BOC Gases
37 Lawsbrook Road
Acton, MA

FEB 1 8 2003

Phase IV Remedy Implementation Plan
As Built Construction Report
Final Inspection Report

ENSR INTERNATIONAL

RTN 2-11461
Tier 1C Permit Number W000707

ENSR Corporation
February 14, 2003
Document Number 00035-142-100

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1.0 INTRODUCTION

On behalf of BOC Gases, ENSR has prepared this Phase IV Remedy Implementation Plan (RIP) in accordance with the Massachusetts Contingency Plan (MCP- 310 CMR 40.0874). This RIP describes the design, construction, and implementation of an existing free product removal system being used to recover light non-aqueous phase liquid (LNAPL) at the BOC Acton, MA facility site. The existing system was installed in 1999 as a Release Abatement Measure (RAM) under a RAM Plan submitted to the MADEP (ENSR, May 1999). The RAM is being formally closed and a RAM Completion Statement submitted to MADEP. This Phase IV Remedy Implementation Plan, As-Built Construction Report, and Final Inspection Report detail the specifics of the current system as it has been installed and will be implemented going forward. Pursuant to Section 310 CMR 40.0897 of the MCP, the free product recovery system will continue to be operated under Post-Class C RAO operation, maintenance and/or monitoring in an effort to make further progress toward a Class A RAO.

1.1 Site Background

Free product was discovered at the BOC Gases facility at 37 Lawsbrook Road, Acton, MA (see Figure 1-Site Locus Map) during subsurface investigation activities, and reported to the MADEP on October 25, 1996. Additional wells and borings were installed in this area to assess the impact to soil and groundwater as part of a Phase I assessment. The area impacted with free product is limited to the parking lot and adjacent wooded area immediately east of the office building (see Figure 2-Site Map). This release was assigned Release Tracking Number (RTN) 2-11461 by the MADEP and was classified as a Tier 1C site on October 23, 1997.

Shortly after the release was detected (December 25, 1996), ENSR initiated an Immediate Response Action (IRA), which consisted of gauging and removal of product from its initial location (MW-17S) and further assessment of the source and extent of the release (ENSR, December 1996). The IRA was completed and an IRA Completion Report was submitted to the MADEP (ENSR, June1997). The first RAM Plan for this site, consisting of a variety of in situ product recovery and soil/groundwater remediation pilot tests, was performed between 1997 and 1998 (ENSR, June 1997 and ENSR, December 1998).

A second RAM Plan was submitted to MADEP in 1999 and described a more automated free product removal approach for the area identified as being impacted by the release (ENSR, May 1999). The objective of that plan was to recover free product through the installation of a product recovery system. A 120-Day RAM Status Report (#1) was submitted to MADEP documenting the free product recovery system operation from its installation on May 26, 1999 through September 3, 1999 (ENSR, September 1999). Subsequent RAM Status reports issued periodically have documented the progress in cleaning up the product to date (ENSR, March 2000; ENSR, September 2000; ENSR, December 2001; ENSR, March 2002; ENSR, September 2002).

A Phase II Comprehensive Site Assessment and a Phase III Remedial Action Plan were prepared and submitted to MADEP (ENSR, July 2001 and ENSR, August 2001). A Phase III Addendum was

subsequently submitted that found conditions at the site not conducive to proceeding in a cost-effective manner with Comprehensive Response Actions for soils and groundwater (ENSR, January 2002). It was recommended that the free product recovery system continue to operate as part of a temporary solution, until such time that the attainment of a permanent solution becomes feasible.

A Class C Response Action Outcome (RAO) was submitted to MADEP on January 31, 2002 that identified that operation of the free product recovery system will be continued until such time that recoverable free product in the area of the system can no longer be removed effectively (ENSR, January 2002). Continued operation of this system will be performed under post-Class C RAO operation and maintenance (O&M) status, as per the MCP (310 CMR 40.0897) and a discussion between the MADEP and the Licensed Site Professional for the site on January 22, 2003. This Phase IV Remedy Implementation Plan, As-Built Construction Report, and Final Inspection Report detail the specifics of the current system as it has been installed and will be implemented going forward. Post-Class C RAO Inspection and Monitoring Reports will be submitted to the agency every 6 months.

2.0 REMEDY IMPLEMENTATION PLAN

2.1 Relevant Site Contacts

The names, addresses, and telephone numbers of the persons responsible for the submittal of the RIP and for operating the remedial actions at the BOC Gases Acton, MA Facility site are listed below:

BOC Gases - PRP:
Mr. Michael Resh
Manager Environmental Remediation
BOC Gases
100 Mountain Avenue
Murray Hill, NJ 07974
(908) 771-1452

Mr. Richard Leva
Site Manager
BOC Gases
37 Lawsbrook Road
Acton, MA
(978) 263-3918

Licensed Site Professional:
Mr. Christopher Mariano, LSP
ENSR International
2 Technology Park Drive
Westford, MA 01886
(978) 589-3000

Remediation Manager:
Mr. Arthur Taddeo,
Program Manager
ENSR International
2 Technology Park Drive
Westford, MA 01886
(978) 589-3000

2.2 Engineering Design

The remedial objective of the recovery system is to meet the MCP requirements by reducing the level of product in the wells to less than ½ inch and ultimately for closure with no land use restrictions (Activity and Use Limitation). Therefore, the LNAPL present in the subsurface must be remediated to meet the health-based standards in the MCP by removing the LNAPL and by reducing the mobility and toxicity of the residual contaminants in the soil and groundwater. However, as discussed in the Phase III Addendum, the operation of the free product recovery system is not expected to achieve these remedial objectives within a reasonable timeframe and therefore, a Class C RAO has been submitted and the system will continue to operate under Post-RAO O&M in an effort to make further progress toward a Class A RAO.

On October 25, 1996, free product was observed on the water table at MW-17S at the BOC Gases facility. Upon expanding the investigation, a number of piezometers were added in this localized area and exhibited product above the MADEP Upper Concentration Limit for NAPL of ½-inch. A number of free product removal methods were evaluated during a series of pilot tests and reported in a RAM Completion Report in December 1998. Based on these efforts, the most effective method for the removal of the product was identified as passive removal of accumulated product from a series of large diameter recovery wells and subsequent recovery into containers above ground for later transport and disposal. Initially, this recovery was done with large diameter hand bailers. Subsequently, automated removal was judged to be more efficient in clearing the product from the area.

2.3 System Description

2.3.1 Installation of the Free Product Recovery System

As discussed in RAM Status Report #1, six recovery wells (RW-1 through RW-6) were installed along the central axis of the free product plume. The six-inch diameter wells were installed to a total depth of approximately 65 feet below ground surface (bgs) with a 15-foot well screen. Groundwater was encountered at approximately 54 feet bgs (see Appendix A - Well Construction Logs). All wells are flush-mounted. Approximately 300 linear feet of trenching was placed in order to install subsurface plumbing conduits from each well vault to a compressor station adjacent to the office building (see Figure 2). The station also includes a spill containment platform, which can accommodate four 55-gallon drums of recovered product. A control panel, which regulates air intake and discharge of the product skimmer pumps, was also installed next to the compressor.

The performance goal of this system was to allow free product (identified as a longitudinal plume oriented east/west, just north of the Office Building) to flow into the large diameter recovery wells, in order to recover the product at an accelerated rate and pump the accumulated product to the surface for disposal. Product recovery devices were placed in each of the recovery wells. The product recovery system consists of skimmer pumps, which employ a passive collection system (hydrophobic membrane) with pneumatic pumping of entrained product. The pumps are connected to the compressor (via an air line) and a recovery drum (via a PVC product line). The skimmer pump floats at the product/water interface centralized around a three-foot long vertical axis rod to account for

groundwater level fluctuations. The skimmer pumps are placed such that the bottom of the float is just below the product/water interface and checked weekly for proper location.

The pneumatic control panel regulates the system with two timers that vary the cycle time and air flow rate of the skimmer pumps. The bladder pump creates a vacuum during its intake phase when product is drawn into it. During the discharge phase, the pressurized air is injected into the bladder that inflates. A check valve on the intake closes and the recovered product is forced through the product line into the collection container.

The system also has a pneumatic tank overfill sensor that shuts off the skimmer pump when the recovery tank (drum) is filled. As the pressure in the dip tube increases during filling, a sensor activates a switching valve that stops the air supply and disables the pump from recovering product. The product discharge tube and sensor must then be switched to an empty drum to re-activate the system. The skimmers are operated simultaneously to achieve maximum product removal. Weekly product level readings are taken in the six recovery wells.

The nature of the media treated by this system is free product only, in an area immediately surrounding the recovery wells. The removal of "source" material should minimize the impact to localized soils at the water table, as well as any migration of dissolved-phase petroleum constituents. The recovery system removes product, and to some extent, oily water as well. It is anticipated that approximately 1,500 gallons of fuel oil free product will be removed by this system. Due to the nature of product recovery systems, as well as the affect of water table fluctuations, both seasonally and due to short-term precipitation events, the expected efficiency of this system is anticipated to remove product to between a sheen and 1 inch thickness in each recovery well. This will be determined by frequent product thickness measurements using an oil/water interface probe.

The product thickness and water table elevations will be measured in each recovery well, as well as nearby piezometers and monitoring wells. The data will be used to monitor the effectiveness of the system performance and to demonstrate whether the system's goal has been achieved. Recovered oil and oily water pumped to drums on the surface will be measured routinely and emptied for proper disposal/recycling by a licensed waste transporter. The wastes are manifested for each disposal event and the manifests kept for documentation. Should product not be observed in the recovery wells, the system will be shut-down temporarily while continued measurements are obtained. The system will be re-started to remove accumulated product when measurable product is observed in the wells.

The system design includes an automated pressure control shut-off to the air-actuated pumps, should the drum fill with oil during recovery. In addition, the four drums are further placed on a spill-containment pallet to control any ancillary leaks, etc. Finally, spill control materials such as sorbent pads and adsorbent litter are kept nearby to the system. If any localized soils become impacted by the oils, due to leaks, small spills, etc, they will be hand removed and stored in a solid waste drum for disposal.

The system has not affected any site-specific conditions such as drainage, natural resources of the nature of the soil or groundwater at the site. The implementation of the free product recovery system has not conflicted with pre-existing or current activities or operations at the Acton site. In addition, removal of free product is anticipated to facilitate redevelopment of the land.

2.4 Construction Plan and Specifications

The proposed system was installed as a RAM in 1999 over a period of approximately 3 to 4 months. Figure 3 shows the planned equipment, plumbing, and electrical diagram. Details of the subsurface construction activities are presented in RAM Status Report #1 (ENSR, September 1999).

2.5 Operation, Maintenance and Monitoring Plan

2.5.1 Routine Operation

Normally the Product Recovery System is operated continuously, 24 hours a day, seven days a week. In the past, the system has been shut down occasionally during high water table periods when free product was not present in the wells in recoverable amounts but in recent months the water table has remained low enough to preclude shutdowns.

During routine operation product is pumped from all six recovery wells simultaneously and delivered to the collection drums through a single tube. Typical recovery rates are of the order of 10 ml/min. Generally the delivery is of pure product although occasionally water is drawn into the system.

2.5.2 Routine Maintenance

The system is maintained on a weekly basis by blowing down the compressor air tank and checking compressor oil. Monthly the filters are checked in the oil/water separator, the air pressure regulator and the compressor. Other tasks are also completed on an as needed basis or on a longer period. Refer to the O&M manual (Appendix B) for details.

Routine maintenance also includes disposal of the collected product and/or contaminated water. This is done on an as needed basis when the last of the four storage drums is nearing capacity. A commercial disposal company empties the drums and disposes of the waste off site. Waste manifests covering the disposal of this waste have been included in periodic status reports. Dates and amounts disposed to date can be found in the Drum Table (see Appendix C).

2.5.3 Routine Monitoring

At least once a week the recovery wells are gauged while the system is shut down for maintenance. A record is kept of the depth to product, depth to water and product thickness and the results are plotted (see Appendix D). The depth of product and depth of water in the current collection drum is also recorded twice a week. These results are recorded on the Drum Table. At the time this is done the flow rate to the current collection drum is also measured. Once a month a more widely scattered set of site wells are gauged to determine that the product plume has not increased.

Should there be any emergency conditions during normal operating hours, any of the contacts listed in Section 2.1 can be consulted. During off-hours, should any emergency conditions be determined, ENSR's Program Manager should be called, either via the ENSR telephone number, or at home (978-456-9294). In case the system requires emergency shut-down, the main power switch located on the building wall to the immediate right of the spill containment pallet can be used to shut the power off.

Inspection and Monitoring Reports will be prepared and submitted to the MADEP every 6 months. Appendix E includes the Health and Safety Plan used for work at the BOC site. In addition, a local Acton Board of Health Hazardous Materials Remediation Permit is included in Appendix F. There are no property access issues related to this treatment system.

3.0 AS-BUILT CONSTRUCTION REPORT

As discussed above, the proposed system was installed in 1999 and has been in operation since then. The system was constructed as shown in Figure 3.

4.0 FINAL INSPECTION REPORT

4.1 Licensed Site Professional Inspection

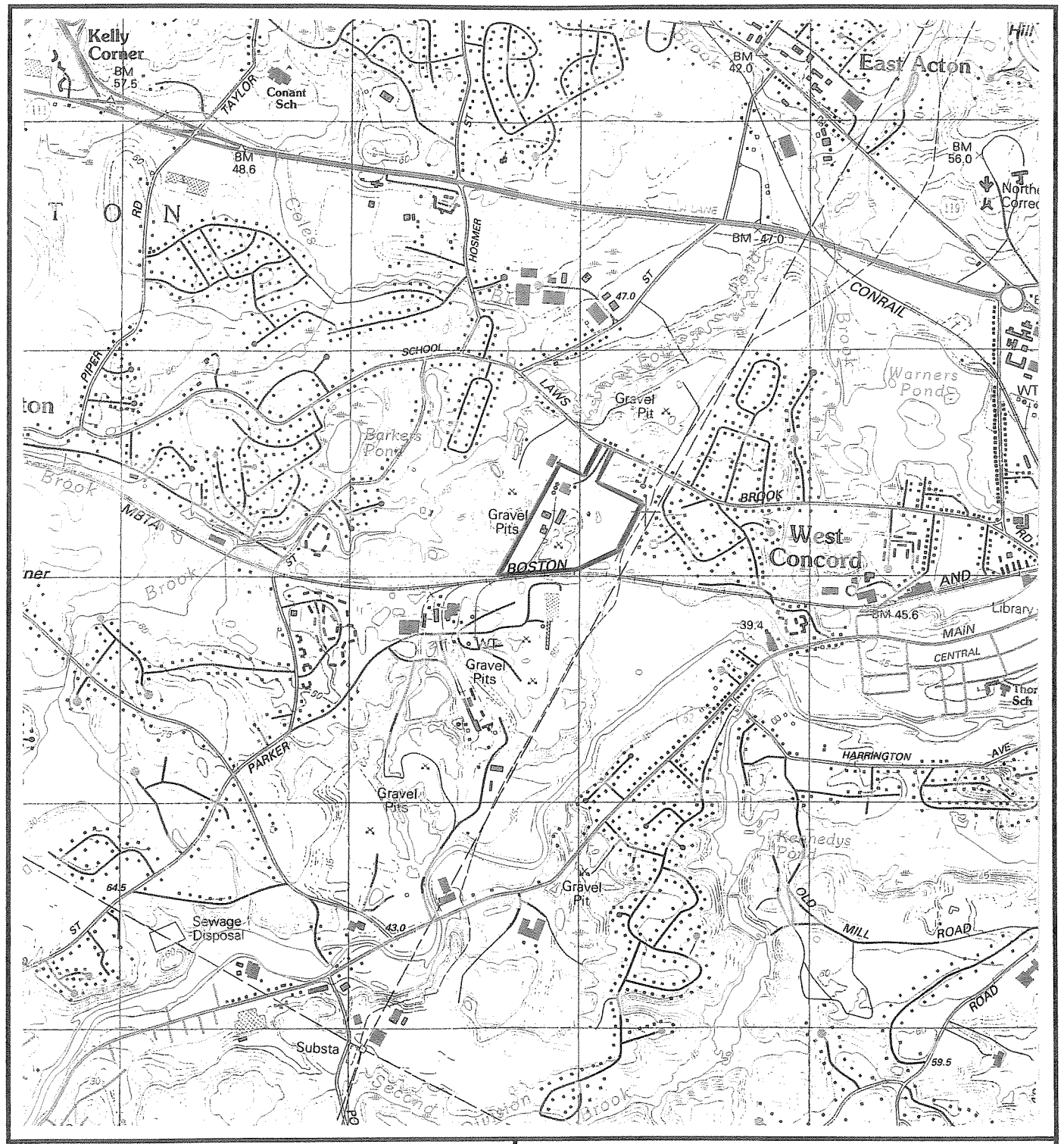
On February 12, 2003, Christopher Mariano, ENSR's Licensed Site Professional (LSP) for the site, conducted an inspection of the LNAPL recovery system. Mr. Mariano verified that the recovery wells and ancillary LNAPL recovery equipment were installed and operating in accordance with the design and as-built specifications described above. It is Mr. Mariano's LSP opinion that the construction and implementation of the LNAPL recovery system has been completed in accordance with the applicable requirements of 310 CMR 40.0870, and the Phase IV performance standards as described in 310 CMR 40.0872 have been met.

4.2 Future Actions at the Site

In addition to continuing O&M, a commitment has been made to the following as part of post-Class C RAO activities:

- groundwater monitoring of selected wells for VPH, EPH, and PAH to observe dissolved constituent impact,
- monitored natural attenuation evaluation of selected wells for hydrocarbon concentration reduction,
- review of enhancements to the system,
- additional remedial alternative evaluation, and
- O&M reports.

Since the next RAM Status Report would have been due to the MADEP on March 6, 2003, ENSR plans to submit the first Post-Class C RAO Inspection and Monitoring Report by that date. The report will include post-Class C data described above obtained as of that time. Continued Inspection and Monitoring Reports will be submitted every 6 months thereafter, until another phase of the MCP is appropriate.



