INTERIM REMEDIAL MEASURES (IRM) WORK PLAN

for

MAKO PROPERTIES LIMITED PARTNERSHIP BUILDING #3
48-50 Enter Lane, Islandia, NY
NYSDEC SITE #1-522-30

October 2013

Prepared for:

Mako Properties Limited Partnership
931B Conklin Street
Farmingdale, NY 11735-2429

Prepared by:

CA RICH CONSULTANTS, INC.
17 Dupont Street
Plainview, NY 11803-1614

CERTIFICATION

I, Stephen Osmundsen, certify that I am currently a registered professional engineer licensed by the State of New York and that this Interim Remedial Measures Work Plan for the Site located at 48-50 Enter Lane in Islandia, NY (NYSDEC Site #1-52-230) was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

056136	October 18, 2013	
NYS Professional Engineer #	Date	Signature

Professional Engineer's Stamp

It is a violation of Article 145 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 145, New York State Education Law.

October 18, 2013

NYSDEC – Region 1
Division of Environmental Remediation
SUNY @ Stony Brook
50 Circle Road
Stony Brook, NY 11790-3409

Attention: Jamie Ascher

Re: **INTERIM REMEDIAL MEASURES (IRM) WORK PLAN**
NYSDEC Site # 1-522-30
Mako Properties Limited Partnership Building #3
48-50 Enter Lane
Islandia, New York

Dear Mr. Ascher:

On behalf of the Mako Properties Limited Partnership, CA RICH Consultants, Inc. is pleased to submit the attached Interim Remedial Measures (IRM) Work Plan for the above-referenced property. A complete electronic copy of this IRM Work Plan is included on a CD in the rear cover of this hard copy.

Sincerely,

CA RICH CONSULTANTS, INC.

Stephen Osmundsen, P.E.
Senior Engineer

Steve Sobstyl
Senior Project Manager

Eric A. Weinstock, CPG
Vice President

cc: see attached distribution

Distribution List

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INTERIM REMEDIAL MEASURES (IRM) WORK PLAN

Mako Properties Limited Partnership Building #3
48-50 Enter Lane
Islandia, NY

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INTERIM REMEDIAL MEASURES WORK PLAN
MAKO PROPERTIES LIMITED PARTNERSHIP - BUILDING #3

48-50 Enter Lane
Islandia, New York
NYSDEC Site # 152-20-30

1.0 INTRODUCTION

This Interim Remedial Measures (IRM) Work Plan was prepared by CA RICH Consultants, Inc. (CA RICH) of Plainview, New York, on behalf of the owner Mako Properties Limited Partnership (Mako Properties) for the above-referenced property (hereinafter referred to as "Building #3" or "Site"). This IRM Work Plan addresses certain findings and recommendations set forth in the Final Site Characterization Report dated November 30, 2012 (Ref. 1).

This IRM Work Plan presents the remedial activities proposed to address the finding of 1,1,1-trichloroethane (TCA) and its degradation products in the groundwater beneath the Site, as well as the presence of TCA vapors in the soil vapor under Building #3. More specifically, the purpose of this IRM Work Plan is to outline the scope of work for conducting pilot tests for treatment of groundwater in the vicinity of monitoring well MW-2 ("MW-2") through air sparging and soil vapor extraction (AS/SVE) and the installation of a sub-slab soil vapor extraction (SVE) system beneath Building #3.

The proposed scope of work presented in this IRM Work Plan will be conducted in accordance with the Quality Assurance Project Plan (Appendix A) and Health & Safety Plan (Appendix B) prepared for this Site and already approved by NYSDEC in the Site Characterization Work Plan (Ref 2).

2.0 SUMMARY OF SITE CHARACTERIZATION FINDINGS

The Site Characterization Investigation determined the following:

1. A Site specific source of the TCA found in the shallow groundwater and the soil vapor beneath Building #3 was not identified. Groundwater analysis of upgradient monitoring wells located behind Building #3 indicates that there may be an up-gradient off-site source for these chemicals.

2. Elevated levels of TCA in groundwater were limited to the immediate vicinity of Building #3. Most notably in the shallow water table at MW-2.

3. Sub-slab soil vapor and indoor air samples from Building #3 contained levels of TCA that fell within the mitigation range as set forth in the NYSDOH Guidance for Soil Vapor Intrusion.

The IRM includes pilot tests for treatment of groundwater in the vicinity of MW-2 using an AS/SVE system and the installation of an SVE system beneath Building #3 (Units #48 and #50). Upon implementation of the IRM Work Plan, monitoring of the efficiency of the groundwater treatment can be accomplished through periodic sampling of on-site and off-site groundwater for VOCs. Also, periodic monitoring of the efficiency of the SVE system to be installed in Building #3 will be accomplished through periodic effluent monitoring during the operation of the SVE system.

3.0 PHYSICAL SITE CHARACTERISTICS

3.1 Site Description, History & Hydrogeologic Setting

The Site is located at 48-50 Enter Lane in Islandia, Suffolk County, New York and is legally designated on SCTM as Section: 006.00; Block: 01.00; Lot: 018.000. The property is relatively level and the exterior is paved with asphalt. Building #3 is a two-story, brick and block structure containing approximately 4,560 square feet of interior floor space. The building is serviced with an on-site sanitary waste disposal system that consists of a primary septic holding tank that connects to single overflow leaching pool. The Site location is presented on a topographic map as illustrated in Figure 1 and a Site Plan is included as Figure 2.

This Site is situated within a well-developed, mixed-use industrial and commercial area commonly referred to as the "Islandia Industrial Park". Surrounding properties are comprised mostly of occupied industrial and commercial buildings with some retail space and associated parking lots. Historical records indicate that the Site was originally developed circa 1978 with the existing brick/block structure.

Historically, Building #3 was occupied by Elmont Electric and Westbury Precision, Inc. Currently, Building #3 is used as office and warehouse space by Island Elevator (Unit #48), a distributor of commercial elevator parts and David Cooke Plaster Company, a pool installation company (Unit #50).

The Site is situated upon unconsolidated glacial outwash sand deposits at an elevation of approximately 115 feet above mean sea level. The subsurface geologic conditions encountered during our Site Characterization Investigation revealed localized subsurface earth materials generally consisting of fairly uniform and permeable tan medium-grained sand with cobbles grading occasionally to light-brown fine sand. The site specific work conducted to date suggests that the Upper Glacial Aquifer is encountered at a depth of approximately 72 feet below land surface and groundwater flows in a southeast direction. Activities associated with the Site Characterization Investigation included drilling into the Upper Glacial Aquifer to a depth of 210 feet. Soil samples collected during this activity did not indicate the presence of the Magothy Aquifer, which is used for public water supply in the area.

3.2 Historical Environmental Reports

The following list identifies earlier studies performed at the Site. Copies of these reports were previously submitted to NYSDEC.

Document	Date
Groundwater Monitoring Plan – Well Network Installation and Baseline Sampling, CA RICH	November 2003
Annual Environmental Summary Report, CA RICH	December 2004
Groundwater Quality Sampling Plan, CA RICH	May 2005
Annual Environmental Summary Report, CA RICH	March 2006
Subsurface Soil Boring Results, CA RICH	September 2007
Groundwater Well Installation and Sampling Report, CA RICH	January 2009

Document	Date
Annual Environmental Summary Report, CA RICH	December 2009
Phase II Environmental Site Investigation, CA RICH	March 2010
Site Characterization Work Plan, CA RICH	March 2011
Final Site Characterization Report, CA RICH	November 2012

4.0 INTERIM REMEDIAL MEASURES

There are two components of the IRM that will meet the objectives of addressing the presence of TCA and its degradation products found in the groundwater beneath the Site and in the sub-slab soil vapor and indoor air of Building #3. Site groundwater will be treated by installing an AS/SVE system in the vicinity of MW-2; and the sub-slab soil vapor and the indoor air associated with Units #48 and #50 of Building #3 will be treated by installing an SVE system.

This IRM Work Plan presents the procedures to be used to conduct pilot tests for groundwater treatment and soil vapor extraction. The information and data will be used for the engineering design of the proposed AS/SVE and SVE remedial systems.

4.1 Groundwater Sampling Results

On July 19, 2013, groundwater samples were collected from three on-site wells surrounding Building #3 to obtain current groundwater information. The concentrations of TCA detected in these wells were: 130 ug/L at MW-2; 21 ug/L at MW-8; and 25 ug/L at MW-9. On July 26, 2013, groundwater samples were collected from intermediate depth well MW-2I and deep well MW-2D. The results did not reveal detections of TCA above laboratory detection limits. Table 1 is a summary of the 2010, 2011, 2012 and recent detections of VOCs in wells MW-2, MW-2I, MW-2D, MW-8 and MW-9. A recent groundwater flow contour map produced from July 17, 2013 water level measurements is presented in Figure 3.

4.2 Air Sparging/Soil Vapor Extraction Well Pilot Test

The AS/SVE pilot test will consist of installing one air sparge point and one soil vapor extraction well within approximately 25 feet of MW-2 (see Figure 4). Figure 4 also includes the proposed locations for the anticipated AS/SVE layout of four permanent sparge points and four vapor extraction wells.

The air sparge points will be constructed of 2-inch diameter, schedule 80 PVC pipe with a two foot, 20-slot screen installed to a terminal depth of 92-feet below the ground surface. The vapor extraction wells will be constructed of 2-inch diameter schedule 40 PVC pipe with a ten foot, 20-slot screen installed to a terminal depth of 62-feet below the ground surface, or installed approximately ten feet above the water table. The screened zone of the sparge points and vapor extraction wells will be gravel packed with clean filter sand two feet above the screen zone followed by a bentonite seal and grouted to just below the surface grade. The AS/SVE wells will be finished to below grade with access through a steel protective curb box and bolted cover. A profile of the proposed air sparge points and vapor extraction wells is presented in Figure 5.

The air sparge point and vapor extraction well will be allowed to equilibrate for several days prior to conducting the pilot test. The pilot test for the air sparge point will be conducted using a portable 2-stage reciprocating-piston air compressor rated at 10 cfm and 125 pounds per square inch (PSI). Air will be injected into the sparge point at a controlled rate. Prior to injecting any air, a static water level measurement will be collected from monitoring well MW-2. During the injection of air, water level measurements will be collected from MW-2 to document and record the rise in water level. Dissolved oxygen readings will also be recorded before and after the test. The pilot test is expected to run for approximately 60 minutes.

A pilot test will also be conducted for the soil vapor extraction well. The SVE well will be tested at three rates at increasing order using a portable 3-horspower Rotron® regenerative blower. During each phase of the pilot test, measurements of vacuum will be at MW-2 using a digital manometer. Once the pilot test data is compiled, the AS/SVE system will be designed such that the radius of influence of the proposed additional air sparge points will overlap.

The final design of the AS/SVE system will include a network of buried pipe that will lead to a utility and equipment storage shed. The shed will house all of the necessary equipment to operate the AS/SVE system. It is anticipated that air sparging will be achieved using a rotary screw compressor equipped with an after-cooler and will be capable of delivering approximately 50 cfm of air at 125 psi. The operation of the sparge points will be divided into groups such that they can be operated in an alternating fashion using a timer and control valves. All electrical connections will be made directly to a panel box located in the shed. The extracted soil vapor will pass through a moisture knock-out drum using a regenerative blower and passed through a series of vapor-phase carbon units located outside of the shed that will lead to a discharge stack. The discharge stack will consist of a 2-inch diameter PVC pipe attached to the side of the building and will be raised eight feet above the roof top.

4.4 Sub-slab Soil Vapor Extraction (SVE) Pilot Test

The sub-slab SVE pilot test will consist of the installation of one permanent SVE well located toward the rear of Building #3 (inside unit #48) and three temporary vacuum monitoring points as illustrated in Figure 6. Also included in Figure 6 is the anticipated final layout of the permanent SVE wells.

The permanent SVE well will be constructed of 4-inch diameter schedule 40 PVC pipe with a five foot, 20-slot screen installed to a terminal depth of approximately 7-feet below the floor surface of the building. A PVC riser pipe will be connected to the well screen section to bring well head up to approximately one foot below the floor surface. The screened zone of the SVE well point will be gravel packed with clean pea gravel to one foot above the screen followed by a cement seal and finished to grade with access through a steel protective curb box and bolted cover. A profile of the proposed SVE well is presented in Figure 7.

The vacuum monitoring points will be installed at three locations as shown in Figure 6 by drilling a 5/16th-inch diameter hole in the floor and inserting a rubber stopper equipped with a barbed fitting in the hole of the rubber stopper. Vacuum readings from the vacuum monitoring points will be recorded using an Infiltec® Model DM1 Digital Micro-Manometer. The pilot test will be conducted using a combination of two different Fantech® vapor abatement fans (a model HP2109 and model HP220) and a portable 3-horsepower, Rotron® regenerative blower with a variable frequency drive to control the discharge rate.

The Fantech® fan is fitted with a 4-inch diameter PVC pipe equipped with a valve port designed such that vacuum readings can be measured from the fan during the test. The fans will be connected to a flexible hose for the purposes of discharging the soil vapor outside of the building during the performance of the pilot test. Each flow rate to be tested will be performed for at least 20 minutes. Also during the 20 minute test, one sample of the extracted soil vapor will be collected using a SUMMA sampling canister for the purposes of analyzing the soil vapor using USEPA Method TO-15. The results of the air sample will be used to calculate the volume of carbon needed for off-gas treatment. The final design of the SVE system will include a network of pipes that will lead to the utility and equipment shed also being used for the AS/SVE groundwater treatment system.

Once the concentrations of VOCs in the extracted soil vapor decreases to levels below NYS Air Guide-1 criteria, CA RICH in coordination with NYSDEC and NYSDOH, will determine whether any other mitigative measure is needed and whether to retrofit the SVE into a sub-slab depressurization system (SSDS). The SSDS, if needed, will be designed to place negative pressure below the concrete slab of Building #3 to prevent vapors containing VOCs from migrating into the building.

5.0 REPORTING

Once all of the data is compiled from the AS/SVE and SVE system pilot tests, an Interim Remedial Measures (IRM) Report – Part A will be prepared. The IRM Report – Part A will summarize the AS/SVE and SVE system pilot test results and include proposed plans for the construction and design of the groundwater and soil vapor remediation systems. The IRM Report – Part A will include the final layout of the planned AS/SVE and SVE systems and the selected air compressor and SVE blower. It will also set forth the criteria for the AS/SVE and SVE systems startup and monitoring schedule.

Once the remedial systems are operational, an Interim Remedial Measures (IRM) Report – Part B will be prepared. The IRM Report – Part B: Construction Completion Report and Operations, Maintenance & Monitoring Plan will summarize the as-built design of the AS/SVE and SVE systems and the start-up data. The IRM Report – Part B will include the monitoring schedule for both groundwater and extracted soil vapor; maintenance procedures for the equipment; and the criteria to terminate the operation of the equipment.

6.0 SCHEDULE

The following Schedule is provided for this IRM Work Plan.

