible.

4.8 Explosion and Fire

The following are possible fire and explosion hazards that may be encountered on the job site and fire preventive measures to take.

4.8.1 Flammable Vapors

The presence of flammable vapors can pose a potential fire and health hazard. Hazard reduction procedures include monitoring the ambient air with an oxygen/LEL meter (combustible gas indicator). If the LEL reading exceeds 20%, leave the site immediately and contact the fire department.

4.8.2 High Oxygen Levels

Atmospheres that contain a level of oxygen greater than 23% pose an extreme fire hazard (the usual ambient oxygen level is approximately 20.5%). This hazard can be compounded by the fact that vapors associated with this site are highly flammable. All personnel encountering atmospheres that contain a level of oxygen greater than 23% must evacuate the site immediately and must notify the Fire Department. If the oxygen level is less than 19.5%, do not enter the space without level B PPE.

4.8.3 Fire Prevention

- During equipment operation, periodic vapor concentration measurements should be taken with an explosimeter or combustimeter. If at any time the vapor concentrations exceed 20% of the LEL, then the Site Safety Officer or designated field worker should immediately shut down all operations.
- Only approved safety cans will be used to transport and store flammable liquids.
- All gasoline and diesel-driven engines requiring refueling must be shut down and allowed to cool prior to filling.
- Smoking is not allowed during any operations within the work area in which petroleum products or solvents in free-floating, dissolved, or vapor forms, or other flammable liquids may be present.
- No open flame or spark is allowed in any area containing petroleum products or other flammable liquids.

4.9 Operational Safety Hazards

4.9.1 Heavy Machinery / Equipment

All site employees must remain aware of those site activities that involve the use of heavy equipment and machinery. Respiratory protection and protective eyewear may be worn frequently during site activities. This protective equipment significantly reduces peripheral vision of the wearer. Therefore, it is essential that all employees at the site exercise extreme caution during operation of equipment and machinery to avoid physical injury to themselves or others.

4.9.2 Vehicular Traffic

All employees will be required to wear a fluorescent safety vest at all times while on site. In addition, supplemental traffic safety equipment use can be exercised when warranted by specific task. Supplemental equipment can be items such as cones, flags, barricades, and/or caution tape.

4.10 Noise Hazards

Requirements set forth in the OSHA Hearing Conservation Regulation (OSHA 1910.95) shall be adhered to during work on-site. Hearing protection shall be provided to the employees where sound pressure levels exceed 85 dB. Hearing protection shall be worn where sound pressure levels in areas and/or on equipment exceeds 90 dB. Typical drilling operations have been monitored with a sound level meter and indicate that hearing protection is required for all personnel while engaged in this action.

4.11 Well Installation, Development, Gauging and Bailing Hazards

Skin and eye contact with contaminated groundwater and/or soil may occur during these tasks. Nitrile gloves and approved safety glasses must be worn.

4.12 Soil & Groundwater Sampling Hazards

Skin and eye contact with contaminated groundwater and/or soil may occur during these tasks. Nitrile gloves and approved safety glasses must be worn.

4.13 Sample Preservation Hazards

When hydrochloric acid is used, skin and eye contact can occur. This hazard can be reduced with the use of Nitrile gloves and safety glasses. Safety goggles should be worn if there is a potential for a splash hazard.

4.14 Equipment Cleaning Hazards

Skin and eye contact with methanol, "Alconox", or other cleaning substances can occur while decontaminating equipment. This hazard can be reduced with the use of Nitrile gloves and safety glasses.

4.15 Heat Exposure Hazards

Since climatic changes cannot be avoided, work schedules will be adjusted to provide time intervals for intake of juices, juice products, and water in an area free from contamination and in quantities appropriate for fluid replacement to prevent heat stress conditions from occurring.

4.15.1 Types of Heat Stress

Heat stress may occur even in moderate temperature areas and may present any or all of the following:

4.15.1.1 Heat Rash

Result of continuous exposure to heat, humid air, and chafing clothes. Heat rash is uncomfortable and decreases the ability to tolerate heat.

4.15.1.2 Heat Cramps

Result of the inadequate replacement of body electrolytes lost through perspiration. Signs include severe spasms and pain in the extremities and abdomen.

4.15.1.3 Heat Exhaustion

Result of increased stress on the vital organs of the body in the effort to meet the body's cooling demands. Signs include shallow breathing; pale, cool, moist skin; profuse sweating; and dizziness.

4.15.1.4 Heat Stroke

Result of overworked cooling system. Heat stroke is the most serious form of heat stress. Body surfaces must be cooled and medical help must be obtained immediately to prevent severe injury and/or death. Signs include red, hot, dry skin, absence of perspiration, nausea, dizziness and confusion, strong, rapid pulse, coma, and death.

4.15.2 Heat Stress Prevention

A. Replace body fluids (water and electrolytes) lost through perspiration. Solutions may include a 0.1% salt and water solution or commercial mixes such as "Gatorade". Employees must be encouraged to drink more than the amount required in order to satisfy thirst.

B. Use cooling devices to aid the natural body ventilation. Cooling occurs through evaporation of perspiration and limited body contact with heat-absorbing protective clothing. Utilize fans and air conditioners to assist in evaporation. Long, cotton underwear is suggested to absorb perspiration and limit any contact with heat-absorbing protective clothing (i.e., coated Tyvek suits).

C. Conduct non-emergency response activities in the early morning or evening during very hot weather.

D. Provide shelter against heat and direct sunlight to protect personnel. Take breaks in shaded areas.

E. Rotate workers utilizing protective clothing during hot weather.

F. Establish a work regime that will provide adequate rest periods, with personnel working in shifts.

4.16 Cold Exposure Hazards

Work schedules will be adjusted to provide sufficient rest periods in a heated area for warming up during operations conducted in cold weather. Also, thermal protective clothing such as wind and/or moisture resistant outerwear is recommended to be worn.

If work is performed continuously in the cold at or below -7 °C (20 °F), including wind chill factor, heated warming shelters (tents, cabins, company vehicles, rest rooms, etc.) shall be made available nearby and the worker should be encouraged to use these shelters at regular intervals, the frequency depending on the severity of the environmental exposure. The onset of heavy shivering, frostnip, the feeling of excessive fatigue, drowsiness, irritability, or euphoria, are indications for immediate return to the shelter. When entering the heated shelter, the outer layer of clothing shall be removed and the remainder of the clothing loosened to permit sweat evaporation. A change of dry work clothing shall be provided as necessary to prevent workers from returning to their work with wet clothing.

Dehydration, or the loss of body fluids, occurs in the cold environment and may increase the susceptibility of the worker to cold injury due to a significant change in blood flow to the extremities. Warm sweet drinks and soups should be provided at the work site to provide caloric intake and fluid volume. The intake of coffee should be limited because of a diuretic and circulatory effect (Adapted from TLV's and Biological Exposure Indices 1988-1989, ACGIH).

4.17 Personnel Training

All personnel assigned to the project site should have completed an initial 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course, health and safety training course, and a current eight-hour refresher course (as required annually after initial 40-hour training completion). Personnel assigned to the site should also have a minimum of three days of field experience under direct supervision of a trained, experienced person.

4.18 Site Supervisors Training

On-site managers and supervisors directly responsible for employees engaged in hazardous waste operations have received an additional eight hours of supervisory training. These training requirements comply with the OSHA Hazardous Waste Operations and Emergency Response Regulation, 29 CFR 1910.120.

The project Quality Assurance Officer (QAO) must have a minimum of a bachelor's degree in chemistry or natural science with a minimum of 20 hours in chemistry. The QAO must be proficient in analytical methodology, data interpretation and validation, the development of sampling plans, quality control procedures, and auditing techniques. Because on-site work may be necessary, verification or completion of the 40-hour OSHA safety training course and 8-hour refresher is required.

4.19 On-Site Training Program

The site safety supervisor will conduct an on-site training meeting for all personnel and observers who will be involved in the various project operations before they are permitted to participate in any site activities. Training meetings will be provided routinely for any new project personnel. This program will cover specific health and safety equipment and protocols and potential problems inherent to each project operation. No one will be allowed to work on the project site in restricted areas (e.g., waste excavation / handling / processing) unless he/she has attended a project training meeting.

The HASP will be reviewed during the meeting. Copies of the HASP will be distributed to all attending and will be kept available for reference in the field office for the project duration.

4.20 Personal Protective Equipment

The purpose of personal protective clothing and equipment (PPE) is to shield or isolate individuals from the chemical, physical, and biological hazards that may be encountered on-site when engineering and other controls are not feasible or cannot provide adequate protection. Careful selection and use of adequate PPE should protect the health of all on-site workers. No single combination of PPE is capable of protecting against all hazards. Therefore, PPE should be used in conjunction with, not in place of, other protective methods, such as engineering controls and safe work practices.

The following is a breakdown of the types of protective clothing and equipment to be used during the site activities. Personal protective equipment is in conformance with EPA criteria for Level B, C, and D protection.

4.21 Levels of Protection

Site Specific chemicals of Concern are Benzene, MTBE, Tetrachloroethene, Toluene, Trans 1,2 Dichloroethane, Trichloroethene, Xylene(s), and Vinyl Chloride. These chemicals are of moderate to low hazard. Therefore, modified level D personal protective equipment will be required at all times when on site.

The Site Safety Officer will determine whether or not a level of protection can be upgraded or downgraded. Changes in the level of protection will be recorded in the dedicated site logbook along with the rationale for the changes.

4.21.1 Level D Personal Protective Equipment

All initial site access and activities will be done in Level D attire. Level D protection is sufficient under conditions where no contaminants are present or those activities that do not pose a potential threat of unexpected inhalation of or contact with hazardous levels of any substances. Typical Level D activities may include sediment, logging and groundwater sampling, as well as surficial site surveys.

Level C protection equipment should be readily available at all times. Consistent with OSHA training, prior to donning Level C, oxygen percent must be continuously monitored.

- Hard hat
- Safety glasses

- Steel toe and shank boots
- Fluorescent vest
- Splash goggles
- Hearing protection (as appropriate)

4.21.2 Modified Level D Personal Protective Equipment

- Hard hat
- Safety glasses
- Steel toe and shank boots
- Fluorescent vest
- Nitrile "N-Dex" inner gloves
- Latex outer boots (chemical resistant)
- Splash goggles
- Polyethylene coated Tyvek suit
- Hearing protection (as appropriate)

4.21.3 Level C Personal Protective Equipment

Level C protection, as described in this plan, will be available at a minimum for those activities that involve surface and subsurface soil (strata disturbance such as well installation, and all subsurface media sampling activities such as split-spoon sampling and borings).

- Buddy system required at all times
- Full-face respirator with NIOSH approved OV/AG/HEPA combination cartridges (MSA GMC-H)
- Saranex coated Tyvek Suit
- Inner Nitrile "N-Dex" gloves
- Outer Nitrile (NBR) gloves
- Steel toe and shank boots
- Outer boots (chemical resistant)

- Hard hat
- Hearing protection (as appropriate)

4.21.4 Level B Personal Protective Equipment

Some activities may require Level B protection. In atmospheres potentially containing toluene and xylenes, the protective ensemble should include chemical resistant clothing since the two compounds have skin absorption potential.

Regional Health and Safety representatives must be on site upon start-up of <u>any</u> project requiring level B protection. This should be understood to include subcontractors conducting Level B activity.

- Buddy system required at all times
- Supplied air respirator or SCBA
- Saranex coated Tyvek Suit
- Inner Nitrile "N-Dex" gloves
- Outer Nitrile (NBR) gloves
- Steel toe and shank boots
- Outer boots (chemical resistant)
- Hard hat
- Hearing protection (as appropriate)

4.22 Personal Use Factors and Equipment Limitations

Prohibitive or precautionary measures should be taken as necessary to prevent workers from jeopardizing safety during equipment use.

All respiratory protective equipment used will be approved by NIOSH/MSHA. Respirator cartridges will be changed once per day at a minimum. This can be accomplished at the end of the workday during respirator decontamination. If odor breakthrough is detected while wearing the respirator or if breathing becomes difficult, change cartridges immediately.

When utilizing protective garments such as Tyvek suits, gloves, and booties, all seams between protective items will be sealed with duct tape.

Contact with contaminated surfaces, or surfaces suspected of being contaminated, should be avoided. This includes walking through, kneeling in, or placing equipment in puddles, mud, discolored surfaces, or on drums and other containers.

Eating, smoking, drinking, and/or the application of cosmetics in the immediate work area is prohibited. Ingestion of contaminants or absorption of contaminants into the skin may occur.

The use of contact lenses on the job site is strongly advised against. Contact lenses may trap contaminants and/or particulate between the lens and eye, causing irritation. However, when glasses are not available, contact lenses are preferred over faulty vision. When contact lenses are worn, safety glasses and/or goggles must be worn at all times while on the job site. Wearing contact lenses with a respirator in a contaminated atmosphere is prohibited under 29 CFR §1910.134(e)(5)(iii).

4.23 Medical Surveillance Requirements

A baseline physical examination should be conducted on all employees before they are permitted to engage in sampling, cleanup, and remedial action work. A complete medical survey should be completed on each employee upon start of employment. Yearly re-examination should be performed to update information on employee health status. Additional re-evaluation will be considered in the event of a chemical overexposure. These medical surveillance requirements shall comply with OSHA regulations as defined in 29 CFR 1910.120.

4.24 Periodic Monitoring

4.24.1 Heat Stress Monitoring

Heat stress may occur even in moderate temperatures and may present heat rash, heat cramps, heat exhaustion, and/or heat stroke.

Monitoring procedures should be implemented to prevent heat stress arising from environmental conditions, use of PPE, and/or intensity of workload.

For temperatures above 70 °F, the following regime shall be followed for workers wearing permeable coveralls:

Adjusted Temperature	Normal Ensemble	Impermeable Ensemble
90 °F or above	After 45 min. of work	After 15 min. of work
87.5 to 90 °F	After 60 min. of work	After 30 min. of work
82.5 to 87.5 °F	After 90 min. of work	After 60 min. of work
77.5 to 82.5 °F	After 120 min. of work	After 90 min. of work
72.5 to 77.5 °F	After 150 min. of work	After 120 min. of work

Workers wearing semi-permeable or impermeable encapsulating protective clothing should be monitored for heart rate and temperature when the temperature in the work area is above 70 °F. In order to monitor the worker, measure:

A. Heart rate - Count the radial pulse during a 30-second period as early as possible in the rest period. If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third.

B. Oral temperature - Use a clinical thermometer or similar device to measure the oral temperature at the end of the work period (before drinking). If oral temperature exceeds 99.6 °F, shorten the next work cycle by one-third.

Do not permit a worker to wear a semi-permeable or impermeable garment if the core body temperature exceeds 100.6 °F.

Workers shall not be required to continue working if they feel any of the symptoms of heat stress. Rest periods should be a minimum of 15 minutes. Length of rest period should be extended as appropriate or as recommended by the Site Safety Officer or alternate.

4.25 Frequency and Types of Air Monitoring / Sampling

During drilling, excavation, and sampling, the air in work areas will be sampled periodically for the presence of contaminants. Levels of organic vapors in the ambient air will be monitored during the fieldwork to ensure that appropriate levels of respiratory protection are employed at all times.

Site Specific chemicals of Concern are Benzene, Tetrachloroethene, Toluene, Trans 1,2 Dichloroethane, Trichloroethene, Xylene(s), and Vinyl Chloride. These chemicals are of moderate to low hazard.

4.25.1 Volatile Organic Compounds

A member of the field investigation team will use a real-time, organic vapor instrument to monitor the concentration of volatile organic compounds (VOCs) in the air in the work areas, and will determine when changes in levels of respiratory protection required are necessary. No changes in the levels of respiratory protection specified above will be made without the approval of the site safety supervisor and the project team leader.

4.25.2 Detection Equipment

During the investigation of the project site, the site workers will use a photoionization detector (PID) to monitor levels of organic vapor in the air and verify that they are within the safety guidelines established by the preliminary assessment of the risks associated with site investigations. The measured readings will be recorded in a vapor-monitoring sheet (See Appendix F). The following information will be recorded in the field notebook:

- Instrument type
- Control settings
- Reading locations
- Atmospheric conditions

All air monitoring results should be logged in the Site Safety Log.