SOURCE: USGS Topographic Quadrangle
Maynard, MA

SCALE

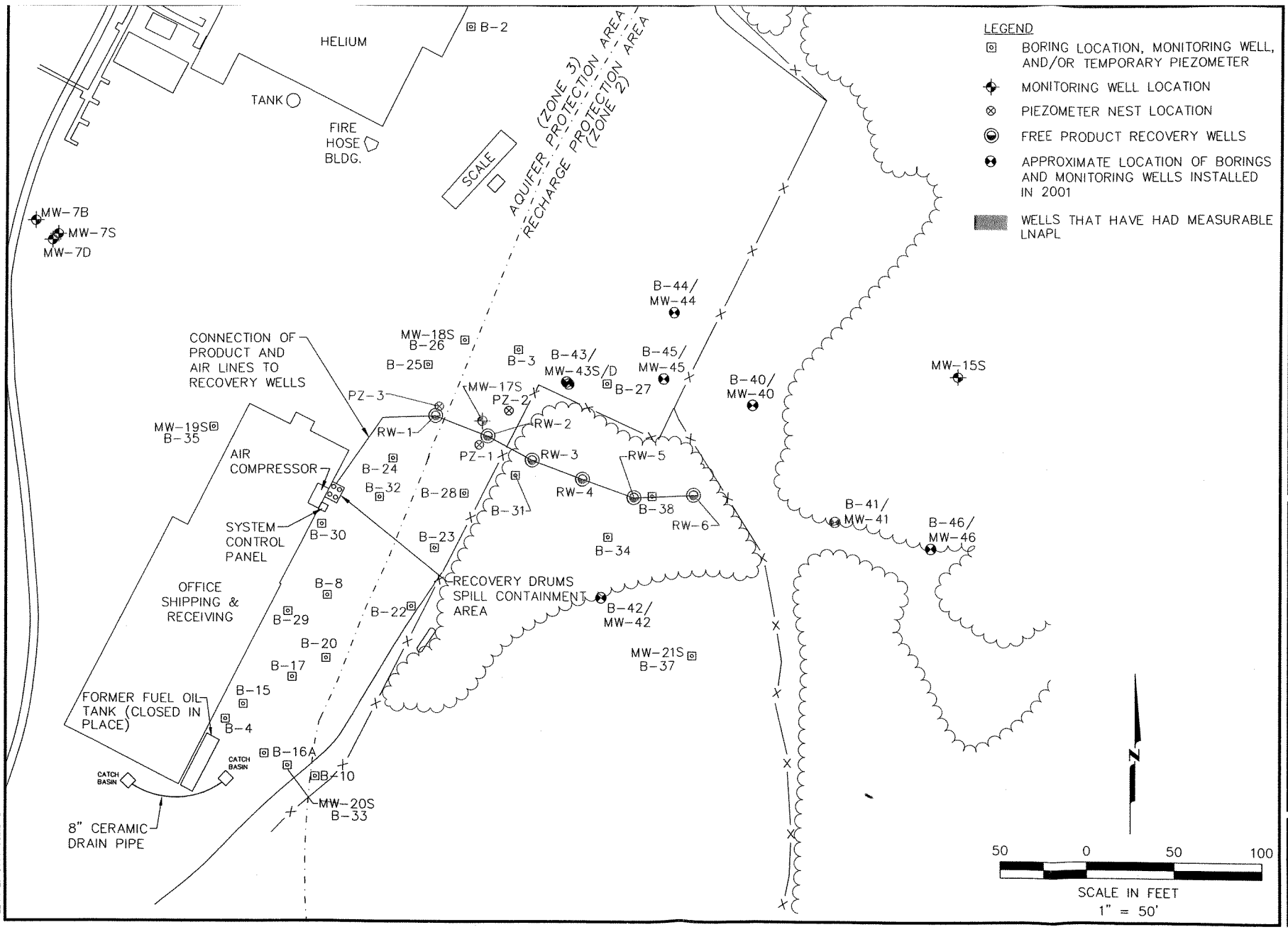
0 1/4 1/2 1 MILE

N

ENSR
ENSR Consulting and Engineering

FIGURE 1
SITE LOCUS MAP
BOC Gases
Acton, MA

DRAWN: JLC	DATE: July 17, 1996	PROJECT NO.:	REV:
FILE NO.:	CHECKED: JC	0035-044	



REVISIONS			
NO:	DESCRIPTION:	DATE:	BY:

DESIGNED BY: M.H.
DRAWN BY: K.P.B.
CHECKED BY: M.H.

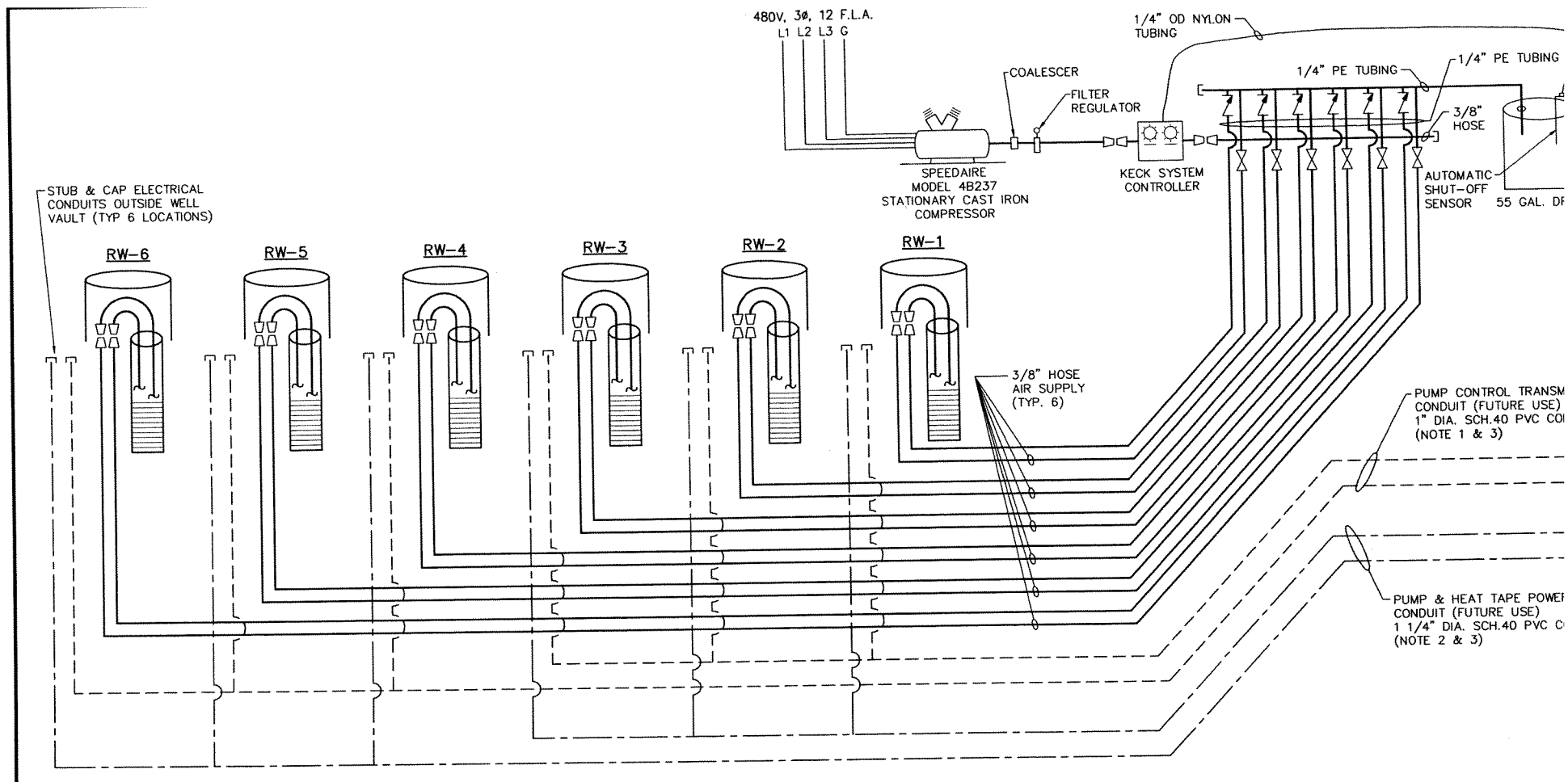
ENSR® INTERNATIONAL
2 TECHNOLOGY PARK DRIVE
WESTFORD, MASSACHUSETTS 01886
PHONE: (978) 589-3000

MONITORING WELL LOCATIONS
BOC GASES, INC.
ACTON, MA

FIGURE NUMBER: 2

SHEET NUMBER: 1

FILENAME: 0035A50B.DWG



NOTES:

1. PUMP CONTROL CONDUIT TO BE INSTALLED EMPTY, STUBBED & CAPPED AT EACH END. PUMP CONTROL CONDUIT SHALL BE SIZED FOR 120VAC LEVEL TRANSMITTER WIRES (L1, L2, N FOR 3 WELLS, PLUS GROUND = 10 CONDUCTORS PER CONDUIT).
2. PUMP & HEAT TAPE POWER CONDUIT TO BE INSTALLED EMPTY, STUBBED & CAPPED AT EACH END. PUMP POWER 230VAC, 1ø, 60hz, 1.5 HP MOTOR, 11 F.L.A. (L1, L2 PLUS GROUND TO EACH WELL). HEAT TAPE POWER 230VAC, 1ø, 0.5 AMP/WELL (5 WATT/FT x 10 FT PER WELL) (L1, L2 PLUS GROUND) DAISY CHAIN HEAT TAPE TO ALL 3 WELLS IN EACH CONDUIT RUN. (TOTAL = 12 CONDUCTORS PER CONDUIT)
3. ELECTRICIAN TO DETERMINE FINAL SIZE OF CONDUIT TO MEET REQUIREMENTS OF NOTES 1 & 2.

LEGEND

- QUICK DISCONNECT COUPLING
- CAP
- BALL VALVE
- CHECK VALVE
- WELL VAULT
- RECOVERY WELL W/PRODUCT RECOVERY PUMP

FIGURE 3

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PIPING & INSTRUMENTATION DIAGI
PRODUCT RECOVERY SYSTEM
BOC GASES
37 LAWSBROOK ROAD
ACTON, MA

DRAWN BY:	DATE:	PROJECT NO.
K.P.B.	2/03	00035-

0035A28B

Project No: 0035-085 Client: BOC Gas Site: Acton MA

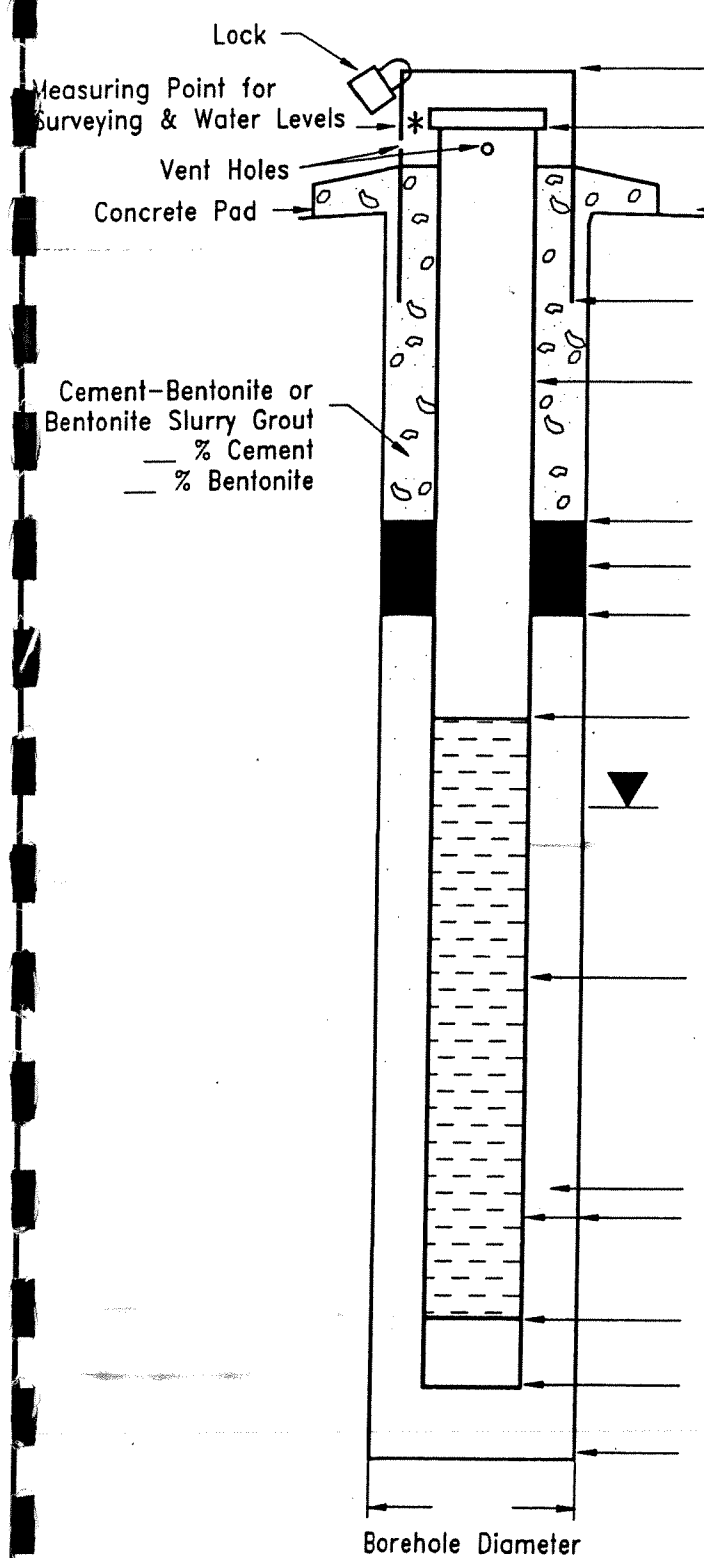
WELL No: BW-1

Well Location: BW-1 (closest to plant/office)

Date Installed: 3/16/99

Contractor: American Drilling Method: Hollow Stem Auger Inspector: S. Cahalan

MONITORING WELL CONSTRUCTION DETAIL



		Depth from G.S. (feet)	Elevation (NGVD)
Top of Steel Guard Pipe			
Top of Riser Pipe			
Ground Surface (G.S.)		0.00	
Bottom of Steel Guard Pipe		NA	
Riser Pipe:			
Length	50'		
Inside Diameter (ID)	6"		
Type of Material	Sch 40 PVC		
Top of Bentonite Seal		46'	
Bentonite Seal Thickness	2'		
Top of Sand		48'	
Top of Screen		50'	
Stabilized Water Level		53'	
Screen:			
Length	15'		
Inside Diameter (ID)	6"		
Slot Size	0.020"		
Type of Material	Sch 40 PVC		
Type/Size of Sand	#2		
Sand Pack Thickness	17'		
Bottom of Screen		65'	
Bottom of Tail Pipe:		~66' (65.5)	
Length			
Bottom of Borehole			

* Describe Measuring Point:

Approved:

Signature

Date 3/16/99

ENSR®

Project No: 0035-085 Client: BOC Gas Site: Acton

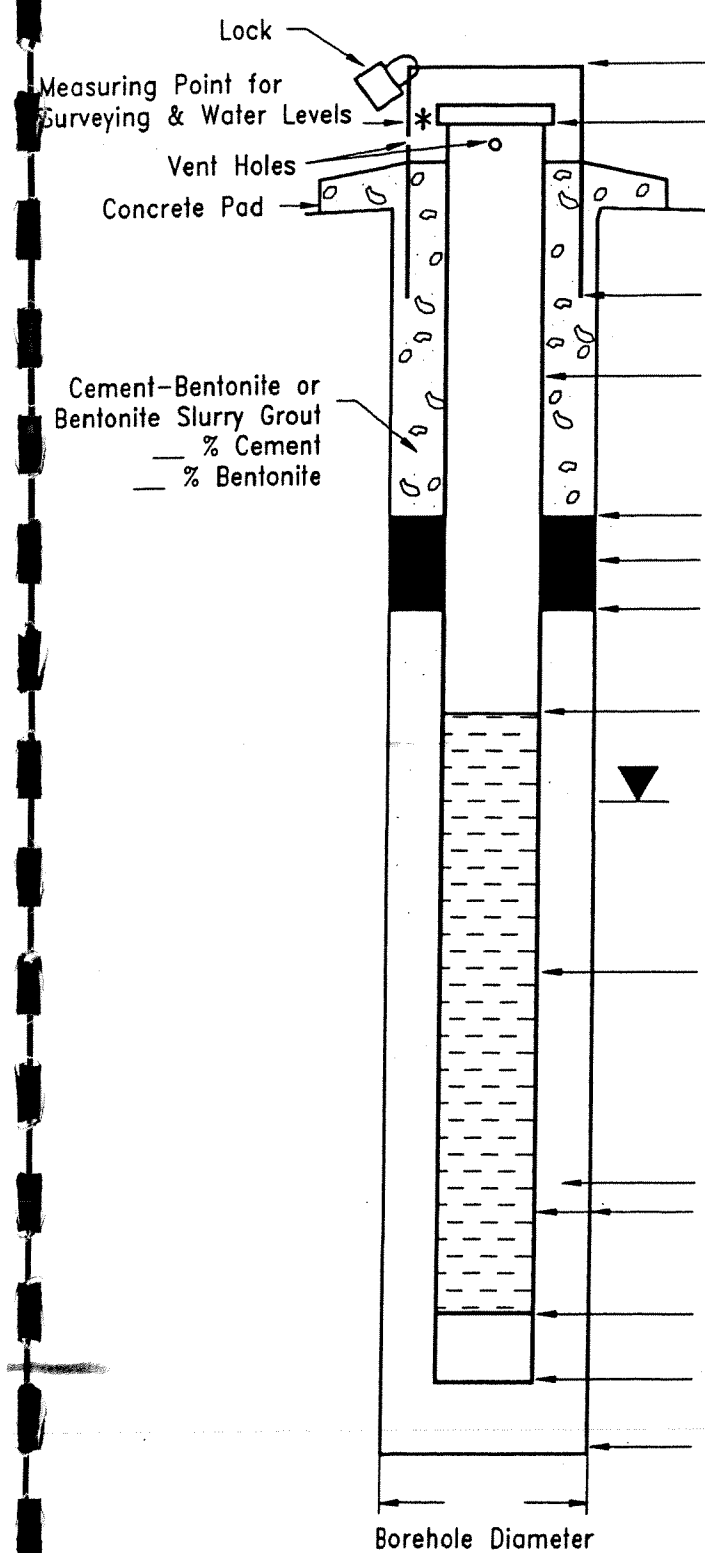
WELL No: BW-2

Well Location: BW-2 (NEXT TO BW-1)

Date Installed: 3/16/99

Contractor: American Drilling Method: Hollow Stem Auger Inspector: S. Cahn

MONITORING WELL CONSTRUCTION DETAIL



		Depth from G.S. (feet)	Elevation (NGVD)
Top of Steel Guard Pipe			
Top of Riser Pipe			
Ground Surface (G.S.)		0.00	
Bottom of Steel Guard Pipe		NA	
Riser Pipe:			
Length	50'		
Inside Diameter (ID)	6"		
Type of Material	Sch 40 PVC		
Top of Bentonite Seal		46'	
Bentonite Seal Thickness	2'		
Top of Sand		48'	
Top of Screen		50'	
Stabilized Water Level		53'	
Screen:			
Length	15'		
Inside Diameter (ID)	6"		
Slot Size	0.020"		
Type of Material	PVC		
Type/Size of Sand	#2		
Sand Pack Thickness	17'		
Bottom of Screen		65'	
Bottom of Tail Pipe:		65.5-66'	
Length			
Bottom of Borehole			

* Describe Measuring Point:

Approved:

Signature

Date 3/16/99

ENSR

Project No: 0035-085 Client: BOC Gas Site: Acton MA

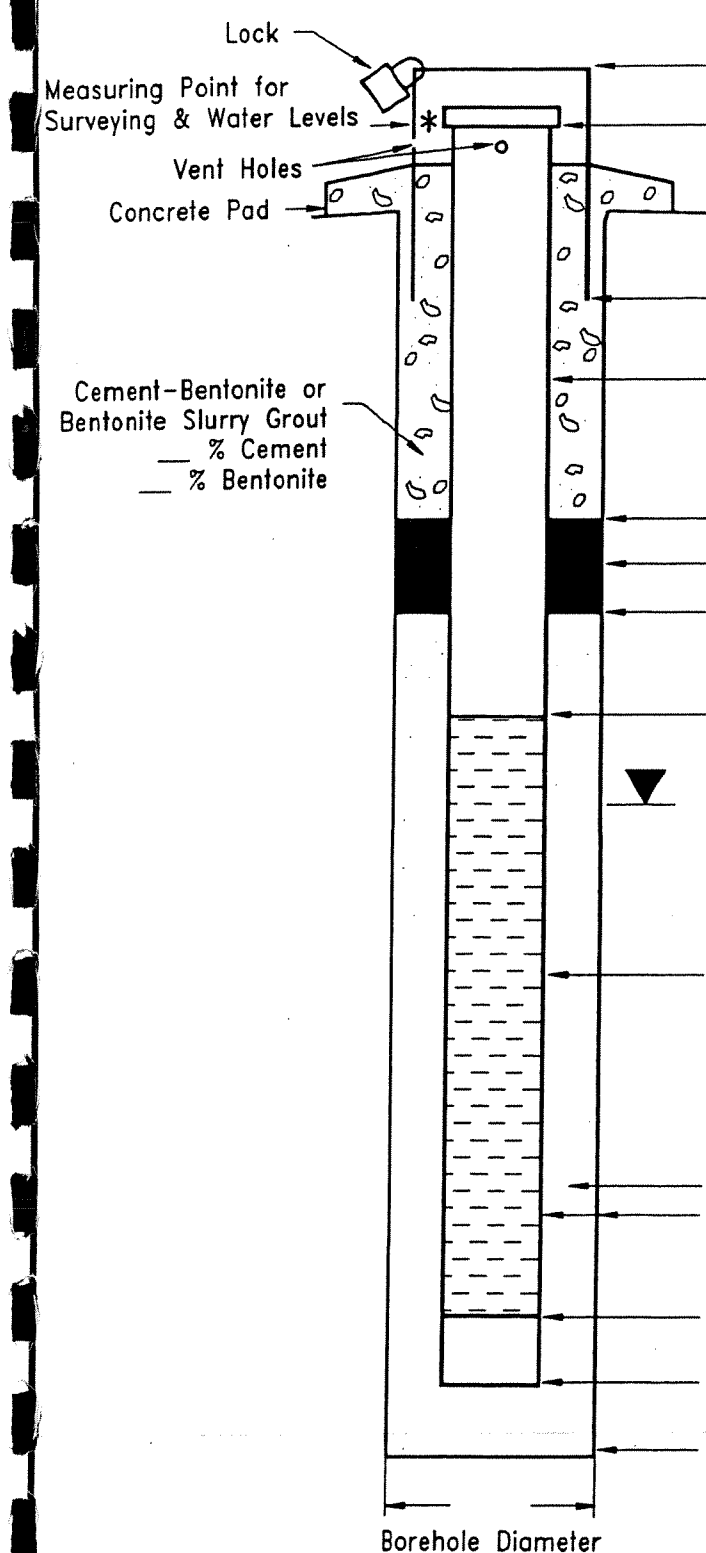
WELL No: RW-3

Well Location: RW-3 (between RW-2 and RW-4

Date Installed: 3/22/99

Contractor: American Drilling Services Method: Hollow Stem Auger Inspector: S. Cahal

MONITORING WELL CONSTRUCTION DETAIL



		Depth from G.S. (feet)	Elevation (NGVD)
Top of Steel Guard Pipe			
Top of Riser Pipe		~1.5' Above Ground Surface	
Ground Surface (G.S.)		0.00	
Bottom of Steel Guard Pipe		N/A	
Riser Pipe:			
Length	55' ~		
Inside Diameter (ID)	6"		
Type of Material	Sch 40 PVC		
Top of Bentonite Seal		49'	
Bentonite Seal Thickness	2'		
Top of Sand		51'	
Top of Screen		53'	
Stabilized Water Level		54' ~	
Screen:			
Length	15'		
Inside Diameter (ID)	6"		
Slot Size	0.020"		
Type of Material	PVC		
Type/Size of Sand	#2		
Sand Pack Thickness			
Bottom of Screen		68'	
Bottom of Tail Pipe:		68.5'	
Length			
Bottom of Borehole			

* Describe Measuring Point:

Approved: [signature] 3/22/99

Signature Date

ENSR

Project No: 0035-085 Client: BOC Gases Site: Acton MA

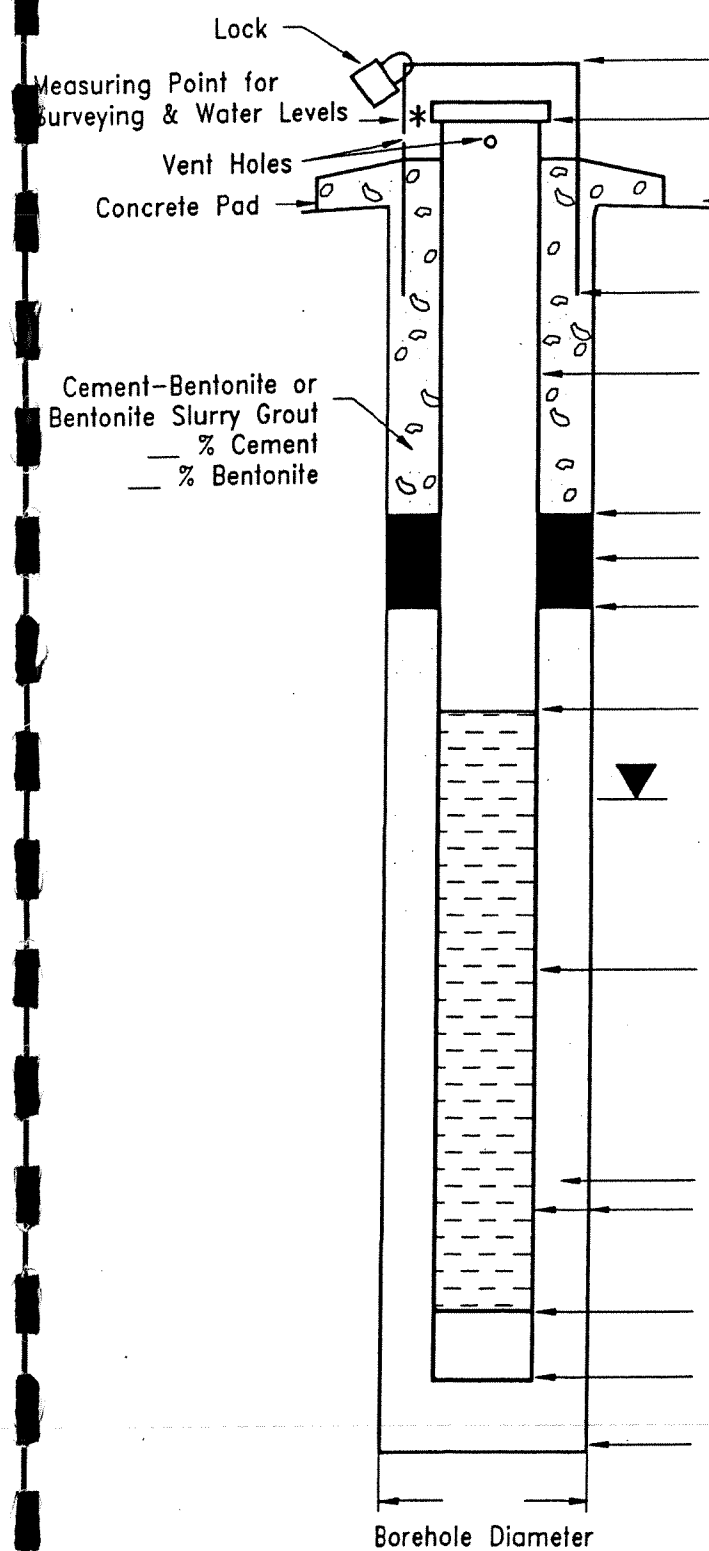
WELL No: RW-4

Well Location: RW-4 between RW-2 and RW-3

Date Installed: 3/19/99

Contractor: American Drilling Method: Hollow Stem Auger Inspector: S. Cohen

MONITORING WELL CONSTRUCTION DETAIL



		Depth from G.S. (feet)	Elevation (NGVD)
Top of Steel Guard Pipe			
Top of Riser Pipe			
Ground Surface (G.S.)		0.00	
Bottom of Steel Guard Pipe		NA	
Riser Pipe:			
Length	55'		
Inside Diameter (ID)	6"		
Type of Material	Sch 40 PVC		
Top of Bentonite Seal		50'	
Bentonite Seal Thickness	2'		
Top of Sand		52'	
Top of Screen		54.5'	
Stabilized Water Level		55'±	
Screen:			
Length	15'		
Inside Diameter (ID)	6"		
Slot Size	0.020"		
Type of Material	PVC		
Type/Size of Sand	#2		
Sand Pack Thickness	17'		
Bottom of Screen		69.5'	
Bottom of Tail Pipe:			
Length	70'		
Bottom of Borehole			

* Describe Measuring Point:

Approved: [signature] 3/19/99

Signature Date

ENSR

Project No: 0035-085 Client: BOL Gas Site: Acton MA

WELL No: RW-5

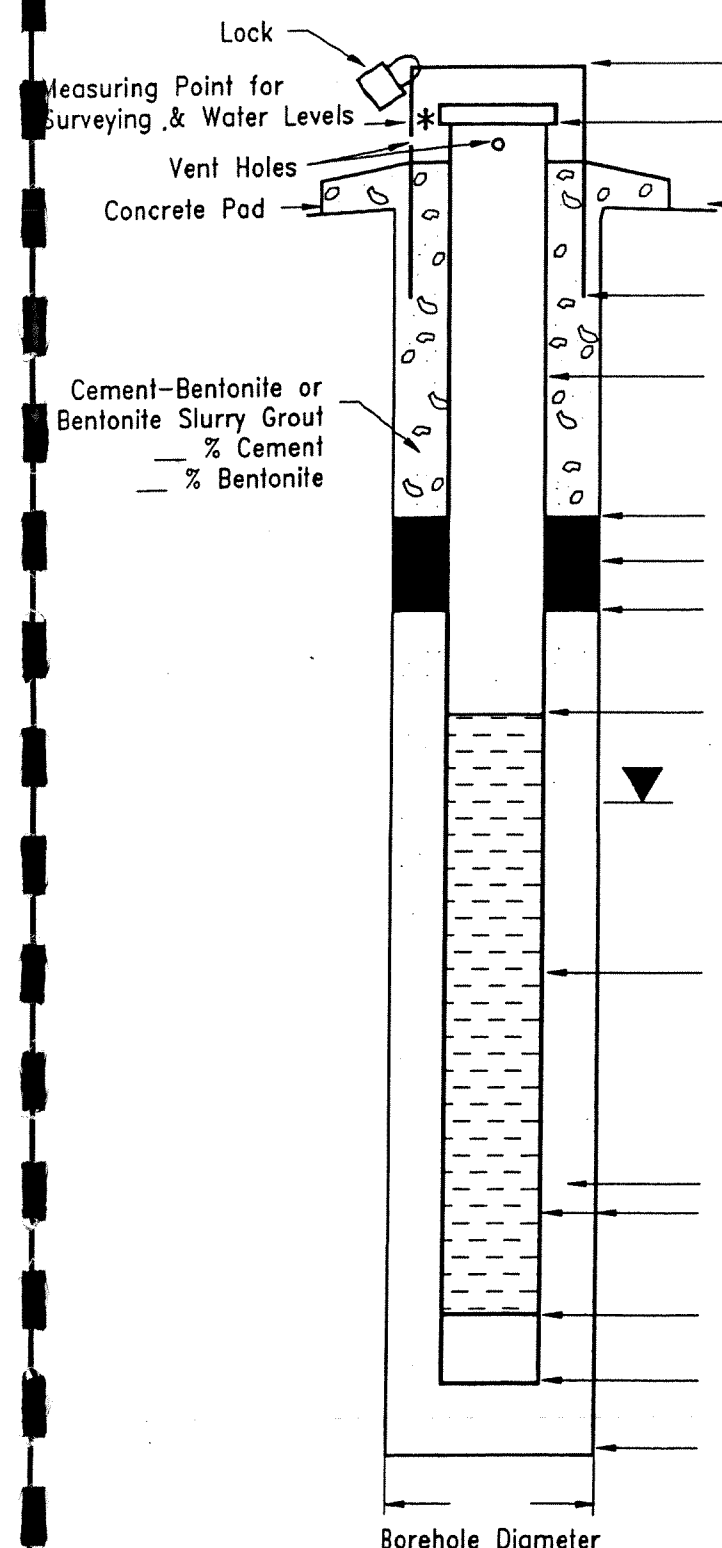
Well Location: RW-5 between RW-4 + RW-6

Date Installed: 3/17/99

Contractor: American Method: HSA

Inspector: S. Baker

MONITORING WELL CONSTRUCTION DETAIL



		Depth from G.S. (feet)	Elevation (NGVD)
Top of Steel Guard Pipe			
Top of Riser Pipe			
Ground Surface (G.S.)		0.00	
Bottom of Steel Guard Pipe		N/A	
Riser Pipe:			
Length	55'		
Inside Diameter (ID)	6"		
Type of Material	Sch 40 PVC		
Top of Bentonite Seal		50'	
Bentonite Seal Thickness	2'		
Top of Sand		52'	
Top of Screen		54.5	
Stabilized Water Level		54~	
Screen:			
Length	15'		
Inside Diameter (ID)	6"		
Slot Size	0.020"		
Type of Material	PVC		
Type/Size of Sand	#2		
Sand Pack Thickness	17'~		
Bottom of Screen		69.5	
Bottom of Tail Pipe:			
Length	70'		
Bottom of Borehole			

* Describe Measuring Point:

Approved:

Signature

Date 3/17/99

ENSR

Project No: 0035-085 Client: BOC Gas Site: Acton MA

WELL No: RW-6

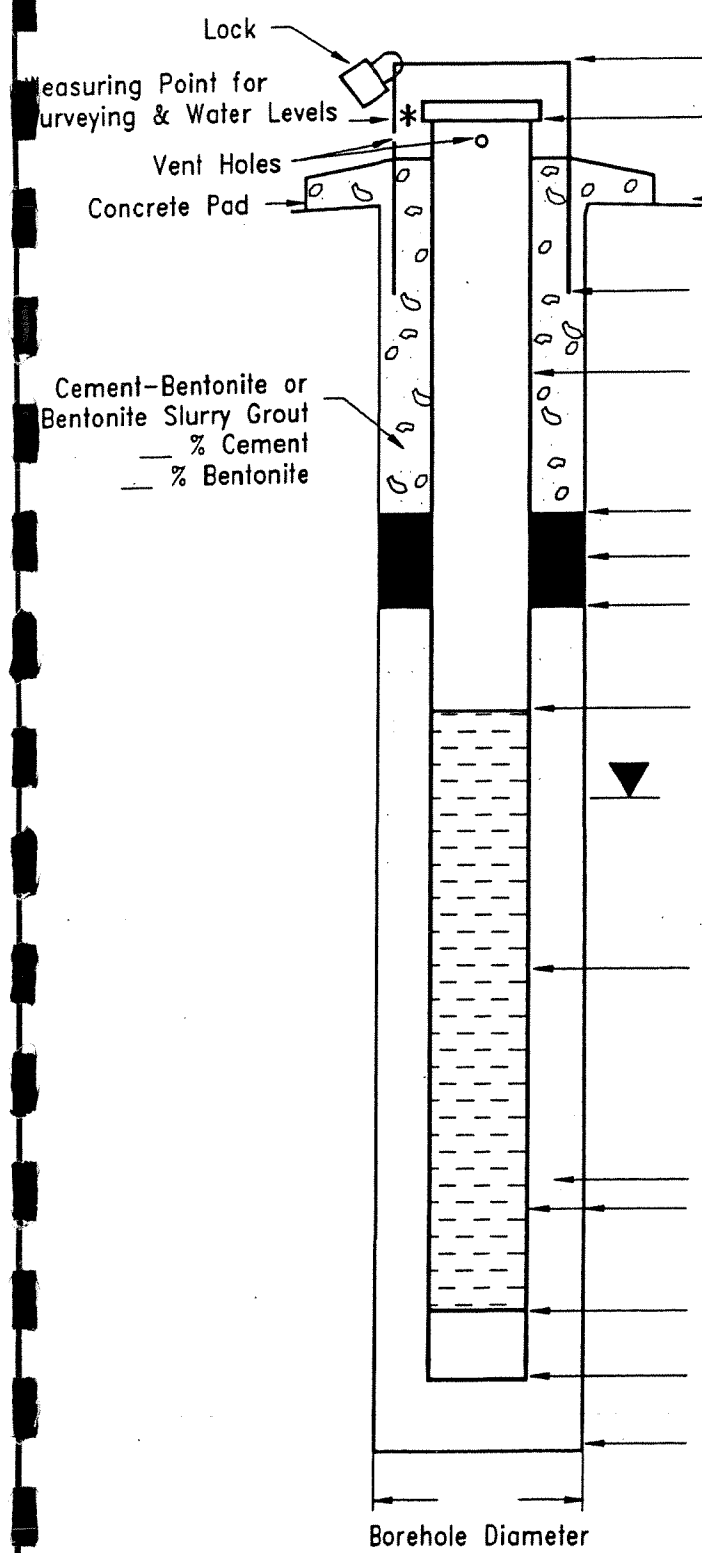
Well Location: RW-6 furthest into woods

Date Installed: 3/18/99

Contractor: ADS Method: HSA

Inspector: S. Cahulan

MONITORING WELL CONSTRUCTION DETAIL



		Depth from G.S. (feet)	Elevation (NGVD)
Top of Steel Guard Pipe			
Top of Riser Pipe			
Ground Surface (G.S.)		0.00	
Bottom of Steel Guard Pipe		NA	
Riser Pipe:			
Length	55'		
Inside Diameter (ID)	6"		
Type of Material	Sch 40 PVC		
Top of Bentonite Seal		50'	
Bentonite Seal Thickness	2'		
Top of Sand		52'	
Top of Screen		54.5'	
Stabilized Water Level		54~	
Screen:			
Length	15'		
Inside Diameter (ID)	6"		
Slot Size	.020"		
Type of Material	PVC		
Type/Size of Sand	#2		
Sand Pack Thickness	19'~		
Bottom of Screen		69.5	
Bottom of Tail Pipe:			
Length			
Bottom of Borehole		~~77~~ 70'	

* Describe Measuring Point:

Approved:

Signature

Date 3/18/99

ENSR

BOC GASES
Acton, MA

Operation and Maintenance Manual
Product Recovery System

ENSR Corporation
August 2000
Document Number 0035-102-100

1.0 INTRODUCTION

The purpose of this Operation and Maintenance (O&M) Manual is to provide the appropriate technical reference material and system operational procedures to ensure that ENSR field technicians are able to monitor and regulate the product recovery system at BOC Gases. This manual includes the following information: treatment goals, operational procedures, scheduled maintenance, and monitoring requirements; shutdown response procedures and troubleshooting; as-built drawings and system schematics; and Installation and Operation Manuals and/or cut sheets for equipment and instrumentation.