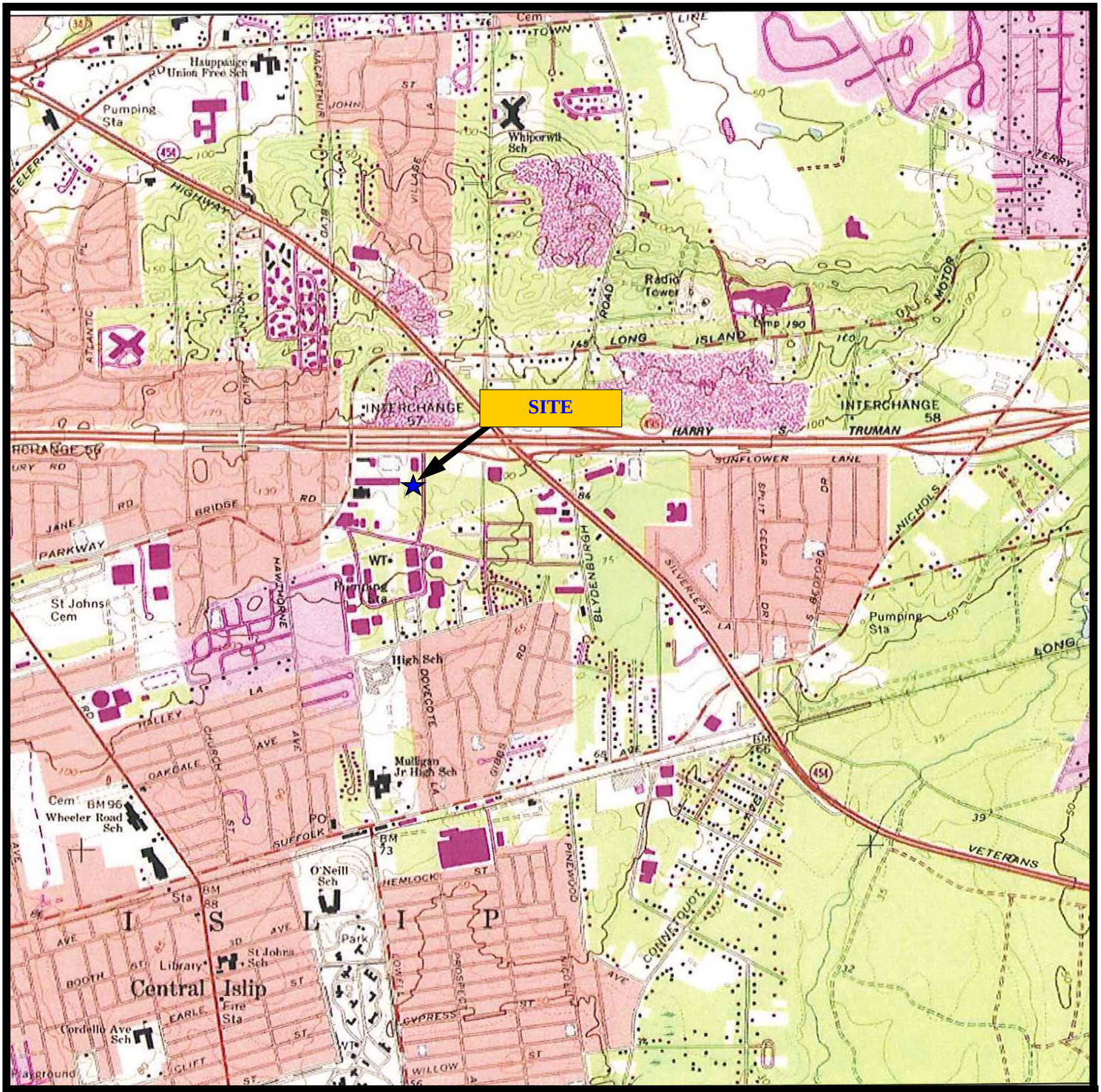
Event	Schedule
Submission of the IRM Work Plan	October, 2013
NYSDEC Review and Comment Period	November, 2013
Implementation of IRM Work Plan AS/SVE System Pilot Tests SVE Pilot Tests	December, 2013
Installation of Off-Site Groundwater Monitoring Wells	November, 2013
Submission of IRM Report – Part A AS/SVE System Design SVE System Design	January, 2014

Event	Schedule
NYSDEC Review and Comment Period	February, 2014
Installation of IRM System	February, 2014
AS/SVE System	
SVE System	
Submission of IRM Report – Part B: Construction Completion Report and Operations, Maintenance & Monitoring Plan	July, 2014

7.0 REFERENCES

1. CA RICH Consultants, Inc., Final Site Characterization Report; November 30, 2012
2. CA RICH Consultants, Inc., Site Characterization Work Plan; March 31, 2011

FIGURES

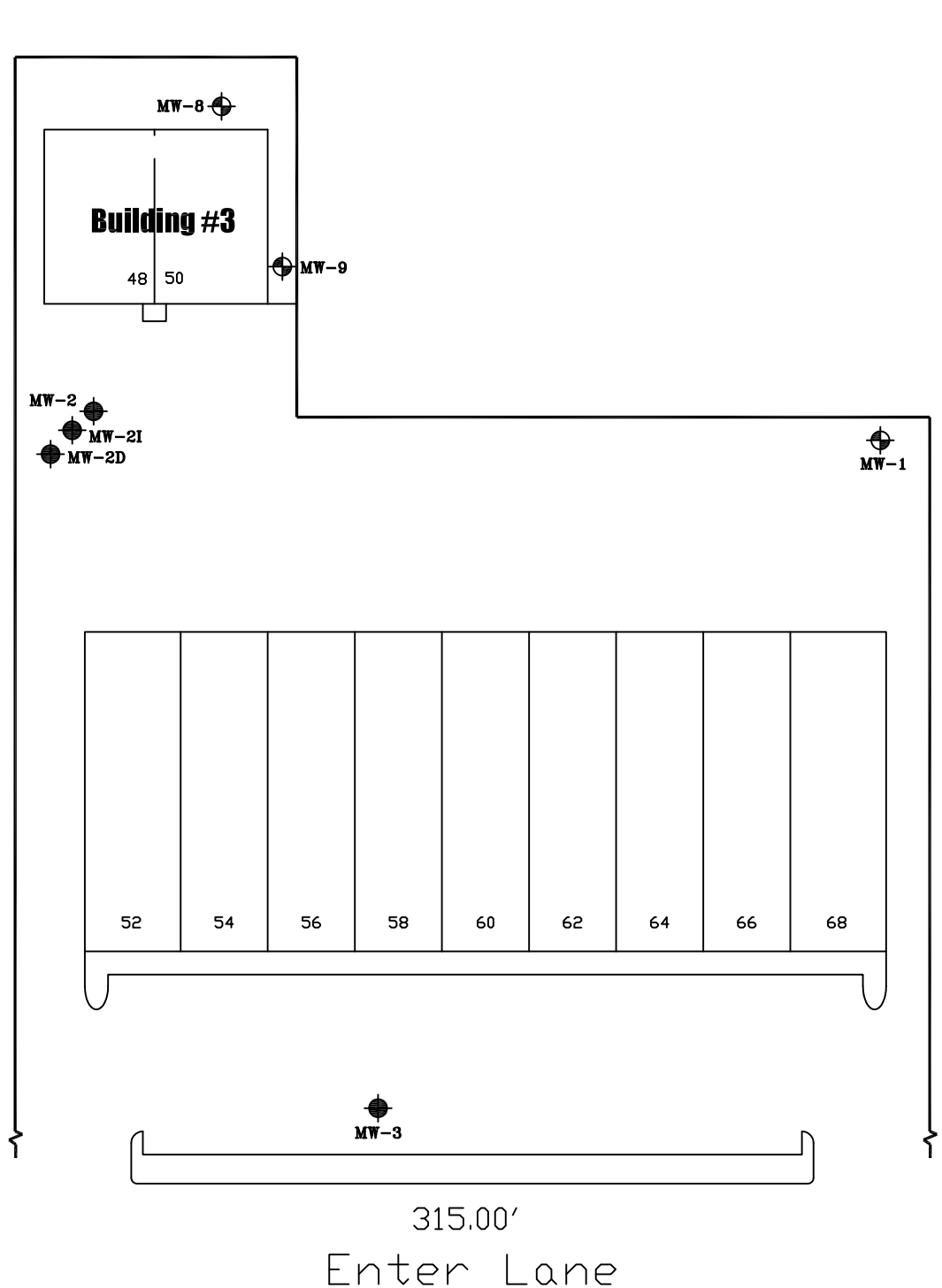


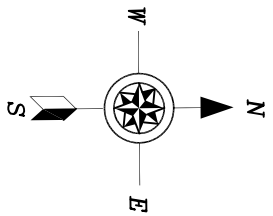
N

Adapted from 1979 USGS Central Islip Quadrangle

CA RICH CONSULTANTS, INC.
17 Dupont Street,
Plainview, NY 11803

TITLE: SITE LOCATION MAP		**DATE:** 4/29/2010
		SCALE: 1 : 24,000
FIGURE: 1	**Mako Properties Ltd. Building # 3** **48-50 Enter Lane** **Islandia, New York**	**DRAWN BY:** JP
DRAWING:		**APPR. BY:** STM





LEGEND

- Upgradient Monitoring Well
- Downgradient Monitoring Well

0 25 50 75 100

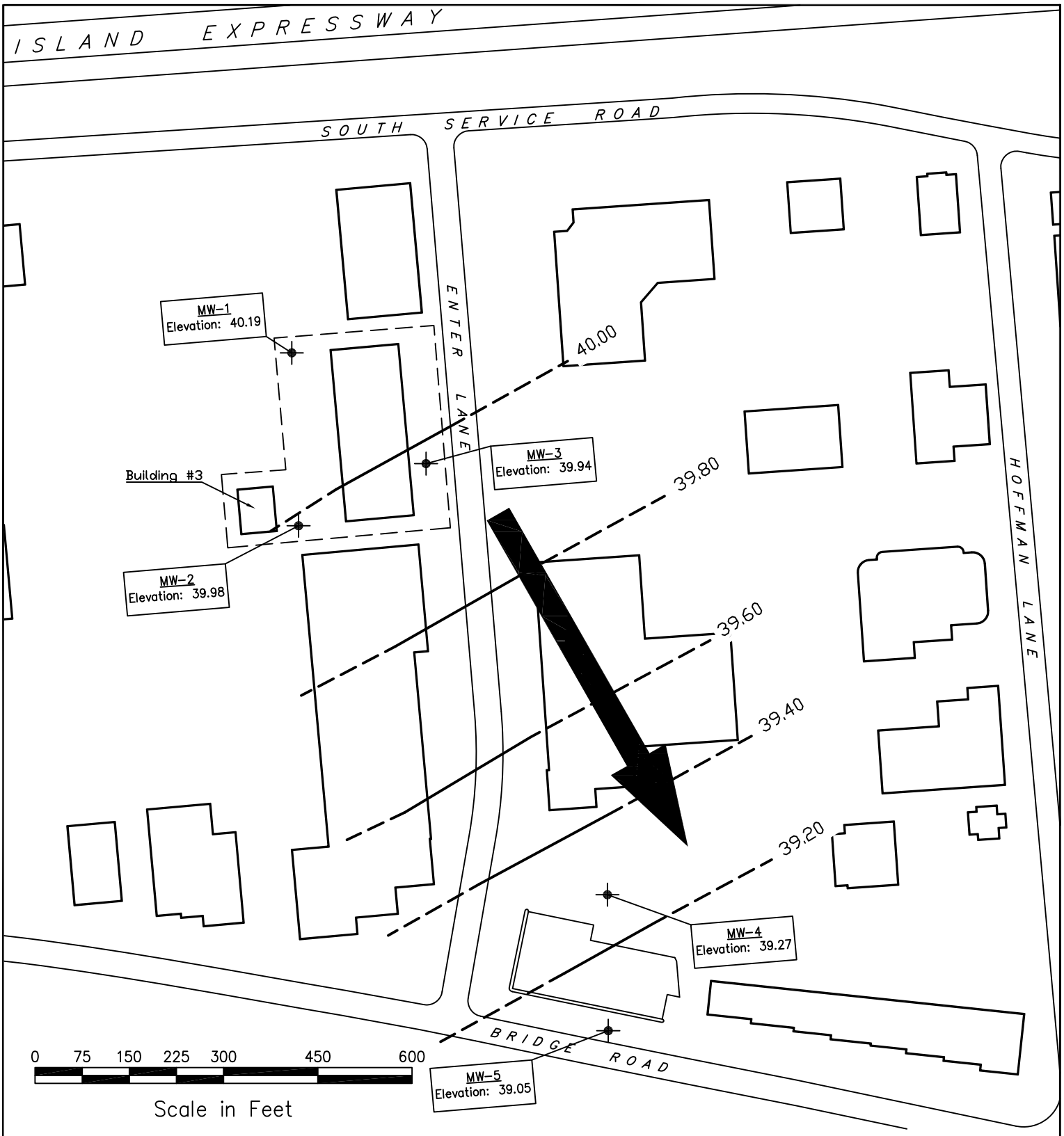
Graphic Scale in Feet

CA RICH CONSULTANTS, INC.

Environmental Specialists Since 1982

17 Dupont Street, Plainview, New York 11803

TITLE: Site Plan with Monitoring Well Locations		DATE: 10/10/2013
		SCALE: As Shown
FIGURE: 2	48-50 ENTER LANE ISLANDIA, NEW YORK	DRAWN BY: J.T.C./T.R.B.
DRAWING NO: 2011-3		APPR. BY: S.T.S.



LEGEND

- Groundwater Monitoring Well
- MW-2 Elevation: 39.98 — Well ID with GW Elevation above Mean Sea Level
- Groundwater Contour Line (Dashed Where Inferred)

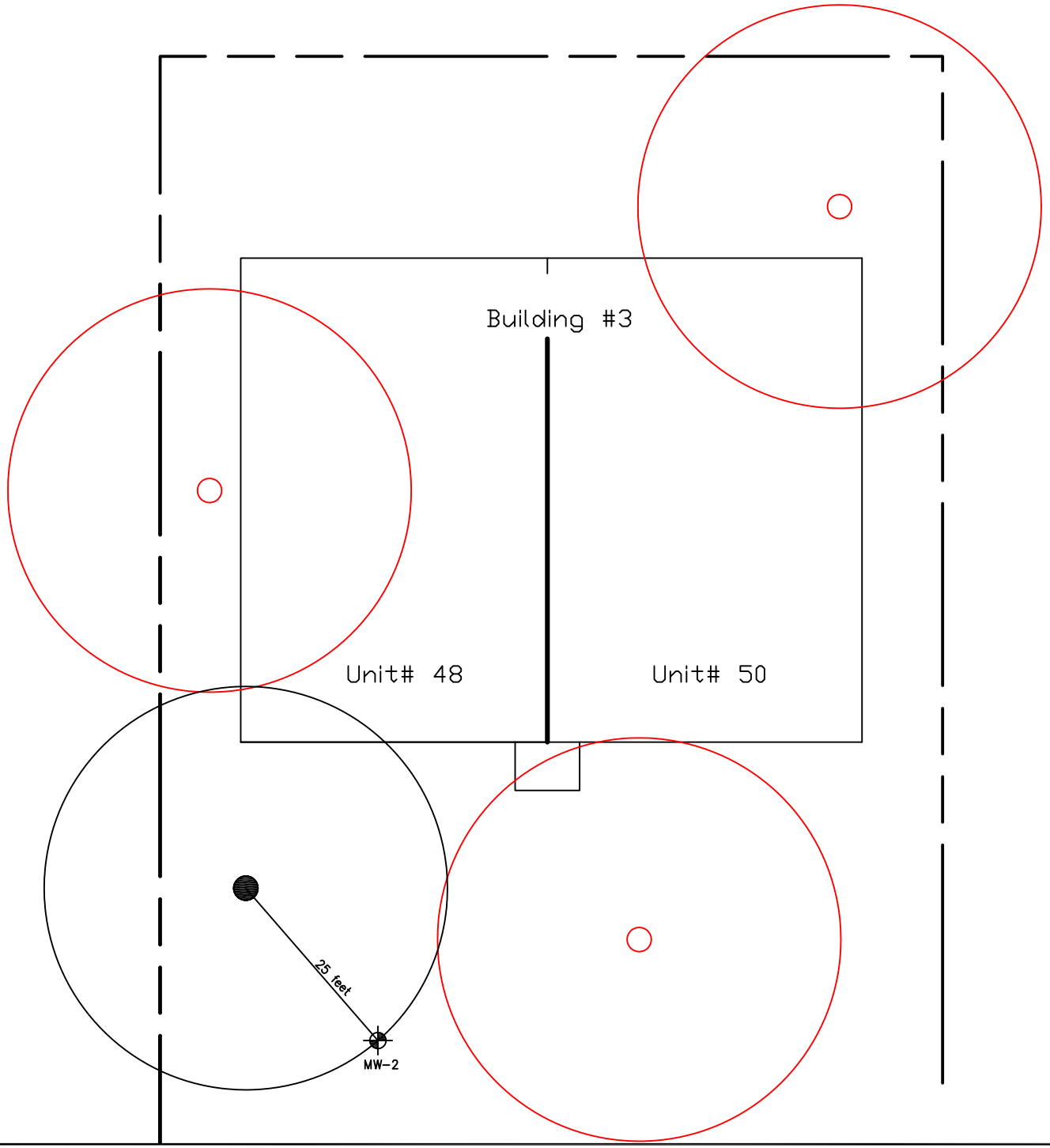
CA RICH CONSULTANTS, INC.