4.25.2.1 Ionization Detector Response

Flame Ionization Detector (FID)	
Concentrations (in ppm)	**Level of PPE Required**
0.0 to 5.0	Level D
5.0 to 250.0	Level C
250.0 to 750.0	Level B
Above 750.0	Immediately withdraw from the area

4.26 Site Control Measures

Site personnel will employ the buddy system when working under certain circumstances, such as enclosed spacing. Under the buddy system, each site worker is responsible for monitoring the well being of another worker. No one will work alone when the buddy system is implemented. At no time will fewer than two employees be present at the site if activities are underway.

4.27 Site Communications Plan

Mobile telephone and/or two-way radios will be used to communicate between the work parties on the site. The following standard hand signals will be used in case of failure of radio communication:

Hands on top of head: Need assistance
Thumbs up: OK, I am alright, I understand
Thumbs down: No, Negative

Personnel in the Contaminated Zone should remain in constant radio communication or within sight of the project team leader. Any failure of radio communication will require the team leader to evaluate whether personnel should leave the zone.

4.28 Work Zone Definition

Work and support areas shall be established based on ambient air data and proposed work sites. They shall be established in order to contain contamination within the smallest areas possible and shall ensure that each employee has the proper PPE for the area or zone in which work is to be performed.

4.28.1 Exclusion Zone (EZ)

It is within this zone that the work activities are performed. No one shall enter this zone unless the appropriate PPE is donned.

4.28.2 Contaminant Reduction Zone (CRZ)

It is within this zone that the decontamination process is undertaken. Personnel and their equipment must be adequately decontaminated before leaving this zone for the support zone. This zone will be set up between the EZ and a well-ventilated open area.

4.28.3 Support Zone (SZ)

The support zone is considered to be uncontaminated; as such, protective clothing and equipment are not required but should be available for use in emergencies. All equipment and materials are stored and maintained within this zone. Protective clothing is put on in the SZ before entering the CRZ. The SZ will be established in a safe environment.

4.29 Safe Work Practices

4.29.1 Safety Practices / Standing Orders

The following are important safety precautions that will be enforced during work activities.

1. Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated.
2. Hands and face must be thoroughly washed upon leaving the work area and before eating, drinking, or any other activity.
3. Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garments are removed.
4. No excessive facial hair that interferes with the effectiveness of a respirator will be permitted on personnel required to wear respiratory protection equipment. The respirator must seal against the face so that the wearer receives air only through the air purifying cartridges attached to the respirator. Fit testing shall be performed prior to respirator use to ensure the wearer obtains a proper seal.
5. Contact with potentially contaminated surfaces should be avoided whenever possible. One should not walk through puddles; kneel on the ground; lean, sit, or place equipment on drums, containers, vehicles, or the ground.
6. Medicine and alcohol can potentate the effect from exposure to certain compounds. Prescribed drugs and alcoholic beverages should not be consumed by personnel involved in the project.
7. Personnel and equipment in the work areas should be minimized, consistent with effective site operations.
8. Work areas for various operational activities should be established.
9. Procedures for leaving the work area must be planned and implemented prior to going to the site. Work areas and decontamination procedures must be established on the basis of prevailing site conditions.

10. Respirators will be issued for the exclusive use of one worker and will be cleaned and disinfected after each use.
11. Safety gloves and boots shall be taped to the disposable, chemical-protective suits as necessary.
12. All unsafe equipment left unattended will be identified by a "DANGER, DO NOT OPERATE" tag.
13. Noise mufflers or earplugs may be required for all site personnel working around heavy equipment. This requirement will be at the discretion of the Site Safety Officer. Disposable, form-fitting plugs are preferred.
14. Cartridges for air-purifying respirators in use will be changed daily at a minimum.

4.30 Decontamination Plan

Personnel involved in work activities at the site may be exposed to compounds in a number of ways, despite the most stringent protective procedures. Site personnel may come in contact with vapors, gases, mists, or particulates in the air, or other site media while performing site duties. Use of monitoring instruments and site equipment can also result in exposure and transmittal of hazardous substances.

In general, decontamination involves scrubbing with a detergent water solution followed by clean water rinses. All disposable items shall be disposed of in a dry container. Certain parts of contaminated respirators, such as harness assemblies and leather or cloth components, are difficult to decontaminate. If grossly contaminated, they may have to be discarded. Rubber components can be soaked in detergent and water and scrubbed with a brush. In addition to being contaminated, all respirators, non-disposable protective clothing, and other personal articles must be sanitized or replaced before they can be used again if they become soiled from exhalation, body oils, and perspiration. The manufacturer's instructions should be followed in sanitizing the respirator masks.

The Site Safety Officer will be responsible for the proper maintenance, decontamination, and sanitizing of all respirator equipment.

The decontamination zone layout and procedures should match the prescribed levels of personal protection.

The following procedures have been established to provide site personnel with minimum guidelines for proper decontamination. Personnel leaving the point of operations designated as the EZ must follow these minimum procedures. The decontamination process shall take place at a reasonable distance away from any area of potential contamination.

4.31 Minimum Decontamination Procedure

Personnel leaving the point of operations should wash outer gloves and boots. At a minimum, the outer boots shall be removed first and stored in an appropriate area or disposed of properly. Outer boots must be properly washed where gross contamination is evident. Personnel shall then remove and dispose of the Tyvek suits. Personnel should remove the Tyvek suits so that the inner clothing does not come in contact with any contaminated surfaces. After Tyvek removal, personnel shall remove and discard outer Nitrile gloves. Personnel shall then remove the respirator, where applicable. Respirators shall be disinfected between uses with towelettes or other sanitary methods. Potable water, at a minimum, will be present so that site personnel can thoroughly wash hands and face after leaving the point of operations.

Portable wash stations shall be utilized for easy and efficient access. The wash station shall consist of a potable water supply, hand soap, and clean towels. Portable sprayer units filled with Alconox solution and potable water should also be available to wash and rinse off grossly contaminated boots, gloves, and equipment. The Site Safety Officer will monitor decontamination procedures to ensure their effectiveness. Modifications of the decontamination procedure may be necessary as determined by the Site Safety Officer's observations.

4.32 Standard Decontamination Procedure

The following decontamination procedures should be implemented during site operations for the appropriate level of protection.

4.32.1 Level B

Segregated equipment drop	Deposit equipment (tools, sampling devices, notes, monitoring instruments, radios, etc.) used on the site onto plastic drop cloths.
Boot covers and glove wash	Outer boots and outer gloves should be scrubbed with a decontamination solution of detergent and water or replaced.
Rinse off boot covers and gloves	Decontamination solution should be rinsed off boot covers and gloves using generous amounts of water. Repeat as many times as necessary.
Tape removal	Remove tape from around boots and gloves and place into container with plastic liner.
Boot cover removal	Remove disposable boot covers and place into container with plastic liner.
Outer glove removal	Remove outer gloves and deposit in container with plastic liner.
Suit / safety boot wash	Completely wash splash suit, SCBA, gloves, and safety boots. Care should be exercised that no water is allowed into the SCBA regulator. It is suggested that the SCBA regulator be wrapped in plastic.
Suit / safety boot rinse	Thoroughly rinse off all decontamination solution from protective clothing.
Tank or canister changes	This is the last step in the decontamination procedure for those workers wishing to change air tanks and return to the EZ. The worker's air tank or cartridge is exchanged, new outer glove and boot covers are donned, and joints taped.
Removal of safety boots	Remove safety boots and deposit in container with a plastic liner.
SCBA backpack removal	Without removing the face piece, the SCBA backpack should be removed and placed on a table. The face piece should then be disconnected from the remaining SCBA unit and then proceed to

	the next station.
Splash suit removal	With care, remove the splash suit. The exterior of the splash suit should not come in contact with any inner layers of clothing.
Inner glove wash	The inner gloves should be washed with a mild decontamination solution (detergent / water).
Inner glove rinse	Generously rinse the inner gloves with water.
Face piece removal	Without touching the face with gloves, remove the face piece. The face piece should be deposited into a container that has a plastic liner.
Inner glove removal	Remove the inner glove and deposit into a container that has a plastic liner.
Field wash	Wash hands and face thoroughly. If highly toxic, skin corrosive, or skin absorbent materials are known or suspected to be present, a shower should be taken.

4.32.2 Level C and Level D

The decontamination procedure for Level C and Level D personal protection will employ applicable steps detailed in the Level B decontamination process.

4.33 Sampling Equipment and Sample Container Decontamination

All non-disposable sampling equipment will be decontaminated with an Alconox / water solution followed by a clean water rinse. As an added precaution against cross-contamination, all non-disposable sampling equipment will be rinsed with distilled water. All disposable sampling equipment will be properly disposed of in dry containers.

Before leaving the site, all sample containers will be thoroughly decontaminated using a detergent and water solution followed by a clean water rinse. The decontamination procedure should include a complete scrubbing of the container's surface to remove possible contamination. Care must be exercised to prevent damage to sample container identification labels.

4.34 Emergency Response / Contingency Plan

In order to properly prepare for emergencies, personal protective equipment (PPE) will be worn by site workers, and first aid equipment will be kept at the site. Material Safety Data Sheets (MSDS) will be maintained for all contaminants that workers may be exposed to.

4.35 Contact Information

In the event of an accident or emergency situation, emergency procedures will be executed. Said procedures can and will be executed by the first person to observe an accident or emergency situation. The Project Field Manager will be notified about the situation immediately after emergency procedures are implemented.

4.35.1 Emergency Contacts

Emergency:	911	
Ambulance:	516-572-6655	Nassau County Medical Center
Hospital:	516-572-0123	Nassau County Medical Center
Local Police Precinct:	516-573-5275	Westbury Police Dept.
State Police:	516-756-3300	New York State Police Department
Fire Department:	516-921-0000	Westbury Fire Dept.
Chemtrec:	800-424-9300	
Poison Control Center:	800-336-6997	
National Response Center:	800-424-8802	
US EPA (24-hour hotline):	800-424-9346	

Directions to Nearest Hospital From Project Site:

Take New York Avenue south and turn left onto Old Country Road. Continue east and turn right onto Carman Ave. Travel approximately two miles south on Carman Ave. and the hospital will be on the left immediately after the Nassau County Jail.

4.35.2 Utility Emergencies / Initiating Subsurface Investigation Work

Impact Environmental Consulting, Inc. ("Impact") representatives are responsible for contacting appropriate agencies prior to conducting on-site activities when applicable.

Gas Company:	718-643-4050	Brooklyn Union Gas
Telephone Company:	516-661-6000	Bell Atlantic
Electric Company:	516-222-7700	Marketspan

4.36 Contingency / Evacuation Plan

It may be possible that a site emergency could necessitate the evacuation of all personnel from the site. If such a situation develops, an audible alarm shall be given for site evacuation (consisting of an air horn). Personnel shall evacuate the site in a calm and controlled fashion and regroup at a predetermined location. The route of evacuation will be dependent on wind direction, severity, type of incident, etc.

The site must not be re-entered until back-up help, monitoring equipment, and/or personal protective equipment are on hand and the appropriate regulatory agencies have been notified.

4.37 Emergency Medical Treatment Procedures

All injuries, no matter how slight, will be reported to the site safety supervisor immediately. The safety supervisor will complete an accident report for all incidents (Appendix B).

Some injuries, such as severe lacerations or burns, may require immediate treatment. Unless required due to immediate danger, seriously injured persons should not be moved without direction from attending medical personnel.

4.37.1 Standard Procedures for Injury

1. Notify the Site Safety Officer, Project Manager, and the Regional Safety Director of all accidents, incidents, and near emergency situations.
2. If the injury is minor, trained personnel should proceed to administer appropriate first aid.
3. Telephone for ambulance/medical assistance if necessary. Whenever possible, notify the receiving hospital of the nature of physical injury or chemical overexposure. If no phone is available, transport the person to the nearest hospital.
4. When transporting an injured person to a hospital, bring this Health and Safety Plan with the attached MSDS to assist medical personnel with diagnosis and treatment.

4.37.2 Chemical Overexposure

In all cases of chemical overexposure, follow standard procedures as outlined below for poison management, first aid, and, if applicable, cardiopulmonary resuscitation. Different routes of exposure and their respective first aid/poison management procedures are outlined below.

Ingestion	Do not induce vomiting unless prompted by a health professional. Transport person to nearest hospital immediately.
Inhalation / Confined Space	Do not enter a confined space to rescue someone who has been overcome unless properly equipped and a standby person present.
Inhalation / Other	Move the person from the contaminated environment. Initiate CPR if necessary. Call or have someone call for medical assistance. Refer to MSDS for additional specific information. If necessary, transport the victim to the nearest hospital as soon as possible.
Skin Contact / Non-Caustic	Wash off skin with a large amount of water immediately. Remove any affected clothing and rewash skin using soap, if

Contaminant (Petroleum, Gasoline, etc.)	available. Transport person to a medical facility if necessary.
Skin Contact / Corrosive Contaminant (Acids, Hydrogen Peroxide, etc.)	Wash off skin with a large amount of water immediately. Remove any affected clothing and rewash skin with water. Transport person to a medical facility if necessary.
Eyes	Hold eyelids open and rinse the eyes immediately with large amounts of water for 15 minutes. Never permit the eyes to be rubbed. Transport person to a medical facility as soon as possible.

4.38 First Aid for Injuries Incurred During Field Work

A first aid kit and an emergency eyewash will be available on-site. Field crews, when performing field operations, will carry portable first aid kits that include emergency eye wash stations.

4.38.1 First Aid Equipment List

The first aid kit(s) kept at the site will consist of a weatherproof container with individually sealed packages for each type of item.

The kit will include at least the following items:

- Gauze roller bandages, 1-inch and 2-inch
- Gauze compress bandages, 4-inch
- Gauze pads, 2-inch
- Adhesive tape, 1-inch
- Bandage, 1-inch
- Butterfly bandages
- Triangular bandages, 40-inch

- Ampules of ammonia inhalants
- Antiseptic applicators or swabs
- Burn dressing and sterilized towels
- Surgical scissors
- Eye dressing
- Portable emergency eye wash
- Emergency oxygen supply
- Alcohol
- Hydrogen peroxide
- Clinical grade thermometer
- Tourniquet

4.38.2 Other Emergency Equipment

One portable fire extinguisher with a rating (ratio) of 20-pound A/B/C and one portable fire extinguisher with a rating of 2A will be conspicuously and centrally located between the restricted and non-restricted zones. In addition, similar extinguishers of the same size and class will be located in the site office trailer so that maximum travel distance to the nearest unit shall not exceed 50 feet. Portable extinguishers will be properly tagged with inspection dates and maintained in accordance with standard maintenance procedures for portable fire extinguishers. Field personnel will be trained in fire extinguisher use before field operations begin.

An emergency at any part of the site, such as fire or chemical release, might require that some appropriately trained site workers direct traffic on or near the site.

The following safety equipment to be used for traffic should be kept readily available on site in the field office:

- reflective/fluorescent vests
- flares
- traffic cones (and flags, or the equivalent, as needed)
- hazard tape (barricades as needed)

- working flashlights

4.39 Record of Injuries Incurred On-Site

4.39.1 Occupational Injuries and Illnesses Form (OSHA 200)

All occupational injuries and illnesses that are required to be recorded under the Occupational Safety and Health Act will be registered on OSHA Form 200 (see Appendix C). The site safety supervisor will record occupational injuries and illnesses within 48 hours of occurrence, as required by statute.

4.39.2 Employer's First Report of Injury

The site safety supervisor for all accidents involving work injury at the site will complete this form (Appendix D). Follow-up procedures will include investigation of each accident or near miss by the safety supervisor to assure that no similar accidents occur in the future.