All monitoring frequencies discussed in this document are subject to modification if, after evaluation of the operating conditions of the system, it is decided that other frequencies are appropriate. The results will be documented and submitted to the DEP every six months in the Release Abatement Measure Status Report.

1.1 Site Background

Separate phase floating product (free product) was discovered at the BOC Gases facility at 37 Lawsbrook Road, Acton, MA (see Figure 1-Site Locus Map) during subsurface investigation activities, and reported to the MADEP on October 25, 1996. Additional wells and borings were installed in this area to assess the impact to soil and groundwater as part of a Phase I assessment. The area impacted with free product is limited to the parking lot and adjacent wooded area immediately east of the office building. This release was assigned release tracking number RTN 2-11461 by the MADEP and was classified as a Tier 1C site on October 23, 1997. A Phase II Comprehensive Site Investigation is underway to define the nature, extent and impact of this release.

Shortly after the release was detected (December 25, 1996), an Immediate Response Action (IRA) Plan was enacted which gauged and removed product from its initial location (MW-17S) and further assessed the source and extent of the release. The IRA was completed and a report submitted to the MADEP on June 20, 1997. The first RAM Plan for this site, consisting of multi-phase extraction pilot testing, was submitted on June 25, 1997 and was completed and a report submitted on December 31, 1998.

A second RAM Plan which is the subject of this report, was submitted to MADEP on May 4, 1999 and described a more rigorous free product (FP) removal approach for the area identified as being impacted by the release. The objective of that plan was to recover light non-aqueous phase liquids (LNAPL) through the installation of a product recovery system. A 120-Day RAM Status Report (#1) was submitted to MADEP on September 13, 1999 documenting the free product recovery system operation from its installation on May 26, 1999 through September 3, 1999. The second RAM Status Report (#2) addressed the operation of the free product recovery system from September 4, 1999 through February 18, 2000. The next RAM Status report is due in September 2000.

1.2 Treatment Goals

The remedial objective is to meet the MCP requirements by reducing the level of product in the wells to less than ½ inch. And ultimately for closure with no land use restrictions (Activity and Use Limitation). Therefore, the LNAPL present in the subsurface must be remediated to meet the health-based standards in the MCP by removing the LNAPL and by reducing the mobility and toxicity of the residual contaminants in the soil and groundwater.

1.3 System Description

1.3.1 Installation of the Free Product Recovery System

As discussed in the 1st RAM Status Report, six recovery wells (RW-1 through RW-6) were installed along the central axis of the free product plume. The six-inch diameter wells were installed to a total depth of approximately 65 feet below ground surface (bgs) with a 15-foot well screen. Groundwater was encountered at approximately 54 feet bgs. All wells are flush mounted. Approximately 300 linear feet of trenching was placed in order to install subsurface electrical and plumbing conduits from each well vault to a power/compressor station adjacent to the office building (see Figure 2). The station also includes a spill containment platform, which can accommodate four 55-gallon drums of recovered product. A control panel, which regulates air intake and discharge of three product skimmer pumps, was also installed next to the compressor.

Three product recovery devices were placed in various recovery wells over the last 6 months, depending on the presence of free product. The product recovery system consists of skimmer pumps, which employ a passive collection system (hydrophobic membrane) with pneumatic pumping of entrained product, connected to the compressor (via an air line) and a recovery drum (via a PVC product line). The skimmer pump floats at the product/water interface centralized around a three foot long vertical axis rod to account for groundwater depth fluctuations. The skimmer pumps are placed in the middle of well's product layer and checked occasionally for proper location.

The pneumatic control panel regulates the system with two timers that vary the cycle time and air flow rate of the skimmer pumps. The bladder pump creates a vacuum during its intake phase when product is drawn into it. During the discharge phase, the pressurized air is injected into the bladder that inflates. A check valve on the intake closes and the recovered product is forced through the product line into the collection container.

The system also has a pneumatic tank overfill sensor that shuts off the skimmer pump when the recovery tank (drum) is filled. As the pressure in the drum increases during filling, a sensor activates a switching valve that stops the air supply and disables the pump from recovering product. The product discharge tube and sensor must then be switched to an empty drum to re-activate the system. The three skimmer pumps are set in those wells that show the greatest product levels and are operated simultaneously to achieve maximum product removal. Periodic product level readings at the six recovery wells dictate where the skimmer pumps are placed.

2.0 REMEDIATION WASTE AND REMEDIAL WASTEWATER MANAGEMENT

Clean Harbors of Braintree has been retained to remove recovered product from the four drums located on the containment basin. ENSR must contact Clean Harbors when the 4 drum capacity is being approached to arrange for a pick up. The liquid waste is pumped out with a vac truck and disposed/recycled at Murphy's in Woburn. Uniform Hazardous Waste Manifest must be filled out for each pickup.

3.0 SYSTEM OPERATION

3.1 Startup Procedures

Refer to the attached appendices for air compressor and keck recovery system startup procedures.

3.2 System Monitoring

Data is collected by ENSR on a weekly and monthly basis. Appendix X includes data collection checklists for weekly, and monthly inspections. The following table summarizes the active system monitoring.

FREQUENCY	ACTIVITY
Weekly	Ensure system is operating and visually inspect piping, containment basin, drums and equipment
Weekly	By refering to the orientation of the ball valves on the manifold record which of the six lines are receiving air. The lines are numbered 1-6, from left to right.
Weekly	Drain the regulator of fluid
Weekly	Drain the compressor tank of fluid
Weekly	Record the pressure in the air compressor tank (maximum and minimum)
Weekly	Record the pressure in the regulator (maximum and minimum)
Weekly	Note the running time and down time of the air compressor
Weekly	Note the cycle time for the air distribution system
Weekly	Record the amount of product and water in each drum using a yard stick and the oil/water paste
Weekly	Record oil level in the air compressor. Add oil if necessary
Weekly	Note if product or water is seen flowing from the tube into the drum. Estimate the flow by recording the time it takes to fill up a small volumetric cylinder
Monthly	Record the condition of the containment basin and note whether it is retaining rain water and/or product.
Monthly	Test the automatic shut off valve and ensure that the connecting tubing is not pinched off or obstructed.

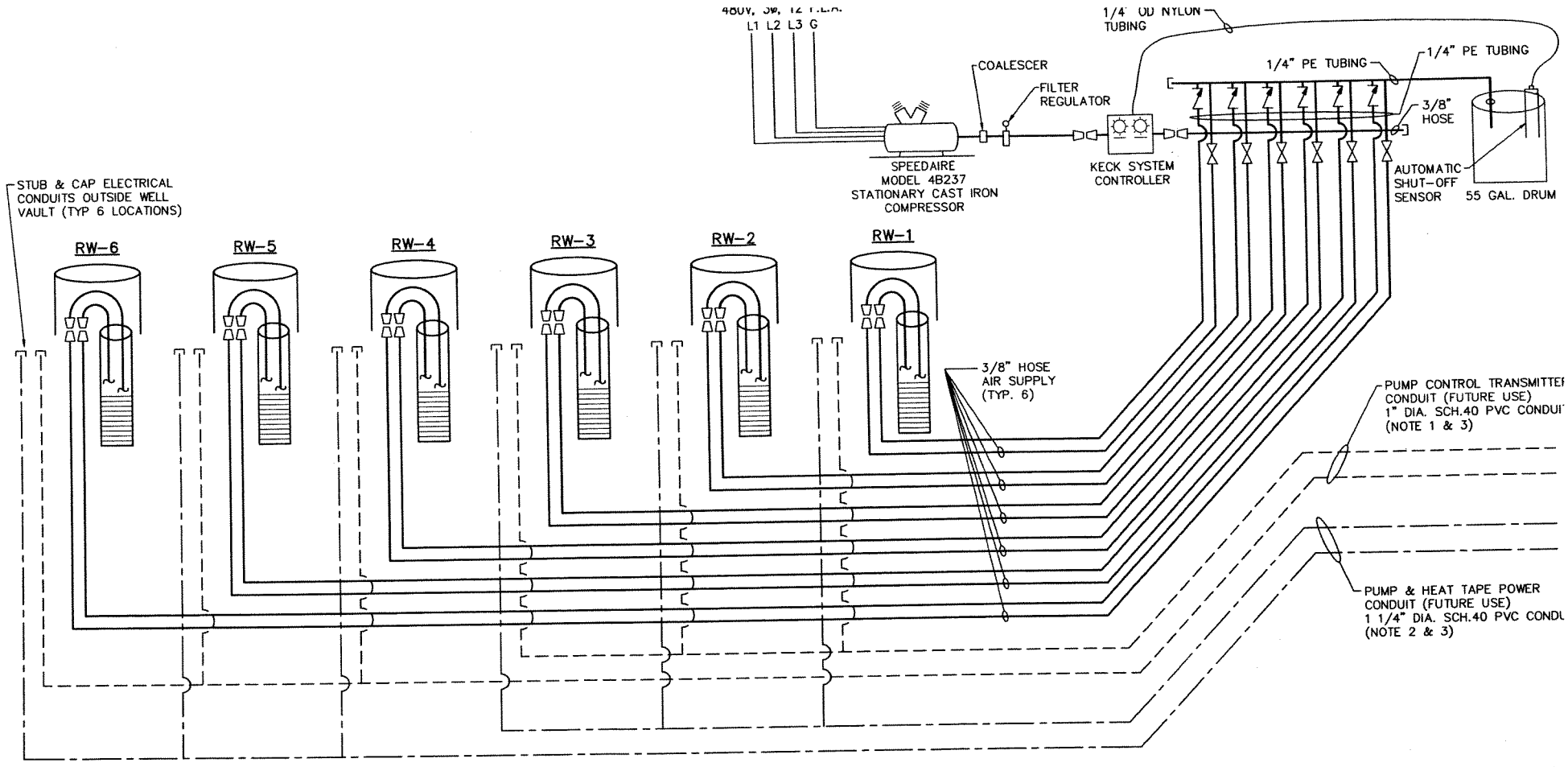
3.3 Treatment Area Monitoring

FREQUENCY	ACTIVITY
Weekly	Check that all the recovery wells and monitoring wells are plugged or caped, especially those that are flush mounted in low-lying areas.
Weekly	Observe and record whether product is flowing at the wells which have pumps (flowing quickly, flowing slow & steady, flowing intermittantly, product moving back and forth, no movement)
Weekly	Record the depth to water and depth to product in each recovery well (6" diameter) **and** the surrounding monitoring wells (2" diameter). Use a small diameter probe for those wells with pumps. Confirm suspect readings with a bailer.
Monthly	Check to ensure that the pumps are placed at the proper depth in the well (10" down from the contact with the liquid in the well – ie. 10" below the audible splash). The pumps will be secured at the proper depth by tying a knot in the rope attached to the pump and placing it in the cut away portion of the riser
Monthly	Check the air pressure at the wells with the air gauge

4.0 SCHEDULED MAINTENANCE

Operation	Daily	Weekly	Monthly	Quarterly
Check Oil Level	♥			
Drain Tank	♥			
Check Air Filter		☻		
Check Safety Valve		☻		
Blow Dirt From Inside Motor		☻		
Check Belt Tightness			♣	
Change Oil				♠

FIGURES



NOTES:

1. PUMP CONTROL CONDUIT TO BE INSTALLED EMPTY, STUBBED & CAPPED AT EACH END. PUMP CONTROL CONDUIT SHALL BE SIZED FOR 120VAC LEVEL TRANSMITTER WIRES (L1, L2, N FOR 3 WELLS, PLUS GROUND = 10 CONDUCTORS PER CONDUIT).
2. PUMP & HEAT TAPE POWER CONDUIT TO BE INSTALLED EMPTY, STUBBED & CAPPED AT EACH END. PUMP POWER 230VAC, 1ø, 60hz, 1.5 HP MOTOR, 11 F.L.A. (L1, L2 PLUS GROUND TO EACH WELL). HEAT TAPE POWER 230VAC, 1ø, 0.5 AMP/WELL (5 WATT/FT x 10 FT PER WELL) (L1, L2 PLUS GROUND) DAISY CHAIN HEAT TAPE TO ALL 3 WELLS IN EACH CONDUIT RUN. (TOTAL = 12 CONDUCTORS PER CONDUIT)
3. ELECTRICIAN TO DETERMINE FINAL SIZE OF CONDUIT TO MEET REQUIREMENTS OF NOTES 1 & 2.

LEGEND

- QUICK DISCONNECT COUPLING
- CAP
- BALL VALVE
- CHECK VALVE
- WELL VAULT
- RECOVERY WELL W/PRODUCT RECOVERY PUMP

FIGURE 3

ENSR

ENSR CONSULTING & ENGINEERING

PIPING & INSTRUMENTATION DIAGRAM
PRODUCT RECOVERY SYSTEM
BOC GASES
37 LAWSBROOK ROAD
ACTON, MA

DRAWN BY:	DATE:	PROJECT NO.
K.P.B.	2/03	00035-142

0035A28B

KECK INSTRUMENTS, INC.
☐ Phone (800) 542-5681

PRS
Product Recovery System

Instruction Manual

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INTRODUCTION

The Keck PRS Product Recovery System has been designed to efficiently collect free floating hydrocarbons in 2 inch or larger monitoring wells. The system consists of a floating skimmer attachment, a control panel that can be mounted indoors or out, a stainless steel bladder pump, a pneumatic tank overfill sensor, and an air compressor.

The PRS' unique skimmer incorporates both a density float and a hydrophobic filter which differentiate between floating hydrocarbons and water. The float follows water table fluctuations and places the filter at the water/product interface. As the system cycles, product is drawn through the hydrophobic filter and transferred to the pump through a coiled hose and the skimmer shaft.

The pneumatic control panel regulates the system and features two timers which vary the cycle time and flow rate of the skimmer pump. The control panel also contains a pneumatic tank full shut off sensor which shuts off the pump when the recovery tank is filled.

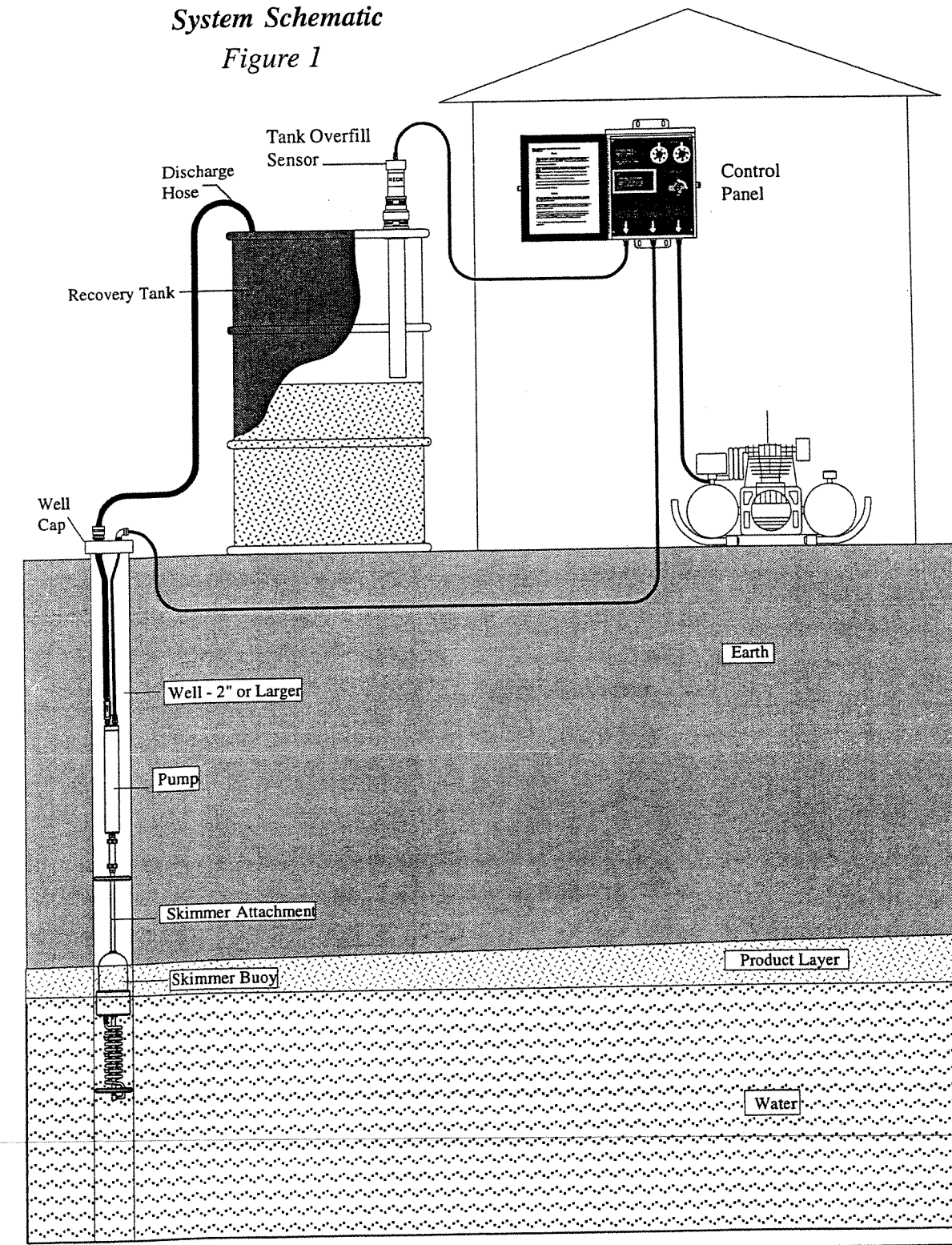
The stainless steel bladder pump has a two-phase pumping cycle. During the first phase--pump intake--pressurized air is vented to the surface, creating a vacuum. This vacuum closes the top discharge check valve and opens the bottom intake check valve, causing product to be drawn through the skimmer buoy into the pump.

During the second phase--pump discharge--pressurized air is injected into the pump bladder, causing it to expand within the pump body. This action closes the bottom intake check valve and opens the top discharge check valve, forcing the recovered product from the pump up to the surface.