Environmental Specialists Since 1982

17 Dupont Street, Plainview, New York 11803

TITLE: Groundwater Flow Contour Map 7/17/2013		DATE: 10/10/2013
		SCALE: As Shown
FIGURE: 3	48-50 ENTER LANE ISLANDIA, NEW YORK	DRAWN BY: T.R.B.
DRAWING NO: 2013-2		APPR. BY: S.T.S.

s\Mako Properties Limited Bldg 3\IRM Work Plan\2013-2



LEGEND

Proposed Sparge Point for Pilot Test (25ft radius)

Proposed Sparge Points for Anticipated Final Design (25ft radius)

0 10 20

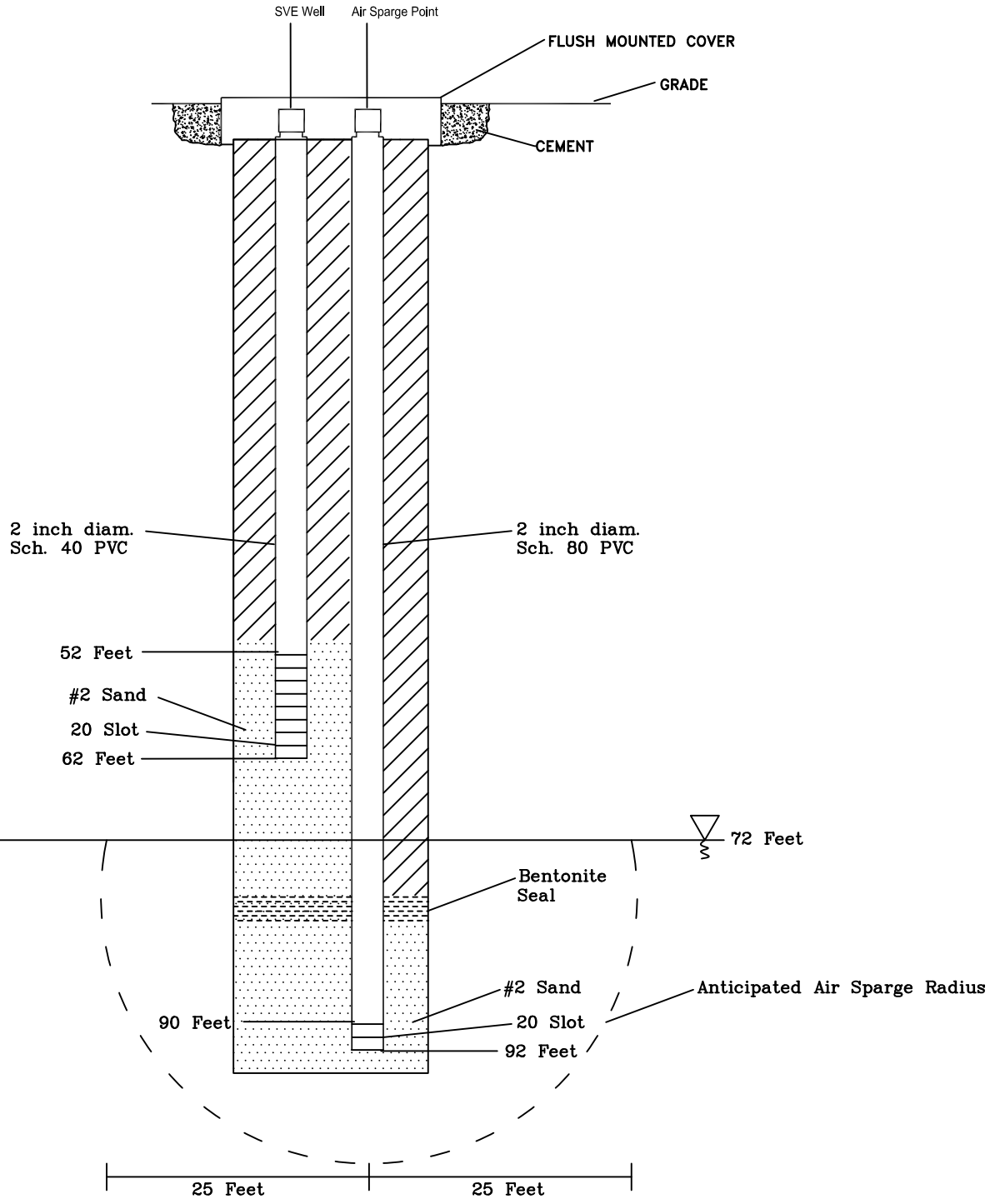
Graphic Scale in Feet

CA RICH CONSULTANTS, INC.

Environmental Specialists Since 1982

17 Dupont Street, Plainview, New York 11803

TITLE: Site Plan with Proposed Air Sparge Injection Points		DATE: 10/10/2013
		SCALE: As Shown
FIGURE: 4	48-50 ENTER LANE ISLANDIA, NEW YORK	DRAWN BY: T.R.B.
DRAWING NO: 2013-5		APPR. BY: S.T.S.



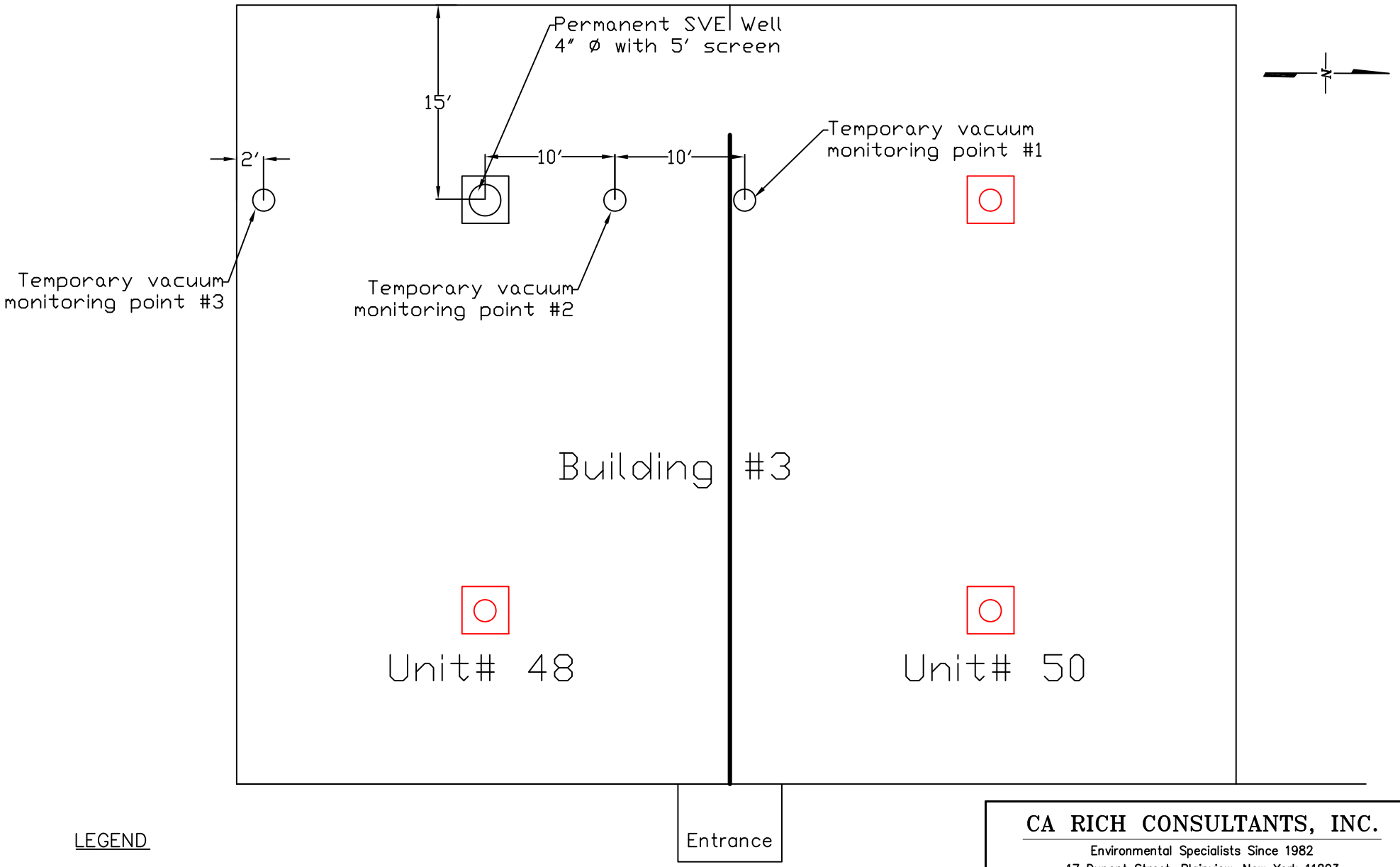
LEGEND

- Bentonite Seal
- #2 Sand
- Cement Grout
- Approximate Water Table Surface

CA RICH CONSULTANTS, INC.

Environmental Specialists Since 1982
17 Dupont Street, Plainview, New York 11803

TITLE: Air Sparge Profile		DATE: 10/10/2013
		SCALE: NTS
FIGURE: 5	48-50 ENTER LANE ISLANDIA, NEW YORK	DRAWN BY: T.R.B.
DRAWING NO: 2013-6		APPR. BY: S.T.S.



LEGEND

Permanent SVE Well to be used for Pilot Test

Anticipated Final Layout for Permanent SVE Wells

0 10 20

Graphic Scale in Feet

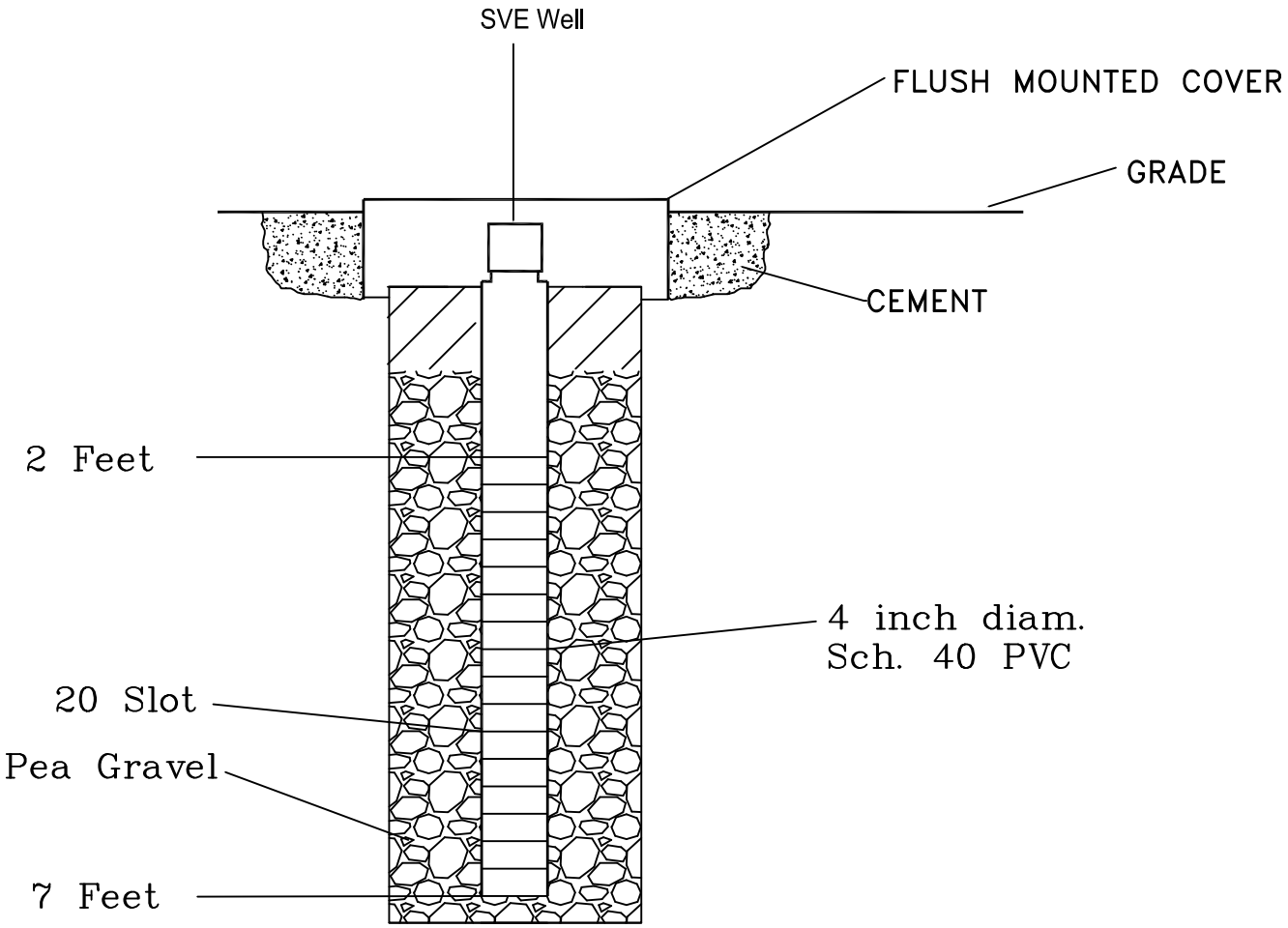
CA RICH CONSULTANTS, INC.

Environmental Specialists Since 1982

17 Dupont Street, Plainview, New York 11803

TITLE: Building Plan with Proposed SVE Points and Vacuum Monitoring Points	DATE: 10/10/2013
	SCALE: As Shown
FIGURE: 6	DRAWN BY: J.T.C./T.R.B.
DRAWING NO: 2013-3	APPR. BY: S.T.S.

48-50 ENTER LANE
ISLANDIA, NEW YORK



LEGEND

Pea Gravel

Cement Grout

CA RICH CONSULTANTS, INC.

Environmental Specialists Since 1982

17 Dupont Street, Plainview, New York 11803

TITLE: Interior SVE Well Profile		DATE: 10/10/2013
		SCALE: NTS
FIGURE: 7	48-50 ENTER LANE ISLANDIA, NEW YORK	DRAWN BY: T.R.B.
DRAWING NO: 2013-7		APPR. BY: S.T.S.

TABLE

Table 1
HISTORICAL SUMMARY OF DETECTED VOLATILE ORGANIC COMPOUNDS
Mako Groundwater Monitoring Program
48-50 Enter Lane, Islandia, NY

	Downgradient of Building #3				Downgradient of Building #3				Downgradient of Building #3				Upgradient of Building #3				Upgradient of Building #3			
	MW-2 2010	***MW-2 2011***	***MW-2 2012***	***MW-2 2013***	***MW-2I 2010***	***MW-2I 2011***	***MW-2I 2012***	***MW-2I 2013***	***MW-2D 2010***	***MW-2D 2011***	***MW-2D 2012***	***MW-2D 2013***	***MW-8 2010***	***MW-8 2011***	***MW-8 2012***	***MW-8 2013***	***MW-9 2010***	***MW-9 2011***	***MW-9 2012***	***MW-9 2013***
Organic Compounds (ug/L)																				
1,1-Dichloroethene	460	50	6.5	2.4	N/A	ND	ND	ND	N/A	ND	ND	ND	N/A	5.5	ND	ND	N/A	ND	ND	ND
1,1,1-Trichloroethane	55,400	3,800	350	130	N/A	ND	ND	ND	N/A	ND	ND	ND	N/A	490	31	21	N/A	31	15	25
Tetrachloroethene	ND	17.7	6.8	3.6	N/A	ND	ND	ND	N/A	4	ND	ND	N/A	15.8	1.7	1.2	N/A	ND	ND	1.1

Notes:
ug/L - micrograms per Liter or parts per billion.
ND - Not Detected above laboratory detection limit.
NA - Not Analyzed.
* - NYSDEC Division of Water Technical and Operational Guidance series (1.1.1) Ambient Water Quality Standards and Guidance Values, June 1998.
Exceeds GW Standard of 5 ug/L.

APPENDIX A

QUALITY ASSURANCE PROJECT PLAN

FINAL

QUALITY ASSURANCE PROJECT PLAN

For

INTERIM REMEDIAL MEASURES (IRM) WORK PLAN

48-50 Enter Lane, Islandia, NY
NYSDEC SITE #152230

October 2013

Prepared for:

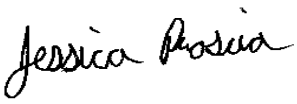
MAKO PROPERTIES LIMITED PARTNERSHIP
931B Conklin Street
Farmingdale, NY 11735-2429

Prepared by:

CA RICH CONSULTANTS, INC.
17 Dupont Street
Plainview, NY 11803-1614

Quality Assurance Project Plan

1.1 Introduction - The following Quality Assurance Project Plan ("QAPP") has been prepared specifically for the Site Characterization Work Plan at 48-50 Enter Lane in Islandia, New York. This Plan was prepared and approved as stated below.



Prepared by: _____ Date: 3/31/11
Jessica Proscia, Quality Assurance Officer

Approved by: _____ Date: 3/31/11
Steve Sobstyl, Project Manager

1.2 QAPP - Table of Contents

The following elements are included in this QAPP:

1.3 Project Description - The IRM Work Plan subject to this QAPP have been prepared to address the following issues:

- Determine the nature and extent of the contamination at the subject Property; and,

- Obtain the necessary information needed to design a Remedial Program for the Site.

The investigative methods that will be used include well drilling, monitoring well installation, monitoring well sampling, soil vapor probe installation and sampling and soil sampling. These are described in detail in the Site Characterization Work Plan.

1.4 Project Organization – Mr. Steven Sobstyl will serve as the Project Manager (PM) and will be responsible for the overall scheduling and performance of all investigative activities.