4.40 Confined Space Entry Procedures

Excavation pits, storage tanks, soil trenches, subsurface vaults, basements, and sheds are examples of confined spaces. Confined spaces can be identified as an area having one of the following characteristics:

- Limited access and egress
- Unfavorable for natural ventilation
- Not designed for continuous human occupancy

Organic and/or combustible vapors may be trapped in confined spaces, resulting in lack of oxygen (anoxia) and/or overexposure to vapors. When site work takes place in a confined space, the air must be monitored for oxygen level, flammable vapors, and toxic vapors. The following air monitoring procedures must be followed before entering a confined space.

4.41 Oxygen Level

Monitor for percent oxygen with an oxygen/LEL meter (e.g., CGI) to ensure an oxygen level between 19.5 and 23%. Because of the high vapor density of the contaminants associated with this site, there is a high probability that vapors in the enclosed spaces or vaults will replace any oxygen that is present, even if the space is open to the air. Therefore, oxygen level monitoring will be done at the top, middle, and bottom of the enclosed space to determine if there is a minimum acceptable oxygen level of 19.5% prior to entry. The oxygen/LEL meter is factory-set to sound an alarm at levels less than 19.5% oxygen. If oxygen is less than 19.5% or greater than 23%, do not enter the space.

4.42 Explosive Vapors

Monitor the percentage of the Lower Explosive Limit (LEL) with an oxygen/LEL meter to determine whether vapor concentrations within the confined space are within the flammable range. If LEL readings exceed 10%, personnel should exercise extreme caution, use non-sparking tools, and utilize ventilation engineering controls to reduce LEL levels. The oxygen/LEL meter is factory set to sound an alarm at levels greater than 20% LEL. If LEL readings exceed 20%, personnel MUST leave the site immediately and contact the project manager.

4.43 Toxic Vapors

Monitor for toxic vapors with a photo ionization detector (PID) to determine whether toxic vapors within the confined space exceed the action levels. PID readings will be taken at the top, middle, and bottom of a vault, shed, or other confined space to determine vapor levels.

4.44 Summary

Do not enter the confined space unless:

- The oxygen concentration is between 19.5 and 23%;
- The LEL is less than 20%; and
- FID readings are less than 250 ppm (a respirator must be worn if the readings exceed 5 ppm)

APPENDIX A

MSDS SHEETS

Tetrachloroethylene
22900

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Tetrachloroethylene
Catalog Numbers:
C182 20, C182 4, C182-20, C182-4, C18220, C1824, 04586 4, 04586-4, 045864
Synonyms:
Ethylene tetrachloride; Tetrachlorethylene; Perchloroethylene; Perchlorethylene
Company Identification: Fisher Scientific
1 Reagent Lane
Fairlawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
127-18-4	Tetrachloroethylene	99.0+	204-825-9

Hazard Symbols: XN N
Risk Phrases: 40 51/53

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: clear, colorless.
Caution! Irritant. May cause central nervous system depression. May cause respiratory and digestive tract irritation. May cause liver and kidney damage. May cause severe eye and skin irritation with possible burns. May cause reproductive and fetal effects. May cause cancer based on animal studies.
Target Organs: Kidneys, central nervous system, liver.

Potential Health Effects

Eye:
Contact with eyes may cause severe irritation, and possible eye burns.

Skin:
May cause severe irritation and possible burns.

Ingestion:
May cause central nervous system depression, kidney damage, and liver damage. Symptoms may include: headache, excitement, fatigue, nausea, vomiting, stupor, and coma. May cause gastrointestinal irritation with nausea, vomiting and diarrhea.

Inhalation:
Inhalation of vapor may cause respiratory tract irritation. May cause central nervous system effects including vertigo, anxiety, depression, muscle incoordination, and emotional instability.

Chronic:
Possible cancer hazard based on tests with laboratory animals. Prolonged or repeated skin contact may cause defatting and dermatitis. May cause respiratory tract cancer. May cause adverse nervous system effects including muscle tremors and incoordination. May cause liver and kidney damage. May cause reproductive and fetal effects.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:

Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

Skin:

Get medical aid if irritation develops or persists. Wash clothing before reuse. Flush skin with plenty of soap and water.

Ingestion:

If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.

Inhalation:

Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician:

Treat symptomatically and

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Containers may explode in the heat of a fire. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas.

Extinguishing Media:

Substance is noncombustible; use agent most appropriate to extinguish surrounding fire. For small fires, use dry chemical, carbon dioxide, or water spray. For large fires, use dry chemical, carbon dioxide, alcohol-resistant foam, or water spray. Cool containers with flooding quantities of water until well after fire is out.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Absorb spill with inert material, (e.g., dry sand or earth), then place into a chemical waste container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Flush down the spill with a large amount of water. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Do not reuse this container. Avoid breathing vapors from heated material. Avoid contact with skin and eyes. Keep container tightly closed. Keep away from flames and other sources of high temperatures that may cause material to form vapors or mists.

Storage:

Keep away from heat and flame. Store in a cool, dry place. Keep containers tightly closed.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

Exposure Limits

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+-------------------+-------------------+-------------------+-----------------+
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Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Tetrachloroethylene	25 ppm; 100 ppm STEL	NIOSH Potential Occupational Carcinogen - see Appendix A; minimize workplace odo r exposure concentrations limit number of workers exposed Potential NIOSH carcinogen.	100 ppm TWA; C 200 ppm; C 200 ppm

OSHA Vacated PELs:
Tetrachloroethylene:
25 ppm TWA; 170 mg/m3 TWA

Personal Protective Equipment

Eyes:
Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin:
Wear appropriate protective gloves to prevent skin exposure.

Clothing:
Wear appropriate protective clothing to prevent skin exposure.

Respirators:
A respiratory protection program that meets OSHA's 29 CFR §1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Liquid
Appearance:	clear, colorless
Odor:	sweetish odor
pH:	Not available.
Vapor Pressure:	15.8 mm Hg
Vapor Density:	5.2
Evaporation Rate:	9 (ether=100)
Viscosity:	0.89 mPa s 20 d
Boiling Point:	121 deg C
Freezing/Melting Point:	-22.3 deg C
Autoignition Temperature:	Not applicable.
Flash Point:	Not applicable.
NFPA Rating:	(est.) Health: 2; Flammability: 0; Reactivity: 0
Explosion Limits, Lower:	Not available.
Upper:	Not available.
Decomposition Temperature:	150 deg C
Solubility:	Nearly insoluble in water.
Specific Gravity/Density:	1.623
Molecular Formula:	C2Cl4
Molecular Weight:	165.812

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable under normal temperatures and pressures.
Conditions to Avoid:

Incompatible materials, excess heat.

Incompatibilities with Other Materials:

Strong bases, metals, liquid oxygen, dinitrogen tetroxide.

Hazardous Decomposition Products:

Hydrogen chloride, phosgene, carbon monoxide, carbon dioxide.

Hazardous Polymerization: Will not occur.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:

CAS# 127-18-4: KX3850000

LD50/LC50:

CAS# 127-18-4: Inhalation, mouse: LC50 =5200 ppm/4H; Inhalation, rat: LC50 =34200 mg/m3/8H; Oral, mouse: LD50 = 8100 mg/kg; Oral, rat: LD50 = 2629 mg/kg.

Carcinogenicity:

Tetrachloroethylene -

ACGIH: A3 - animal carcinogen
California: carcinogen; initial date 4/1/88
NIOSH: occupational carcinogen
NTP: Suspect carcinogen
OSHA: Possible Select carcinogen
IARC: Group 2A carcinogen

Epidemiology:

Epidemiologic studies have given inconsistent results. Studies have shown that tetrachloroethylene has not caused cancer in exposed workers. The studies have serious weaknesses such as mixed exposures. In tests with rats and mice, it appeared that tissue destruction or peroxisome proliferation rather than genetic mechanisms were the cause of the observed increases in normally occurring cancers. The oral mouse TDLo that was tumorigenic was 195 gm/kg/50W-I.

Teratogenicity:

Has caused musculoskeletal abnormalities. Has caused morphological transformation at a dose of 97mol/L in a study using rat embryos.

Reproductive Effects:

Has caused behavioral, biochemical, and metabolic effects on newborn rats when the mother was exposed to the TCLo of 900 ppm/7H at 7-13 days after conception. A dose of 300 ppm/7H 6-15 days after conception caused post-implantation mortality.

Neurotoxicity:

No information available.

Mutagenicity:

Not mutagenic in Escherichia coli. No mutagenic effects were seen in rat liver after exposure at 200 ppm for 10 weeks. No chromosome changes were seen in the bone marrow cells of exposed mice.

Other Studies:

A case of 'obstructive jaundice' in a 6-week old infant has been attributed to tetrachloroethylene in breast milk.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Ecotoxicity:

Fish: Rainbow trout: LC50 = 5.28 mg/L; 96 Hr.; Static Condition, 12 degrees CFish: Fathead Minnow: LC50 = 18.4 mg/L; 96 Hr.; Flow-through conditionFish: Bluegill/Sunfish: LC50 = 12.9 mg/L; 96 Hr.; Static ConditionBacteria: Phytobacterium phosphoreum: EC50 = 120.0 mg/L; 30 minutes; Microtox test

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Chemical waste generators must determine whether a discarded chemical is classif
as a hazardous waste.
US EPA guidelines for the classification determination are listed in 40 CFR Part
Additionally, waste generators must consult state and local hazardous waste regu
ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: CAS# 127-18-4: waste number U210.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT
Shipping Name: TETRACHLOROETHYLENE
Hazard Class: 6.1
UN Number: UN1897
Packing Group: III

Canadian TDG
Shipping Name: TETRACHLOROETHYLENE
Hazard Class: 6.1
UN Number: UN1897

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL

TSCA

CAS# 127-18-4 is listed on the TSCA inventory.

Health & Safety Reporting List

CAS# 127-18-4: Effective Date: June 1, 1987; Sunset Date: June 1, 1997

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

SARA

Section 302 (RQ)

CAS# 127-18-4: final RQ = 100 pounds (45.4 kg)

Section 302 (TPQ)

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 127-18-4: acute.

Section 313

This material contains Tetrachloroethylene (CAS# 127-18-4, 99 0%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 372.

Clean Air Act:

CAS# 127-18-4 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 127-18-4 is listed as a Priority Pollutant under the Clean Water Act.
CAS# 127-18-4 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

Tetrachloroethylene can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.
The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:
WARNING: This product contains Tetrachloroethylene, a chemical known to the state of California to cause cancer.
California No Significant Risk Level:
CAS# 127-18-4: no significant risk level = 14 ug/day

European/International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols: XN N
Risk Phrases:
R 40 Possible risks of irreversible effects.
R 51/53 Toxic to aquatic organisms; may cause

long-term adverse effects in the aquatic environment.

Safety Phrases:

S 23 Do not inhale gas/fumes/vapour/spray.

S 36/37 Wear suitable protective clothing and gloves.

S 61 Avoid release to the environment. Refer to special instructions/Safety data sheets.

WGK (Water Danger/Protection)

CAS# 127-18-4: 3

United Kingdom Occupational Exposure Limits

CAS# 127-18-4: OES-United Kingdom, TWA 50 ppm TWA; 345 mg/m3 TWA

CAS# 127-18-4: OES-United Kingdom, STEL 100 ppm STEL; 689 mg/m3 STEL

Canada

CAS# 127-18-4 is listed on Canada's DSL/NDSL List.

This product has a WHMIS classification of D1B, D2A.

CAS# 127-18-4 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

CAS# 127-18-4: OEL-ARAB Republic of Egypt:TWA 5 ppm (35 mg/m3);Skin
OEL-AUSTRALIA:TWA 50 ppm (335 mg/m3);STEL 150 ppm;CAR
OEL-BELGIUM:TWA 50 ppm (339 mg/m3);STEL 200 ppm (1368 mg/m3)
OEL-CZECHOSLOVAKIA:TWA 250 mg/m3;STEL 1250 mg/m3
OEL-DENMARK:TWA 30 ppm (200 mg/m3);Skin
OEL-FINLAND:TWA 50 ppm (335 mg/m3);STEL 75 ppm (520 mg/m3);Skin
OEL-FRANCE:TWA 50 ppm (335 mg/m3)
OEL-GERMANY:TWA 50 ppm (345 mg/m3);Carcinogen
OEL-HUNGARY:STEL 50 mg/m3;Skin;Carcinogen
OEL-JAPAN:TWA 50 ppm (340 mg/m3)
OEL-THE NETHERLANDS:TWA 35 ppm (240 mg/m3);Skin
OEL-THE PHILIPPINES:TWA 100 ppm (670 mg/m3)
OEL-POLAND:TWA 60 mg/m3
OEL-RUSSIA:TWA 50 ppm;STEL 10 mg/m3
OEL-SWEDEN:TWA 10 ppm (70 mg/m3);STEL 25 ppm (170 mg/m3)
OEL-SWITZERLAND:TWA 50 ppm (345 mg/m3);STEL 100 ppm;Skin
OEL-THAILAND:TWA 100 ppm;STEL 200 ppm
OEL-UNITED KINGDOM:TWA 50 ppm (335 mg/m3);STEL 15 ppm
OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV
OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 6/17/1999 Revision #2 Date: 8/02/2000

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cis-1,2-Dichloroethylene, 97%
ACROS97773

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: cis-1,2-Dichloroethylene, 97%
Catalog Numbers:
AC113380000, AC113380025, AC113380100
Synonyms:
Acetylene Dichloride

Company Identification (Europe):
Acros Organics N.V.
Janssen Pharmaceuticalaan 3a
2440 Geel, Belgium

Company Identification (USA):
Acros Organics
One Reagent Lane
Fairlawn, NJ 07410

For information in North America, call:	800-ACROS-01
For information in Europe, call:	0032(0) 14575211
For emergencies in the US, call CHEMTREC:	800-424-9300
For emergencies in Europe, call:	0032(0) 14575299

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
156-59-2	cis-1,2-Dichloroethylene	97%	205-859-7

Hazard Symbols: XN F
Risk Phrases: 11 20 52/53

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: colorless liquid. Flash Point: 6 deg C.
Warning! Flammable liquid. May cause central nervous system depression. May cause eye and skin irritation. May cause respiratory and digestive tract irritation. This substance may form hazardous decomposition products which may cause irritation and possible burns.
Target Organs: Central nervous system.

Potential Health Effects

Eye:
May cause eye irritation.

Skin:
May cause skin irritation. May cause dermatitis.

Ingestion:
May cause gastrointestinal irritation with nausea, vomiting and diarrhea.

Inhalation:
Inhalation of high concentrations may cause central nervous system effects characterized by headache, dizziness, unconsciousness and coma. May cause respiratory tract irritation. Inhalation of high concentrations may cause narcotic effects.

Chronic:
Not available.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:
Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

Skin:
Get medical aid. Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes.

Ingestion:
If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.

Inhalation:
Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician:
Treat symptomatically and supportively.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:
As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas.

Extinguishing Media:
Use water spray to cool fire-exposed containers. In case of fire use water spray, dry chemical, carbon dioxide, or appropriate foam.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:
Absorb spill with inert material, (e.g., dry sand or earth), then place into a chemical waste container. Remove all sources of ignition. Use a spark-proof tool.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:
Wash thoroughly after handling. Use only in a well ventilated area. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Avoid contact with heat, sparks and flame. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.

Storage:
Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:
Use adequate ventilation to keep airborne concentrations low.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
cis-1,2-Dichloroethylene	200 ppm	none listed	none listed

OSHA Vacated PELs:
cis-1,2-Dichloroethylene:
No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes:
Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin:
Wear appropriate protective gloves to prevent skin exposure.

Clothing:
Wear appropriate protective clothing to prevent skin exposure.

Respirators:
Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Liquid
Appearance:	colorless liquid
Odor:	pleasant odor
pH:	Not available.
Vapor Pressure:	400 mm Hg @41.0 deg C
Vapor Density:	3.34
Evaporation Rate:	Not available.
Viscosity:	Not available.
Boiling Point:	60 deg C @ 760.00mm Hg
Freezing/Melting Point:	-80 deg C
Autoignition Temperature:	Not available.
Flash Point:	6 deg C (42.80 deg F)
NFPA Rating:	Not published.
Explosion Limits, Lower:	9.7%
Upper:	12.8%
Decomposition Temperature:	
Solubility:	
Specific Gravity/Density:	1.2840g/cm3
Molecular Formula:	C2H2Cl2
Molecular Weight:	96.94

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable under normal temperatures and pressures.