The tank full shut off sensor system consists of a sensor tube and a switching valve. The sensor tube is installed in the recovery tank's 2 inch bung opening. As the recovery tank fills, the rising pressure is transmitted to the switching valve located in the control panel. When the pressure reaches the activation point (an indication of a filled recovery tank) the switching valve stops the air supply to the timers and disables the pump from recovering product or overfilling the recovery tank. After the tank is emptied, the tank full shut off protection valve will automatically reset, allowing the system to resume normal operation.

System Schematic

Figure 1

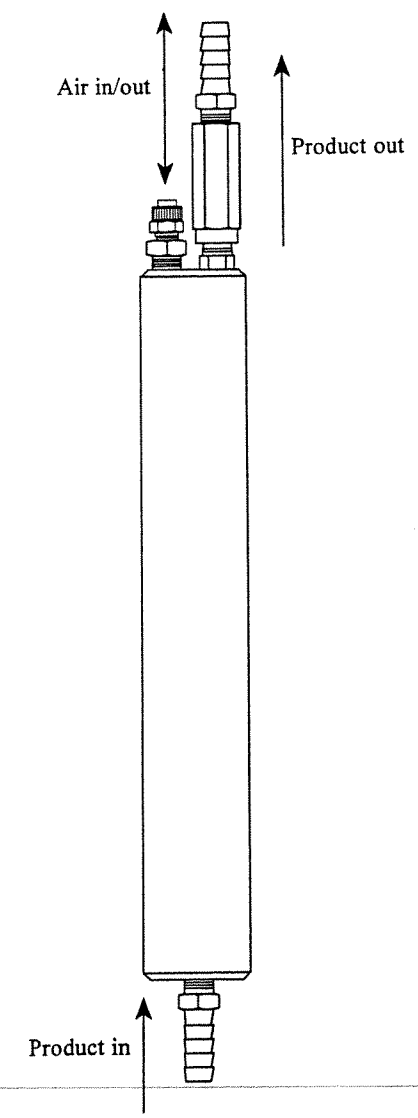


System Components

Pump

The Keck PRS Product Recovery System utilizes an air driven bladder pump. The pump consists of a stainless steel outer housing, top and bottom check valves, and a flexible inner bladder. The pump is designed for pumping liquids only; any solids (silt, dirt, etc.) may reduce its performance or cause the pump to malfunction.

Figure 2

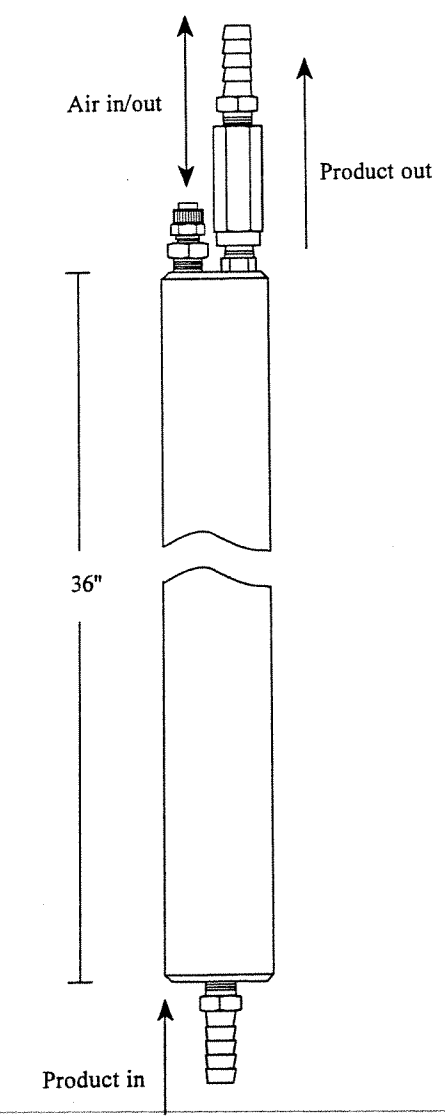


System Components

Optional High-Capacity Pump

The Keck PRS Product Recovery System also offers an optional high-capacity pump. The pump is constructed the same as the standard PRS pump, but gives twice the flow rate of recovery.

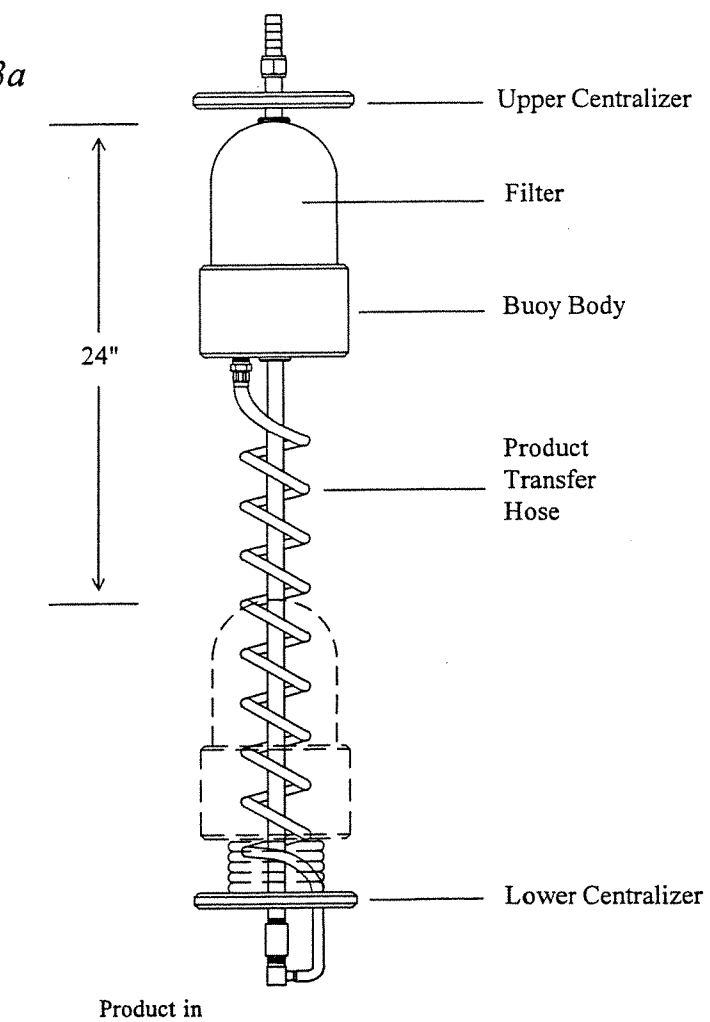
Figure 2a



Standard Skimmer Attachment *(4" skimmer shown)*

The PRS' standard skimmer attachment is designed to recover light fuels, skimming down to a sheen over a 2 foot travel range (1 foot travel for the 2 inch skimmer), and will not pump water unless forcibly submerged. Up to 5 feet of travel (4 inch skimmer only) is available on a custom order basis. The skimmer is connected to the bottom of the pump, and consists of a floating collection buoy, a coiled product transfer hose, and a transfer shaft with centralizers placed at the top and bottom.

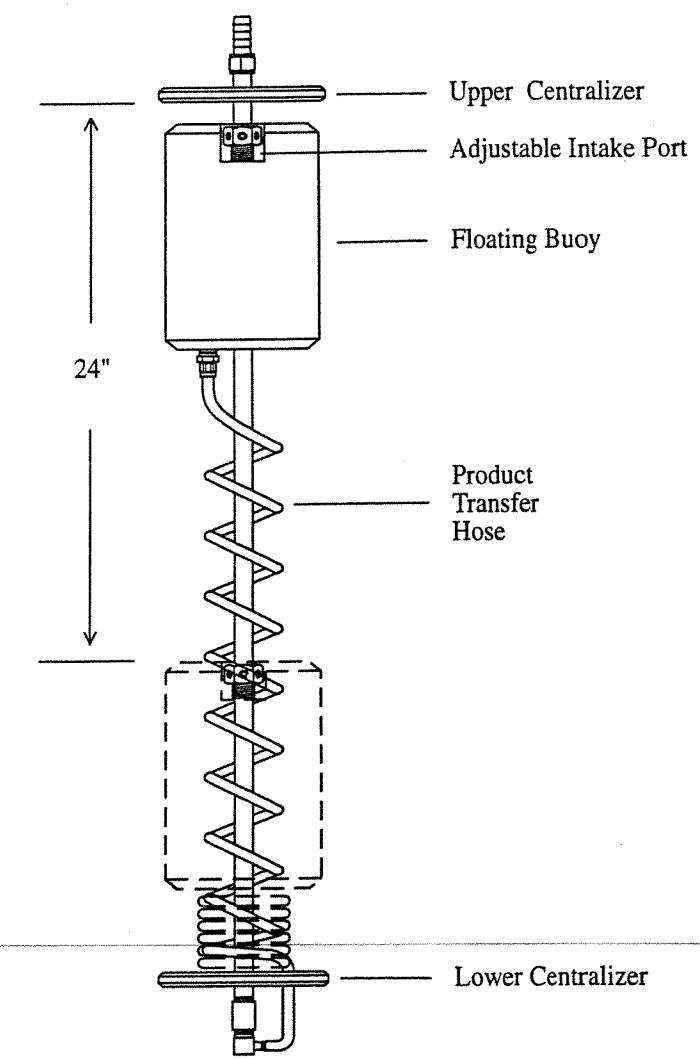
Figure 3a



Optional Oil Skimmer Attachment

The PRS' optional oil skimmer attachment is designed to recover a range of fluids from gasoline to gear oil, skimming down to .01 feet in 4 inch and larger wells. The skimmer is connected to the bottom of the pump, and consists of a floating collection buoy, a coiled product transfer hose, and a transfer shaft with centralizers placed at the top and bottom. The buoy can travel a distance of 2 feet between these centralizers. The skimmer intake can be fine tuned by adjusting the fitting on the buoy: turn the fitting clockwise to lower the intake relative to the product/water interface, or turn it counter-clockwise to raise the intake away from the interface.

Figure 3b

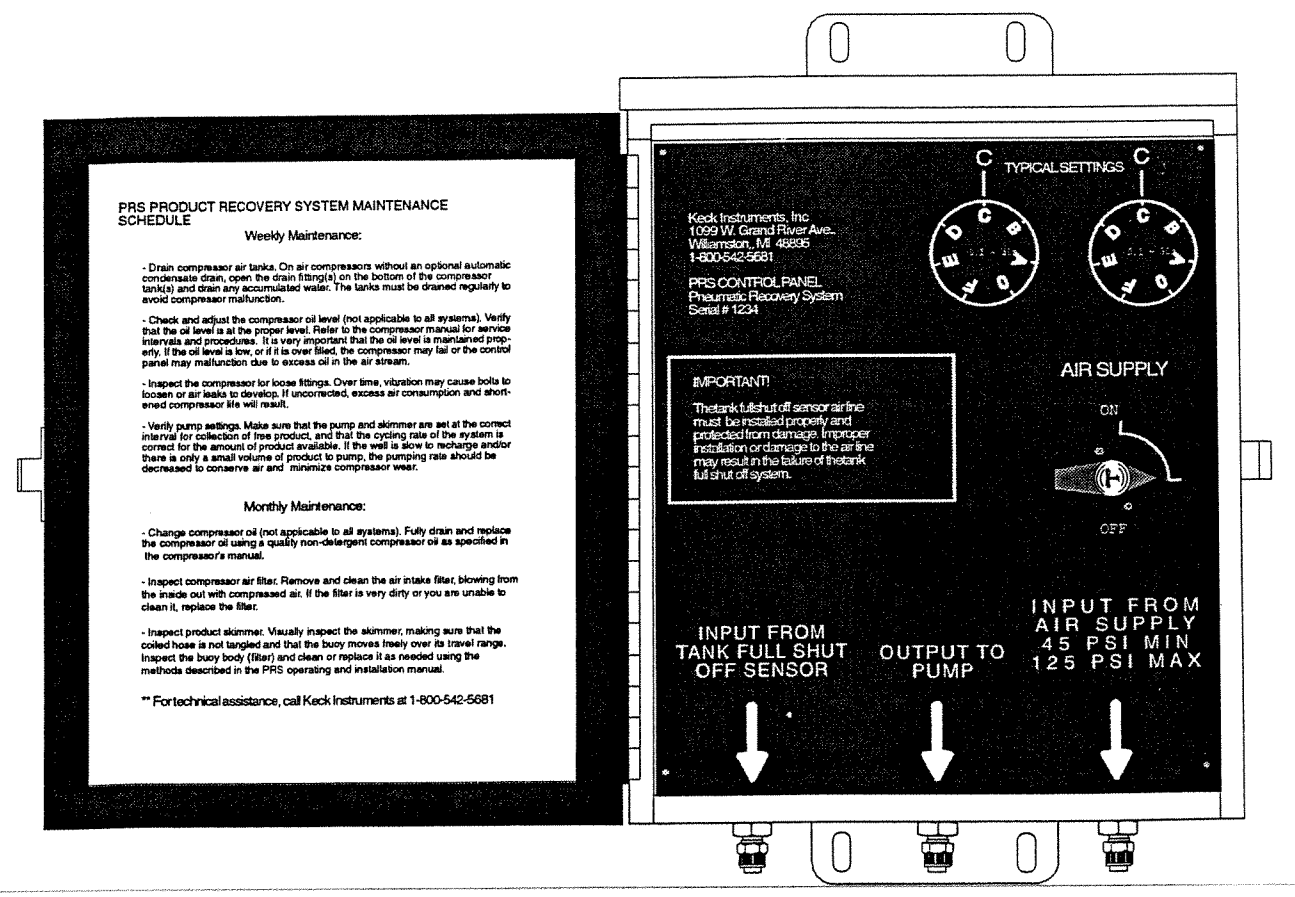


PRS System Control Panel

The air-driven pump controller is the "heart" of the PRS Product Recovery System. The controller uses two timers to vary the pumping rate of the system, independently controlling the discharge time and the recharge time of the pump. A clean, dry air source that can deliver one cubic foot per minute (CFM) at 90 psi will adequately allow the controller to drive one pump. Up to four pumps can be run from one controller with a commercial air supply of at least 4 CFM at 90 psi.

PRS System Control Panel

Figure 4



Air Supply

The standard single or dual pump PRS system is supplied with a 115V 1¼ hp or 2 hp oil-less air compressor. Larger multiple well head systems typically use a 1.5 hp or larger oil lubricated air compressor.

Oil lubricated air compressors usually require the installation of the intake air filter and the filling of the oil sump before operation. The filter and appropriate oil are provided with the compresssor. Refer to the instructions provided with the air compressor for set-up procedures.

The oil-less air compressors require a 115V 15 amp circuit, and the oil lubricated air compressors require at least a 115V 20 amp circuit (depending on the model). To avoid electrical overload, do not use an extension cord or plug any other equipment into the same circuit as the compressor.

An automatic tank drain and an air dryer may be required for the air compressor if the system is operating in very humid conditions.

Bottled air may be used to operate the PRS if operating an air compressor is not feasible. A high pressure regulator must be used to reduce the air pressure to the range of 45 - 125 psi. Pressures outside of this range may cause the system to malfunction.

Important

The air compressor must be kept as cool as possible. If placing the compressor in an enclosure, it must be well ventilated and a fan may be required for proper cooling.

Product Recovery Tank

A product recovery tank is not provided with the PRS. A tank with a 2 inch bung opening for the overfill sensor tube, a product inlet opening, and a vent are required for proper operation -- typically a 55 gallon drum or other suitable container. Check local and state regulations regarding fuel storage before selecting a recovery tank.

Air Line and Discharge Hoses

Protect the supplied air lines and hoses for the pump, controller, and recovery tank from damage. Conduit or PVC pipe buried below grade will provide adequate line protection. The dimensions of air line and hose to the listed devices are as follows:

Compressor/Pump Air Line (White)	1/4" O.D. x 150 ft.
Controller to Tank Full Shut Off Sensor (Black)	1/4" O.D. x 50 ft.
Product Discharge Line (Black)	5/8" O.D. x 100 ft.

Installation Guidelines

To successfully plan the installation of the PRS Product Recovery System, use the following guidelines to determine a suitable location for the control panel, air compressor, and recovery tank (also refer to page 2, Figure 1, *System Schematic*):

1. Do not locate the compressor in areas where there may be explosive vapors. Compliance with Chapter 5 of the National Electric Code Handbook and any local codes is essential for an electrically safe installation. The compressor requires a cool, well ventilated environment to operate efficiently, and may require an air dryer in freezing or humid conditions.

2. The PRS controller is designed for either indoor or outdoor installation, and must be mounted vertically. Locate the controller as close as possible to the well head for best performance.

3. The product recovery tank should be located within 50 feet of the controller when the tank full shut off sensor is used.

4. Run all system air lines and discharge hoses through pipe or conduit to protect the lines from damage.

5. All air line connections must be installed properly for the system to function correctly. When cutting the air line, the cut must be clean and square. When inserting the air line into compression fittings, push the air line firmly into the fitting, hand tighten the compression nut, and then tighten one more full turn with a wrench.

System Installation

1. Cut a length of the provided air line and connect it from the output of the air compressor to the port labeled "INPUT FROM AIR SUPPLY" on the control panel.

2. Remove the inner ring of the well cap, and secure it to the well casing using the three set screws located on the perimeter of the ring.

3. Calculate the amount of air line and discharge hose required to suspend the pump and skimmer in the well. Determine the static water level, subtract 46 inches (38 inches for the 2 inch skimmer) from the reading, and measure out this amount of air line and discharge hose. For the optional high-capacity pump, subtract 63 inches (55 inches for the 2" skimmer) from the reading. Pull the measured lengths of air line and discharge hose through the fittings on the well cap, and fully tighten the compression fittings. The well cap will suspend the pump and skimmer by the discharge hose, setting the skimmer buoy at the midpoint of its travel range.

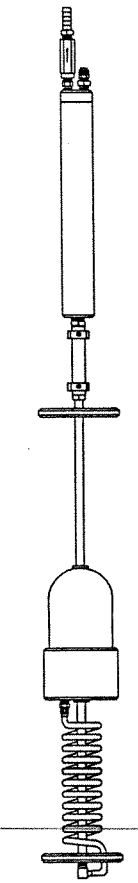
4. Attach the air line and discharge hose to the pump using the provided compression fitting and hose clamp respectively, and set the pump and skimmer in the well.

5. Connect the free end of the pump air line to the controller fitting labeled "OUTPUT TO PUMP" (see figure 4 on page 7).

6. Connect the free end of the product discharge hose to the product recovery tank.

7. Install the black tank full shut off sensor air line between the tank full shut off sensor tube and the controller fitting labeled "INPUT FROM TANK FULL SHUT OFF SENSOR" (see figure 4 on page 7).

Pump and Skimmer Assembly
Figure 5



System Operation

1. Start the air compressor. Two pressure gauges, a pressure switch, an air valve, and a pressure regulator are located on the top of the compressor air tank(s). The main pressure gauge shows the total tank pressure, and the other (mounted on the regulator at the air outlet) shows the useable outlet air pressure. The pressure switch has a lever with two positions. Move the lever to the "AUTO" position, and the compressor will run until the tank pressure reaches 125 psi. Turn the air valve on and verify that the pressure shown on the regulator gauge reads between 75 and 95 psi. If the setting is outside of this range, adjust the pressure by rotating the knob on the regulator.