Ms. Jessica Proscia will serve as the Quality Assurance Officer (QAO) for this project. Her duties will include:

- Review of laboratory data packages
- Interface with laboratory
- Performance of Field Audits

Experienced CA RICH staff will perform and/or oversee completion of all the field activities described in the Investigation Work Plan.

1.5 Quality Assurance Objectives and Data Measurement – There are two sources of data collection methodology that will provide data information during this Investigation.

Field Screening - Organic vapor readings will be recorded from the head space of soil samples. This data is intended to be used only as a screening tool. To meet these goals, clean sampling tools will be used for each head space measurement and the photo-ionization detector (PID) will be calibrated at the beginning of each screening day on-site.

Chemical Analysis – All environmental samples will delivered to a New York State-Certified laboratory contracted to CA RICH for chemical analysis. This data is intended to determine the nature and extent of contamination in soil and groundwater. The laboratory will follow the NYSDEC – Analytical Services Protocol dated 2005. All analytical reports will be prepared in NYSDEC ASP Category B deliverables. All samples will be placed in iced-filled coolers and delivered to the laboratory within 48 hours of collection.

Quality assurance objectives are generally defined in terms of five parameters:

- **Representativeness -** Representativeness is the degree to which sampling data accurately and precisely represents site conditions, and is dependent on sampling and analytical variability. The Supplemental Site Investigation Work Plan has been designed to assess the presence of the constituents in the target media at the time of sampling. The Plan present the rationale for sample quantities and location. The Plan also present field sampling methodologies and laboratory analytical methodologies.

  The use of the prescribed field and laboratory analytical methods with associated holding times and preservation requirements are intended to provide representative data. Further discussion of QC checks is presented in Section 1.11.

- **Comparability** - Comparability is the degree of confidence with which one data set can be compared to another data set. Comparability between this investigation and to the extent possible, with existing data will be maintained through consistent sampling and analytical methodology set forth in the QAPP; the and the Supplemental Site Investigation Work Plan; the NYSDEC ASP analytical methods (2005) with NYSDEC ASP QA/QC requirements (2005); and through use of QA/QC procedures and appropriately trained personnel.

- **Completeness -** Completeness is defined as a measure of the amount of valid data obtained from a sampling event compared to the amount that was expected to be obtained under normal conditions. This will be determined upon assessment of the analytical results.

- **Precision -** Precision is the measure of reproducibility of sample results. The goal is to maintain a level of analytical precision consistent with the objectives of the Work Plan. To maximize precision, sampling and analytical procedures will be followed. All work for the investigation phase of this project will adhere to established protocols presented in the QAPP, and Supplemental Site Investigation and IRM Work Plans. Checks for analytical precision will include the analysis of matrix spike duplicated, laboratory duplicates, and field duplicates. Checks for field measurement precision will include obtaining duplicate field measurements. Further discussion of precision QC checks is provided in Section 1.11.

- **Accuracy** - Accuracy is the deviation of a measurement from the true value of a known standard. Both field and analytical accuracy will be monitored through initial and continuing calibration of instruments. In addition, internal standards, matrix spikes, blank spikes, and surrogates (system monitoring compounds) will be used to assess the accuracy of the laboratory analytical data.

1.6 Sampling Procedures - The sampling procedures that will be employed are discussed in detail in the Site Characterization and IRM Work Plans.

1.7 Sample and Document Custody Procedures

- **General** - The Chain-of-Custody program allows for the tracing of possession and handling of the sample from its time of collection through its chemical analysis in the laboratory. The chain-of-custody program at this site will include:

  - Sample labels
  - Chain-of-Custody records
  - Field records

- **Sample Container Details**

Sample Matrix and Parameters	Container Type and Preservative	Method	Holding Time*
Groundwater			
VOCs	Two (2) - 40 Vial with HCL - ICE	USEPA 8260	14 Days
Sub Slab Vapor			
VOCs	Six-liter Summa Canister	TO-15	30 Days

*Holding Time is calculated from collection date

- **Sample Labels** - To prevent misidentification of samples, a label will be affixed to the sample container and will contain the following information:

  - Site Name
  - Sample identification number
  - Date and time of collection
  - Initials of Sampler
  - Preservation (if any)
  - Type of analysis to be conducted.

- **Chain-of-Custody Records** - To establish the documentation necessary to trace sample possession from the time of collection, a chain-of-custody record (sample attached) will be filled out and will accompany samples at all times. The record will contain the following information:

  - Project name:
  - Printed name and signature of samplers
  - Sample number
  - Date and time of collection
  - Sampling location
  - Number of containers for each sample
  - Signature of individuals involved in sample transfer (when relinquishing and accepting samples)
  - Inclusive dates and times of possession.

- **Field Records** - Field records will be maintained during each sampling effort in a logbook. All aspects of sample collection, handling and visual observations will be recorded. All sample collection equipment, field analytical equipment and equipment utilized to make physical measurements will be identified in the field logbook.

  All calculations, results and calibration data for field sampling, field analytical and field physical measurement equipment will also be recorded in the field logbook. Entries will be dated and initialed. Entries will be made in ink, and will be legible.

1.8 Calibration Procedures and Frequency - The contracted laboratory will follow the NYSDEC Category-B requirements for equipment calibration procedures and frequency.

The QA Officer will be responsible for ensuring that the Field PID is calibrated at the beginning of each day of field sampling using calibration gas supplied by the manufacturer. A log of the meter calibration will be kept in the field logbook.

1.9 Analytical Procedures - All laboratory analysis will follow NYSDEC ASP (2005) protocols with Category B deliverables. The following samples will be collected for QA/QC purposes: 1 trip blank, 1 field blank, 1 duplicate samples, 1 matrix spike, and 1 matrix spike duplicate per every twenty field samples. A qualified data validator will review the laboratory data and a Data Usability Summary Report (DUSR) will be prepared.

1.10 Data Reduction, Validation and Reporting

- **Field Data** - All field data recorded in logbooks or on log sheets will be evaluated in the Office and transferred to word processor text by field personnel or clerical staff. PID readings will be included on the logs. The QAO and/or PM will review this data for accuracy and completeness. Typed test pit logs will be prepared for all test pits. Construction diagrams will be prepared for all monitoring wells and soil vapor probes installed by CA RICH.

- **Laboratory Data** - The laboratory will transfer the instrument readings to laboratory report forms. Ms. Lori Beyer will perform independent data validation of all analytical data using NYSDEC DUSR protocols. Lori Beyer's resume is attached.

  The Data Validator will provide CA RICH with a Data Validation Summary Report. The QAO will review the summary report as well as other field data and prepare a Data Usability Report.

  CA RICH will prepare summary tables of the validated analytical data using computer spreadsheet software. The data entries will be reviewed using the red check-green check method. All entries will be reviewed and entry errors will be marked in red ink. Once these entries are corrected, the printouts will be marked with green ink and placed in the project file.

1.11 Internal Quality Control Checks

Both field and laboratory quality control checks are proposed for this project. In the event that there are any deviations from these checks, the Project Manager and Quality Assurance Officer will be notified. The proposed field and laboratory control checks are discussed below.

Field Quality Control Checks

- **Field Measurements -** To verify the quality of data collected using field instrumentation, at least one duplicate measurement will be obtained per day and reported for all field analytical measurements.

- **Sample Containers -** Certified-clean sample containers will be supplied by the contracted laboratory.

- **Field Duplicates** – Field duplicates will be collected to check reproducibility of the sampling methods. Field duplicates will be prepared as discussed in the IRM Work Plan. Field duplicates will be analyzed every 20 field samples.

- **Field Rinse Blanks** – Field rinse blanks are used to monitor the cleanliness of the sampling equipment and the effectiveness of the cleaning procedures. Field rinse blanks will be prepared and submitted for analysis during this investigation. Field rinse blanks will be prepared by filling sample containers with analyte-free water (supplied by the laboratory), which has been routed through a cleaned sampling device.

- **Trip Blanks** – Trip blanks will be used to assess whether site samples have been exposed to non-site-related volatile constituents during storage and transport. Trip blanks will be analyzed at a frequency of once per day, and will be analyzed for volatile organic constituents. A trip blank will consist of a container filled with analyte-free water (supplied by the laboratory), which remains unopened with field samples throughout the sampling event. Trip blanks will only be analyzed for volatile organic constituents.

1.12 Performance and Systems Audits

Performance and systems audits will be completed in the field and the laboratory during the investigation phase of this project as described below.

- **Field Audits –** CA RICH's Project Manager and Quality Assurance Officer will monitor field performance and field meter calibrations to verify that measurements are taken according to established protocols. The Project Manager will review all field logs. In addition, the Project Manager and the Quality Assurance Officer will review the field rinse and trip blank data to identify potential deficiencies in field sampling and cleaning procedures.

- **Laboratory Audits** – The contracted laboratory will perform internal audits consistent with NYSDEC ASP (2005).

1.13 Preventive Maintenance

Preventive maintenance schedules have been developed for both field and laboratory instruments. A summary of the maintenance activities to be performed is presented below.

- **Field Instruments and Equipment -** Prior to any field sampling, each piece of field equipment will be inspected to assure it is operational. If the equipment is not operational, it must be serviced prior to use. All meters which require charging or batteries will be fully charged or have fresh batteries. If instrument servicing is required, it is the responsibility of the field personnel to follow the maintenance schedule and arrange for prompt service.

- **Laboratory Instruments and Equipment -** The laboratory will document Laboratory instrument and equipment procedures. Documentation includes details of any observed problems, corrective measure(s), routine maintenance, and instrument repair (which will include information regarding the repair and the individual who performed the repair).

  Preventive maintenance of laboratory equipment generally will follow the guidelines recommended by the manufacturer. A malfunctioning instrument will be repaired immediately by in-house staff or through a service call from the manufacturer.

1.14 Data Assessment Procedures

The analytical data generated during the Investigation Work Plan and IRM Work Plan will be evaluated with respect to precision, accuracy, and completeness. The procedures utilized when assessing data precision, accuracy, and completeness are presented below.

- **Data Precision Assessment Procedures -** Field precision is difficult to measure because of temporal variations in field parameters. However, precision will be controlled through the use of experienced field personnel, properly calibrated meters, and duplicate field measurements. Field duplicates will be used to assess precision for the entire measurement system including sampling, handling, shipping, storage, preparation and analysis.

  Laboratory data precision for organic analyses will be monitored through the use of matrix spike duplicate sample analyses. For other parameters, laboratory data precision will be monitored through the use of field duplicates and/or laboratory duplicates.

  The precision of data will be measured by calculation of the standard deviation (SD) and the coefficient of variation (CV) of duplicate sample sets. The SD and CV are calculated for duplicate sample sets by:

  $$SD = (A-B)/1.414$$
  $$CV = ((A-B)/1.414(A+B)/2))$$

  Where:

  A = Analytical result from one of two duplicate measurements
  B = Analytical result from the second measurement.

  Where appropriate, A and B may be either the raw measurement or an appropriate mathematical transformation of the raw measurement (e.g., the logarithm of the concentration of a substance).

  Alternately, the relative percent difference (RPD) can be calculated by the following equation:

  $$RPD = \frac{(A-B)}{(A+B)/2} \times 100$$

  $$RPD = 1.414\ (CV)(100)$$

- **Data Accuracy Assessment Procedures -** The accuracy of field measurements will be controlled by experienced field personnel, properly calibrated field meters, and adherence to established protocols. The accuracy of field meters will be assessed by review of calibration and maintenance logs.

  Laboratory accuracy will be assessed via the use of matrix spikes, surrogate spikes, and internal standards. Where available and appropriate, QA performance standards will be analyzed periodically to assess laboratory accuracy. Accuracy will be calculated as a percent recovery as follows:

  $$Accuracy = \frac{A-X}{B} \times 100$$

  Where:

  A = Value measured in spiked sample or standard
  X = Value measured in original sample
  B = True value of amount added to sample or true value of standard

This formula is derived under the assumption of constant accuracy over the original and spiked measurements. If any accuracy calculated by this formula is outside of the acceptable levels, data will be evaluated to determine whether the deviation represents unacceptable accuracy, or variable, but acceptable accuracy. Accuracy objectives for matrix spike recoveries and surrogate recovery objectives are identified in the NYSDEC, ASP (2005).

- **Data Completeness Assessment Procedures -** Completeness of a field or laboratory data set will be calculated by comparing the number of samples collected or analyzed to the proposed number.

$$\text{Completeness} = \frac{\text{No. Valid Samples Collected or Analyzed}}{\text{No. Proposed Samples Collected or Analyzed}} \times 100$$

As general guidelines, overall project completeness is expected to be at least 90 percent. The assessment of completeness will require professional judgment to determine data usability for intended purposes.

1.15 Corrective Action

Corrective actions are required when field or analytical data are not within the objectives specified in this QAPP, or the Supplemental Investigation Work Plan. Corrective actions include procedures to promptly investigate, document, evaluate, and correct data collection and/or analytical procedures. Field and laboratory corrective action procedures for this project are described below.

- **Field Procedures** - When conducting the investigative fieldwork, if a condition is noted that would have an adverse effect on data quality, corrective action will be taken so as not to repeat this condition. Condition identification, cause and corrective action implemented will be documented as a memo to the project file and reported to the Project Manager.

  Examples of situations, which would require corrective actions, are provided below:

  - Protocols as defined by the QAPP and the Supplemental Site Investigation and IRM Work Plans have not been followed;
  - Equipment is not in proper working order or properly calibrated;
  - QC requirements have not been met; and
  - Issues resulting from performance or systems audits.

  Project field personnel will continuously monitor ongoing work performance in the normal course of daily responsibilities.

- **Laboratory Procedures -** In the laboratory, when a condition is noted to have an adverse effect on data quality, corrective action will be taken so as not to repeat this condition. Condition identification, cause and corrective action to be taken will be documented, and reported to the Quality Assurance Officer.

Corrective action may be initiated, at a minimum, under the following conditions:

- Specific laboratory analytical protocols have not been followed;
- Predetermined data acceptance standards are not obtained;
- Equipment is not in proper working order or calibrated;
- Sample and test results are not completely traceable;
- QC requirements have not been met; and
- Issues resulting from performance or systems audits.

Laboratory personnel will continuously monitor ongoing work performance in the normal course of daily responsibilities.

1.16 Quality Assurance Reports and Management

- **Internal Reporting -** The analytical laboratory will submit analytical reports using NYSDEC ASP (2005), Category B requirements. The analytical reports will be submitted to the Data Validator for review. Supporting data (i.e., historic data, related field or laboratory data) will also be reviewed to evaluate data quality, as appropriate. The Quality Assurance Officer will incorporate results of data validation reports (if any) and assessments of data usability into a summary report. This report will be filed in the project file and will include the following:

  - Assessment of data accuracy, precision, and completeness for field & laboratory data;
  - Results of the performance and systems audits;
  - Significant QA/AC problems, solutions, corrections, and potential consequences;
  - Analytical data validation report; and
  - Data usability report.

- **Reporting** - The IRM Report will contain a separate QA/QC section including the DUSR and a summary of data collected and/or used as appropriate to the project DQOs. The Quality Assurance Officer will prepare the QA/QC summary tables and reports and memoranda documenting the data assessment and validation.

L.A.B. Validation Corp.
Qualification Summary

Services Overview

L.A.B. Validation is an independent outside source that evaluates data integrity, compliance and usability. L.A.B Validation utilizes the USEPA National Functional Guidelines, as well as other program specific requirements supplied by the client. L.A.B. Validation has a dedicated office facility and secure data storage area. Projects are scheduled and completed within client specified deadlines. Reports are issued via hardcopy and or fax/email/disk deliverables. L.A.B. Validation Corp. operates under Employer Identification Number 58-238-1714 and maintains General Liability Insurance for all projects.

Personnel Overview

L.A.B. Validation has a unique blend of technical expertise and environmental laboratory operational experience. Ms. Beyer has 25 years of progressive positions that required analytical and QA working knowledge. She is well versed in Organic and Inorganic analyses and the associated USEPA requirements as well as other Federal Agency (i.e. USCOE) and State regulations. She has completed data validation training for both Organic and Inorganic analyses (see attached Certificates).

References

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Phone (302) 999-0925
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Program: NYSDEC

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Modern Continental Construction Co., Inc.
950 Fountain Avenue
Brooklyn, New York
Program: NYCDEP

L.A.B. Validation Corp., 14 West Point Drive, East Northport, New York 11731

Lori A. Beyer

SUMMARY: General Manager/Laboratory Director with a solid technical background combined with Management experience in environmental testing industry. Outstanding organizational, leadership, communication and technical skills. Customer focused, quality oriented professional with consistently high marks in customer/employee satisfaction.

EXPERIENCE:

1998-Present L.A.B. Validation Corporation, 14 West Point Drive, East Northport, NY
President

- Perform Data Validation activities relating to laboratory generated Organic and Inorganic Environmental Data.