Conditions to Avoid:
Light, ignition sources, excess heat, exposure to flame.

Incompatibilities with Other Materials:
Potassium hydroxide, sodium, sodium hydroxide, strong oxidizing agents, bases, Reaction with solid caustic alkalies or concentrated solution produces chloracetylene gas which ignites spontaneously in air..

Hazardous Decomposition Products:
Hydrogen chloride, phosgene, carbon monoxide, carbon dioxide.

Hazardous Polymerization: Will not occur.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 156-59-2: KV9420000

LD50/LC50:
Not available.

Carcinogenicity:
cis-1,2-Dichloroethylene -
Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.

Epidemiology:

No data available.
Teratogenicity:
No data available.
Reproductive Effects:
No data available.
Neurotoxicity:
No data available.
Mutagenicity:
See actual entry in RTECS for complete information.
Other Studies:
No data available.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Ecotoxicity:
Dictionary of Substances and Their Effects 1992

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Chemical waste generators must determine whether a discarded chemical is classif
as a hazardous waste.
US EPA guidelines for the classification determination are listed in 40 CFR Part
Additionally, waste generators must consult state and local hazardous waste regu
ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT
Shipping Name: 1,2-DICHLOROETHYLENE
Hazard Class: 3
UN Number: 1150
Packing Group: II
Canadian TDG
No information available.

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL
TSCA
CAS# 156-59-2 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA
Section 302 (RQ)
None of the chemicals in this material have an RQ.
Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
Section 313
No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous
Substances under the CWA.
None of the chemicals in this product are listed as Priority
Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants

under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

cis-1,2-Dichloroethylene can be found on the following state right to know lists: Florida, Pennsylvania, Massachusetts.

California No Significant Risk Level:

None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: XN F

Risk Phrases:

R 11 Highly flammable.
R 20 Harmful by inhalation.
R 52/53 Harmful to aquatic organisms; may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 7 Keep container tightly closed.
S 16 Keep away from sources of ignition - No smoking.
S 29 Do not empty into drains.
S 61 Avoid release to the environment. Refer to special instructions/Safety data sheets.

WGK (Water Danger/Protection)

CAS# 156-59-2: No information available.

United Kingdom Occupational Exposure Limits

Canada

None of the chemicals in this product are listed on the DSL/NDSL list.

WHMIS: Not available.

CAS# 156-59-2 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 2/09/1998 Revision #2 Date: 8/02/2000

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if the company has been advised of the possibility of such damages.

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trans-1,2-Dichloroethylene, 99.7% (GC), stabilized
ACROS62420

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: trans-1,2-Dichloroethylene, 99.7% (GC), stabilized
Catalog Numbers:
AC406840000, AC406840250, AC406842500
Synonyms:
trans-Acetylene Dichloride
Company Identification (Europe): Acros Organics N.V.
Janssen Pharmaceuticalaan 3a
2440 Geel, Belgium
Company Identification (USA): Acros Organics
One Reagent Lane
Fairlawn, NJ 07410
For information in North America, call: 800-ACROS-01
For information in Europe, call: 0032(0) 14575211
For emergencies in the US, call CHEMTREC: 800-424-9300
For emergencies in Europe, call: 0032(0) 14575299

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
156-60-5	Trans-1,2-Dichloroethylene	99.7%	205-860-2

Hazard Symbols: XN F
Risk Phrases: 11 20 52/53

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: clear. Flash Point: 6 deg C.
Warning! Flammable liquid. Light sensitive. Air sensitive. Moisture sensitive. May be harmful if swallowed.
Target Organs: Central nervous system, respiratory system, eyes.

Potential Health Effects

Eye:
Causes moderate eye irritation.

Skin:
Causes moderate skin irritation. May cause dermatitis.

Ingestion:
May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May be harmful if swallowed. May cause central nervous system depression.

Inhalation:
May cause respiratory tract irritation. May cause narcotic effects in high concentration. May cause nausea and possible vomiting.

Chronic:
Not available.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:
Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

Skin:
Get medical aid. Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes.

Ingestion:
If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical

aid immediately.

Inhalation:

Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician:

Treat symptomatically and supportively.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. Will burn if involved in a fire. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas.

Extinguishing Media:

Use water spray to cool fire-exposed containers. In case of fire, use water fog, dry chemical, carbon dioxide, or regular foam.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Absorb spill with inert material, (e.g., dry sand or earth), then place into a chemical waste container. Remove all sources of ignition. Use a spark-proof tool.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Use only in a well ventilated area. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.

Storage:

Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Use adequate ventilation to keep airborne concentrations low.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Trans-1,2-Dichloroethylene	200 ppm	none listed	none listed

OSHA Vacated PELs:

Trans-1,2-Dichloroethylene:

No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin:

Wear appropriate protective gloves to prevent skin exposure.

Clothing:

Wear appropriate protective clothing to prevent skin exposure.

Respirators:

Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Liquid
Appearance:	clear
Odor:	Pleasant odor
pH:	Not available.
Vapor Pressure:	710 hPa @ 38 deg C
Vapor Density:	3.3
Evaporation Rate:	Not available.
Viscosity:	Not available.
Boiling Point:	48 deg C @ 760.00mm Hg
Freezing/Melting Point:	-50 deg C
Autoignition Temperature:	440 deg C (824.00 deg F)
Flash Point:	6 deg C (42.80 deg F)
NFPA Rating:	Not published.
Explosion Limits, Lower:	9.70 vol %
Upper:	12.80 vol %
Decomposition Temperature:	
Solubility:	immiscible
Specific Gravity/Density:	1.2600g/cm3
Molecular Formula:	C2H2C12
Molecular Weight:	96.94

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:

Stable under normal temperatures and pressures.

Conditions to Avoid:

Light, ignition sources, exposure to air, exposure to moist air or water.

Incompatibilities with Other Materials:

Copper, copper alloys, oxidizing agents, alkalies, bases.

Hazardous Decomposition Products:

Hydrogen chloride, phosgene, carbon monoxide, carbon dioxide.

Hazardous Polymerization: Has not been reported

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:

CAS# 156-60-5: KV9400000

LD50/LC50:

CAS# 156-60-5: Oral, mouse: LD50 = 2122 mg/kg; Oral, rat: LD50 = 1235 mg/kg; Skin, rabbit: LD50 = >5 gm/kg.

Carcinogenicity:

Trans-1,2-Dichloroethylene -

Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.

Epidemiology:

No data available.

Teratogenicity:

No data available.

Reproductive Effects:

See actual entry in RTECS for complete information.

Neurotoxicity:

No data available.
Mutagenicity:
See actual entry in RTECS for complete information.
Other Studies:
No data available.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Ecotoxicity:
Invertebrate toxicity: LC50 (30 min) Photobacterium phosphoreum 1540 ppm Microtox test. (Dictionary of Substances and Their Effects 1992)

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Chemical waste generators must determine whether a discarded chemical is classif as a hazardous waste.
US EPA guidelines for the classification determination are listed in 40 CFR Part
Additionally, waste generators must consult state and local hazardous waste regu
ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: CAS# 156-60-5: waste number U079.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT
Shipping Name: 1,2-DICHLOROETHYLENE
Hazard Class: 3
UN Number: 1150
Packing Group: II
Canadian TDG
Shipping Name: DICHLOROETHYLENE
Hazard Class: 3
UN Number: UN1150

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL
TSCA
CAS# 156-60-5 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA
Section 302 (RQ)
CAS# 156-60-5: Final RQ = 1000 pounds (454 kg)
Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 156-60-5: acute, chronic, flammable.
Section 313
No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 156-60-5 is listed as a Priority Pollutant under the Clean Water Act.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

Trans-1,2-Dichloroethylene can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Massachusetts.

California No Significant Risk Level:
None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: XN F

Risk Phrases:

R 11 Highly flammable.
R 20 Harmful by inhalation.
R 52/53 Harmful to aquatic organisms; may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 7 Keep container tightly closed.
S 16 Keep away from sources of ignition - No smoking.
S 29 Do not empty into drains.
S 61 Avoid release to the environment. Refer to special instructions/Safety data sheets.

WGK (Water Danger/Protection)
CAS# 156-60-5: No information available.

United Kingdom Occupational Exposure Limits

Canada
CAS# 156-60-5 is listed on Canada's DSL/NDSL List.
This product does not have a WHMIS classification.
CAS# 156-60-5 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits
CAS# 156-60-5: Not available.

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 11/21/1997 Revision #2 Date: 8/02/2000

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if the company has been advised of the possibility of such damages.

Trichloroethylene
23850

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Trichloroethylene
Catalog Numbers:
S80327ACS-1, S80327ACS-2, NC932384B, NC9494003, NC9494591, S80232, S80237ACS-1, S80237ACS-2, T340 4, T340-4, T3404, T341 20, T341 4, T341 500, T341-20, T341-4, T341-500, T34120, T3414, T341500, T341J4, T403 4, T403-4, T4034
Synonyms:
Ethylene trichloride, triclene, trichloroethene, benzinol cecolene
Company Identification: Fisher Scientific
1 Reagent Lane
Fairlawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
79-01-6	Trichloroethylene	100	201-167-4

Hazard Symbols: XN
Risk Phrases: 40 52/53

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: clear, colorless.
Warning! May cause central nervous system depression. Aspiration hazard. May cause liver damage. May cause reproductive effects based upon animal studies. Causes eye and skin irritation. May cause respiratory and digestive tract irritation. May cause cancer based on animal studies. Potential cancer hazard.
Target Organs: Central nervous system, liver.

Potential Health Effects

Eye:

Causes moderate eye irritation. May result in corneal injury. Contact produces irritation, tearing, and burning pain.

Skin:

Causes mild skin irritation. Prolonged and/or repeated contact may cause defatting of the skin and dermatitis. May cause peripheral nervous system function impairment including persistent neuritis, and temporary loss of touch. Damage to the liver and other organs has been observed in workers who have been overexposed.

Ingestion:

Aspiration hazard. May cause irritation of the digestive tract. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.

Inhalation:

Inhalation of high concentrations may cause central nervous system effects characterized by headache, dizziness, unconsciousness and coma. May cause respiratory tract irritation. May cause liver abnormalities. May cause peripheral nervous system effects.

Chronic:

Possible cancer hazard based on tests with laboratory animals. Chronic inhalation may cause effects similar to those of acute inhalation. Prolonged or repeated skin contact may cause defatting and dermatitis. May cause peripheral nervous system function impairment including persistent neuritis, and temporary loss of touch. Damage to the liver and other organs has been observed in workers who have been overexposed.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:

Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.

Skin:

Get medical aid if irritation develops or persists. Flush skin with plenty of soap and water.

Ingestion:

If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Possible aspiration hazard. Get medical aid immediately.

Inhalation:

Get medical aid immediately. Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. DO NOT use mouth-to-mouth respiration.

Notes to Physician:

Treat symptomatically and

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors can travel to a source of ignition and flash back. Combustion generates toxic fumes. Containers may explode in the heat of a fire.

Extinguishing Media:

Use water spray to cool fire-exposed containers. In case of fire use water spray, dry chemical, carbon dioxide, or chemical foam.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Absorb spill with inert material, (e.g., dry sand or earth), then place into a chemical waste container. Remove all sources of ignition. Provide ventilation.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Use only in a well ventilated area. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.

Storage:

Keep away from sources of ignition. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Trichloroethylene	50 ppm; 100 ppm STEL	NIOSH Potential Occupational Carcinogen - see Appendix A; see Appendix C for sup plementary exposure limits Potential NIOSH carcinogen.	100 ppm TWA; C 200 ppm; C 200 ppm

OSHA Vacated PELs:
Trichloroethylene:
50 ppm TWA; 270 mg/m3 TWA

Personal Protective Equipment

Eyes:
Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin:
Wear appropriate protective gloves to prevent skin exposure.

Clothing:
Wear appropriate protective clothing to prevent skin exposure.

Respirators:
Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Liquid
Appearance:	clear, colorless
Odor:	sweetish odor - chloroform-like
pH:	Not available.
Vapor Pressure:	58 mm Hg @20C
Vapor Density:	4.53
Evaporation Rate:	0.69 (CCl4=1)
Viscosity:	0.0055 poise
Boiling Point:	189 deg F
Freezing/Melting Point:	-121 deg F
Autoignition Temperature:	778 deg F (414.44 deg C)
Flash Point:	Not applicable.
NFPA Rating:	(est.) Health: 2; Flammability: 1; Reactivity: 0
Explosion Limits, Lower:	12.5
Upper:	90.0
Decomposition Temperature:	Not available.
Solubility:	Insoluble in water.
Specific Gravity/Density:	1.47 (water=1)
Molecular Formula:	C2HCl3
Molecular Weight:	131.366

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable under normal temperatures and pressures.
Conditions to Avoid:

Incompatible materials, ignition sources, oxidizers.

Incompatibilities with Other Materials:

Alkalis (sodium hydroxide), chemically active metals (aluminum, beryllium, lithium, magnesium), epoxies and oxidants. Can react violently with aluminum, barium, lithium, magnesium, liquid oxygen, ozone, potassium hydroxide, potassium nitrate, sodium, sodium hydroxide, titanium, and nitrogen dioxide. Reacts with water under heat and pressure to form hydrogen chloride gas.

Hazardous Decomposition Products:

Hydrogen chloride, carbon dioxide, chloride fumes.

Hazardous Polymerization: Has not been reported.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:

CAS# 79-01-6: KX4550000

LD50/LC50:

CAS# 79-01-6: Inhalation, mouse: LC50 =8450 ppm/4H; Oral, mouse: LD50 = 2402 mg/kg; Oral, rat: LD50 = 5650 mg/kg; Skin, rabbit: LD50 = >20 gm/kg.

Carcinogenicity:

Trichloroethylene -
ACGIH: A5 - not suspected as a human carcinogen
California: carcinogen; initial date 4/1/88
NIOSH: occupational carcinogen
OSHA: Possible Select carcinogen
IARC: Group 2A carcinogen

Epidemiology:

Suspected carcinogen with experimental carcinogenic, tumorigenic, and teratogenic data.

Teratogenicity:

No information available.

Reproductive Effects:

Experimental reproductive effects have been observed.

Neurotoxicity:

No information available.

Mutagenicity:

Human mutation data has been reported. IARC and the National Toxicology Program (NTP) stated that variability in the mutagencity test results with thichloroethylene may be due to the presence of various stabilizers used in TCE which are mutagens (e.g. epoxybutane, epichlorohydrin).

Other Studies:

None.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Ecotoxicity:

Bluegill sunfish, LD50= 44,700 ug/L/96Hr. Fathead minnow, LC50=40.7 mg/L/96Hr.

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Chemical waste generators must determine whether a discarded chemical is classif
as a hazardous waste.
US EPA guidelines for the classification determination are listed in 40 CFR Part
Additionally, waste generators must consult state and local hazardous waste regu
ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: CAS# 79-01-6: waste number U228.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT

Shipping Name: TRICHLOROETHYLENE
Hazard Class: 6.1
UN Number: UN1710

Packing Group: III

Canadian TDG

Shipping Name: TRICHLOROETHYLENE
Hazard Class: 6.1(9.2)
UN Number: UN1710

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL

TSCA

CAS# 79-01-6 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

SARA

Section 302 (RQ)

CAS# 79-01-6: final RQ = 100 pounds (45.4 kg)

Section 302 (TPQ)

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 79-01-6: acute, chronic, reactive.

Section 313

This material contains Trichloroethylene (CAS# 79-01-6, 100%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 372.

Clean Air Act:

CAS# 79-01-6 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 79-01-6 is listed as a Hazardous Substance under the CWA.
CAS# 79-01-6 is listed as a Priority Pollutant under the Clean Water Act.
CAS# 79-01-6 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

Trichloroethylene can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Trichloroethylene, a chemical known to the state of California to cause cancer.