2. Verify that the controller's pump intake and pump discharge timers are on the "C" setting as indicated on the controller faceplate. Turn the air valve on the control panel to the "ON" position. The system will now begin to cycle and recover product.

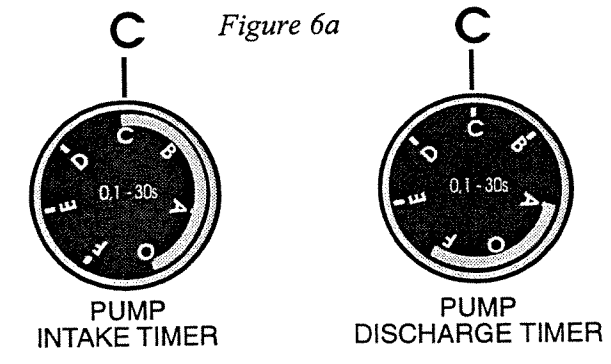
3. Test the tank full shut off protection system by immersing the sensor tube in a pail of water (at least 10 inches deep) while the system is cycling. Within one cycle, the sensor will shut off the air supply to the control panel. When you remove the sensing tube from the water, the panel will resume operation. If the system does not function as described, check the fittings at both the controller and sensing tube, and check for kinks in the sensor air line. Install the sensing tube in a 2 inch bung opening on the discharge tank.

System Operation (continued)

4. The pumping rate is pre-set and need not be adjusted further. If there is a large volume of product, or a minimal amount of product in the well, the pumping rate may be adjusted by referring to the following illustrations. **DO NOT USE THE SETTINGS IN THE LIGHTLY SHADED AREA ON THE DIALS.**

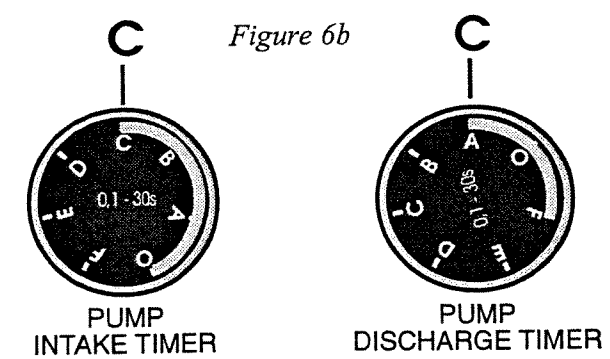
A. Normal (default) setting

Figure 6a



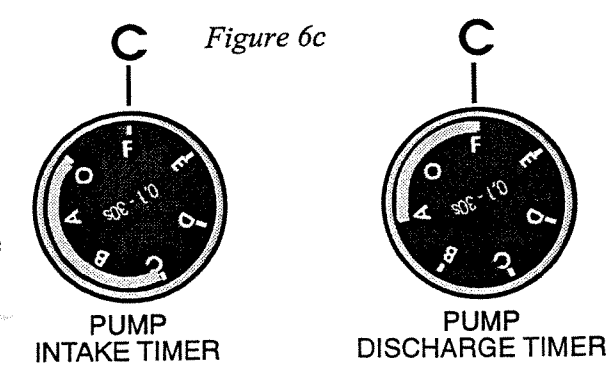
B. Maximum pumping rate

Figure 6b



C. Minimum pumping rate. The pumping rate may be further reduced by reducing the system air pressure (45 psi minimum).

Figure 6c



CARE AND MAINTENANCE

Skimmer Buoy Cleaning

If the pump will not recover product from the well, the hydrophobic filter on the skimmer buoy may be plugged. To clean the filter of the skimmer buoy, disconnect the coiled tubing from the hose barb on the bottom of the buoy, and connect it to the air line from the air compressor. Purge air through the buoy, forcing out any solids that may be blocking flow through the buoy. This procedure is most effective when the buoy is saturated with product. If the purging is ineffective, refer to the assembly drawing (figure 7 on page 18) and proceed as follows:

1. Remove the buoy from the skimmer assembly and disassemble the buoy. Clean the hydrophobic buoy filter with a mild abrasive household soap.

2. The buoy filter may also be cleaned by spraying the buoy filter from the inside out using a pressure washer or a steam cleaner. If using a steam cleaner, be sure that the temperature does not exceed 103°C (266°F) or the filter will be permanently damaged.

3. Rinse the buoy with clean water and make sure it is completely dry before reinstalling on the skimmer.

4. If these cleaning procedures are ineffective, the buoy filter must be replaced. Discoloration of the buoy filter is normal and does not indicate that the filter needs replacement. Inexpensive replacement buoy filters are readily available from Keck Instruments.

Bladder Replacement

The pump is fitted with a field replaceable bladder for easy repairing on the job site.

1. Remove the three allen screws that attach the top cap to the pump body and pull the top cap off.

2. Unscrew the old bladder and screw on the new one. The bladder can be tightened snugly using two 9/16" open-end wrenches.

3. Re-assemble the pump.

Weekly Maintenance

1. Turn the air compressor off. Drain compressor air tanks. On air compressors without an optional automatic condensate drain, open the drain fitting(s) on the bottom of the compressor tank(s) and drain any accumulated water. The tanks must be drained regularly to avoid compressor malfunction.

2. Check and adjust the compressor oil level (not applicable to all systems). Verify that the oil is at the proper level. Refer to the compressor manual for service intervals and procedures. It is very important that the oil level is maintained properly. If the oil level is low, or if it is over filled, the compressor may fail, or the control panel may malfunction due to excess oil in the air stream.

3. Inspect the compressor for loose fittings. Over time, vibration may cause bolts to loosen or air leaks to develop. If uncorrected, excess air consumption and shortened compressor life will result.

4. Verify pump settings. Make sure that the pump and skimmer are set at the correct interval for collection of free product, and that the cycling rate of the system is correct for the amount of product available. If the well is slow to recharge and/or there is only a small volume of product to pump, the pumping rate should be decreased to conserve air and minimize compressor wear.

*** For technical assistance, call Keck Instruments at 1-800-542-5681***

Monthly Maintenance

1. Turn the air compressor off. Drain compressor air tanks. On air compressors without an optional automatic condensate drain, open the drain fitting(s) on the bottom of the compressor tank(s) and drain any accumulated water. The tanks must be drained regularly to avoid compressor malfunction.

2. If the supplied compressor is oil lubricated, change the compressor oil. Fully drain and replace the compressor oil using a quality non-detergent compressor oil as specified in the compressor's operating instructions.

3. Inspect the compressor's air filter. Remove and clean the air intake filter, blowing from the inside out with compressed air. If the filter is very dirty, or you are unable to clean it, replace the filter.

4. Inspect the product skimmer. Visually inspect the skimmer, making sure that the coiled hose is not tangled and that the buoy moves freely over its travel range. Inspect the buoy filter and clean or replace it as needed using the methods described in the section of this manual on skimmer buoy cleaning (see page 13).

5. Verify pump settings. Make sure that the pump and skimmer are set at the correct interval for collection of free product, and that the cycling rate of the system is correct for the amount of product available. If the well is slow to recharge and/or there is only a small volume of product to pump, the pumping rate should be decreased to conserve air and minimize compressor wear.

*** For technical assistance, call Keck Instruments at 1-800-542-5681***

TROUBLESHOOTING

For technical assistance, please contact Keck Instruments, Inc.
1-800-542-5681

Problem: PRS Product Recovery System discharges air only, no product.

A. Product has been removed.
   A. Decrease the pumping rate to conserve air.

B. Controller cycling too fast, pumping rate exceeds product recharge rate.
   B. Decrease the pumping rate by adjusting the pump intake controls.

C. Fluid level is below skimmer assembly.
   C. Readjust the system as outlined in "*System Installation*" section of this manual (page 10).

Problem: Compressor is not operating.

A. Fuse or circuit breaker open from electrical source.
   A. Replace the fuse or reset the circuit breaker.

B. Extension cord is inadequate for the amperage of the compressor motor.
   B. Avoid using an extension cord, or obtain a larger wire gauge to supply the air compressor.

C. Electrical circuit not rated for compressor motor.
   C. Use a circuit with larger amperage rating.

D. Compressor selector switch is disengaged (UP).
   D. Move the selector switch to the auto (DOWN) position.

Problem: Pump discharges water only.

A. Water level has exceeded the allowable travel of the skimmer buoy.
   A. Pull the pump and skimmer out of the well and purge water out of the buoy by allowing the system to cycle for several minutes. The hydrophobic filter must be dry before reinstalling. Refer to the "*System Installation*" section of this manual (page 10) and reset the pump and skimmer.

B. Pump and skimmer have been installed below the water level.
   B. Refer to the step A. above. Readjust the system as outlined in the "*System Installation*" section of this manual (page 10).

C. Coiled product hose is tangled.
   C. Adjust the coiled hose, and verify that the buoy moves freely over its travel range. Refer to the "*System Installation*" section of this manual (page 10) and reset the pump and skimmer.

TROUBLESHOOTING (CONTINUED)

Problem: Pump does not pump air or product.

A. Filter material on the skimmer buoy is plugged.

A. Clear the filter of debris. Refer to the "*Care and Maintenance*" section of this manual page 13) for skimmer buoy cleaning instructions.

B. One or both of the check valves are not opening.

B. Turn off the air supply at the compressor. Referring to figure 7 on page 18, remove the product transfer hose from the hose barb at the bottom of the transfer shaft. Disconnect the compressor air line at the control panel, and hold the free end to the bottom of the transfer shaft. Turn on the air at the compressor and blow air through the shaft, which will free any stuck check valves. Re-connect the air line and transfer hose, and reset the pump and skimmer in the well.

Problem: Pump does not discharge product.

A. Discharge hose plugged or damaged.

A. Verify that the discharge hose is clear and undamaged.

B. Viscosity of the product is too thick for the hydrophobic buoy filter.

B. Consult Keck Instruments' technical staff at 1-800-542-5681.

Problem: The pump controller does not cycle.

A. Air source restricted or contaminated.

A. Check for kinked air lines.

B. Air valve closed.

B. Turn the valve on the controller's faceplate to the "ON" setting. Refer to page 12, "*System Operation*", and make sure the timers are set correctly.

C. Product recovery tank is full.

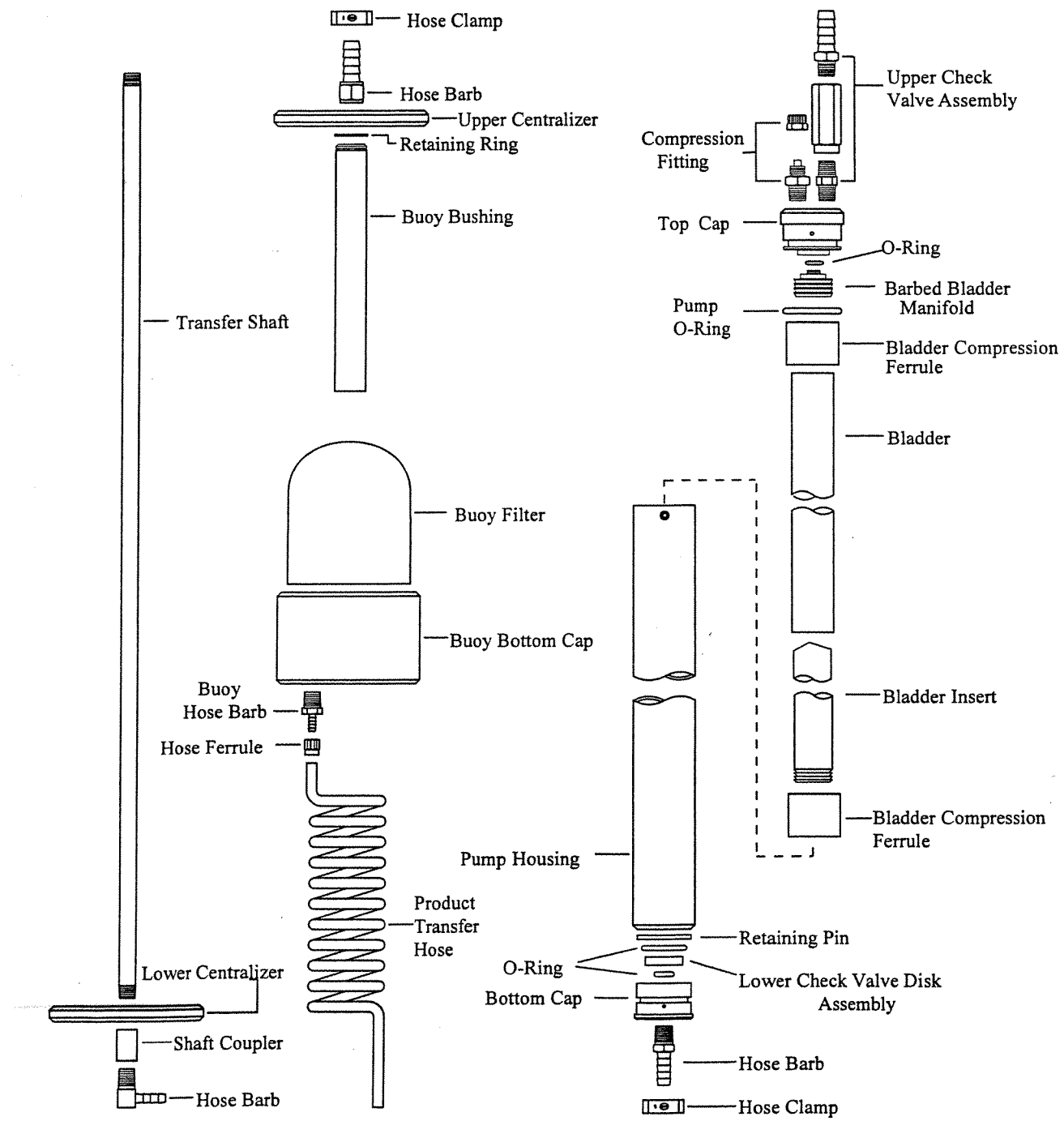
C. Turn the valve on the controller's faceplate to the "OFF" setting. Empty the recovery tank, and turn the valve to the "ON" position. The system will now resume operation.

D. Air supply operating pressure is too low or too high.

D. Adjust the air supply to 45-125 psi.

Pump and Skimmer Parts List *(4" Skimmer shown)*

Figure 7



Speedaire® Compresseurs d'Air Stationnaires

Guide de Dépannage (Suite)

Symptome	Cause(s) Possible(s)	Mesure Corrective
Usure de courroie excessive	1. Poulie hors d'alignement 2. Courroie trop serrée ou desserrée 3. Patinage de courroie 4. Poulie tremblante	1. Aligner la poulie du moteur avec la poulie du compresseur 2. Ajuster la tension (Voir section de Courroies d'Entrainement) 3. Ajuster la tension ou remplacer la courroie (Voir section de Courroies d'Entrainement) 4. Vérifier pour un vilebrequin, rainure de clavette ou alésage de poulie résultant du fonctionnement du compresseur ou du moteur avec poulies lâches. Vérifier pour des poulies ou vilebrequin courbés
Bruit excessif (cognement)	1. Poulie de moteur ou de compresseur lâche 2. Manque d'huile dans le carter 3. Bielle usée 4. Douille d'axe de piston usée 5. Roulements usés 6. Le piston frappe la plaque de soupape 7. Clapet bruyant	1. Le cognement des compresseurs est souvant le résultat de poulies de moteur ou de compresseurs desserrées. Serrer les boulons de serrage et les vis de pression de la poulie 2. Vérifier le niveau d'huile; si bas, vérifier pour des roulements endommagés. De l'huile sale peut causer l'usure excessive 3. Remplacer la bielle 4. Enlever les montages de piston du compresseur et les inspecter pour l'usure excessive. Remplacer l'axe de piston ou les pistons usés au besion 5. Remplacer les roulements usés et changer l'huile 6. Enlever la culasse et plaque de soupape du compresseur et les inspecter pour des dépots charbonneux ou autres matières étranges sur le piston. Remplacer la culasse et la plaque de soupape utilisant un nouveau joint d'étanchéité 7. Remplacer
L'huile dans l'air de décharge	1. Segments de piston usés 2. Arrivée d'air du compresseur obstrué 3. Reniflard obstrué 4. Huile excessif dans le compresseur 5. Huile de mauvaise viscosité 6. Bielle hors-d'alignement	1. Remplacer avec des nouveaux segments 2. Nettoyer le filtre. Vérifier pour d'autres restrictions dans le système d'arrivée 3. Nettoyer et vérifier le reniflard pour l'opération libre 4. Vider jusqu'au niveau plein 5. Utiliser l'huile Model 4ZF21 Rarus® 427 6. Remplacer la bielle
Fuite d'air dans l'appareil de déchargement sur le manostat	Clapet grippé dans la position ouverte	Enlever et remplacer le clapet **⚠ DANGER** ***Ne pas démonter le clapet s'il y a de l'air dans le réservoir.***

FRANCAIS

Fabriqué pour Dayton Electric Mfg. Co.
Niles, Illinois 60714 É.-U.

SPEEDAIRE®

Please read and save these instructions. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.

Speedaire® Stationary Air Compressors

Description

Air compressor units are intended to provide compressed air to power pneumatic tools and operate spray guns. The pumps supplied are oil lubricated. A small amount of oil carryover is present in the compressed air stream. Applications requiring air free of oil or water should have the appropriate filter installed. The air compressor unit must be mounted on a solid floor or solid ground. Any other use of these units will void the warranty and the manufacturer will not be responsible for problems or damages resulting from such misuse.

Safety Guidelines

This manual contains information that is very important to know and understand. This information is provided for SAFETY and to PREVENT EQUIPMENT PROBLEMS. To help recognize this information, observe the following symbols.

⚠ DANGER ***Danger indicates an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.***

⚠ WARNING ***Warning indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.***

⚠ CAUTION ***Caution indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury.***

⚠ NOTICE ***Notice indicates important information, that if not followed, MAY cause damage to equipment.***

Unpacking

After unpacking the unit, inspect carefully for any damage that may have occurred during transit. Make sure to tighten fittings, bolts, etc., before putting unit into service.

⚠ WARNING ***Do not operate unit if damaged during shipping, handling or use. Damage may result in bursting and cause injury or property damage.***

General Safety Information

Since the air compressor and other components (material pump, spray guns, filters, lubricators, hoses, etc.) used, make up a high pressure pumping system, the following safety precautions must be observed at all times:

1. Read all manuals included with this product carefully. Be thoroughly familiar with the controls and the proper use of the equipment.
2. Follow all local electrical and safety codes as well as the United States National Electrical Codes (NEC) and Occupational Safety and Health Act (OSHA).
3. Only persons well acquainted with these rules of safe operation should be allowed to use the compressor.
4. Keep visitors away and NEVER allow children in the work area.
5. Wear safety glasses and use hearing protection when operating the unit.
6. Do not stand on or use the unit as a handhold.
7. Before each use, inspect compressed air system and electrical components for signs of damage, deterioration, weakness or leakage. Repair or replace defective items before using.
8. Check all fasteners at frequent intervals for proper tightness.