1998-Present American Analytical Laboratories, LLC. 56 Toledo Street, Farmingdale, NY
Laboratory Director/Technical Director

- Plan, direct and control the operation, development and implementation of programs for the entire laboratory in order to meet AAL's financial and operational performance standards.
- Ensures that all operations are in compliance with AAL's QA manual and other appropriate regulatory requirements.
- Actively maintains a safe and healthy working environmental that is demanded by local laws/regulations.
- Monitors and manages group's performance with respect to data quality, on time delivery, safety, analyst development/goal achievement and any other key performance indices.
- Reviews work for accuracy and completeness prior to release of results to customers.

1996-1998 Nytest Environmental, Inc. (NEI) Port Washington, New York
General Manager

- Responsible for controlling the operation of an 18,000 square foot facility to meet NEI's financial and operational performance standards.
- Management of 65 FTEs including Sales and Operations
- Ensure that all operations are in compliance with NEI's QA procedures
- Ensures that productivity indicators, staffing levels and other cost factors are held within established guidelines
- Maintains a quantified model of laboratory's capacity and uses this model as the basis for controlling the flow of work into and through the lab so as to ensure that customer requirements and lab's revenue and contribution targets are achieved.

1994-1996 Nytest Environmental, Inc. (NEI) Port Washington, New York
Technical Project Manager

- Responsible for the coordination and implementation of environmental testing programs requirements between NEI and their customers
- Supervise Customer Service Department
- Assist in the development of major proposals
- Complete management of all Federal and State Contracts and assigned commercial contracts
- Provide technical assistance to the customer, including data validation and interpretation
- Review and implement Project specific QAPP's.

1995-1996 Nytest Environmental, Inc. (NEI) Port Washington, New York
Corporate QA/QC Officer

- Responsible for the implementation of QA practices as required in the NJDEP and EPA Contracts
- Primary contact for NJDEP QA/QC issues including SOP preparation, review and approval
- Responsible for review, verification and adherence to the Contract requirements and NEI QA Plan

1992-1994 Nytest Environmental, Inc. (NEI) Port Washington, New York
Data Review Manager

- Responsible for the accurate compilation, review and delivery of analytical data to the company's customers. Directly and effectively supervised a department of 22 personnel.
- Managed activities of the data processing software including method development, form creation, and production
- Implement new protocol requirements for report and data management formats
- Maintained control of data storage/archival areas as EPA/CLP document control officer

1987-1991 Nytest Environmental, Inc. (NEI) Port Washington, New York
Data Review Specialist

- Responsible for the review of GC, GC/MS, Metals and Wet Chemistry data in accordance with regulatory requirements
- Proficient with USEPA, NYSDEC, NJDEP and NEESA requirements
- Review data generated in accordance with SW846, NYSDEC ASP, EPA/CLP and 40 CFR Methodologies

1986-1987 Nytest Environmental, Inc (NEI) Port Washington, New York
GC/MS VOA Analyst

EDUCATION:

1982-1985 State University of New York at Stony Brook, New York; BS Biology/Biochemistry
1981-1982 University of Delaware; Biology/Chemistry
5/91 **Rutgers University; Mass Spectral Data Interpretation Course, GC/MS Training**
8/92 **Westchester Community College; Organic Data Validation Course**
9/93 **Westchester Community College; Inorganic Data Validation Course**

Westchester Community College

Professional Development Center

Awards this Certificate of Achievement To

LORI BEYER

for Successfully Completing

ORGANIC DATA VALIDATION COURSE (35 HOURS)

Dr. John Samuelian

Date AUGUST 1992

Assistant Dean
Professional Development Center

President

The Professional
Development Center

SUNY
WESTCHESTER COMMUNITY COLLEGE
Valhalla, New York 10595

Westchester Community College

Professional Development Center

Awards this Certificate of Achievement To

LORI BEYER

for Successfully Completing

INORGANIC DATA VALIDATION

Instructor: Dale Boshart

Date MARCH 1993

Assistant Dean
Professional Development Center

President

The Professional
Development Center

SUNY
WESTCHESTER COMMUNITY COLLEGE
Valhalla, New York 10595

State University of New York

State University at Stony Brook

On the Recommendation of the Faculty and by Virtue of the Authority vested in them the Trustees of the University have conferred on

Lori Ann Isenberg

the Degree of

Bachelor of Science

and have granted this Diploma as evidence thereof
Given at Stony Brook, in the State of New York, in the United States of America on the twentieth day of December one thousand nine hundred and eighty-five.

Chairman of the Board of Trustees

Chairman of the Council,
State University at Stony Brook

STATE UNIVERSITY OF NEW YORK · TO LEARN · TO SEARCH · TO SERVE · 1948

Chancellor of the State University of New York

President,
State University at Stony Brook

APPENDIX B

HEALTH & SAFETY PLAN

FINAL
HEALTH AND SAFETY PLAN
&
COMMUNITY AIR MONITORING PLAN

For

INTERIM REMEDIAL MEASURES (IRM) WORK PLAN

48-50 Enter Lane, Islandia, NY
NYSDEC SITE #152230

October 2013

Prepared for:

MAKO PROPERTIES LIMITED PARTNERSHIP
931B Conklin Street
Farmingdale, NY 11735-2429

Prepared by:

CA RICH CONSULTANTS, INC.
17 Dupont Street
Plainview, NY 11803-1614

HEALTH AND SAFETY PLAN
&
COMMUNITY AIR MONITORING PLAN

1.0 INTRODUCTION

This Health and Safety Plan (HASP) is developed for implementation during the planned site remedial activities at 48-50 Enter Lane, Islandia, New York, NYSDEC Site #152230 (hereinafter referred to a 'Mako Building #3' or the 'Site'. The HASP is to be enforced by the Project Health and Safety Manager and on-site Health & Safety Coordinator (HSC). The on-site HSC will interface with the Project Manager and is vested with the authority to make field decisions including the termination of on-site activities if an imminent health and safety hazard, condition or related concern arises. Information and protocol in the HASP is applicable to all on-site personnel who will be entering the work zone.

2.0 POTENTIAL HAZARDS

2.1 Chemical Hazards

During the investigation activities, CA RICH Consultants, Inc. (CA RICH) will operate as if the contaminants of concern are 1,1,1-trichloroethane (TCA) and its degradation products.

TCA looks like water and has a mild sweet odor like the odor of chloroform or ether. TCA vapor is heavier than air, so it can collect in very high concentrations in pits, tanks, or other low spots. Acute exposure to significant concentrations of TCA can cause irritation of the skin, eyes and mucus membrane, headache, dizziness, nausea, and in high enough concentrations, loss of consciousness and death *(Sax, 1984)*. It is suspected to be carcinogenic with chronic exposure.

Physical properties and additional toxicological information is included in Appendix A.

2.2 Other Health and Safety Risks

The HASP addresses the environmentally-related chemical hazards identified on the Site. Normal physical hazards associated with using drilling equipment and hand tools as well as hazards associated with adverse climatic conditions (heat & cold) also exist and represent a certain degree of risk to be assumed by on-site personnel.

Certain provisions in this Plan, specifically the use of personnel protective equipment, may tend to increase the risk of physical injury, as well as susceptibility to cold or heat stress. This is primarily due to restrictions in dexterity, hearing, sight, and normal body heat transfer inherent in the use of protective gear.

3.0 RISK MANAGEMENT

3.1 Work / Exclusion Zones

For each proposed investigation activity dealing (eg. monitoring well installation, soil vapor sampling, etc.), a work / exclusion zone will be established surrounding the activity. Access to this area will be limited to properly trained, properly protected personnel directly involved with the on-site activities. Enforcement of the work / exclusion zone boundaries is the responsibility of the on-site Health and Safety Coordinator.

3.2 Personnel Protection

Health & Safety regulatory personnel have developed different levels of personnel protection to deal with differing degrees of potential risks of exposure to chemical constituents. The levels are designated as **A, B, C,** and **D** and ranked according to the amount of personnel protection afforded by each level. Level **A** is the highest level of protection and Level **D** is the lowest level of protection as described below.

A – Fully encapsulating suit, SCBA, hard hat, chemcial-resistant steel-toed boots, boot covers, inner and outer gloves.

B – One-piece, hooded chemical-resistant splash suit, SCBA, hard hat, chemcial-resistant steel-toed boots, boot covers, inner and outer gloves.

C – One-piece, hooded chemical-resistant splash suit, hard hat, canister equipped face mask, chemcial-resistant steel-toed boots, boot covers, inner and outer gloves.

D – Work clothes, hard hat (optional), work boots/shoes, gloves (as needed).

The different levels are primarily dependent upon the degree of respiratory protection necessary, in conjunction with appropriate protective clothing. Levels of protection mandate a degree of respiratory protection. However, flexibility exists within the lower levels (B, C, and D) concerning proper protective clothing.

The four levels of protection were developed for utilization in situations which involve suspected or known atmospheric and/or environmental hazards including airborne contamination and skin-affecting substances.

It is anticipated that all of the investigation work will be performed using Level D protection (no respiratory protection with protective clothing requirements limited to long sleeved shirts, long pants or coveralls, work gloves and steel-toe leather work boots).

Level D may be modified by the HSC to include protective clothing or equipment (Saran-coated disposable coveralls or PVC splash suits, safety glasses, hard hat with face shield, and chemically resistant boots) based upon physical hazards, skin contact concerns, and real-time monitoring.

Real-time air monitoring for total airborne organics using either a photo-ionization detector will determine if and when an upgrade from Level D to a higher level of respiratory protection is warranted. Decisions for an upgrade from Level D to higher levels of protection, mitigative actions, and/or suspension of work are the responsibility of the Project Manager and/or the designated on-site Health & Safety Coordinator.

3.3 Air Monitoring

The Health & Safety Coordinator or his properly trained assignee will conduct “Real Time” air monitoring for total organic vapor and total particulates. 'Real-time' monitoring refers to the utilization of instrumentation, which yields immediate measurements. The utilization of real time monitoring helps determine immediate or long-term risks to on-site personnel and the general public, the appropriate level of personnel respiratory protection necessary, and actions to mitigate the recognized hazard. Air monitoring will be conducted in accordance with NYSDOH's Community Air Monitoring Program.

3.3.1. Particulate Monitoring

a. Instrumentation

Dust particulates in air will be monitored using a light scattering technique MINIRAM Model PDM-3 Miniature Real-time Aerosol Monitor (MINIRAM) or equivalent. The MINIRAM is capable of measuring airborne dust particles within the range of 10 to 100,000 micrograms per cubic meter ($\mu g/m^3$).

b. Application

Dust monitoring will occur at regular intervals excavation work activities. Monitoring will be conducted in upgradient and downgradient locations, relative to prevailing wind direction) along the perimeter of the work zone. The HSC or his designee will perform monitoring. As outlined in the NYSDOH Community Air Monitoring Plan, if particluate levels in the downwind location are 150 mg/m^3 greater than those measured in the upwind location, dust suppression techniques shall be employed.

3.3.2 Organic Vapor

a. Instrumentation

Real-time monitoring for total organic vapor (TOV) utilizes either a photo-ionization detector (PID) or flame ionization detector (FID). The appropriate PID is an intrinsically safe HNU Systems Model PI-101 Photoionization detector (HNU) or MiniRae™ Photo-ionization detector or equivalent, which is factory, calibrated to benzene. The appropriate FID is a Foxboro model 128 Organic vapor Analyzer (OVA) or equivalent, which is factory calibrated to methane.

b. Application

Organic vapor monitoring is performed as outlined in the NYSDOH Community Air Monitoring Plan. Specifically, monitoring shall be conducted at the downwind perimeter of the work zone periodically during work activities. If TOV levels exceed 5 parts per million (ppm) above established pre-work background levels, work activities will be halted and monitoring will be continued under the provision of a Vapor Emission Response Plan (as outlined in the Community Air Monitoring Plan).

3.4 Worker Training

Personnel overseeing the excavation of the contaminated soil will be trained, fit-tested, and medically certified (OSHA 29 CFR 1910. 134). This includes the Health & Safety Coordinator or his/her properly trained assignee.

Prior to any work, all workers involved with the project should be aware of the potential chemical, physical and biological hazards discussed in this document, as well as the general safety practices outlined below. A safety briefing by the on-site HSC and/or assistant designee shall take place at the outset of work activities.

The HSC will be available to address project-related health & safety issues a site worker (such as an equipment operator or laborer) may have regarding the site conditions. Once an issue is brought to the HCS's attention, he or she will evaluate the issue and apply the procedures outlined in this Health & Safety Plan.

3.5 General Safety Practices

All project personnel shall follow the following safety practices:

1. Avoid unnecessary skin exposure to subsurface materials. Long-sleeved shirts tucked into long pants (or coveralls), work gloves, and steel-toe leather work boots are required unless modified gear is approved by the HSC. Remove any excess residual soil from clothes prior to leaving the site.

2. No eating, drinking, gum or tobacco chewing, or smoking allowed in designated work areas. Thoroughly wash hands prior to these activities outside the work area. Avoid sitting on the ground during breaks or while eating and drinking. Thoroughly wash all exposed body areas at the end of the workday.

3. Some symptoms of acute exposure include: nausea, dizziness, light-headedness, impaired coordination, headache, blurred vision, and nose/throat/eye irritation. If these symptoms are experienced or strong odor is detected, leave the work area and immediately report the incident to the on-site HSC.

3.6 Enforcement

Enforcement of the Site Safety Plan will be the responsibility of the HSC. The Coordinator should be on-site on a full-time basis and perform or directly oversee all aspects of Project Health & Safety operations including: air monitoring; environmental mitigation; personnel respiratory and skin protection; general safety practices; documentation; emergency procedures and protocol; and reporting and recordkeeping as described below.

3.7 Reporting and Recordkeeping

Incidents involving injury, symptoms of exposure, discovery of contained (potentially hazardous) materials, or unsafe work practices and/or conditions should be immediately reported to the HSC.

A log book must be maintained on-site to document all aspects of HASP enforcement. The log is paginated and dated with entries made on a daily basis in waterproof ink, initialed by the HSC or designee. Log entries should include date and time of instrument monitoring, instrument type, measurement method, test results, calibration and maintenance information, as well as appropriate mitigative actions responding to detections. Miscellaneous information to be logged may include weather conditions, reported complaints or symptoms, regulatory inspections, and reasons to upgrade personnel protection above the normal specification (Level D).

4.0 EMERGENCIES

4.1 EMERGENCY RESPONSE SERVICES

(1)	**HOSPITAL** Southside Hospital 301 East Main Street Bay Shore, NY 11706 (See Figure 1 for Map Route)	**(631) 968-3000**
(2)	**AMBULANCE**	**911**
(3)	**FIRE DEPARTMENT** **HAZARDOUS MATERIAL**	**911**
(4)	**POLICE DEPARTMENT**	**911**
(5)	**POISON CONTROL CENTER**	**(800) 222-1222**

The preceding list and associated attached map (Figure 1) illustrating the fastest route to the nearest hospital must be conspicuously posted in areas of worker congregation and adjacent to all on-site telephones (if any).

4.2 EMERGENCY PROCEDURES

4.2.1 Contact or Exposure to Suspected Hazardous Materials

In the event of a fire, chemical discharge, medical emergency, workers are instructed to immediately notify the HSC and proper emergency services (posted). Should physical contact with unknown or questionable materials occur, immediately wash the affected body areas with clean water and notify the HSC. Anyone experiencing symptoms of exposure should exit the work area, notify the HSC, and seek medical attention.

4.2.2 Personnel Decontamination, First Aid, and Fire Protection

The first step in the treatment of skin exposure to most chemicals is to rinse the affected area with water. For this reason, adequate amounts of potable water and soap are maintained on-site in a clearly designated and readily-accessible location. Portable emergency eyewash stations and a first aid kit must be made available and maintained in the same locations as the potable water. Fire extinguishers are also to be maintained on-site in designated locations. All on-site personnel are to be made aware of the locations of the above-mentioned on-site Health & Safety accommodations during the initial Health and Safety briefing.

4.2.3 Ingress/egress

Clear paths of ingress/egress to work zones and site entrances/exits must be maintained at all times. Unauthorized personnel are restricted from accessing the site.

5.0 COMMUNITY AIR MONITORING PLAN

Real-time air monitoring, for volatile compounds and particulate levels at the perimeter of the work area is necessary. This plan includes the following:

- Volatile organic compounds must be monitored at the downwind perimeter of the work area on a continuous basis. If total organic vapor levels exceed 5 ppm above background, work activities must be halted and monitoring continued under the provisions of a Vapor Emission Response Plan. All readings must be recorded and be available for State (DEC & DOH) personnel to review.

- Particulates should be continuously monitored upwind, downwind and within the work area at temporary particulate monitoring stations during excavation activities. If the downwind particulate level is 150 µg/m^3 greater than the upwind particulate level, then dust suppression techniques must be employed. All readings must be recorded and be available for State (DEC & DOH) personnel to review.