California No Significant Risk Level:

CAS# 79-01-6: ingestion: no significant risk level = 50 ug/day; inhalation: no significant ris k level = 80 ug/day

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: XN

Risk Phrases:

R 40 Possible risks of irreversible effects.
R 52/53 Harmful to aquatic organisms; may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 23 Do not inhale gas/fumes/vapour/spray.
S 36/37 Wear suitable protective clothing and gloves.
S 61 Avoid release to the environment. Refer to special instructions/Safety data sheets.

WGK (Water Danger/Protection)
CAS# 79-01-6: 3
United Kingdom Occupational Exposure Limits

Canada
CAS# 79-01-6 is listed on Canada's DSL/NDSL List.
This product has a WHMIS classification of D1B, D2B.
CAS# 79-01-6 is not listed on Canada's Ingredient Disclosure List.
Exposure Limits
CAS# 79-01-6: OEL-AUSTRALIA:TWA 50 ppm (270 mg/m3);STEL 200 ppm (1080 mg/m3)
OEL-BELGIUM:TWA 50 ppm (269 mg/m3);STEL 200 ppm (1070 mg/m3)
OEL-CZECHOSLOVAKIA:TWA 250 mg/m3;STEL 1250 mg/m3
OEL-DENMARK:TWA 30 ppm (160 mg/m3)
OEL-FINLAND:TWA 30 ppm (160 mg/m3);STEL 45 ppm (240 mg/m3);Skin
OEL-FRANCE:TWA 75 ppm (405 mg/m3);STEL 200 ppm (1080 mg/m3)
OEL-GERMANY:TWA 50 ppm (270 mg/m3);Carcinogen
OEL-HUNGARY:TWA 10 mg/m3;STEL 40 mg/m3
OEL-JAPAN:TWA 50 ppm (270 mg/m3)
OEL-THE NETHERLANDS:TWA 35 ppm (190 mg/m3);STEL 100 ppm
OEL-THE PHILIPPINES:TWA 100 ppm (535 mg/m3)
OEL-POLAND:TWA 50 mg/m3
OEL-RUSSIA:TWA 50 ppm;STEL 10 mg/m3
OEL-SWEDEN:TWA 10 ppm (50 mg/m3);STEL 25 ppm (140 mg/m3)
OEL-THAILAND:TWA 100 ppm;STEL 200 ppm
OEL-TURKEY:TWA 100 ppm (535 mg/m3)
OEL-UNITED KINGDOM:TWA 100 ppm (535 mg/m3);STEL 150 ppm;Skin
OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV
OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 2/01/1999 Revision #2 Date: 8/02/2000

1,1,1-Trichloroethane
14370

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: 1,1,1-Trichloroethane
Catalog Numbers:
S80231, T391 1, T391 20, T391 200, T391 4, T391-1, T391-20, T391-200, T391-4, T3911, T39120, T391200, T3914, T398 20, T398 4, T398-20, T398-4, T39820, T3984
Synonyms:
Ethane, 1,1,1-trichloro-; Chloroform, methyl-; Chlorothene; Methylchloroform; Methyl chloroform; Methyltrichloromethane; Trichloroethane; Trichloro-1,1,1-ethane; alpha-Trichloroethane; Trichloromethylmethane
Company Identification: Fisher Scientific
1 Reagent Lane
Fairlawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
71-55-6	1,1,1-trichloroethane	>96	200-756-3
75-52-5	Nitromethane	0.34	200-876-6
106-88-7	1,2-butylene oxide	0.47	203-438-2
123-91-1	1,4-dioxane	2.5	204-661-8

Hazard Symbols: XN N
Risk Phrases: 20 59

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: colorless liquid.
Warning! Causes respiratory tract irritation. May cause digestive tract irritation. Dangerous to the environment. May cause central nervous system depression. May cause fetal effects based upon animal studies. May cause cardiac disturbances. May cause liver and kidney damage. Causes eye and skin irritation. May be harmful if inhaled.
Target Organs: Kidneys, heart, central nervous system, liver, cardiovascular system.

Potential Health Effects

Eye:

Causes severe eye irritation. May cause conjunctivitis.

Skin:

Causes moderate skin irritation. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. Exposure may cause irritation characterized by redness, dryness, and inflammation. May be absorbed through the skin. 1,4-Dioxane may cause an allergic skin reaction, and absorption of this substance may cause systemic toxicty.

Ingestion:

May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause effects similar to those for inhalation exposure. May cause central nervous system depression. Alcohol can intensify effects.

1,1,1-Trichloroethane may sensitize the heart to epinephrine and produce associated cardiac abormalities.

Inhalation:

Inhalation of high concentrations may cause central nervous system effects characterized by headache, dizziness, unconsciousness and coma. May cause narcotic effects in high concentration. Causes irritation of the mucous membrane and upper respiratory tract.

Chronic:

Prolonged or repeated skin contact may cause defatting and dermatitis. May cause fetal effects. Laboratory experiments have resulted in mutagenic effects. Prolonged exposure may cause liver, kidney, and heart damage.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:

Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.

Skin:

Get medical aid. Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.

Ingestion:

Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.

Inhalation:

Remove from exposure to fresh air immediately. If breathing is difficult, give oxygen. Get medical aid. DO NOT use mouth-to-mouth respiration. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.

Notes to Physician:

Causes cardiac sensitization to endogenous catelcholamines which may lead to cardiac arrhythmias. Do NOT use adrenergic agents such as epinephrine or pseudoepinephrine. Alcoholic beverage consumption may enhance the toxic effects of this substance.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

Extinguishing Media:

Use extinguishing media most appropriate for the surrounding fire. In case of fire, use water fog, dry chemical, carbon dioxide, or regular foam.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Provide ventilation.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:
Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use only in a well ventilated area. Avoid breathing dust, vapor, mist, or gas. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Do not ingest or inhale.

Storage:
Keep away from sources of ignition. Store in a cool, dry, well-ventilated area away from incompatible substances. Do not store in aluminum containers.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:
Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
1,1,1-trichloroethane	350 ppm; 450 ppm STEL	see Appendix C for supplementary exposure limits 700 ppm IDLH	350 ppm TWA; 1900 mg/m3 TWA
Nitromethane	20 ppm	no established RELs - see Appendix D 750 ppm IDLH	100 ppm TWA; 250 mg/m3 TWA
1,2-butylene oxide	none listed	none listed	none listed
1,4-dioxane	20 ppm; skin - potential for cutaneous absorption	NIOSH Potential Occupational Carcinogen - see Appendix A Potential NIOSH carcinogen.	100 ppm TWA; 360 mg/m3

OSHA Vacated PELs:
1,1,1-trichloroethane:
350 ppm TWA; 1900 mg/m3 TWA
Nitromethane:
100 ppm TWA; 250 mg/m3 TWA
1,2-butylene oxide:
No OSHA Vacated PELs are listed for this chemical.
1,4-dioxane:
25 ppm TWA; 90 mg/m3 TWA

Personal Protective Equipment

Eyes:
Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin:
Wear appropriate protective gloves to prevent skin exposure.

Clothing:
Wear appropriate protective clothing to prevent skin

exposure.

Respirators:

A respiratory protection program that meets OSHA's 29 CFR §1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Liquid
Appearance:	colorless liquid
Odor:	Sweet, mild chloroform-like.
pH:	Not available.
Vapor Pressure:	100 mm Hg @ 20 deg C
Vapor Density:	4.55 (air=1)
Evaporation Rate:	1.0 (carbon tetrachloride=1)
Viscosity:	0.86 cP @ 20 de
Boiling Point:	74-76 C
Freezing/Melting Point:	-35 deg C
Autoignition Temperature:	536 deg C (996.80 deg F)
Flash Point:	Not available.
NFPA Rating:	Not published.
Explosion Limits, Lower:	7.5 vol %
Upper:	15 vol %
Decomposition Temperature:	Not available.
Solubility:	Insoluble.
Specific Gravity/Density:	1.338 (water=1)
Molecular Formula:	$C_2H_3Cl_3$
Molecular Weight:	133.38

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:

Stable at room temperature in closed containers under normal storage and handling conditions.

Conditions to Avoid:

High temperatures, incompatible materials, ignition sources, moisture.

Incompatibilities with Other Materials:

Strong oxidizing agents, aluminum, aluminum alloys, magnesium, magnesium alloys, strong bases, potassium, sodium, active metals, aluminum oxide + heavy metals, metals, sodium hydroxide, liquid oxygen, hydrochloric acid, halocarbons, nitrogen tetroxide, caustics (e.g. ammonia, ammonium hydroxide, calcium hydroxide, potassium hydroxide, sodium hydroxide), water, halogens, reducing agents, decaborane, sulfur trioxide, triethynylaluminum, boron trifluoride.

Hazardous Decomposition Products:

Hydrogen chloride, phosgene, carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.

Hazardous Polymerization: Has not been reported

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:

CAS# 71-55-6: KJ2975000
CAS# 75-52-5: PA9800000
CAS# 106-88-7: EK3675000
CAS# 123-91-1: JG8225000

LD50/LC50:

CAS# 71-55-6: Inhalation, mouse: LC50 =3911 ppm/2H; Inhalation, rat: LC50 =18000 ppm/4H; Oral, mouse: LD50 = 6 gm/kg; Oral, rabbit: LD50 = 5660 mg/kg; Oral, rat: LD50 = 9600 mg/kg.

CAS# 75-52-5: Oral, mouse: LD50 = 950 mg/kg; Oral, rat: LD50 = 940 mg/kg.

CAS# 106-88-7: Oral, rat: LD50 = 500 mg/kg; Skin, rabbit: LD50 = 2100 mg/kg.

CAS# 123-91-1: Inhalation, mouse: LC50 =37 gm/m3/2H; Inhalation, rat: LC50 =46 gm/m3/2H; Oral, mouse: LD50 = 5700 mg/kg; Oral, rabbit: LD50 = 2 gm/kg; Skin, rabbit: LD50 = 7600 mg/kg.

Carcinogenicity:

1,1,1-trichloroethane -
ACGIH: A4 - Not Classifiable as a Human Carcinogen
IARC: Group 3 carcinogen

Nitromethane -
California: carcinogen; initial date 5/1/97

1,2-butylene oxide -
OSHA: Possible Select carcinogen
IARC: Group 2B carcinogen

1,4-dioxane -
ACGIH: A3 - animal carcinogen
California: carcinogen; initial date 1/1/88
NIOSH: occupational carcinogen
NTP: Suspect carcinogen
OSHA: Possible Select carcinogen
IARC: Group 2B carcinogen

Epidemiology:

No information available.

Teratogenicity:

Oral, rat: TDLo = 43 mg/kg (female 1-22 day(s) after conception and lactating female 21 day(s) post-birth) Specific Developmental Abnormalities - cardiovascular (circulatory) system.; Inhalation, rat: TCLo = 2100 ppm/6H (female 1-20 day(s) after conception) Effects on Embryo or Fetus - fetotoxicity (except death, e.g., stunted fetus).

Reproductive Effects:

No information available.

Neurotoxicity:

No information available.

Mutagenicity:

Morphological Transformation: Rat, Embryo = 99 umol/L.; Mutation in Microorganisms: Mouse, Lymphocyte = 31300 ug/L.; Morphological Transformation: Mouse, Embryo = 20 mg/L.; Cytogenetic Analysis: Hamster, Ovary = 160 mg/L.

Other Studies:

Standard Draize Test(Skin, rabbit) = 20 mg/24H (Moderate) Standard Draize Test: Administration into the eye (rabbit) = 2 mg/24H (Severe).

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Ecotoxicity:

Fish: Fathead Minnow: EC50 = 52.9 mg/L; 96 Hr; Flow-through at 25.5°CFish: Bluegill/Sunfish: LC50 = 72 mg/L; 96 Hr; Static bioassayFish: Fathead Minnow: LC50 = 52.9 mg/L; 96 Hr; Flow-through at 25.5°CFish: Sheepshead minnow: LC50 = 53-72 mg/L; 96 Hr; UnspecifiedWater flea Daphnia: EC50 > 530 mg/L; 48 Hr; UnspecifiedReleases to surface water will decrease in concn almost entirely due to evaporation. Spills on land will decrease in concentration almost entirely due to volatilization and leaching.

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Chemical waste generators must determine whether a discarded chemical is classif
as a hazardous waste.
US EPA guidelines for the classification determination are listed in 40 CFR Part
Additionally, waste generators must consult state and local hazardous waste regu
ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: CAS# 71-55-6: waste number U226. CAS# 123-91-1: waste number U108.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT

Shipping Name: 1,1,1-TRICHLOROETHANE
Hazard Class: 6.1
UN Number: UN2831
Packing Group: III

Canadian TDG
Shipping Name: 1 1 1 TRICHLOROETHANE
Hazard Class: 6.1
UN Number: UN2831

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL

TSCA

CAS# 71-55-6 is listed on the TSCA inventory.
CAS# 75-52-5 is listed on the TSCA inventory.
CAS# 106-88-7 is listed on the TSCA inventory.
CAS# 123-91-1 is listed on the TSCA inventory.

Health & Safety Reporting List

CAS# 71-55-6: Effective Date: October 4, 1982; Sunset Date: October 4, 1992
CAS# 75-52-5: Effective Date: April 13, 1989; Sunset Date: December 19, 1995
CAS# 106-88-7: Effective Date: October 4, 1982; Sunset Date: October 4, 1992

Chemical Test Rules

CAS# 71-55-6: Testing required by: manufacturers; processors (40 CFR 7

Section 12b

CAS# 71-55-6: 4a/12b/4 term

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

SARA

Section 302 (RQ)

CAS# 71-55-6: final RQ = 1000 pounds (454 kg)
CAS# 123-91-1: final RQ = 100 pounds (45.4 kg)

Section 302 (TPQ)

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 71-55-6: acute.
CAS # 75-52-5: chronic, flammable, reactive.
CAS # 106-88-7: acute.
CAS # 123-91-1: chronic, flammable.

Section 313

This material contains 1,1,1-trichloroethane (CAS# 71-55-6, 96%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 372.

This chemical is not at a high enough concentration to be reportable under Section 313.

This material contains 1,4-dioxane (CAS# 123-91-1, 2 5%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 372.

Clean Air Act:

CAS# 71-55-6 is listed as a hazardous air pollutant (HAP).
CAS# 106-88-7 is listed as a hazardous air pollutant (HAP).
CAS# 123-91-1 is listed as a hazardous air pollutant (HAP).
CAS# 71-55-6 is listed as a Class 1 ozone depletor with an ODP = 0.1; GWP = 110; commodity code 2903.19.6010; essential use - cleaning, bon
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 71-55-6 is listed as a Priority Pollutant under the Clean Water Act.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

CAS# 75-52-5 is considered highly hazardous by OSHA.

STATE

1,1,1-trichloroethane can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

Nitromethane can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

1,2-butylene oxide can be found on the following state right to know lists: New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

1,4-dioxane can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

WARNING: This product contains Nitromethane, a chemical known to the state of California to cause cancer.

WARNING: This product contains 1,4-dioxane, a chemical known to the state of California to cause cancer.

California No Significant Risk Level:

CAS# 123-91-1: no significant risk level = 30 ug/day

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: XN N

Risk Phrases:

R 20 Harmful by inhalation.
R 59 Dangerous for the ozone layer.

Safety Phrases:

S 24/25 Avoid contact with skin and eyes.
S 59 Refer to manufacturer/supplier for information on recovery/recycling.
S 61 Avoid release to the environment. Refer to special instructions/Safety data sheets.