⚠ WARNING ***Motors, electrical equipment and controls can cause electrical arcs that will ignite a flammable gas or vapor. Never operate or repair in or near a flammable gas or vapor. Never store flammable liquids or gases in the vicinity of the compressor.***

⚠ DANGER

Breathable Air Warning

This compressor/pump is NOT equipped and should NOT be used "as is" to supply breathing quality air. For any application of air for human consumption, you must fit the air compressor/pump with suitable in-line safety and alarm equipment. This additional equipment is necessary to properly filter and purify the air to meet minimal specifications for Grade D breathing as described in Compressed Gas Association Commodity Specification G 7.1 - 1966, OSHA 29 CFR 1910. 134, and/or Canadian Standards Associations (CSA).

DISCLAIMER OF WARRANTIES
IN THE EVENT THE COMPRESSOR IS USED FOR THE PURPOSE OF BREATHING AIR APPLICATION AND PROPER IN-LINE SAFETY AND ALARM EQUIPMENT IS NOT SIMULTANEOUSLY USED, EXISTING WARRANTIES ARE VOID, AND DAYTON ELECTRIC MFG. CO. DISCLAIMS ANY LIABILITY WHATSOEVER FOR ANY LOSS, PERSONAL INJURY OR DAMAGE.

⚠ WARNING ***Never operate compressor without a beltguard. This unit can start automatically without warning. Personal injury or property damage could occur from contact with moving parts.***

9. Do not wear loose clothing or jewelry that will get caught in the moving parts of the unit.

⚠ CAUTION ***Compressor parts may be hot even if the unit is stopped.***

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SPEEDAIRE®

Speedaire® Stationary Air Compressors

General Safety Information (Continued)

10. Keep fingers away from a running compressor; fast moving and hot parts will cause injury and/or burns.
11. If the equipment should start to vibrate abnormally, STOP the engine/motor and check immediately for the cause. Vibration is generally a warning of trouble.
12. To reduce fire hazard, keep engine/motor exterior free of oil, solvent, or excessive grease.

⚠WARNING ***An ASME code safety relief valve with a setting no higher than 150 psi MUST be installed in the tank for this compressor. The ASME safety valve must have sufficient flow and pressure ratings to protect the pressurized components from bursting.***

⚠ CAUTION ***See compressor specification decal for maximum operating pressure. Do not operate with pressure switch or pilot valves set higher than the maximum operating pressure.***

13. Never attempt to adjust ASME safety valve. Keep safety valve free from paint and other accumulations.

⚠ DANGER

Never attempt to repair or modify a tank! Welding, drilling or any other modification will weaken the tank resulting in damage from rupture or explosion. Always replace worn, cracked or damaged tanks.

⚠WARNING ***Drain liquid from tank daily.***

14. Tanks rust from moisture build-up, which weakens the tank. Make sure to drain tank regularly and inspect periodically for unsafe conditions such as rust formation and corrosion.
15. Fast moving air will stir up dust and debris which may be harmful. Release air slowly when draining moisture or depressurizing the compressor system.

SPRAYING PRECAUTIONS

⚠WARNING

Do not spray flammable materials in vicinity of open flame or near ignition sources including the compressor unit.

16. Do not smoke when spraying paint, insecticides, or other flammable substances.
17. Use a face mask/respirator when spraying and spray in a well ventilated area to prevent health and fire hazards.
18. Do not direct paint or other sprayed material at the compressor. Locate compressor as far away from the spraying area as possible to minimize overspray accumulation on the compressor.
19. When spraying or cleaning with solvents or toxic chemicals, follow the instructions provided by the chemical manufacturer.

Assembly

⚠WARNING

Disconnect, tag and lock out power source, then release all pressure from the system before attempting to install, service, relocate or perform any maintenance.

OIL DRAIN EXTENSION

Some models include an oil drain extension and cap (found with the owner's manual). Install the oil drain extension and cap **before adding oil to the pump**. To avoid oil leaks, it is highly recommended to apply Teflon® tape or plumber's putty to the threads on each end of the oil drain extension. Screw the cap onto one end of the extension. Remove the oil drain plug from the base of the pump and install the oil drain extension (See Figure 1).

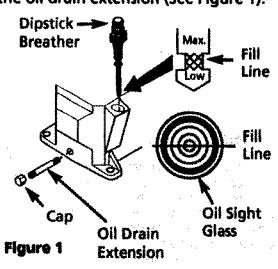


Figure 1

NOTE: If your model is equipped with an oil sight glass, add oil to the fill line (See Figure 1).

LUBRICATION

⚠ CAUTION ***THIS UNIT CONTAINS NO OIL! Follow lubrication instructions before operating compressor.***

Ensure oil drain extension has been installed (if included) then remove the dipstick/ breather and fill pump with oil according to the chart. Use single viscosity, ISO100 (SAE 30), non-detergent compressor oil; Mobil Rarus® 427 (Stock No. 4ZF21), available at your local branch.

Model	Oil Capacity (approx.)
4B232, 4B233, 4B234	11.5 oz.
4B236, 4B237	16 oz.
4YN52	22 oz.

Do not use a multi-viscosity oil such as 10W-30. Proper oil fill is illustrated in Figure 1.

ADDITIONAL HARDWARE NEEDED

Purchase necessary regulator, plumbing and filtration devices to attach to compressor. Make sure pressure ratings of added components exceed that of the compressor.

Installation

LOCATION

It is extremely important to install the compressor in a clean, well ventilated area where the surrounding air temperature will not be more than 100°F. A minimum clearance of 18 inches between the compressor flywheel or fan and a wall is required because objects could obstruct air flow.Do not locate the compressor air inlet near steam, paint spray, sandblast areas or any other source of contamination.

TANK MOUNTING

The tank should be bolted to a concrete floor or on a separate concrete foundation. Vibration isolators should be used between the tank leg and the floor. When using isolator pads, do not draw bolts tight. Allow the pads to absorb vibrations. A flexible coupling should be installed between the tank and service piping. The air compressor should be mounted on a flat, even surface.

Cast Iron Series

Installation (Continued)

⚠ CAUTION ***Never use the wood shipping skids for mounting the compressor.***

INSTALLING A SHUT-OFF VALVE

A shut-off valve should be installed on the discharge port of the tank to control the air flow out of the tank. The valve should be located between the tank and the piping system.

⚠WARNING ***Never install a shut-off valve between the compressor pump and the tank. Personal injury and/or equipment damage may occur.***

PIPING

⚠WARNING ***Never use plastic (PVC) pipe for compressed air. Serious injury or death could result.***

Bury underground lines below the frost line and avoid pockets where condensation can gather and freeze. Apply air pressure to the piping installation and make sure all joints are free from leaks BEFORE underground lines are covered. Before putting the compressor into service, find and repair all leaks in the piping, fittings and connections.

ELECTRICAL INSTALLATION

⚠WARNING

All wiring and electrical connections must be performed by a qualified electrician. Installations must be in accordance with local and national codes.

GROUNDING

This product must be grounded. If the unit comes with a factory installed cord, plug the cord into a properly sized, grounded outlet. For units that do not have a factory installed cord, install permanent wiring from the electrical source to the pressure switch with a ground conductor connected to the grounding screw on the pressure switch. A properly sized cord with a ground conductor and plug may also be installed by the user.

⚠ DANGER

Improperly grounded motors are shock hazards. Make sure all the equipment is properly grounded.

WIRING

Local electrical wiring codes differ from area to area. Source wiring, plug and protector must be rated for at least the amperage and voltage indicated on the motor nameplate, and meet all electrical codes for this minimum. Use a slow blow fuse type T or a circuit breaker.

⚠ CAUTION ***Overheating, short circuiting and fire damage will result from inadequate wiring.***

When the compressor unit is connected to the electrical supply by permanent wiring, an approved disconnect device must be installed in the circuit.

Do not use the pressure switch as a disconnect while performing service on the compressor unit. A circuit break may be used as a disconnect if it is visible from the compressor and can be locked in the open or off position.

If the motor does not have built-in protection, an overload device must be installed in the supply circuit. Consult the approriate codes for acceptable thermal protection. Some 3 Phase motor installations will require a magnetic starter as shown in Figure 2.

NOTE: Terminal configuration may vary. Check the pressure switch markings on your unit!

Operation

Refer to Figure 3 to locate the following items.

Pressure Switch - Auto/Off Switch. On some models there is no manual switch. The switch is permanently in the auto mode. In the AUTO position, the compressor shuts off automatically when tank pressure reaches the maximum preset pressure. In the OFF position, the compressor will not operate. This switch should be in the OFF position when connecting or disconnecting the power cord from the electrical outlet or when changing air tools.

For units without a manual switch, whenever the procedures call for turning the switch to the OFF position, use the switch at the disconnect device instead.

Regulator - A regulator controls the amount of air pressure released at the hose outlet.

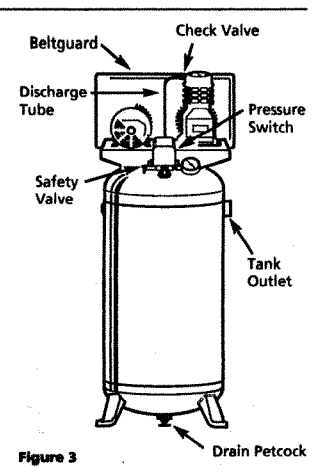


Figure 3

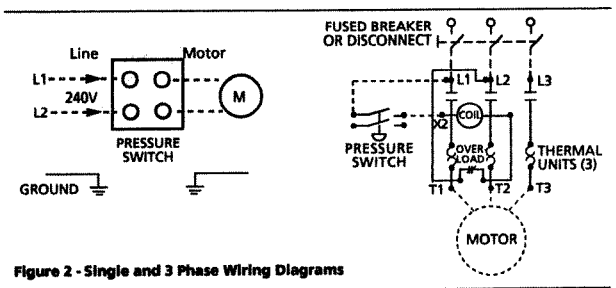


Figure 2 - Single and 3 Phase Wiring Diagrams

SPEEDAIRE®

Speedaire® Stationary Air Compressors

Operation (Continued)

ASME Safety Valve - This valve automatically releases air if the tank pressure exceeds the preset maximum.

Discharge Tube - This tube carries compressed air from the pump to the check valve. This tube becomes very hot during use.

⚠WARNING

To avoid the risk of severe burns, never touch the discharge tube.

Check Valve - One-way valve that allows air to enter the tank, but prevents air in the tank from flowing back into the compressor pump.

Belt Guard - Covers the belt, motor pulley and flywheel.

⚠WARNING

Never operate compressor without a beltguard. This unit can start automatically without warning. Personal injury or property damage could occur from contact with moving parts.

Drain Petcock - This valve is located on the bottom of the tank. Use this valve to drain moisture from the tank daily to reduce the risk of corrosion. Reduce tank pressure below 10 psi, then drain moisture from tank daily to avoid tank corrosion. Drain moisture from tank(s) by opening the drain petcock located underneath the tank.

RECOMMENDED BREAK-IN PERIOD

The compressor should be run continuously for one hour to allow proper seating of the piston rings.

1. Open drain cock completely and run the compressor for 60 minutes.

If the compressor is run under humid conditions for short periods of time, the humidity will condense in the crankcase and cause the oil to look creamy. Oil contaminated by condensed water will not provide adequate lubrication and must be changed immediately. Using contaminated oil will damage bearings, pistons, cylinders and rings and is not covered under warranty.

NOTE: To avoid water condensation in the oil, periodically run the compressor with tank pressure near 120 psi for single stage compressors by opening the drain cock or air valve connected to the tank or hose.

Run the pump for an hour at a time at least once a week or more often if the condensation reoccurs.

2. Turn off the compressor and close drain cock. The compressor is now ready for use.

START-UP (SEE FIGURE 4)

⚠ NOTICE ***This compressor pump must be filled with oil before startup. See Lubrication section.***

⚠ CAUTION ***Do not attach air tools to open end of the hose until start-up is completed and the unit checks OK.***

1. Remove the dipstick breather and fill pump to the proper oil level. See Lubrication section.
2. Turn pressure switch lever to OFF position and plug in power cord (See Figure 5).

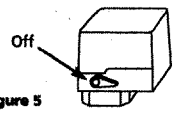


Figure 5

3. Turn pressure switch lever to AUTO position and run unit for 30 minutes to break in the pump parts (See Figure 6).

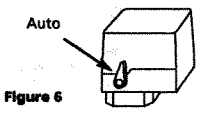


Figure 6

4. After use, turn pressure switch lever to the OFF position.

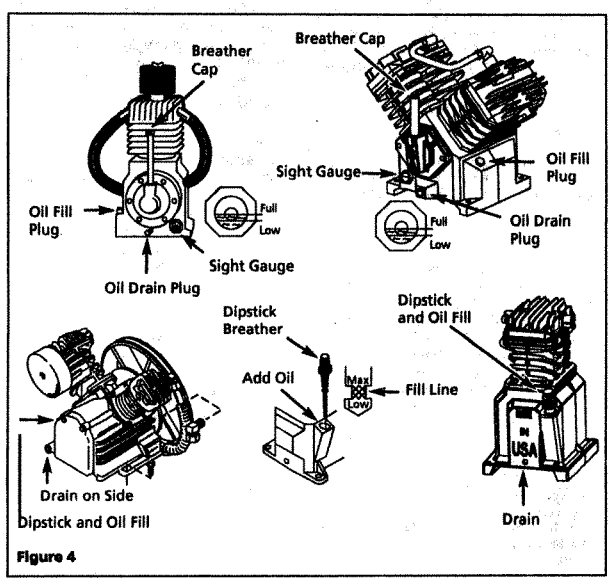


Figure 4

Cast Iron Series

Operation (Continued)

5. If compressor is not used for a long time period, bleed air from line and use drain cock to drain water from the tank. Then, follow the maintenance schedule.

NOTE: Electric models are equipped with a pressure switch that automatically turns the motor OFF when the tank pressure reaches a preset level. After air is used from the tank and drops to a preset low level, the pressure switch automatically turns the motor back on.

⚠ CAUTION ***RISK OF INJURY! Never connect or disconnect air pressure fittings while the line is pressurized. Drain the pressure from tank first or lock the tank shut-off valve closed to prevent injury.***

Maintenance

⚠WARNING

Disconnect, tag and lock out power source, then release all pressure from the system before attempting to install, service, relocate or perform any maintenance.

All repairs should be performed by an authorized service representative.

FOR EFFICIENT OPERATION:

Perform the following test to verify free operation of the safety valve weekly and follow maintenance schedule.

1. Pull ring on safety valve and allow the ring to snap back to normal position (See Figure 7). This valve automatically releases air if the tank pressure exceeds the preset maximum.

⚠ DANGER ***Do not attempt to tamper with this valve. This valve should be checked occasionally. If air leaks after the ring has been released, or the valve is stuck and cannot be actuated by the ring, the safety valve must be replaced.***

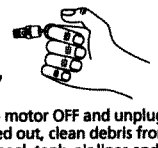


Figure 7

2. With motor OFF and unplugged or locked out, clean debris from motor, flywheel, tank, air lines and pump cooling fins.

MOISTURE IN COMPRESSED AIR

Moisture in compressed air will form into droplets as it comes from an air compressor pump. When humidity is high or when a compressor is in continuous use for an extended period of time, this moisture will collect in the tank. When using a paint spray or sandblast gun, this water will be carried from the tank through the hose, and out of the gun as droplets mixed with the spray material.

IMPORTANT: This condensation will cause water spots in a paint job, especially when spraying other than water based paints. If sandblasting, it will cause the sand to cake and clog the gun, rendering it ineffective.

A filter or air dryer in the air line, located as near to the gun as possible, will help eliminate moisture.

BELT ADJUSTMENT

POLY V DRIVE BELT

Normal belt adjustment is not necessary for Poly V belt driven compressors. The Poly V belt is specially designed, self-tensioned and CANNOT be replaced by standard drive belts. If replacement is necessary, use only OEM replacement parts.

TO INSTALL REPLACEMENT POLY V DRIVE BELT:

⚠WARNING ***Before removing the front of the belt guard, disconnect compressor from the power source.***

1. Remove the belt guard front.
2. Carefully align the pump and motor shaft to assure they are parallel within 1° and are centered on an 14.63" centerline (+/- .25").
3. Align the replacement belt on the motor pulley and start to wrap it around the flywheel. Gently clamp the belt to the flywheel with locking pliers. Turn the flywheel to roll the belt completely onto the flywheel. Align the belt with Poly V grooves on the pulley by gently guiding it while turning the flywheel by hand.
4. Tension is preset. The replacement belt will seem 2-3" shorter than necessary before installation begins. Correct placement between the motor pulley and the flywheel will provide the correct tension.
5. Reinstall all guards.

A SECTION DRIVE BELT

Belts will stretch in normal use. Properly adjusted, a 5-pound force applied to the belt between the motor pulley and the pump will deflect the belt about 1/2" (See Figure 8).

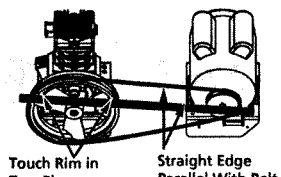


Figure 8

TO ADJUST A SECTION DRIVE BELT:

1. Remove belt guard.
2. Loosen the four fasteners holding the motor to the baseplate.
3. Shift the motor in the proper direction. The belt must be properly aligned when adjustment is made.
4. To align belt, lay a straightedge against the face of the flywheel touching the rim at two places (See Figure 8).
5. Adjust flywheel or motor pulley so that the belt runs parallel to the straight edge (See Figure 9).

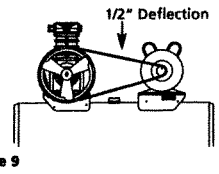


Figure 9

6. If necessary, use a gear puller to move the pulley on the motor shaft. Tighten setscrew after pulley is positioned.
7. Attach belt guard.

SPEEDAIRE®

Speedaire® Stationary Air Compressors

Maintenance (Continued)

STORAGE

1. When not in use, store hose and compressor in a cool dry place.
2. Drain tanks of moisture and disconnect hose. Hang hose with open ends down to allow any moisture to drain.
3. Protect the electrical cord from possible damage by winding the cord loosely around the handle of the unit or coiling the cord up.