Vapor Emission Response Plan

If the ambient air concentration of organic vapors exceeds 5 ppm above background at the perimeter of the work area, activities will be halted and monitoring continued. If the organic vapor level decreases below 5 ppm above background, work activities can resume. If the organic vapor levels are greater than 5 ppm over background but less than 25 ppm over background at the perimeter of the work area, activities can resume provided:

- The organic vapor level 200 ft. downwind of the work area or half the distance to the nearest residential or commercial structure, whichever is less, is below 5 ppm over background.

If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown. When work shutdown occurs, downwind air monitoring as directed by the Safety Officer will be implemented to ensure that vapor emission does not impact the nearest residential or commercial structure at levels exceeding those specified in the Major Vapor Emission section.

Major Vapor Emission

If any organic levels greater than 5 ppm over background are identified 200 feet downwind from the work area or half the distance to the nearest residential or commercial property, whichever is less, all work activities must be halted.

If, following the cessation of the work activities, or as the result of an emergency, organic levels persist above 5 ppm above background 200 feet downwind or half the distance to the nearest residential or commercial property from the work area, then the air quality must be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20 Foot Zone).

If efforts to abate the emission source are unsuccessful and, if organic vapor levels are approaching 5 ppm above background for more than 30 minutes in the 20 Foot Zone, then the Major Vapor Emission Response Plan shall automatically be placed into effect;

However, the Major Vapor Emission Response Plan shall be immediately placed into effect if organic vapor levels are greater than 10 ppm above background.

Major Vapor Emission Response Plan

Upon activation, the following activities will be undertaken:

1. All Emergency Response Contacts as listed in the Health and Safety Plan of the Work Plan will go into effect.

2. The local police authorities will immediately be contacted by the Safety Officer and advised of the situation.

3. Frequent air monitoring will be conducted at 30 minutes intervals within the 20 Foot Zone. If two successive readings below action levels are measured, air monitoring may be halted or modified by the Safety Officer.

6.0 HEALTH AND SAFETY PLAN REFERENCES

1. American Conference Governmental Industrial Hygienists, 1989; Threshold Limit Values And Biological Exposure Indices, 111 Pp.

2. Geoenvironmental Consultants, Inc.; 1987; Safety & Operations At Hazardous Materials Sites

3. NIOSH Guide To Chemical Hazards, 1985, US Department Of Health And Human Services, Centers For Disease Control

4. US Department Of Labor Occupational Safety & Health Administration, 1989; Hazardous Waste Operations And Emergency Response Interim Final Rule, 29 CFR Part 1910

5. Sax, N. I. Dangerous Properties Of Industrial Materials; © 1984

7.0 KEY PERSONNEL

Responsibility	Name and Phone Number	Task Description
Project Manager	Steve Sobstyl (516) 576-8844	Oversee and coordinate all technical aspects for the project
Site Safety Officer	Jessica Proscia (516) 576-8844	Coordinate and inspect all health and safety operations from the project site
Client Representative	Mark Seiden (631) 420-0070 and Jim Kogel (631) 420-0070	
Project Manager Alternate	Eric Weinstock (516) 576-8844	
Site Safety Officer Alternate	Mike Yager (516) 576-8844	

Figure 1

Hospital Route Map

mapquest

Trip to:
Southside Hospital
301 E Main St
Bay Shore, NY 11706
(631) 968-3000
9.95 miles
20 minutes

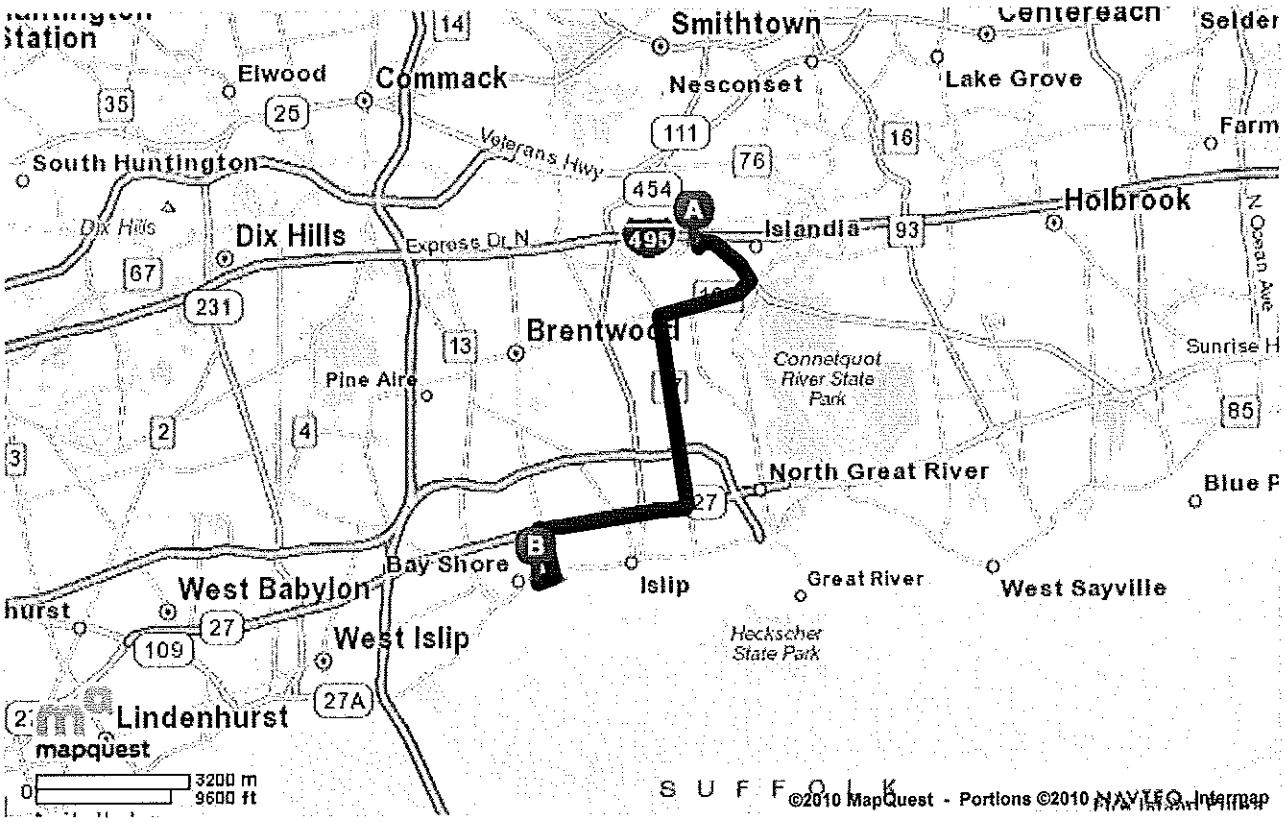
Notes

Figure 1
Hospital Route Map

		Miles Per Section	Miles Driven
	48 Enter Ln Islandia, NY 11749-4811		
	1. Start out going NORTH on ENTER LN toward EXPRESS DR S / EXPRESSWAY DR S.	**go 0.10 mi**	0.10 mi
	2. Turn RIGHT onto EXPRESS DR S / EXPRESSWAY DR S.	**go 0.3 mi**	0.4 mi
EAST 454	3. Take the 2nd RIGHT onto VETERANS HWY / VETERANS MEMORIAL HWY / RT-454 E. *If you are on EXPRESS DR S and reach BLYDENBURGHS RD you've gone about 0.1 miles too far*	**go 0.9 mi**	1.3 mi
	4. Turn RIGHT onto E SUFFOLK AVE / CR-100 W. *E SUFFOLK AVE is 0.3 miles past SYCAMORE AVE*	**go 1.6 mi**	2.9 mi
	5. Turn LEFT onto CR-17 S / CARLETON AVE. *CR-17 S is 0.1 miles past CHURCH ST*	**go 3.2 mi**	6.1 mi
	6. Turn RIGHT toward RT-27 W. *If you are on CR-17 and reach JACKSON ST you've gone about 0.1 miles too far*	**go 0.02 mi**	6.2 mi
	7. Turn SLIGHT RIGHT onto ISLIP BLVD.	**go 0.03 mi**	6.2 mi
	8. Take the 1st LEFT onto GARFIELD AVE. *If you reach WASHINGTON AVE you've gone a little too far*	**go 0.06 mi**	6.3 mi
	9. Turn RIGHT onto SUNRISE HWY.	**go 0.4 mi**	6.6 mi

 	10. Merge onto RT-27 W / SUNRISE HWY via the ramp on the LEFT.	**go 1.7 mi**	8.3 mi
	11. Take EXIT 44 toward BRENTWOOD RD / BRENTWOOD / BAY SHORE.	**go 0.1 mi**	8.4 mi
	12. Stay STRAIGHT to go onto SUNRISE HWY.	**go 0.3 mi**	8.7 mi
	13. Take the BRENTWOOD RD ramp toward BAY SHORE. *If you reach PENATAQUIT AVE you've gone about 0.1 miles too far*	**go 0.1 mi**	8.8 mi
	14. Turn SLIGHT RIGHT onto BRENTWOOD RD.	**go 0.9 mi**	9.6 mi
 	15. Turn RIGHT onto E MAIN ST / E MONTAUK HWY / RT-27A / MONTAUK HWY. Continue to follow E MAIN ST / E MONTAUK HWY / RT-27A. *E MAIN ST is 0.1 miles past UNION BLVD*	**go 0.3 mi**	10.0 mi
	16. 301 E MAIN ST is on the RIGHT. *Your destination is just past N MONTGOMERY AVE* *If you reach MOWBRAY AVE you've gone a little too far*	**go 0.01 mi**	10.0 mi
	**Southside Hospital** 301 E Main St, Bay Shore, NY 11706 (631) 968-3000	**10.0 mi**	**10.0 mi**

Total Travel Estimate: **9.95 miles 20 minutes**



APPENDIX A

Physical Properties and Toxicological Information

MSDS Number: **T4914** * * * * * *Effective Date: 05/26/09* * * * * *Supercedes: 07/06/06*

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300
National Response in Canada
CANUTEC: 613-996-6666
Outside U.S. And Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance

1,1,1-TRICHLOROETHANE

1. Product Identification

Synonyms: Methyl chloroform; trichloroethane; chloroetene
CAS No.: 71-55-6
Molecular Weight: 133.40
Chemical Formula: CH3CCl3
Product Codes: 9435, 9437, W509, W510

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Methyl Chloroform	71-55-6	96 - 100%	Yes
Dioxane	123-91-1	< 3%	Yes
1,2-Epoxybutane	106-88-7	< 0.5%	Yes
Actual concentrations proprietary			

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER, KIDNEYS, AND CARDIOVASCULAR SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. POSSIBLE CANCER HAZARD. CONTAINS DIOXANE WHICH MAY CAUSE CANCER BASED ON ANIMAL DATA. Risk of cancer depends on duration and level of exposure.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Cancer Causing)
Flammability Rating: 1 - Slight
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe (Life)
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES
Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:
Inhalation of vapors will irritate the respiratory tract. Affects the central nervous system. Symptoms include headache, dizziness, weakness, nausea. Higher levels of exposure (> 5000 ppm) can cause irregular heart beat, kidney and liver damage, fall in blood pressure, unconsciousness and even death.
Ingestion:
Harmful if swallowed. Symptoms similar to inhalation will occur along with nausea, vomiting. Aspiration of material into the lungs can cause chemical pneumonitis which can be fatal. If aspirated, may be rapidly absorbed through the lungs and result in injury to other body systems.
Skin Contact:
Causes mild irritation and redness, especially on prolonged contact. Repeated contact may cause drying or flaking of the skin.
Eye Contact:
Liquids and vapors cause irritation. Symptoms include tearing, redness, stinging, swelling.
Chronic Exposure:
Prolonged or repeated skin contact may cause dermatitis. Chronic exposure may affect the kidneys and liver. Dioxane is a suspected human carcinogen based on animal data.
Aggravation of Pre-existing Conditions:
Personnel with CNS, kidney, liver or heart disease may be more susceptible to the effects of this substance. Use of alcoholic beverages may aggravate symptoms.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Autoignition temperature: 500C (932F)
Flammable limits in air % by volume:
lel: 7.0; uel: 16.0
Vapors in containers can explode if subjected to high energy source.
Dioxane has a flash point below 16C (60F).
Explosion:
Can react with strong caustic, such as potash to form a flammable or explosive material. Air/vapor mixtures may explode when heated. Vapors can flow along surfaces to distant ignition source and flash back. Sealed containers may rupture when heated.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Combustion by-products include phosgene and hydrogen chloride gases. Structural firefighters' clothing provides only limited protection to the combustion products of this material.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! Do not use aluminum, magnesium or zinc metal for storage container. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Do not use aluminum equipment or storage containers. Contact with aluminum parts in a pressurized fluid system may cause violent reactions.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
350 ppm (TWA) for trichloroethane
100 ppm (TWA) skin for dioxane
-ACGIH Threshold Limit Value (TLV):
350 ppm (TWA), 450 ppm (STEL) for trichloroethane
20 ppm (TWA) skin, A3 - Animal Carcinogen for dioxane
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Breathing air quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134). This substance has questionable warning properties. Where respirators are required, you must have a written program covering the basic requirements in the OSHA respirator standard. These include training, fit testing, medical approval, cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Viton is a recommended material for personal protective equipment.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.
Odor:
Mild chloroform-like odor.
Solubility:
4,400 ppm in water @ 20C (68F)
Specific Gravity:
1.34 @ 20C/4C
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
74C (165F)
Melting Point:
-32C (-26F)
Vapor Density (Air=1):
4.63
Vapor Pressure (mm Hg):
100 @ 20C (68F)
Evaporation Rate (BuAc=1):
12.8

10. Stability and Reactivity

Stability:
Requires inhibitor content to prevent corrosion of metals. Slowly hydrolyzes in water to form hydrochloric and acetic acid.
Hazardous Decomposition Products:
May produce carbon monoxide, carbon dioxide, hydrogen chloride and phosgene when heated to decomposition. Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Hazardous polymerization can occur in contact with aluminum trichloride.
Incompatibilities:
Open flames, welding arcs, nitrogen tetroxide, oxygen, liquid oxygen, sodium, sodium hydroxide, and sodium-potassium alloy, strong alkalis, oxidizers, aluminum and other reactive metals.
Conditions to Avoid:
Insufficient inhibitor, incompatibles, heat, flame and ignition sources

11. Toxicological Information

Oral rat LD50: 9600 mg/kg; inhalation rat LC50: 18000 ppm/4H; investigated as a mutagen, tumorigen, reproductive effector; irritation eye rabbit, Standard Draize, 2mg/24H severe.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Methyl Chloroform (71-55-6)	No	No	3
Dioxane (123-91-1)	No	Yes	2B
1,2-Epoxybutane (106-88-7)	No	No	2B

12. Ecological Information

Environmental Fate:
When released into the soil, this material is not expected to biodegrade. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released to water, this material is expected to quickly evaporate. This material is not expected to significantly bioaccumulate. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition. When released to the atmosphere, this material has an average global half-life of 6.0 - 6.9 years. When released into the air, this material may adversely affect the ozone layer.
Environmental Toxicity:
This material is expected to be slightly toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/l.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: 1,1,1-TRICHLOROETHANE
Hazard Class: 6.1
UN/NA: UN2831
Packing Group: III
Information reported for product/size: 20L

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
Methyl Chloroform (71-55-6)	Yes	Yes	Yes	Yes
Dioxane (123-91-1)	Yes	Yes	Yes	Yes
1,2-Epoxybutane (106-88-7)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Methyl Chloroform (71-55-6)	Yes	Yes	No	Yes
Dioxane (123-91-1)	Yes	Yes	No	Yes
1,2-Epoxybutane (106-88-7)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Methyl Chloroform (71-55-6)	No	No	Yes	No
Dioxane (123-91-1)	No	No	Yes	No
1,2-Epoxybutane (106-88-7)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\--------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Methyl Chloroform (71-55-6)	1000	U226	No
Dioxane (123-91-1)	100	U108	No
1,2-Epoxybutane (106-88-7)	100	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Australian Hazchem Code: 2[Z]
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 2 Flammability: 1 Reactivity: 0
Label Hazard Warning:
WARNING! HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER, KIDNEYS, AND CARDIOVASCULAR SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. POSSIBLE CANCER HAZARD. CONTAINS DIOXANE WHICH MAY CAUSE CANCER BASED ON ANIMAL DATA. Risk of cancer depends on duration and level of exposure.