WGK (Water Danger/Protection)

CAS# 71-55-6: 3
CAS# 75-52-5: 2
CAS# 106-88-7: 3
CAS# 123-91-1: 2

United Kingdom Occupational Exposure Limits

CAS# 71-55-6: OES-United Kingdom, TWA 200 ppm TWA; 1110 mg/m3 TWA
CAS# 71-55-6: OES-United Kingdom, STEL 400 ppm STEL; 2220 mg/m3 STEL
CAS# 75-52-5: OES-United Kingdom, TWA 100 ppm TWA; 254 mg/m3 TWA
CAS# 75-52-5: OES-United Kingdom, STEL 150 ppm STEL; 381 mg/m3 STEL
CAS# 75-52-5: OES-United Kingdom, STEL 150 ppm STEL; 381 mg/m3 STEL
CAS# 123-91-1: OES-United Kingdom, TWA 25 ppm TWA; 91 mg/m3 TWA
CAS# 123-91-1: OES-United Kingdom, STEL 100 ppm STEL; 366 mg/m3 STEL

Canada

CAS# 71-55-6 is listed on Canada's DSL/NDSL List.
CAS# 75-52-5 is listed on Canada's DSL/NDSL List.
CAS# 106-88-7 is listed on Canada's DSL/NDSL List.
CAS# 123-91-1 is listed on Canada's DSL/NDSL List.
This product has a WHMIS classification of D1B, D2A.
CAS# 71-55-6 is not listed on Canada's Ingredient Disclosure List.
CAS# 75-52-5 is not listed on Canada's Ingredient Disclosure List.
CAS# 106-88-7 is not listed on Canada's Ingredient Disclosure List.
CAS# 123-91-1 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

CAS# 71-55-6: OEL-AUSTRALIA:TWA 125 ppm (680 mg/m3)
OEL-BELGIUM:TWA 350 ppm (1910 mg/m3);STEL 450 ppm (2460 mg/m3)
OEL-CZECHOSLOVAKIA:TWA 500 mg/m3;STEL 2000 mg/m3
OEL-DENMARK:TWA 100 ppm (540 mg/m3)
OEL-FINLAND:TWA 100 ppm (540 mg/m3);STEL 250 ppm (1400 mg/m3)
OEL-FRANCE:TWA 300 ppm (1650 mg/m3);STEL 450 ppm (2500 mg/m3)
OEL-GERMANY:TWA 200 ppm (1080 mg/m3)
OEL-HUNGARY:TWA 100 mg/m3;STEL 300 mg/m3;Skin
OEL-JAPAN:TWA 200 ppm (1100 mg/m3)
OEL-THE NETHERLANDS:TWA 200 ppm (1080 mg/m3);STEL 500 ppm
OEL-THE PHILIPPINES:TWA 350 ppm (1900 mg/m3) JAN9
OEL-RUSSIA:TWA 200 ppm;STEL 20 mg/m3
OEL-SWEDEN:TWA 50 ppm (300 mg/m3);STEL 90 ppm (50 mg/m3)
OEL-SWITZERLAND:TWA 200 ppm (1080 mg/m3);STEL 100 ppm

OEL-TURKEY:TWA 350 ppm (1900 mg/m3)
OEL-UNITED KINGDOM:TWA 350 ppm (1900 mg/m3);STEL 450 ppm
OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV
OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV
CAS# 75-52-5: OEL-DENMARK:TWA 100 ppm (250 mg/m3)
OEL-FINLAND:TWA 100 ppm (250 mg/m3);STEL 150 ppm (375 mg/m3)
OEL-FRANCE:TWA 100 ppm (250 mg/m3)
OEL-GERMANY:TWA 100 ppm (250 mg/m3)
OEL-THE NETHERLANDS:TWA 100 ppm (250 mg/m3)
OEL-THE PHILIPPINES:TWA 100 ppm (250 mg/m3)
OEL-SWITZERLAND:TWA 100 ppm (250 mg/m3)
OEL-TURKEY:TWA 100 ppm (250 mg/m3)
OEL-UNITED KINGDOM:TWA 100 ppm (250 mg/m3);STEL 150 ppm
OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV
OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV
CAS# 123-91-1: OEL-AUSTRALIA:TWA 25 ppm (90 mg/m3);Skin
OEL-AUSTRIA:TWA 50 ppm (180 mg/m3);Skin
OEL-BELGIUM:TWA 25 ppm (90 mg/m3);Skin
OEL-DENMARK:TWA 10 ppm (36 mg/m3);Skin
OEL-FINLAND:TWA 25 ppm (90 mg/m3);STEL 40 ppm (13 mg/m3);Skin
OEL-FRANCE:TWA 10 ppm (35 mg/m3);STEL 40 ppm (140 mg/m3);CAR
OEL-GERMANY:TWA 50 ppm (180 mg/m3);Skin;Carcinoge
OEL-HUNGARY:STEL 10 mg/m3;Skin;Carcinogen
OEL-JAPAN:TWA 10 ppm (36 mg/m3);Skin;Carcinogen
OEL-THE NETHERLANDS:TWA 50 ppm (180 mg/m3);Skin
OEL-THE PHILIPPINES:TWA 100 ppm (360 mg/m3);Skin
OEL-POLAND:TWA 10 mg/m3
OEL-RUSSIA:TWA 10 ppm;STEL 10 mg/m3;Skin
OEL-SWEDEN:TWA 25 ppm (90 mg/m3);STEL 50 ppm;Skin;CAR
OEL-SWITZERLAND:TWA 25 ppm (90 mg/m3);STEL 50 ppm;Skin
OEL-TURKEY:TWA 100 ppm (360 mg/m3);Skin
OEL-UNITED KINGDOM:TWA 25 ppm (90 mg/m3);STEL 100 ppm;Skin
OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV
OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 6/11/1999 Revision #2 Date: 8/02/2000

1,1,2-Trichloroethane
26380

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: 1,1,2-Trichloroethane
Catalog Numbers:
T339 1, T339 4, T339-1, T339-4, T3391, T3394, T3991
Synonyms:
Beta-T, Vinyl Trichloride, Beta-Trichloroethane.
Company Identification: Fisher Scientific
1 Reagent Lane
Fairlawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
79-00-5	1,1,2-trichloroethane	ca. 100	201-166-9

Hazard Symbols: XN
Risk Phrases: 20/21/22

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: clear slightly yellow.
Caution! May be harmful if swallowed. May cause central nervous system depression. May cause eye and skin irritation. May cause respiratory and digestive tract irritation. May cause cancer based on animal studies.
Target Organs: Kidneys, central nervous system, liver.

Potential Health Effects

Eye:

May cause eye irritation. May cause eye injury.

Skin:

Exposure may cause irritation characterized by redness, dryness, and inflammation.

Ingestion:

May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. May be harmful if swallowed.

Inhalation:

Inhalation of high concentrations may cause central nervous system effects characterized by headache, dizziness, unconsciousness and coma. Causes respiratory tract irritation.

Chronic:

May cause liver and kidney damage.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:

Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.

Skin:

Get medical aid. Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.

Ingestion:

If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.

Inhalation:

Get medical aid immediately. Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Notes to Physician:

Treat symptomatically and

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Containers may explode in the heat of a fire.

Extinguishing Media:

For small fires, use dry chemical, carbon dioxide, halon, or water spray. For large fires, use water spray, fog or regular foam. Cool containers with flooding quantities of water until well after fire is out.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Absorb spill with inert material, (e.g., dry sand or earth), then place into a chemical waste container. Clean up spills immediately, observing precautions in the Protective Equipment section. Flush spill area with water. A vapor suppressing foam may be used to reduce vapors.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Do not reuse this container.

Storage:

Keep away from heat, sparks, and flame. Store in a cool, dry place. Keep from contact with oxidizing materials. Do not store in metal containers. Keep containers tightly closed.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
1,1,2-trichloroethane	10 ppm; skin - potential for cutaneous absorption	10 ppm TWA; 45 mg/m3 TWA; NIOSH Potential Occupational Carcinogen - see Appendix A; see Appendix C	10 ppm TWA; 45 mg/m3 TWA

		(Chloroethanes) for supplementary exposure limits Potential NIOSH carcinogen.	

OSHA Vacated PELs:
1,1,2-trichloroethane:
10 ppm TWA; 45 mg/m3 TWA

Personal Protective Equipment

Eyes:
Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin:
Wear appropriate protective gloves to prevent skin exposure.

Clothing:
Wear appropriate protective clothing to prevent skin exposure.

Respirators:
Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Liquid
Appearance:	clear slightly yellow
Odor:	sweetish odor - irritating odor - weak odor
pH:	Not available.
Vapor Pressure:	3.1 kPa @ 25C
Vapor Density:	4.63
Evaporation Rate:	Not available.
Viscosity:	1.69 cP @ 25C
Boiling Point:	110 - 115 deg C @ 760.00mm Hg
Freezing/Melting Point:	-37 deg C
Autoignition Temperature:	459 deg C (858.20 deg F)
Flash Point:	None
NFPA Rating:	Not published.
Explosion Limits, Lower:	6.0 vol %
Upper:	15.5 vol %
Decomposition Temperature:	
Solubility:	0.4 G/100ML WATER (20°C)
Specific Gravity/Density:	1.4350g/cm3
Molecular Formula:	$C_2H_3Cl_3$
Molecular Weight:	133.40

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable under normal temperatures and pressures.

Conditions to Avoid:
Incompatible materials, metals, strong oxidants.

Incompatibilities with Other Materials:
Strong bases, strong oxidizing agents, sodium, potassium, magnesium, aluminum, heat.

Hazardous Decomposition Products:
Hydrogen chloride, phosgene, carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.

Hazardous Polymerization: Will not occur.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 79-00-5: KJ3150000
LD50/LC50:
CAS# 79-00-5: Oral, mouse: LD50 = 378 mg/kg; Oral, rat: LD50 = 836 mg/kg; Skin, rabbit: LD50 = 5377 mg/kg.
Carcinogenicity:
1,1,2-trichloroethane -
ACGIH: A4 - Not Classifiable as a Human Carcinogen
California: carcinogen; initial date 10/1/90
NIOSH: occupational carcinogen
IARC: Group 3 carcinogen
Epidemiology:
No information available.
Teratogenicity:
No information available.
Reproductive Effects:
No information available.
Neurotoxicity:
No information available.
Mutagenicity:
No information available.
Other Studies:
No data available.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Other
No information available.

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Chemical waste generators must determine whether a discarded chemical is classif
as a hazardous waste.
US EPA guidelines for the classification determination are listed in 40 CFR Part
Additionally, waste generators must consult state and local hazardous waste regu
ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: CAS# 79-00-5: waste number U227.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT
No information available
Canadian TDG
Shipping Name: POISONOUS LIQUID NOS (TRICHLOROETHANE)
Hazard Class: 6.1(9.2)
UN Number: UN2810

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL
TSCA
CAS# 79-00-5 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 79-00-5: Effective Date: June 1, 1987; Sunset Date: June 1, 1997
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA
Section 302 (RQ)
CAS# 79-00-5: final RQ = 100 pounds (45.4 kg)
Section 302 (TPQ)

None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 79-00-5: acute, chronic, flammable.
Section 313
This material contains 1,1,2-trichloroethane (CAS# 79-00-5, 100%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 372.
Clean Air Act:
CAS# 79-00-5 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 79-00-5 is listed as a Priority Pollutant under the Clean Water Act.
CAS# 79-00-5 is listed as a Toxic Pollutant under the Clean Water Act.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.

STATE
1,1,2-trichloroethane can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.
The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:
WARNING: This product contains 1,1,2-trichloroethane, a chemical known to the state of California to cause cancer.
California No Significant Risk Level:
CAS# 79-00-5: no significant risk level = 10 ug/day

European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols: XN
Risk Phrases:
R 20/21/22 Harmful by inhalation, in contact with skin and if swallowed.
Safety Phrases:
S 9 Keep container in a well-ventilated place.
WGK (Water Danger/Protection)
CAS# 79-00-5: 3
United Kingdom Occupational Exposure Limits

Canada
CAS# 79-00-5 is listed on Canada's DSL/NDSL List.
This product has a WHMIS classification of D1B.
CAS# 79-00-5 is not listed on Canada's Ingredient Disclosure List.
Exposure Limits
CAS# 79-00-5: OEL-ARAB Republic of Egypt:TWA 10 ppm (40 mg/m3);Skin
OEL-AUSTRALIA:TWA 10 ppm (45 mg/m3);Skin
OEL-BELGIUM:TWA 10 ppm (55 mg/m3);Skin
OEL-DENMARK:TWA 10 ppm (54 mg/m3);Skin
OEL-FINLAND:TWA 10 ppm (54 mg/m3);STEL 20 ppm (11 mg/m3);Skin
OEL-GERMANY:TWA 10 ppm (55 mg/m3);Skin;Carcinogen
OEL-HUNGARY:TWA 10 mg/m3;STEL 20 mg/m3;Skin
OEL-JAPAN:TWA 10 ppm (55 mg/m3);Skin
OEL-THE NETHERLANDS:TWA 10 ppm (45 mg/m3);Skin
OEL-POLAND:TWA 100 mg/m3
OEL-RUSSIA:TWA 10 ppm
OEL-SWITZERLAND:TWA 10 ppm (55 mg/m3);STEL 50 ppm;Skin
OEL-UNITED KINGDOM:TWA 10 ppm (45 mg/m3);STEL 20 ppm;Skin
OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV
OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 9/02/1997 Revision #3 Date: 8/02/2000

1,1-Dichloroethane,99+%, Stabilized with Nitromethane
ACROS83933

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: 1,1-Dichloroethane,99+%, Stabilized with Nitromethane
Catalog Numbers:
AC113350000, AC113350010, AC113351000, AC113352500
Synonyms:
Ethylidene Chloride.
Company Identification (Europe): Acros Organics N.V.
Janssen Pharmaceuticalaan 3a
2440 Geel, Belgium
Company Identification (USA): Acros Organics
One Reagent Lane
Fairlawn, NJ 07410
For information in North America, call: 800-ACROS-01
For information in Europe, call: 0032(0) 14575211
For emergencies in the US, call CHEMTREC: 800-424-9300
For emergencies in Europe, call: 0032(0) 14575299

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
75-34-3	1,1-Dichloroethane	>99	200-863-5

Hazard Symbols: XN F
Risk Phrases: 11 22 36/37 52/53

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: clear colorless to very faint yellow. Flash Point: -10 deg C. Danger! Extremely flammable liquid. Causes respiratory tract irritation. May cause skin irritation. May be harmful if swallowed. May cause central nervous system depression. May cause digestive tract irritation with nausea, vomiting, and diarrhea. Causes eye irritation.
Target Organs: Central nervous system.

Potential Health Effects

Eye:
Causes eye irritation. May cause chemical conjunctivitis and corneal damage.

Skin:
May cause irritation and dermatitis. May cause cyanosis of the extremities.

Ingestion:
May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May be harmful if swallowed. Ingestion of large amounts may cause CNS depression.

Inhalation:
Causes respiratory tract irritation. The toxicological properties of this substance have not been fully investigated. Aspiration may lead to pulmonary edema. Vapors may cause dizziness or suffocation. May cause burning sensation in the chest.

Chronic:
Effects may be delayed.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:
Immediately flush eyes with plenty of water for at least 15 minutes,

occasionally lifting the upper and lower eyelids. Get medical aid.

Skin:

Get medical aid. Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.

Ingestion:

Never give anything by mouth to an unconscious person. Get medical aid immediately. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.

Inhalation:

Get medical aid immediately. Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. DO NOT use mouth-to-mouth respiration.

Notes to Physician:

Treat symptomatically and supportively.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Will burn if involved in a fire. Use water spray to keep fire-exposed containers cool. Extremely flammable liquid. Containers may explode in the heat of a fire. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. Will be easily ignited by heat, sparks or flame.

Extinguishing Media:

For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. For large fires, use water spray, fog, or alcohol-resistant foam. Use water spray to cool fire-exposed containers. Water may be ineffective. Do NOT use straight streams of water.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Absorb spill with inert material, (e.g., dry sand or earth), then place into a chemical waste container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. A vapor suppressing foam may be used to reduce vapors.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Use with adequate ventilation. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Avoid contact with heat, sparks and flame. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.

Storage:

Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low. Use adequate general or local explosion-proof ventilation to keep airborne levels to acceptable levels.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
1,1-Dichloroethane	100 ppm	100 ppm TWA; 400 mg/m3 TWA; see Appendix C (Chloroethanes) for supplementary exp osure limits 3000 ppm IDLH	100 ppm TWA; 400 mg/m3 TWA

OSHA Vacated PELs:
1,1-Dichloroethane:
100 ppm TWA; 400 mg/m3 TWA

Personal Protective Equipment

Eyes:
Wear chemical goggles. Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin:
Wear appropriate protective gloves to prevent skin exposure.

Clothing:
Wear appropriate protective clothing to prevent skin exposure.

Respirators:
A respiratory protection program that meets OSHA's 29 CFR §1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Liquid
Appearance:	clear colorless to very faint yellow
Odor:	None reported.
pH:	Not available.
Vapor Pressure:	244 mbar @ 20 C
Vapor Density:	3.41
Evaporation Rate:	Not available.
Viscosity:	Not available.
Boiling Point:	57 deg C @ 760.00mm Hg
Freezing/Melting Point:	-97 deg C
Autoignition Temperature:	660 deg C (1,220.00 deg F)
Flash Point:	-10 deg C (14.00 deg F)
NFPA Rating:	(est.) Health: 2; Flammability: 3; Reactivity: 0
Explosion Limits, Lower:	.16 vol %
Upper:	.06 vol %
Decomposition Temperature:	
Solubility:	0.5g/100ml
Specific Gravity/Density:	1.1770g/cm3

Molecular Formula: C2H4Cl2
Molecular Weight: 98.96

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable under normal temperatures and pressures.
Conditions to Avoid:
Incompatible materials, ignition sources, excess heat, strong oxidants.
Incompatibilities with Other Materials:
Oxidizing agents.
Hazardous Decomposition Products:
Hydrogen chloride, phosgene, carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.
Hazardous Polymerization: Has not been reported.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 75-34-3: KI0175000
LD50/LC50:
CAS# 75-34-3: Inhalation, rat: LC50 =13000 ppm/4H; Oral, rat: LD50 = 725 mg/kg.
Carcinogenicity:
1,1-Dichloroethane -
ACGIH: A4 - Not Classifiable as a Human Carcinogen
California: carcinogen; initial date 1/1/90
Epidemiology:
No information available.
Teratogenicity:
No information available.
Reproductive Effects:
No information available.
Neurotoxicity:
No information available.
Mutagenicity:
No information available.
Other Studies:
See actual entry in RTECS for complete information.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Chemical waste generators must determine whether a discarded chemical is classif
as a hazardous waste.
US EPA guidelines for the classification determination are listed in 40 CFR Part
Additionally, waste generators must consult state and local hazardous waste regu
ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: CAS# 75-34-3: waste number U076.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT
Shipping Name: 1,1-DICHLOROETHANE
Hazard Class: 3
UN Number: UN2362
Packing Group: II
Canadian TDG
Shipping Name: 1,1-DICHLOROETHANE
Hazard Class: 3
UN Number: UN2362
Other Information: FLASHPOINT -10 C

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL

TSCA

CAS# 75-34-3 is listed on the TSCA inventory.

Health & Safety Reporting List

CAS# 75-34-3: Effective Date: June 1, 1987; Sunset Date: June 1, 1997

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

CAS# 75-34-3: 4/12b

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

SARA

Section 302 (RQ)

CAS# 75-34-3: final RQ = 1000 pounds (454 kg)

Section 302 (TPQ)

None of the chemicals in this product have a TPQ.

Section 313

This material contains 1,1-Dichloroethane (CAS# 75-34-3, 99%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 372.

Clean Air Act:

CAS# 75-34-3 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 75-34-3 is listed as a Priority Pollutant under the Clean Water Act.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

1,1-Dichloroethane can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.
The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:
WARNING: This product contains 1,1-Dichloroethane, a chemical known to the state of California to cause cancer.
California No Significant Risk Level:
CAS# 75-34-3: no significant risk level = 100 ug/day

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: XN F

Risk Phrases:

R 11 Highly flammable.
R 22 Harmful if swallowed.
R 36/37 Irritating to eyes and respiratory system.
R 52/53 Harmful to aquatic organisms; may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 9 Keep container in a well-ventilated place.
S 16 Keep away from sources of ignition - No smoking.
S 23 Do not inhale gas/fumes/vapour/spray.
S 28A After contact with skin, wash immediately with plenty of water.
S 33 Take precautionary measures against static discharges.
S 37 Wear suitable gloves.
S 45 In case of accident or if you feel unwell, seek

medical advice immediately (show the label where possible).
S 61 Avoid release to the environment. Refer to special instructions/Safety data sheets.

WGK (Water Danger/Protection)
CAS# 75-34-3: 3

United Kingdom Occupational Exposure Limits
CAS# 75-34-3: OES-United Kingdom, TWA 200 ppm TWA; 823 mg/m3 TWA
CAS# 75-34-3: OES-United Kingdom, STEL 400 ppm STEL; 1650 mg/m3 STEL

Canada
CAS# 75-34-3 is listed on Canada's DSL/NDSL List.
This product has a WHMIS classification of B2, D2B.
CAS# 75-34-3 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits
CAS# 75-34-3: OEL-ARAB Republic of Egypt
OEL-AUSTRALIA:TWA 200 ppm (810 mg/m3);STEL 250 pp (1010 mg/m3)
OEL-AUSTRIA:TWA 100 ppm (400 mg/m3)
OEL-BELGIUM:TWA 200 ppm (810 mg/m3);STEL 250 ppm (1010 mg/m3)
OEL-DENMARK:TWA 100 ppm (400 mg/m3)
OEL-FINLAND:TWA 100 ppm (400 mg/m3);STEL 250 ppm (1000 mg/m3)
OEL-FRANCE:TWA 200 ppm (810 mg/m3)
OEL-GERMANY:TWA 100 ppm (400 mg/m3)
OEL-JAPAN:TWA 100 ppm (400 mg/m3)
OEL-THE NETHERLANDS:TWA 200 ppm (820 mg/m3)
OEL-THE PHILIPPINES:TWA 100 ppm (400 mg/m3)
OEL-RUSSIA:TWA 100 ppm
OEL-SWITZERLAND:TWA 100 ppm (400 mg/m3);STEL 200 ppm (800 mg/m3)
OEL-THAILAND:TWA 50 ppm;STEL 100 ppm
OEL-TURKEY:TWA 100 ppm (400 mg/m3)
OEL-UNITED KINGDOM:TWA 200 ppm (810 mg/m3);STEL 400 ppm
OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV
OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 9/02/1997 Revision #5 Date: 8/02/2000

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if the company has been advised of the possibility of such damages.

International Chemical Safety Cards

1,1,2,2-TETRACHLOROETHANE

ICSC: 0332

1,1,2,2-TETRACHLOROETHANE
Acetylene tetrachloride
Symmetrical-tetrachloroethane
S-tetrachloroethane
$CHCl_2CHCl_2$
Molecular mass: 167.9

CAS # 79-34-5
RTECS # KI8575000
ICSC # 0332
UN # 1702
EC # 602-015-00-3

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not flammable. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION			In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE!	
• INHALATION	Abdominal pain. Cough. Dizziness. Headache. Nausea. Sore throat. Vomiting.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
• SKIN	MAY BE ABSORBED! Dry skin. Tremors (further see Inhalation).	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
• EYES	Redness. Pain.	Face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• INGESTION	Abdominal pain. Nausea. Vomiting (further see Inhalation).	Do not eat, drink, or smoke during work.	Do NOT induce vomiting. Rest. Refer for medical attention.

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. Do NOT let this chemical enter the environment (extra personal protection: complete protective clothing including self-contained breathing apparatus).	Separated from strong bases, food and feedstuffs. Cool. Keep in the dark. Well closed. Keep in a well-ventilated room.	Airtight. Do not transport with food and feedstuffs. T+ symbol R: 26/27-51/53 S: (1/2-)38-45-61 UN Hazard Class: 6.1 UN Packing Group: II Marine pollutant.

SEE IMPORTANT INFORMATION ON BACK

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

ADDITIONAL INFORMATION

ICSC: 0332 1,1,2,2-TETRACHLOROETHANE

IMPORTANT LEGAL NOTICE:

Poly(Vinyl Benzyl Chloride)
ACROS89444

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Poly(Vinyl Benzyl Chloride)
Catalog Numbers:
AC9411521, XXPVCBCL2KG
Synonyms:
None

Company Identification (Europe):
Acros Organics N.V.
Janssen Pharmaceuticalaan 3a
2440 Geel, Belgium

Company Identification (USA):
Acros Organics
One Reagent Lane
Fairlawn, NJ 07410

For information in North America, call: 800-ACROS-01
For information in Europe, call: 0032(0) 14575211
For emergencies in the US, call CHEMTREC: 800-424-9300
For emergencies in Europe, call: 0032(0) 14575299

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
0-00-0	Poly(Vinyl Benzyl Chloride)	100.0	unlisted

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: white.
Caution! The toxicological properties of this material have not been fully investigated. May cause eye and skin irritation. May cause respiratory and digestive tract irritation.
Target Organs: None known.

Potential Health Effects

Eye:
May cause eye irritation.

Skin:
May cause skin irritation.

Ingestion:
May cause irritation of the digestive tract. The toxicological properties of this substance have not been fully investigated.

Inhalation:
May cause respiratory tract irritation. The toxicological properties of this substance have not been fully investigated.

Chronic:
No information found.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:
Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

Skin:
Get medical aid if irritation develops or persists. Flush skin with plenty of soap and water.

Ingestion:
If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.

Inhalation:

Remove from exposure to fresh air immediately. Get medical aid if cough or other symptoms appear.

Notes to Physician:

Treat symptomatically and supportively.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear.

Extinguishing Media:

In case of fire use water spray, dry chemical, carbon dioxide, or chemical foam.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Sweep up or absorb material, then place into a suitable clean, dry, closed container for disposal. Avoid generating dusty conditions.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with skin and eyes. Avoid ingestion and inhalation.

Storage:

Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Use adequate ventilation to keep airborne concentrations low.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Poly(Vinyl Benzyl Chloride)	none listed	none listed	none listed

OSHA Vacated PELs:

Poly(Vinyl Benzyl Chloride):

No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin:

Wear appropriate protective gloves to prevent skin exposure.

Clothing:

Wear appropriate protective clothing to prevent skin exposure.

Respirators:

Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State: Solid
Appearance: white
Odor: Not available.
pH: Not available.
Vapor Pressure: Not available.
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: Not available.
Freezing/Melting Point: Not available.
Autoignition Temperature: Not available.
Flash Point: Not available.
NFPA Rating: Not published.
Explosion Limits, Lower: Not available.
Upper: Not available.
Decomposition Temperature:
Solubility:
Specific Gravity/Density:
Molecular Formula:
Molecular Weight:

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable.
Conditions to Avoid:
Incompatible materials.
Incompatibilities with Other Materials:
Strong oxidizing agents, strong bases.
Hazardous Decomposition Products:
Hydrogen chloride, carbon monoxide, carbon dioxide.
Hazardous Polymerization: Will not occur.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 0-00-0 unlisted.
LD50/LC50:
Not available.
Carcinogenicity:
Poly(Vinyl Benzyl Chloride) -
Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.
Epidemiology:
No data available.
Teratogenicity:
No data available.
Reproductive Effects:
No data available.
Neurotoxicity:
No data available.
Mutagenicity:
No data available.
Other Studies:
No data available.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Chemical waste generators must determine whether a discarded chemical is classif as a hazardous waste.

US EPA guidelines for the classification determination are listed in 40 CFR Part
Additionally, waste generators must consult state and local hazardous waste regu
ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT
No information available
Canadian TDG
No information available.

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL
TSCA
CAS# 0-00-0 is not listed on the TSCA inventory.
It is for research and development use only.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA
Section 302 (RQ)
None of the chemicals in this material have an RQ.
Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
Section 313
No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
Poly(Vinyl Benzyl Chloride) is not present on state lists from CA, PA, MN, MA, FL, or NJ.
California No Significant Risk Level:
None of the chemicals in this product are listed.
European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols: Not available.
Risk Phrases:
Safety Phrases:
WGK (Water Danger/Protection)
CAS# 0-00-0: No information available.
United Kingdom Occupational Exposure Limits

Canada
None of the chemicals in this product are listed on the DSL/NDSL list.
WHMIS: Not available.
CAS# 0-00-0 is not listed on Canada's Ingredient Disclosure List.
Exposure Limits

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 3/10/1998 Revision #1 Date: 8/02/2000

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if the company has been advised of the possibility of such damages.

APPENDIX B

ACCIDENT REPORT FORM

ACCIDENT REPORT FORM
ACCIDENT FORM

Report No. ____________

SITE: ______________________________ PROJECT NO. ____________________

Location: ____

Date of Report: ____________________ Preparers Name: ______________________

Name and Address of Injured: ______________________ SSN: ____________ Age: ______

____ Sex: ______

Years of Service: ________ Time on Present Job ________ Title/Classification ______________

Division/Department ______________________ Date of Accident ______________

Accident Category: _____ Motor Vehicle _____ Property Damage Fire

_____ Chemical Exposure _____ Near Miss Other

Severity of Injury or Illness: _____ Non-disabling _____ Disabling

_____ Medical Treatment _____ Fatality

Amount of Damage: $ ______________ Property Damaged: ______________________

Estimated Number of Days Away from Job: ______________________________

Nature of Illness ____

CLASSIFICATION OF INJURY:

_____ Fractures

_____ Dislocations

_____ Sprains

_____ Abrasions

_____ Lacerations

_____ Punctures

_____ Bites

_____ Toxic Ingestions

_____ Heat Burns

_____ Chemical Burns

_____ Radiation Burns

_____ Bruises

_____ Blisters

_____ Toxic Respiratory Exposure

_____ Toxic Ingestions

_____ Dermal Allergy

_____ Cold Exposure

_____ Frostbite

_____ Heat Stroke

_____ Heat Exhaustion

_____ Concussion

_____ Faint/Dizziness

_____ Toxic Respiratory

Part of Body Affected ____

Degree of Disability ____

Accident Report Form (continued)

18. Injuries: Please Check Any Injuries You Have Had

☐ Fractures/Broken Bones
☐ Back Injury
☐ Low Back Pain
☐ None

☐ Severe Cuts
☐ Severe Burns
☐ Loss of Arm, Leg, Finger, Toe

☐ Loss of Consciousness
☐ Dislocations
☐ Other Injury

19. Check Yes or No. If Yes, Give Details in Blank Area	Yes	No	Details
a. Any Time Loss From Work Past Two Year Due to Illness			
b. Any Brace or Support Worn			
c. Discharged or Disqualified From Armed Services for any Reason			
d. Military Service - Dates and Locations			
e. Applied for, or Received Workmen's Compensation			
f. Been Exposed to Work with Dusts, Radiation, Excessive Noise; Chemicals			
g. Have you Been Unable to Hold a Job Because of:			
1. Sensitivity to Chemicals, Dust, Sunlight, etc.			
2. Inability to Perform Certain Motions			
3. Inability to Assume Certain Positions			
4. Other Medical Reasons			
h. Been a Patient in a Hospital or Sanitarium			
i. Had Surgery Recommended or Perform. Date and Type			
j. Are You Taking Medicines Now.			
k. Have You Been Turned Down on a Physical Examination or Been Informed of Any Abnormal Findings From a Physical Examination.			
l. Do You Smoke - If Yes, Quantity Per Day.			
m. Do You Use Alcoholic Beverages - If Yes, Quantity per Day			
n. Have You Lived or Traveled Outside the Continental U.S.A.			
o. Allergies			

Accident Report Form (continued)

Date Medical Care Was Received

Where Medical Care Was Received

Address (if off-site):

ACCIDENT LOCATION:

Causative agent most directly related to accident (Object substance, material, machinery, equipment conditions):

Was weather a factor?