Label Precautions:
Avoid breathing vapor.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Avoid contact with eyes, skin and clothing.
Label First Aid:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases call a physician.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 3.
Disclaimer:
****
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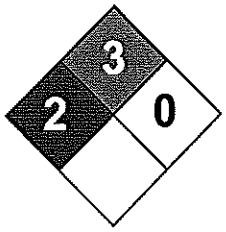
****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

ScienceLab.com
Chemicals & Laboratory Equipment



Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
1,1-Dichloroethane MSDS

Section 1: Chemical Product and Company Identification

Product Name: 1,1-Dichloroethane

Catalog Codes: SLD3280

CAS#: 75-34-3

RTECS: KI0175000

TSCA: TSCA 8(b) inventory: 1,1-Dichloroethane

CI#: Not available.

Synonym:

Chemical Name: 1,1-Dichloroethane

Chemical Formula: C2-H4-Cl2

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
{1,1-}Dichloroethane	75-34-3	100

Toxicological Data on Ingredients: 1,1-Dichloroethane: ORAL (LD50): Acute: 725 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified 2 (Reasonably anticipated.) by NTP. A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE]. The substance is toxic to kidneys, lungs, liver, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 458°C (856.4°F)

Flash Points: CLOSED CUP: -17°C (1.4°F). OPEN CUP: -6°C (21.2°F).

Flammable Limits: LOWER: 5.6% UPPER: 11.4%

Products of Combustion: These products are carbon oxides (CO, CO2), halogenated compounds.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable liquid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes Keep away from incompatibles such as oxidizing agents, alkalis.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 100 STEL: 250 (ppm) from ACGIH (TLV) [1999] TWA: 100 (ppm) from OSHA (PEL) Australia: TWA: 200 (ppm) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Oily liquid.)

Odor: Chloroform like odor (Slight.)

Taste: Not available.

Molecular Weight: 98.96 g/mole

Color: Colorless.

pH (1% soln/water): Not available.

Boiling Point: 57.3°C (135.1°F)

Melting Point: -96.9°C (-142.4°F)

Critical Temperature: 261.5°C (502.7°F)

Specific Gravity: 1.175 (Water = 1)

Vapor Pressure: 180 mm of Hg (@ 20°C)

Vapor Density: 3.44 (Air = 1)

Volatility: Not available.

Odor Threshold: 120 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties:
Partially dispersed in diethyl ether. See solubility in water, diethyl ether.

Solubility: Partially soluble in diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents, alkalis.

Corrosivity: Corrosive in presence of aluminum.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Will attack some forms of plastic and rubber

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 725 mg/kg [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 2 (Reasonably anticipated.) by NTP. A4 (Not classifiable for human or animal.) by ACGIH. DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE]. The substance is toxic to kidneys, lungs, liver, central nervous system (CNS).

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification:
CLASS 3: Combustible liquid with a flash point greater than 37.8C (100F). Marine pollutant

Identification: : 1,1-Dichloroethane : UN2362 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65 (no significant risk level): 1,1-Dichloroethane California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: 1,1-Dichloroethane Rhode Island RTK hazardous substances: 1,1-Dichloroethane Pennsylvania RTK: 1,1-Dichloroethane Florida: 1,1-Dichloroethane Minnesota: 1,1-Dichloroethane Massachusetts RTK: 1,1-Dichloroethane New Jersey: 1,1-Dichloroethane New Jersey spill list: 1,1-Dichloroethane TSCA 8(b) inventory: 1,1-Dichloroethane TSCA 8(a) PAIR: 1,1-Dichloroethane TSCA 8(d) H and S data reporting: 1,1-Dichloroethane: June 1999 TSCA 12(b) one time export: 1,1-Dichloroethane SARA 313 toxic chemical notification and release reporting: 1,1-Dichloroethane: 1% CERCLA: Hazardous substances.: 1,1-Dichloroethane: 1000 lbs. (453.6 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R11- Highly flammable. R22- Harmful if swallowed. R37/38- Irritating to respiratory system and skin. R41- Risk of serious damage to eyes. R52- Harmful to aquatic organisms.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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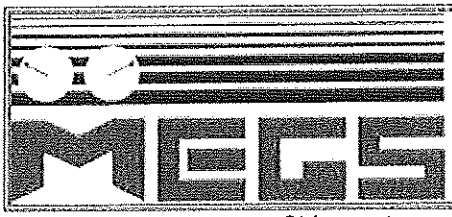

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Quebec	Quebec	Tel : 418-834-7447	Fax : 418-834-3774

1,1,-DICHLORETHYLENE- MATERIAL SAFETY DATA SHEET

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24 Hour EMERGENCY CONTACT

U.S- CHEMTREC 1-800-424-9300

CANADA- CANUTEC 613-996-6666

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Up to Table of Contents

Matheson Tri-Gas, Inc.

The telephone numbers listed below are emergency numbers, please contact your local branch for routine inquiries.

USA	CANADA
959 Route 46 East	530 Watson Street
Parsippany, New Jersey	Whitby, Ontario
07054-0624 USA	L1N 5R9 Canada
Phone: 973-257-1100	**Phone:** 905-668-3570

SUBSTANCE: 1,1-DICHLOROETHYLENE

SYMBOL: $C_2H_2Cl_2$

TRADE NAMES/SYNONYMS:
1,1-DICHLOROETHENE; 1,1-DICHLOROETHYLENE; VDC; VINYLIDENE CHLORIDE MONOMER; VINYLIDENE DICHLORIDE; VINYLIDENE CHLORIDE, INHIBITED; RCRA U078; UN 1303; C2H2CL2; MAT25070; RTECS KV9275000

CHEMICAL FAMILY: halogens

CREATION DATE: Jan 24 1989
REVISION DATE: Mar 16 1999

2. COMPOSITION, INFORMATION ON INGREDIENTS

Up to Table of Contents

COMPONENT: 1,1-DICHLOROETHYLENE

CAS NUMBER: 75-35-4

EC NUMBER (EINECS): 200-864-0

PERCENTAGE: >99.9

COMPONENT: 4-METHOXYPHENOL

CAS NUMBER: 150-76-5

EC NUMBER (EINECS): 205-769-8

PERCENTAGE: 0.02000

3. HAZARDS IDENTIFICATION

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NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=4 REACTIVITY=2

WHMIS CLASSIFICATION: BD2

EC CLASSIFICATION (ASSIGNED):
F+ Extremely Flammable
Xn Harmful

R 12-20-40

EC Classification may be inconsistent with independently-researched data.


EMERGENCY OVERVIEW:
Color: colorless

Physical Form: volatile liquid

Odor: faint odor, sweet odor

Major Health Hazards: harmful if swallowed, respiratory tract irritation, skin irritation, eye irritation, central nervous system depression

Physical Hazards: Flammable liquid and vapor. Vapor may cause flash fire. May polymerize. Containers may rupture or explode. May form peroxides during prolonged storage.

POTENTIAL HEALTH EFFECTS:

INHALATION:
Short Term Exposure: irritation, symptoms of drunkenness, lung congestion, liver damage, convulsions
Long Term Exposure: kidney damage, tumors

SKIN CONTACT:
Short Term Exposure: irritation (possibly severe)
Long Term Exposure: same as effects reported in short term exposure

EYE CONTACT:
Short Term Exposure: irritation (possibly severe), eye damage
Long Term Exposure:same as effects reported in short term exposure

INGESTION:
Short Term Exposure: same as effects reported in short term exposure
Long Term Exposure: same as effects reported in short term exposure

CARCINOGEN STATUS:
OSHA: N
NTP: N
IARC: N

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4. FIRST AID MEASURES

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INHALATION:
Remove from exposure immediately. Use a bag valve mask or similar device to perform artificial respiration (rescue breathing) if needed. Get medical attention.

SKIN CONTACT:
Remove contaminated clothing, jewelry, and shoes immediately. Wash with soap or mild detergent and large amounts of water until no evidence of chemical remains (at least 15-20 minutes). Get medical attention, if needed.

EYE CONTACT:
Wash eyes immediately with large amounts of water or normal saline, occasionally lifting upper and lower lids, until no evidence of chemical remains. Get medical attention immediately.

INGESTION:
If vomiting occurs, keep head lower than hips to help prevent aspiration. Get medical attention, if needed.

5. FIRE FIGHTING MEASURES

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FIRE AND EXPLOSION HAZARDS:
Severe fire hazard. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back. Vapor/air mixtures are explosive above flash point. Containers may rupture or explode if exposed to heat.

EXTINGUISHING MEDIA:
alcohol resistant foam, carbon dioxide, regular dry chemical, water

Large fires: Use alcohol-resistant foam or flood with fine water spray.

FIRE FIGHTING:
Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. For tank, rail car or tank truck: Evacuation radius: 800 meters (1/2 mile). Do not attempt to extinguish fire unless flow of material can be stopped first. Flood with fine water spray. Do not scatter spilled material with high-pressure water streams. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Water may be ineffective.

FLASH POINT:
14 F (-10 C)

LOWER FLAMMABLE LIMIT:
5.6%

UPPER FLAMMABLE LIMIT:
11.4%

AUTOIGNITION:
855 F (457 C)

FLAMMABILITY CLASS (OSHA):
IA

6. ACCIDENTAL RELEASE MEASURES

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AIR RELEASE:
Reduce vapors with water spray. Stay upwind and keep out of low areas.

SOIL RELEASE:
Dig holding area such as lagoon, pond or pit for containment. Dike for later disposal. Absorb with sand or other non-combustible material.

WATER RELEASE:
Collect with absorbent into suitable container. Collect spilled material using mechanical equipment.

OCCUPATIONAL RELEASE:
Avoid heat, flames, sparks and other sources of ignition. Remove sources of ignition. Stop leak if possible without personal risk. Reduce vapors with water spray. Small spills: Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: Dike for later disposal. Keep unnecessary people away, isolate hazard area and deny entry. Stay upwind and keep out of low areas. Reportable Quantity (RQ): Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

7. HANDLING AND STORAGE

Up to Table of Contents

Store and handle in accordance with all current regulations and standards. Subject to storage regulations: U.S. OSHA 29 CFR 1910.106. Grounding and bonding required. Store in a cool, dry place. Store in a well-ventilated area. Keep in the dark. Keep separated from incompatible substances. Store outside or in a detached building. Store with flammable liquids. Store in a tightly closed container. Containers must have overpressure release device. Avoid heat, flames, sparks and other sources of ignition. Keep separated from incompatible substances. Monitor inhibitor content. Avoid exposure to low temperatures or freezing. May form explosive peroxides. Store in a tightly closed container. Avoid contact with light. Store in a cool, dry place. Monitor inhibitor content. Do not evaporate or distill to dryness. Keep separated from incompatible substances.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

Up to Table of Contents

EXPOSURE LIMITS:
1,1-DICHLOROETHYLENE:
1 ppm (4 mg/m3) OSHA TWA (vacated by 58 FR 35338, June 30, 1993)
5 ppm (20 mg/m3) ACGIH TWA
20 ppm (80 mg/m3) ACGIH STEL

VENTILATION: Provide local exhaust ventilation system. Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from

NIOSH and/or OSHA.
At any detectable concentration -
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.
Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.
Escape -
Any air-purifying respirator with a full facepiece and an organic vapor canister.
Any appropriate escape-type, self-contained breathing apparatus.
For Unknown Concentrations or Immediately Dangerous to Life or Health -
Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.
Any self-contained breathing apparatus with a full facepiece.

9. PHYSICAL AND CHEMICAL PROPERTIES

Up to Table of Contents

PHYSICAL STATE: liquid

COLOR: colorless

PHYSICAL FORM: volatile liquid

ODOR: faint odor, sweet odor

MOLECULAR WEIGHT: 96.64

MOLECULAR FORMULA: C2-H2-CL2

BOILING POINT: 86-90 F (30-32 C)

FREEZING POINT: -188 F (-122 C)

VAPOR PRESSURE: 400 mmHg @ 14.8 C

VAPOR DENSITY (air=1): 3.4

SPECIFIC GRAVITY (water=1): 1.213

WATER SOLUBILITY: 0.04% @ 20 C

PH: Not available

VOLATILITY: Not available

ODOR THRESHOLD: 500 ppm

EVAPORATION RATE: Not available

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available

SOLVENT SOLUBILITY:
Soluble: organic solvents

10. STABILITY AND REACTIVITY

Up to Table of Contents

REACTIVITY:
May form explosive peroxides. Avoid contact with temperatures above -40 C. Avoid contact with heat, air, light or moisture and monitor inhibitor content. May polymerize. Closed containers may rupture violently.

CONDITIONS TO AVOID:
Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat.

INCOMPATIBILITIES:
metals, acids, oxidizing materials

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: phosgene, halogenated compounds, oxides of carbon

POLYMERIZATION:
May polymerize. Avoid contact with heat or light and monitor inhibitor content.

11. TOXICOLOGICAL INFORMATION

Up to Table of Contents

VINYLIDENE CHLORIDE:

TOXICITY DATA:
6350 ppm/4 hour(s) inhalation-rat LC50; 200 mg/kg oral-rat LD50

CARCINOGEN STATUS:
IARC: Human Inadequate Evidence, Animal Limited Evidence, Group 3; ACGIH: A3 -Animal Carcinogen

LOCAL EFFECTS:
Irritant: inhalation, skin, eye

ACUTE TOXICITY LEVEL:
Toxic: ingestion
Slightly Toxic: inhalation

TARGET ORGANS:
central nervous system, liver

TUMORIGENIC DATA:
Available.

MUTAGENIC DATA:
Available.

REPRODUCTIVE EFFECTS DATA:
Available.

12. ECOLOGICAL INFORMATION

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ECOTOXICITY DATA:

FISH TOXICITY:
74000 ug/L 96 hour(s) LC50 (Mortality) Bluegill (Lepomis macrochirus)

INVERTEBRATE TOXICITY:
224000 ug/L 96 hour(s) LC50 (Mortality) Opossum shrimp (Mysidopsis bahia)

ALGAL TOXICITY:
>712000 ug/L 96 hour(s) EC50 (Photosynthesis) Diatom (Skeletonema costatum)

ENVIRONMENTAL SUMMARY:
Moderately toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

Up to Table of Contents

Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): U078. Hazardous Waste Number(s): D029. Dispose of in accordance with U.S. EPA 40 CFR 262 for concentrations at or above the Regulatory level. Regulatory level- 0.7 mg/L. Dispose in accordance with all applicable regulations.

14. TRANSPORT INFORMATION

Up to Table of Contents

U.S. DOT 49 CFR 172.101. SHIPPING NAME-UN NUMBER; HAZARD CLASS; PACKING GROUP; LABEL:
Vinylidene chloride, inhibited-UN1303; 3; I; Flammable liquid

15. REGULATORY INFORMATION

Up to Table of Contents

U.S. REGULATIONS:
TSCA INVENTORY STATUS: Y

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

CERCLA SECTION 103 (40CFR302.4): Y
1,1-Dichloroethylene: 100 LBS RQ

SARA SECTION 302 (40CFR355.30): N

SARA SECTION 304 (40CFR355.40): N

SARA SECTION 313 (40CFR372.65): Y
1,1-Dichloroethylene

SARA HAZARD CATEGORIES, SARA SECTIONS 311/312 (40CFR370.21):
ACUTE: Y
CHRONIC: Y
FIRE: Y
REACTIVE: Y
SUDDEN RELEASE: Y

OSHA PROCESS SAFETY (29CFR1910.119): N

STATE REGULATIONS:
California Proposition 65: N

EUROPEAN REGULATIONS:

EC NUMBER (EINECS): 200-864-0

EC RISK AND SAFETY PHRASES:

R 12	Extremely flammable.
R 20	Harmful by inhalation.
R 40	Possible risks of irreversible effects.
S 2	Keep out of reach of children.
S 7	Keep container tightly closed.
S 16	Keep away from sources of ignition - No smoking.
S 29	Do not empty into drains.

CONCENTRATION LIMITS:
C>=12.5% Xn R 20-40
1%<=C<12.5% Xn R 40

16. OTHER INFORMATION

Up to Table of Contents

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Linde Gas

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MATERIAL
SAFETY
DATA SHEET

No. 155

PRODUCT NAME Vinyl Chloride		CAS #	75-01-4
TRADE NAME AND SYNONYMS Vinyl chloride, inhibited (D.O.T.)		DOT I.D. No.:	UN 1086; RQ 1.0 (0.454)
CHEMICAL NAME AND SYNONYMS Vinyl Chloride, Chloroethylene; Chloroethene		DOT Hazard Class:	Division 2.1
		Formula	C_2H_3Cl or CH_2CHC
ISSUE DATES AND REVISIONS Revised january 1995		Chemical Family:	Halogenated Alkene

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT
TWA = 5 molar ppm with an A1 Carcinogen Rating (ACGIH 1994-1995). Al is a confirmed human carcinogen. OSHA 1993. 1910.1017, 8 Hr. TWA = 1 Molar PPM (Continued on Page 4)

SYMPTOMS OF EXPOSURE
Inhaling high concentrations causes mild symptoms of drowsiness, blurred vision, staggering gate and tingling and numbness in the extremities.