Unsafe mechanical/physical/environmental condition at time of accident (Be specific):

Unsafe act by injured and/or others contributing to the accident (Be specific, must be answered):

Personal factors (Improper attitude, lack of knowledge of skill, slow reaction, fatigue):

Accident Report Form (continued)

Level of personal protection equipment requested in Site Safety Plan: ______________________

____

Modifications: ______________________________________

Was injured using required equipment ______________________________

If not, how did actual equipment use differ from plan: ______________________

____

What can be done to prevent a recurrence of this type of accident (Modification of machine; mechanical guards; correct environment training):

____

____

Detailed narrative description (How did accident occur, why; objects, equipment tools used, circumstance assigned duties) (Be specific):

____

____

____

(Use back of sheet as required)

Witness to accident ______________________________________

____

Signature of Preparer ______________________

Signature of Site Leader ______________________

APPENDIX C

OSHA FORM 200

OSHA FORM 200

Log and Summary of Occupational Injuries and Illnesses

NOTE: This form is required by Public Law 91-596 and must be kept in the establishment for 5 years. Failure to maintain and post can result in the issuance of citations and assessment of penalties. *(See posting requirements on the other side of form.)*

RECORDABLE CASES: You are required to record information about every occupational death; every nonfatal occupational illness; and those nonfatal occupational injuries which involve one or more of the following: loss of consciousness, restriction of work or motion, transfer to another job, or medical treatment (other than first aid). *(See definitions on the other side of form.)*

Case or File Number	Date of Injury or Onset of Illness	Employee's Name	Occupation	Department	Description of Injury or Illness
Enter a nonduplicating number which will facilitate comparisons with supplementary records.	Enter Mo./day.	Enter first name or initial, middle initial, last name.	Enter regular job title, not activity employee was performing when injured or at onset of illness. In the absence of a formal title, enter a brief description of the employee's duties.	Enter department in which the employee is regularly employed or a description of normal workplace to which employee is assigned, even though temporarily working in another department at the time of injury or illness.	Enter a brief description of the injury or illness and indicate the part or parts of body affected. Typical entries for this column might be: Amputation of 1st joint right forefinger; Strain of lower back; Contact dermatitis on both hands; Electrocution—body.
(A)	(B)	(C)	(D)	(E)	(F)
					PREVIOUS PAGE TOTALS →
					TOTALS (Instructions on other side of form.) →

OSHA No. 200

OSHA Form 200 (continued)

U.S. Department of Labor

For Calendar Year 19 ______ Page ___ of ___

Company Name

Establishment Name

Establishment Address

Form Approved
O.M.B. No. 1218-0176
See OMB Disclosure
Statement on reverse.

Extent of and Outcome of INJURY						Type, Extent of, and Outcome of ILLNESS												
Fatalities	Nonfatal Injuries					Type of Illness							Fatalities	Nonfatal Illnesses				
Injury Related	Injuries With Lost Workdays				Injuries Without Lost Workdays	CHECK Only One Column for Each Illness (See other side of form for terminations or permanent transfers.)							Illness Related	Illnesses With Lost Workdays				Illnesses Without Lost Workdays
Enter DATE of death. Mo./day/yr.	Enter a CHECK if injury involves days away from work, or days of restricted work activity, or both.	Enter a CHECK if injury involves days away from work.	Enter number of DAYS away from work.	Enter number of DAYS of restricted work activity.	Enter a CHECK if no entry was made in columns 1 or 2 but the injury is recordable as defined above.	Occupational skin diseases or disorders	Dust diseases of the lungs	Respiratory conditions due to toxic agents	Poisoning (systemic effects of toxic materials)	Disorders due to physical agents	Disorders associated with repeated trauma	All other occupational illnesses	Enter DATE of death. Mo./day/yr.	Enter a CHECK if illness involves days away from work, or days of restricted work activity, or both.	Enter a CHECK if illness involves days away from work.	Enter number of DAYS away from work.	Enter number of DAYS of restricted work activity.	Enter a CHECK if no entry was made in columns 8 or 9.
(1)	(2)	(3)	(4)	(5)	(6)	(7)							(8)	(9)	(10)	(11)	(12)	(13)
						(a)	(b)	(c)	(d)	(e)	(f)	(g)						

cation of Annual Summary Totals By ______________________________ Title ______________________________ Date ______________

No. 200

POST ONLY THIS PORTION OF THE LAST PAGE NO LATER THAN FEBRUARY 1.

OSHA Form 200 (continued)

Columns
6 and 13 — INJURIES OR ILLNESSES WITHOUT LOST WORKDAYS. Self-explanatory.

Columns 7a
through 7g — TYPE OF ILLNESS.
Enter a check in only one column for each illness.

TERMINATION OR PERMANENT TRANSFER—Place an asterisk to the right of the entry in columns 7a through 7g (type of illness) which represented a termination of employment or permanent transfer.

V. Totals

Add number of entries in columns 1 and 8.
Add number of checks in columns 2, 3, 6, 7, 9, 10, and 13.
Add number of days in columns 4, 5, 11, and 12.
Yearly totals for each column (1-13) are required for posting. Running or page totals may be generated at the discretion of the employer.

If an employee's loss of workdays is continuing at the time the totals are summarized, estimate the number of future workdays the employee will lose and add that estimate to the workdays already lost and include this figure in the annual totals. No further entries are to be made with respect to such cases in the next year's log.

VI. Definitions

OCCUPATIONAL INJURY is any injury such as a cut, fracture, sprain, amputation, etc., which results from a work accident or from an exposure involving a single incident in the work environment.
NOTE: Conditions resulting from animal bites, such as insect or snake bites or from one-time exposure to chemicals, are considered to be injuries.

OCCUPATIONAL ILLNESS of an employee is any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases which may be caused by inhalation, absorption, ingestion, or direct contact.

The following listing gives the categories of occupational illnesses and disorders that will be utilized for the purpose of classifying recordable illnesses. For purposes of information, examples of each category are given. These are typical examples, however, and are not to be considered the complete listing of the types of illnesses and disorders that are to be counted under each category.

7a. Occupational Skin Diseases or Disorders
Examples: Contact dermatitis, eczema, or rash caused by primary irritants and sensitizers or poisonous plants; oil acne; chrome ulcers; chemical burns or inflammations; etc.

7b. Dust Diseases of the Lungs (Pneumoconioses)
Examples: Silicosis, asbestosis and other asbestos-related diseases, coal worker's pneumoconiosis, byssinosis, siderosis, and other pneumoconioses.

7c. Respiratory Conditions Due to Toxic Agents
Examples: Pneumonitis, pharyngitis, rhinitis or acute congestion due to chemicals, dusts, gases, or fumes; farmer's lung; etc.

7d. Poisoning (Systemic Effect of Toxic Materials)
Examples: Poisoning by lead, mercury, cadmium, arsenic, or other metals; poisoning by carbon monoxide, hydrogen sulfide, or other gases; poisoning by benzol, carbon tetrachloride, or other organic solvents; poisoning by insecticide sprays such as parathion, lead arsenate; poisoning by other chemicals such as formaldehyde, plastics, and resins; etc.

7e. Disorders Due to Physical Agents (Other than Toxic Materials)
Examples: Heatstroke, sunstroke, heat exhaustion, and other effects of environmental heat; freezing, frostbite, and effects of exposure to low temperatures; caisson disease; effects of ionizing radiation (isotopes, X-rays, radium); effects of nonionizing radiation (welding flash, ultraviolet rays, microwaves, sunburn); etc.

7f. Disorders Associated With Repeated Trauma
Examples: Noise-induced hearing loss; synovitis, tenosynovitis, and bursitis; Raynaud's phenomena; and other conditions due to repeated motion, vibration, or pressure.

7g. All Other Occupational Illnesses
Examples: Anthrax, brucellosis, infectious hepatitis, malignant and benign tumors, food poisoning, histoplasmosis, coccidioidomycosis, etc.

MEDICAL TREATMENT includes treatment (other than first aid) administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does NOT include first-aid treatment (one-time treatment and subsequent observation of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care) even though provided by a physician or registered professional personnel.

ESTABLISHMENT: A single physical location where business is conducted or where services or industrial operations are performed (for example: a factory, mill, store, hotel, restaurant, movie theater, farm, ranch, bank, sales office, warehouse, or central administrative office). Where distinctly separate activities are performed at a single physical location, such as construction activities operated from the same physical location as a lumber yard, each activity shall be treated as a separate establishment.

For firms engaged in activities which may be physically dispersed, such as agriculture; construction; transportation; communications; and electric, gas, and sanitary services, records may be maintained at a place to which employees report each day.

Records for personnel who do not primarily report or work at a single establishment, such as traveling salesmen, technicians, engineers, etc., shall be maintained at the location from which they are paid or the base from which personnel operate to carry out their activities.

WORK ENVIRONMENT is comprised of the physical location, equipment, materials processed or used, and the kinds of operations performed in the course of an employee's work, whether on or off the employer's premises.

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*U.S. Government Printing Office: 1996 - 405-052/34106

OSHA Form 200 (continued)

Public reporting burden for this collection of information is estimated to vary from 4 to 30 (time in minutes) per response with an average of 15 (time in minutes) per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. If you have any comments regarding this estimate or any other aspect of this information collection, including suggestions for reducing this burden, please send them to the OSHA Office of Statistics and/or the Department of Labor, Office of IRM Policy, Room N-1301, 200 Constitution Avenue, N.W. Washington, D.C. 20210

Instructions for OSHA No. 200

I. Log and Summary of Occupational Injuries and Illnesses

Each employer who is subject to the recordkeeping requirements of the Occupational Safety and Health Act of 1970 must maintain for each establishment a log of all recordable occupational injuries and illnesses. This form (OSHA No. 200) may be used for that purpose. A substitute for the OSHA No. 200 is acceptable if it is as detailed, easily readable, and understandable as the OSHA No. 200.

Enter each recordable case on the log within six (6) workdays after learning of its occurrence. Although other records must be maintained at the establishment to which they refer, it is possible to prepare and maintain the log at another location, using data processing equipment if desired. If the log is prepared elsewhere, a copy updated to within 45 calendar days must be present at all times in the establishment.

Logs must be maintained and retained for five (5) years following the end of the calendar year to which they relate. Logs must be available (normally at the establishment) for inspection and copying by representatives of the Department of Labor, or the Department of Health and Human Services, or States accorded jurisdiction under the Act. Access to the log is also provided to employees, former employees and their representatives.

II. Changes in Extent of or Outcome of Injury or Illness

If, during the 5-year period the log must be retained, there is a change in an extent and outcome of an injury or illness which affects entries in columns 1, 2, 6, 8, 9, or 13, the first entry should be lined out and a new entry made. For example, if an injured employee at first required only medical treatment but later lost workdays away from work, the check in column 6 should be lined out, and checks entered in columns 2 and 3 and the number of lost workdays entered in column 4.

In another example, if an employee with an occupational illness lost workdays, returned to work, and then died of the illness, any entries in columns 9 through 12 should be lined out and the date of death entered in column 8.

The entire entry for an injury or illness should be lined out if later found to be nonrecordable. For example: an injury which is later determined not to be work related, or which was initially thought to involve medical treatment but later was determined to have involved only first aid.

III. Posting Requirements

A copy of the totals and information following the fold line of the last page for the year must be posted at each establishment in the place or places where notices to employees are customarily posted. This copy must be posted no later than *February 1 and must remain in place until March 1.*

Even though there were no injuries or illnesses during the year, zeros must be entered on the totals line, and the form posted.

The person responsible for the *annual summary totals* shall certify that the totals are true and complete by signing at the bottom of the form.

IV. Instructions for Completing Log and Summary of Occupational Injuries and Illnesses

Column A — CASE OR FILE NUMBER. Self-explanatory.

Column B — DATE OF INJURY OR ONSET OF ILLNESS.
For occupational injuries, enter the date of the work accident which resulted in injury. For occupational illnesses, enter the date of initial diagnosis of illness, or, if absence from work occurred before diagnosis, enter the first day of the absence attributable to the illness which was later diagnosed or recognized.

Columns C through F — Self-explanatory.

Columns 1 and 8 — INJURY OR ILLNESS-RELATED DEATHS.
Self-explanatory.

Columns 2 and 9 — INJURIES OR ILLNESSES WITH LOST WORKDAYS
Self-explanatory.

Any injury which involves days away from work, or days of restricted work activity, or both must be recorded since it always involves one or more of the criteria for recordability.

Columns 3 and 10 — INJURIES OR ILLNESSES INVOLVING DAYS AWAY FROM WORK. Self-explanatory.

Columns 4 and 11 — LOST WORKDAYS— DAYS AWAY FROM WORK
Enter the number of workdays (consecutive or not) on which the employee would have worked but could not because of occupational injury or illness. The number of lost workdays should not include the day of injury or onset of illness or any days on which the employee would not have worked even though able to work.

NOTE: For employees not having a regularly scheduled shift, such as certain truck drivers, construction workers, farm labor, casual labor, part-time employees, etc., it may be necessary to estimate the number of lost workdays. Estimates of lost workdays shall be based on prior work history of the employee AND days worked by employees, not ill or injured, working in the department and/or occupation of the ill or injured employee.

Columns 5 and 12 — LOST WORKDAYS——DAYS OF RESTRICTED WORK ACTIVITY
Enter the number of workdays (consecutive or not) on which because of injury or illness:

(1) the employee was assigned to another job on a temporary basis, or

(2) the employee worked at a permanent job less than full time, or

(3) the employee worked at a permanently assigned job but could not perform all duties normally connected with it.

The number of lost workdays should not include the day of injury or onset of illness or any days on which the employee would not have worked even though able to work.

APPENDIX D

EMPLOYER'S FIRST REPORT OF INJURY FORM

EMPLOYER'S FIRST REPORT OF INJURY

Please submit this report in TRIPLICATE

Employer
1. Name of Employer ______________________________
2. Office address: No. & St.____________________ City/town ________________ State ____
3. Insured by Name of Company ______________________________
4. Give nature of Business (or article manufactured) ______________________________

Time and Place
5. (a) Location of plant or place where accident occurred ______________________________
   (b) If injured in a mine, did accident occur on surface, under ground, shaft, drift or mill ________________________.
6. Date of injury ____________19___ Day of week ___ Hour of day ________ a.m. ______ p.m.
7. Date disability began __________________ 19___ a.m. ____ p.m. ____
8. Was injured pain in full for this day ______________________________
9. When did you or foreman first know of injury______________________________
10. Name of foreman ______________________________

Injured Person
11. Name of Injured ______________________________
    (First Name) (middle Initial) (Last Name) (SS #)
12. Address: No. and St. __________________________ City/Town ______________ State ___
13. Check ( ) Married___Single____ Widowed ___ Widower___ Divorced___ Male ____ Female___
14. Age____Did you have on file employment certificate or permit ______________________
15. (a) Occupation when injured ________________
    (b) Was this his or her register occupation ______________________________
    (If not, state in what department or branch or work regularly employed ______________
16. (a) How long employed by you _____________ (b) Wages per day $ ______________
17. (a) No. hours worked per day _____________ (b) Wages per day$ ______________
    (c) No. Days worked per week _____________ (d) Average weekly earning $ ________
    (e) If board, lodging, fuel or other advantages were furnished in addition to wages, give estimated value per day, week, or month ______________________________

Cause of Injury
18. Machine, tool or thing causing injury ______________________________
19. Kind of power (hand, foot, electrical, steam, etc.) ______________________________
20. Part of machine on which accident occurred ______________________________
21. (a) Was safety appliance or regulation provided ________ (b) Was it in use at time ________
22. Was accident caused by injury's failure to use or observe safety appliance or regulation
23. Describe fully how accident occurred, and state what employee was doing when injured
    ____
    ____
    ____
24. Name and addresses of witnesses ______________________________
    ____

Nature of Injury
25. Nature and location of injury (describe fully exact location of amputations or fractures, right or left)
    ____
    ____
26. Probably length of disability ______________________________
27. Has injured return to work ______________________________ If so, date and hour ________________ At what wage $ ________________
28. At what occupation ______________________________
29. (a) Name and address of physician ______________________________
    (b) Name and address of hospital ______________________________

Cases Fatal 30. Has injured died______________________ If so, give date of death ____________________

Date of this report ______________________ Firm name ______________________

Signed by ____________________ Official title ______________________

APPENDIX E

SAFETY MEETING SHEET

RECORD OF SAFETY MEETINGS

Company	Date/Time	Location	Attended By	Affiliation

APPENDIX F

VAPOR MONITORING SHEET

VAPOR MONITORING SHEET

DATE	TIME	READING	COMMENTS