Liquid vinyl chloride may cause severe irritation or burns on skin or eye contact.

TOXICOLOGICAL PROPERTIES
Several workers who handled and used vinyl chloride developed a rare form of liver cancer.

IARC, NTP and OSHA all list vinyl chloride as a carcinogen.

Persons in ill health where such illness would be aggravated by exposure to vinyl chloride should not be allowed to work with or handle this product.

RECOMMENDED FIRST AID TREATMENT
PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO VINYL CHLORIDE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS AND BE COGNIZANT OF EXTREME FIRE AND EXPLOSION HAZARD.

Inhalation: Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given assisted respiration and supplemental oxygen. Further treatment should be symptomatic and supportive.

(Continued an Page 4)

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

Vinyl chloride polymerizes on exposure to sunlight, heat or in the presence of oxygen or air. The addition of phenol or hydroquinone inhibits the polymerization. It is flammable in air.

PHYSICAL DATA

BOILING POINT 7.3°F (-13.7°C)	LIQUID DENSITY AT BOILING POINT 60.6 lb/ft³ (971 kg/m³)
VAPOR PRESSURE @ 70°F (21.1°C) = 52 psia (360 kPa)	GAS DENSITY AT 70°F, 1 atm @ 77°F (25°C) = .164 lb/ft³ (2.63 kg/m³)
SOLUBILITY IN WATER Slightly Soluble	FREEZING POINT -244.8°F (-153.8°C)
EVAPORATION RATE N/A (Gas)	SPECIFIC GRAVITY (AIR=1) @ 77°F (25°C) = 2.22

APPEARANCE AND ODOR Colorless gas with a pleasant, sweet odor

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) -108°F (CC)	AUTO IGNITION TEMPERATURE 882°F (472°C)	FLAMMABLE LIMITS % BY VOLUME (See Page 4) LEL 3.6 UEL 33

EXTINGUISHING MEDIA Water, dry chemical, carbon dioxide	ELECTRICAL CLASSIFICATION Class 1, Group Not Specified

SPECIAL FIRE FIGHTING PROCEDURES
Attempt to stop the flow of vinyl chloride. Use water spray to cool surrounding containers.

UNUSUAL FIRE AND EXPLOSION HAZARDS
Vinyl chloride vapors are heavier than air and may travel a considerable distance to a source of ignition. Should fire be extinguished and flow of gas continue, increase ventilation to prevent formation of flammable mixtures in low areas or pockets.

REACTIVITY DATA

STABILITY		CONDITIONS TO AVOID
Unstable		None
Stable	X	

INCOMPATIBILITY (Materials to avoid) Oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS None

HAZARDOUS POLYMERIZATION		CONDITIONS TO AVOID
May Occur	X	It is inhibited with phenol or hydroquinone to prevent polymerization.
Will Not Occur		

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact your closest supplier location or call the emergency telephone number listed herein.

WASTE DISPOSAL METHOD
Do not attempt to dispose of waste or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to your supplier. For emergency disposal assistance, contact your closest supplier location or call the emergency telephone number listed herein.

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)	Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.	
VENTILATION	LOCAL EXHAUST	SPECIAL
Hood with forced ventilation	To prevent accumulation above the TWA	N/A
	MECHANICAL (Gen.)	OTHER
	In accordance with electrical codes	N/A
PROTECTIVE GLOVES	Most materials except natural rubber	
EYE PROTECTION	Safety goggles or glasses	
OTHER PROTECTIVE EQUIPMENT	Safety shoes, safety shower, eyewash "fountain," transparent face shield	

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION

DOT Shipping Name: Vinyl chloride, inhibited
DOT Shipping Label: Flammable Gas
I.D. No.: UN 1086; RQ 1.0(0.454)
DOT Hazard Class: Division 2.1

SPECIAL HANDLING RECOMMENDATIONS

Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connectinn cylinder to lower pressure (<150 psiq) pipinq or systems. Do not heat cylinder by any means to increase tne discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional handling recommendations, consult Compressed Gas Association's Pamphlets I P-1 and P-10.

SPECIAL STORAGE RECOMMENDATIONS

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of noncombustible construction away from heavily trafficked areas and emergency exits.

Do not allow the temperature where cylinders are stored to exceed 125F (52C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in - first out" inventory system to prevent full cylinders beins stored for excessive periods of time. Post "No Smoking or Open Flames" signs in the storage or use area. There should be no sources of ignition in the storage or use area.

For additional storage recommendations, consult Compressed Gas Association's Pamphlet P-1 and P-10.

SPECIAL PACKAGING RECOMMENDATIONS

Most metals except copper and its alloys may be used with vinyl chloride. Copper and its alloys could form explosive acetylides by reacting with the acetylene impurity in the product.

Teflon® is the preferred gasketing material.

OTHER RECOMMENDATIONS OR PRECAUTIONS

Earth-ground and bond all lines and equipment associated with the vinyl chloride system. Electrical equipment should be non-sparking or explosion proof. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of federal Law (49CFR).

(Continued on Page 4)

*Various Government Agencies (i.e. Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which will not be reflected in this data sheet. The customer should review these regulations to ensure that he is in full compliance.

HEALTH HAZARD DATA

TWA DATA: (continued)

(<5 Molar PPM averaged over any period not exceeding 15 minutes) with the prohibition of any personal direct contact with vinyl chloride liquid and it is classified as a cancer suspect agent.

RECOMMENDED FIRST AID TREATMENT: (Continued)

Eye Contact: PERSONS WITH POTENTIAL EXPOSURE TO VINYL CHLORIDE SHOULD NOT WEAR CONTACT LENSES.

Flush contaminated eye(s) with copious quantities of water. Part eyelids with fingers to assure complete flushing. Continue for minium of 15 minutes. An eye specialict should be summoned promptly.

Skin Contact: Flush affected areas with copious quantities of water. Remove affected clothing as rapidly as possible. A physician should see the patient. Follow the water flush with a soap and water wash.

SPECIAL PRECAUTIONS

OTHER RECOMMENDATIONS OR PRECAUTIONS: (Continued)

Always secure cylinders in an upright position before transporting them. Never transport cylinders in trunks OT vehicles, enclosed vans, truck cabs or in passenger compartments. Transport cyclinders secured in open flatbed or in open pick-up type vehicles.

Vinyl chloride is a toxic chemical and it is subject to the reporting requirements of SARA, Title III, Section 313.

Material Safety Data Sheet

Ethyl Chloride

Airgas

Section 1. Chemical product and company identification

Product name	:	Ethyl Chloride
Supplier	:	AIRGAS INC., on behalf of its subsidiaries 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
Product use	:	Synthetic/Analytical chemistry.
Synonym	:	Ethane, chloro-; Aethylis; Aethylis chloridum; Anodynon; Chelen; Chlorene; Chlorethyl; Chloridum; Chloroethane; Chloryl; Chloryl anesthetic; Cloretilo; Dublofix; Ether chloratus; Ether hydrochloric; Ether muriatic; Hydrochloric ether; Kelene; Monochlorethane; Monochloroethane; Muriatic ether; Narcotile; C2H5Cl; Aethylchlorid; Chloorethaan; Chloroaethan; Chlorure D'ethyle; Cloroetano; Cloruro di etile; Etylu chlorek; NCI-C06224; UN 1037; Aethylisaethylis chloridum; Chloryle anesthetic; 1-Chloroethane
MSDS #	:	001023
Date of Preparation/Revision	:	**4/26/2010.**
In case of emergency	:	1-866-734-3438

Section 2. Hazards identification

Physical state	:	Gas. [COLORLESS LIQUID OR GAS WITH A PUNGENT, ETHER-LIKE ODOR]
Emergency overview	:	WARNING! FLAMMABLE GAS. MAY CAUSE FLASH FIRE. MAY CAUSE EYE AND SKIN IRRITATION. MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. CONTENTS UNDER PRESSURE. Keep away from heat, sparks and flame. Do not puncture or incinerate container. Avoid contact with eyes, skin and clothing. May cause target organ damage, based on animal data. Use only with adequate ventilation. Wash thoroughly after handling. Keep container closed. Contact with rapidly expanding gases can cause frostbite.
Target organs	:	May cause damage to the following organs: kidneys, liver, mucous membranes, cardiovascular system, upper respiratory tract, skin, eyes, central nervous system (CNS).
Routes of entry	:	Inhalation Dermal Eyes
Potential acute health effects		
Eyes	:	Moderately irritating to eyes. Contact with rapidly expanding gas may cause burns or frostbite.
Skin	:	Moderately irritating to the skin. Contact with rapidly expanding gas may cause burns or frostbite.
Inhalation	:	Acts as a simple asphyxiant.
Ingestion	:	Ingestion is not a normal route of exposure for gases
Potential chronic health effects	:	**CARCINOGENIC EFFECTS**: Classified + (Proven.) by NIOSH. Classified A3 (Proven for animals.) by ACGIH, 3 (Possible for humans.) by European Union. 3 (Not classifiable for humans.) by IARC. **MUTAGENIC EFFECTS**: Not available. **TERATOGENIC EFFECTS**: Not available.
Medical conditions aggravated by over-exposure	:	Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

Section 3. Composition, Information on Ingredients

Name	CAS number	% Volume	Exposure limits
Ethyl Chloride	75-00-3	100	**ACGIH TLV (United States, 1/2009).** **Absorbed through skin.** TWA: 264 mg/m³ 8 hour(s). TWA: 100 ppm 8 hour(s). **OSHA PEL (United States, 11/2006).** TWA: 2600 mg/m³ 8 hour(s). TWA: 1000 ppm 8 hour(s). **OSHA PEL 1989 (United States, 3/1989).** TWA: 2600 mg/m³ 8 hour(s). TWA: 1000 ppm 8 hour(s).

Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training.If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus.It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : As this product is a gas, refer to the inhalation section.

Section 5. Fire-fighting measures

Flammability of the product : Flammable.

Auto-ignition temperature : 518.75°C (965.8°F)

Flash point : Closed cup: -50.15°C (-58.3°F).

Flammable limits : Lower: 3.8% Upper: 15.4%

Products of combustion : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
halogenated compounds
carbonyl halides

Fire hazards in the presence of various substances : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge, heat and oxidizing materials.

Fire-fighting media and instructions : In case of fire, use water spray (fog), foam or dry chemical.

In case of fire, allow gas to burn if flow cannot be shut off immediately. Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.

Contains gas under pressure. Flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Section 7. Handling and storage

Handling : Use only with adequate ventilation. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Wash thoroughly after handling. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Keep container closed. Avoid contact with skin and clothing. Avoid contact with eyes. Keep away from heat, sparks and flame. To avoid fire, eliminate ignition sources. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Storage : Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Segregate from oxidizing materials. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Personal protection

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Personal protection in case of a large spill : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product. Full chemical-resistant suit and self-contained breathing apparatus should be worn only by trained and authorized persons.

Product name

chloroethane

ACGIH TLV (United States, 1/2009). Absorbed through skin.
TWA: 264 mg/m³ 8 hour(s).
TWA: 100 ppm 8 hour(s).
OSHA PEL (United States, 11/2006).
TWA: 2600 mg/m³ 8 hour(s).
TWA: 1000 ppm 8 hour(s).
OSHA PEL 1989 (United States, 3/1989).
TWA: 2600 mg/m³ 8 hour(s).
TWA: 1000 ppm 8 hour(s).

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

Molecular weight	: 64.52 g/mole
Molecular formula	: C2-H5-Cl
Boiling/condensation point	: 12.2°C (54°F)
Melting/freezing point	: -138.9°C (-218°F)
Critical temperature	: 187.3°C (369.1°F)
Vapor density	: 2.2 (Air = 1)
Specific Volume (ft^3/lb)	: 6.0241
Gas Density (lb/ft^3)	: 0.166

Section 10. Stability and reactivity

Stability and reactivity	: The product is stable.
Incompatibility with various substances	: Extremely reactive or incompatible with the following materials: oxidizing materials.
Hazardous decomposition products	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Hazardous polymerization	: Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data

Product/ingredient name	Result	Species	Dose	Exposure
chloroethane	TDLo Oral	Rat	250 mg/kg	-
	LC50 Inhalation Vapor	Rat	152 g/m3	10 minutes
	LC50 Inhalation Vapor	Rat	152 g/m3	2 hours
	LC50 Inhalation Vapor	Rat	150000 mg/m3	2 hours

IDLH : 3800 ppm

Chronic effects on humans : **CARCINOGENIC EFFECTS**: Classified + (Proven.) by NIOSH. Classified A3 (Proven for animals.) by ACGIH, 3 (Possible for humans.) by European Union. 3 (Not classifiable for humans.) by IARC.
May cause damage to the following organs: kidneys, liver, mucous membranes, cardiovascular system, upper respiratory tract, skin, eyes, central nervous system (CNS).

Other toxic effects on humans : No specific information is available in our database regarding the other toxic effects of this material to humans.

Specific effects

Carcinogenic effects	: No known significant effects or critical hazards.
Mutagenic effects	: No known significant effects or critical hazards.
Reproduction toxicity	: No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity

Not available.

Products of degradation : Products of degradation: carbon oxides (CO, CO_2) and water, halogenated compounds.

Environmental fate	: Not available.
Environmental hazards	: No known significant effects or critical hazards.
Toxicity to the environment	: Not available.

Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation.Return cylinders with residual product to Airgas, Inc.Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1037	ETHYL CHLORIDE	2.1	Not applicable (gas).		**Reportable quantity** 100 lbs. (45.4 kg) **Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: Forbidden. **Cargo aircraft** Quantity limitation: 150 kg **Special provisions** B77, T50
TDG Classification	UN1037	ETHYL CHLORIDE	2.1	Not applicable (gas).		**Explosive Limit and Limited Quantity Index** 0.125 **ERAP Index** 3000 **Passenger Carrying Road or Rail Index** Forbidden
Mexico Classification	UN1037	ETHYL CHLORIDE	2.1	Not applicable (gas).		-

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Section 15. Regulatory information

United States

U.S. Federal regulations : **United States inventory (TSCA 8b):** This material is listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: chloroethane
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: chloroethane: Fire hazard, reactive, Sudden release of pressure, Immediate (acute) health hazard, Delayed (chronic) health hazard

Clean Water Act (CWA) 307: chloroethane

Clean Water Act (CWA) 311: No products were found.

Clean Air Act (CAA) 112 accidental release prevention: chloroethane

Clean Air Act (CAA) 112 regulated flammable substances: chloroethane

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

SARA 313

	Product name	CAS number	Concentration
Form R - Reporting requirements	Ethyl Chloride	75-00-3	100
Supplier notification	Ethyl Chloride	75-00-3	100

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

State regulations : **Connecticut Carcinogen Reporting:** This material is not listed.
Connecticut Hazardous Material Survey: This material is not listed.
Florida substances: This material is not listed.
Illinois Chemical Safety Act: This material is not listed.
Illinois Toxic Substances Disclosure to Employee Act: This material is not listed.
Louisiana Reporting: This material is not listed.
Louisiana Spill: This material is not listed.
Massachusetts Spill: This material is not listed.
Massachusetts Substances: This material is listed.
Michigan Critical Material: This material is not listed.
Minnesota Hazardous Substances: This material is not listed.
New Jersey Hazardous Substances: This material is listed.
New Jersey Spill: This material is not listed.
New Jersey Toxic Catastrophe Prevention Act: This material is not listed.
New York Acutely Hazardous Substances: This material is listed.
New York Toxic Chemical Release Reporting: This material is not listed.
Pennsylvania RTK Hazardous Substances: This material is listed.
Rhode Island Hazardous Substances: This material is not listed.

California Prop. 65 : **WARNING:** This product contains a chemical known to the State of California to cause cancer.

Ingredient name	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
Ethyl Chloride	Yes.	No.	Yes.	No.

Canada

WHMIS (Canada) : Class A: Compressed gas.
Class B-1: Flammable gas.

CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

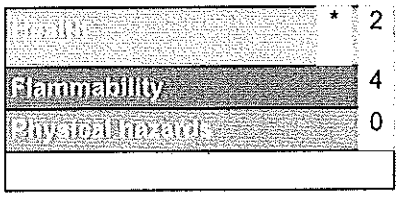
United States

Label requirements : FLAMMABLE GAS.
MAY CAUSE FLASH FIRE.
MAY CAUSE EYE AND SKIN IRRITATION.
MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
CONTENTS UNDER PRESSURE.

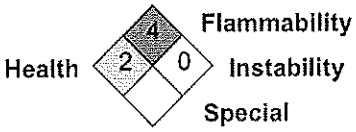
Canada

Label requirements : Class A: Compressed gas.
Class B-1: Flammable gas.

Hazardous Material Information System (U.S.A.) :



National Fire Protection Association (U.S.A.) :



Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.