MAINTENANCE SCHEDULE

Operation	Daily	Weekly	Monthly	3 Months
Check Oil Level	●			
Drain Tank	●			
Check Air Filter		●		
Check Safety Valve		●		
Blow Dirt From Inside Motor		●		
Check Belt Tightness			●	
Change Oil				●

Troubleshooting Chart

Symptom	Possible Cause(s)	Corrective Action
Low discharge pressure	1. Air leaks	1. Listen for escaping air. Apply soap solution to all fittings and connections. Bubbles will appear at points of leakage. Tighten or replace leaking fittings or connections
	2. Leaking valves	2. Remove head and inspect for valve breakage, weak valves, scored valve seats, etc. Replace defective parts and reassemble **⚠ CAUTION** ***Be sure that the old head gasket is replaced with a new one each time the head is removed.***
	3. Restricted air intake	3. Clean the air filter element
	4. Slipping belts	4. Loosen motor clamping bolts and move the motor in a direction away from the compressor, being sure that the motor pulley is perfectly aligned with the flywheel. Tighten motor clamping bolts. The belt should deflect about 1/2" under 5-lbs of pressure
	5. Blown gaskets	5. Replace any gaskets proven faulty on inspection
	6. Low compression	6. Low pressure can be due to worn rings and cylinder walls. Correction is made by replacing the rings, cylinders, and pistons as required
Overheating	1. Poor ventilation	1. Relocate the compressor to an area where an ample supply of cool, clean, dry and well-circulated air is available
	2. Dirty cooling surfaces	2. Clean the cooling surfaces of pump and motor/engine
Unit stalls **NOTE:** Electric models are equipped with a pressure switch that automatically turns the motor OFF when the tank pressure reaches a preset level. After air is used from the tank and drops to a preset low level, the pressure switch automatically turn the motor back on.	1. Overloaded motor	1. Have certified electrician check the motor and wiring, then proceed with his/her recommendations. Check motor voltage connection
	2. Improper lubrication	2. See Lubrication, under Assembly
	3. Low oil level	3. Check oil level. Fill if necessary
	4. Defective check valve	4. Replace

Cast Iron Series

Troubleshooting Chart (Continued)

Symptom	Possible Cause(s)	Corrective Action
Excessive belt wear	1. Pulley out of alignment	1. Realign motor pulley with compressor pulley
	2. Belt too loose or too tight	2. Adjust tension (See Drive Belt section)
	3. Belt slipping	3. Adjust tension or replace belt (See Drive Belt section)
	4. P'ulley wobbles	4. Check for worn crankshaft, keyway or pulley bore resulting from running the compressor or motor with loose pulleys. Check for bent pulleys or bent crankshaft
Excessive noise (knocking)	1. Loose motor or compressor pulley	1. Loose motor or compressor pulleys are a very common cause of compressors knocking. Tighten pulley clamp bolts and set-screws
	2. Lack of oil in crankcase	2. Check for proper oil level; if low, check for possible damage to bearings. Dirty oil can cause excessive wear
	3. Worn connecting rod	3. Replace connecting rod
	4. Worn piston pin bushing	4. Remove piston assemblies from the compressor and inspect for excess wear. Replace excessively worn piston pin or pistons, as required
	5. Worn bearings	5. Replace worn bearings and change oil
	6. Piston hitting the valve plate	6. Remove the compressor head and valve plate and inspect for carbon deposits or other foreign matter on top of piston. Replace head and valve plate using new gasket
	7. Noisy check valve	7. Replace
Oil in the discharge air	1. Worn piston rings	1. Replace with new rings
	2. Compressor air intake restricted	2. Clean filter. Check for other restrictions in the intake system
	3. Restricted breather	3. Clean and check breather for free operation
	4. Excessive oil in compressor	4. Drain down to full level
	5. Wrong oil viscosity	5. Use Model 4ZF21 Rarus® 427 oil
	6. Connecting rod out of alignment	6. Replace rod
Air leaking from unloader on pressure switch	Check valve stuck in open position	Remove and replace check valve **⚠ DANGER** ***Do not disassemble check valve with air in tank.***

SPEEDAIRE®

Speedaire® Compresseurs D'Air Stationnaires

GARANTIE LIMITÉE

GARANTIE LIMITÉE D'UN AN DAYTON. *Les Compresseurs D'Air Stationnaires Speedaire, Modèles couverts dans ce manuel, sont garanties par Dayton Electric Mfg. Co. (Dayton) à l'utilisateur initial contre les défauts de fabrication et de matière pendant l'usage normal pour un an à compter de la date d'achat. N'importe quelle pièce qui a été déterminée défectueuse en matière ou en fabrication et retournée à un centre de service autorisé désigné par Dayton, taux de frais payés d'avance, sera, comme remède exclusive, réparée ou remplacée à l'option de Dayton. Pour procédures de réclamation de la garantie limitée, voir la section DISPOSITION RAPIDE ci-dessous. Cette garantie limitée donne à l'acheteur des droits légals précis qui varient de juridiction à juridiction.*

LIMITATION DE RESPONSABILITÉ. *La responsabilité de Dayton pour dommages fortuits ou indirects est expressément déniée selon la mesure permite sous la loi applicable. La responsabilité de Dayton en tous cas est limitée à et ne dépassera pas le prix d'achat.*

DÉNÉGATION DE LA GARANTIE. *Dayton a fait un effort assidu pour fournir de l'information concernant les produits et pour illustrer avec précision les produits dans ces brochures; toutefois, ces informations et illustrations sont seulement pour l'identification, et n'expriment pas ni n'impliquent pas que les produits SONT VENDABLES ou CONVENABLES À UN USAGE PARTICULIER, ou que le produit conforme aux illustrations ou descriptions. À l'exception de ce qui est fourni ci-dessous, aucune garantie ou affirmation de faits exprimés ou indiqués, sauf ce qui est déclaré dans la "GARANTIE LIMITÉE" ci-dessous est autorisé par Dayton.*

CONVENANCE DU PRODUIT. *Plusieurs juridictions ont des codes et règlements gouvernant la vente, la construction, l'installation et/ou l'utilisation des produits pour certaines intentions, qui peuvent varier de celles des alentours. Quoique Dayton fait un effort d'assurer que ces produits se conforment aux codes de ce genre, ceci ne peut pas garantir la conformité, et ne peut pas être responsable pour la manière que le produit soit installé ou utilisé. Étudier les applications du produit et tous les codes et règlements nationaux et locaux applicables avant d'acheter et d'utiliser le produit et assurer que le produit, l'installation et son usage vont conformer avec eux.*

Certains aspects des dénégations ne sont pas applicables aux produits pour consommateurs; par exemple, (a) certaines juridictions n'autorisent pas l'exclusion ni la limitation de dommages fortuits ou indirects. La limitation ou exclusion précédente peut ne donc pas s'appliquer; (b) certaines juridictions n'autorisent pas de limitations de durée pour les garanties implicites. Les limitations précédentes peuvent ne donc pas s'appliquer; et (c) en accordance avec la loi, pendant la durée de cette garantie limitée, les garanties implicites de commercialisabilité et d'adaption à une fonction particulière applicable aux produits désignés pour consommateurs et achetés par consommateurs, ne peuvent pas être exclus ou autrement déniés.

DISPOSITION RAPIDE. *Dayton fera un effort en toute bonne foi pour la correction ou l'ajustement rapide concernant les produits qui se sont révélés défectueux pendant la durée de la garantie limitée. Pour n'importe quel produit que vous croyez défectueux pendant la durée de la garantie limitée, contacter par lettre ou téléphone, le marchand qui vous a vendu le produit. Le marchand peut vous donner plus d'information. Si l'acheteur n'est pas satisfait du service, contacter Dayton par mot écrit à l'adresse ci-dessous. Fournir le nom du marchand, l'adresse, la date et le numéro de la facture et une description du défect. Titre et risque de perte sont la responsabilité de l'acheteur pendant la livraison par manière de voiturier public. Si le produit est endommagé pendant son transport, réclamer les dommages de l'expéditeur.*

Fabriqué pour Dayton Electric Mfg. Co., 5959 W. Howard St., Niles, IL 60714 É-U.

FRANÇAIS

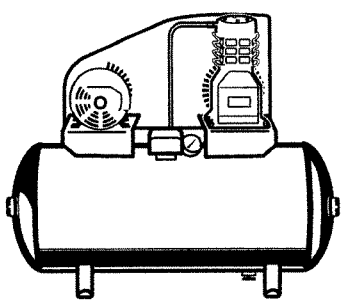
Fabriqué pour Dayton Electric Mfg. Co.
Niles, Illinois 60714 É-U

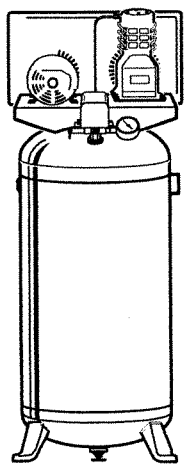
SPEEDAIRE®

Please read and save this Replacement Parts Manual. Read this manual and the General Operating Instructions carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. The Safety Instructions are contained in the General Operating Instructions. Failure to comply with the safety instructions accompanying this product could result in personal injury and/or property damage! Retain instructions for future reference.

Speedaire® Stationary Air Compressors

Refer to Form 5S3876 for General Operating and Safety Instructions **Cast Iron Series**





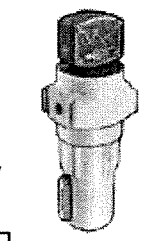
Specifications

Model	HP	Free Air CFM @ 90 psi	Free Air CFM @ Max. psi	Tank Cap (Gal.)	Tank Outlet (F) NPT	Volts, Phase	Amp Draw	Max. Working Pressure	Max. Duty Cycle	Dimensions L	Dimensions W	Dimensions H
4B232B	1	5.5	5.4	30	1/4	115/230, 1	15/7.5	100 psi	65/35	40⅝"	21⅝"	38"
4B233C	2	5.7	4.6	30	1/2	115/230, 1	15/7.5	135	65/35	26¼	19	52
4B234C	2	5.7	4.6	30	1/4	115/230, 1	15/7.5	135	65/35	40⅝	21⅝	38
4B236B	6	10.3	9.0	60	3/4	230, 1	15	135	65/35	29	29	65
4B237B	3	8.5	8.3	30	1/4	230/460, 3	8/4	135	65/35	40⅝	21⅝	38

Form 5S3874 Printed in U.S.A. 02433 1298/262/VCPVP IN229103AV 1/99

SPEEDAIRE®

Silicone-Free Particulate and Oil-Removal (Coalescing) Filters


Standard

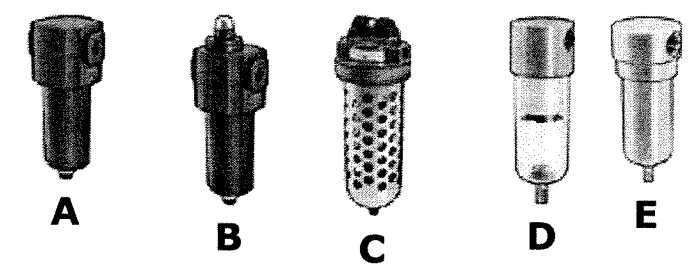
Specially manufactured and sealed in a clean environment to be completely free of silicone. Perfect for painting and surface treatment applications where silicone can cause bubbles and ripples in your finishing processes. All units have a die cast aluminum body and bowl, automatic drain, filter service indicator (differential pressure gauge), and borosilicate glass element. Maximum pressure is 232 psi. Maximum temperature is 150° F. Inlet and outlet connections are NPT female.

Standard filters remove particulates as small as 1 micron and oil to .6 ppm. **High-efficiency filters** remove particulates as small as .01 micron and oil to .01 ppm.

			STANDARD FILTERS				HIGH-EFFICIENCY FILTERS			
Pipe Size	Max. scfm @ 100 psi	Overall Size, Ht. x Wd.	Complete Units	Each	Replacement Element Kits	Each	Complete Units	Each	Replacement Element Kits	Each
1/4"	19	8.9" x 3"	1029K11	$163.21	1029K21	$62.26	1029K31	$163.21	1029K41	$62.26
3/8"	36	10.1" x 3.5"	1029K12	204.72	1029K22	77.36	1029K32	204.72	1029K42	77.36
1/2"	64	11.5" x 3.5"	1029K13	251.89	1029K23	119.81	1029K33	251.89	1029K43	119.81
3/4"	127	14.5" x 4.7"	1029K14	338.68	1029K24	138.68	1029K34	338.68	1029K44	138.68
1"	170	18.4" x 4.7"	1029K15	416.98	1029K25	183.02	1029K35	416.98	1029K45	183.02
1 1/4"	254	18.4" x 4.7"	1029K16	541.51	1029K25	183.02	1029K36	541.51	1029K45	183.02
1 1/2"	307	18.4" x 4.7"	1029K17	604.72	1029K25	183.02	1029K37	604.72	1029K45	183.02

Oil-Removal (Coalescing) Filters

Remove oil mist and aerosols from your compressed air. Inlet and outlet connections are NPT female.



A Aluminum Body and Bowl— The most popular oil-removing filters. They use a synthetic fiber and polyurethane foam element to remove 99.9% of oil mist and aerosols as small as .01 micron.

B Aluminum Body and Bowl with Filter Service Indicator— An indicator is in plain view on the top of the filter that lets you know when your filter element needs changing. Filters use a synthetic fiber and polyurethane foam element to remove more than 99.9% of oil mist and aerosols as small as .01 micron.

C Zinc Body and Polycarbonate Bowl with Filter Service Indicator— Transparent bowl allows a view of what's being filtered and the indicator lets you know when the element needs replacing. Bowl has a steel guard. The porous borosilicate glass element removes 99.99998% of oil as small as .01 micron.

D Brass Body and Polyurethane Bowl— Have a transparent bowl for visibility that's also chemically compatible; it won't crack in systems heavy with synthetic compressor oils and

	Pipe Size	Max. scfm @ 100 psi	Max. psi	Max. Temp.	Overall Size, Ht. x Wd.	Complete Units	Each	Replacement Filter Elements	Each
A	1/4"	36	250	150° F	6.8" x 2.68"	9826K31	$68.95	8282K52	$24.10
A	3/8"	75	250	150° F	7.35" x 3.15"	9826K61	81.10	8282K72	24.80
A	1/2"	75	250	150° F	7.35" x 3.15"	9826K62	82.20	8282K72	24.80
A	1/2"	110	250	150° F	9.44" x 3.15"	9826K63	93.20	8282K73	38.00
A	3/4"	110	250	150° F	9.44" x 3.15"	9826K64	93.20	8282K73	38.00
A	3/4"	450	250	150° F	11.31" x 4.75"	9826K84	152.60	8282K35	70.25
A	1"	450	250	150° F	11.31" x 4.75"	9826K85	152.60	8282K35	70.25
B	1/4"	21	250	150° F	8.16" x 2.68"	8282K31	77.25	8282K52	24.10
B	3/8"	34	250	150° F	8.71" x 3.15"	8282K61	92.55	8282K72	24.80
B	1/2"	34	250	150° F	8.71" x 3.15"	8282K62	92.55	8282K72	24.80
B	1/2"	59	250	150° F	10.8" x 3.15"	8282K63	104.50	8282K73	38.00
B	3/4"	59	250	150° F	10.8" x 3.15"	8282K64	104.50	8282K73	38.00
B	3/4"	90	250	150° F	12.67" x 4.75"	8282K56	171.71	8282K35	70.25
B	1"	125	250	150° F	12.67" x 4.75"	8282K25	171.00	8282K35	70.25
B	1 1/2"	250	250	150° F	18.26" x 8.22"	8282K26	439.00	8282K36	147.50
B	2"	300	250	150° F	18.26" x 8.22"	8282K27	439.00	8282K36	147.50
C	1/4"	20	150	125° F	7.5" x 3"	59185K11	83.10	59185K12	30.38
C	3/8"	60	150	125° F	11.5" x 3.75"	59185K21	101.96	59185K22	37.42
C	1/2"	60	150	125° F	11.5" x 3.75"	59185K31	101.96	59185K22	37.42

Manufactured by / Fabricado para / Fabriqué pour
Dayton Electric Mfg. Co., Niles, Illinois 60714 U.S.A.

SPEEDAIRE®

Please read and save these instructions. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.

Speedaire® Automatic Drain for Filters

Description

Speedaire automatic drains automatically remove collected liquids from your pneumatic systems.

General Safety Information

Automatic drains for filters are utilized in a variety of air system applications. Because the automatic drain and other components (compressor, spray gun, filters, regulators, hoses, etc.) make up a high pressure pumping system, the following safety precautions should be observed at all times.

1. Read the instruction manuals for each component carefully before attempting to assemble, disassemble or operate your particular system.
2. Do not exceed the pressure rating of any component in the system.
3. Protect material lines and air lines from damage or puncture.
4. Never point a spray gun at oneself or any other person. Accidental discharge may result in serious injury.
5. Check hoses for weak or worn condition before each use, making certain that all connections are secure.
6. Release all pressures within the system before attempting to service any component.

Installation

To install the Auto Drain, SHUT OFF AIR SUPPLY and depressurize the unit.

1. Remove bowl by unscrewing bowl or collar.
2. Remove manual drain assembly from bowl. Be careful not to scratch or damage the inside surfaces of the bowl.
3. Clean or replace filter element. Clean bowl and all internal parts. See Polycarbonate bowl cleaning section.
4. Install Automatic Drain on inside of bowl (be sure O-ring is in place between drain and bowl).
5. Install retaining nut loosely – just to hold the drain in place.
6. Replace bowl seal. Lightly lubricate seal to assist with retaining it in position. Use only mineral based oils or grease. Do NOT use synthetic oils such as esters, and Do NOT use silicones.
7. Reassemble bowl into body. Tighten from 48 to 52 in-lbs torque.
8. Apply system pressure and tighten retaining nut by fingers – DO NOT over tighten.
9. Check for air leaks around bowl joints, on top and bottom, plus discharge hole of drain. Repeat all steps (including shutoff and depressurization) if leaks occur.

Operating Pressure Range:

Polycarbonate Bowl
10 to 150 PSIG (.7 to 10.3 bar)
Metal Bowl
10 to 250 PSIG (.7 to 17.2 bar)
Conversions: 1 bar = 14.5 PSI

Ambient Temperature Range:

Polycarbonate Bowl
32°F to 125°F (0°C to 52°C)
Metal Bowl
32°F to 175°F (0°C to 80°C)
°C = 5/9 (°F - 32)

Limited Warranty

Dayton One-Year Limited Warranty. *Speedaire® Automatic Drain for Filters. Models covered in this manual, are warranted by Dayton Electric Mfg. Co. (Dayton) to the original user against defects in workmanship or material under normal use for one year after date of purchase. Any part which is determined to be defective in material or workmanship and returned to an authorized service location, as Dayton designates, shipping costs prepaid, will be, as the exclusive remedy, repaired or replaced at Dayton's option. For limited warranty claim procedures, see PROMPT DISPOSITION below. This limited warranty gives purchasers specific legal rights which vary from jurisdiction to jurisdiction.*

Limitation of Liability. *To the extent allowable under applicable law, Dayton's liability for consequential and incidental damages is expressly disclaimed. Dayton's liability in all events is limited to and shall not exceed the purchase price paid.*

Warranty Disclaimer. *Dayton has made a diligent effort to provide product information and illustrate the products in this literature accurately; however, such information and illustrations are for the sole purpose of identification, and do not express or imply a warranty that the products are merchantable, or fit for a particular purpose, or that the products will necessarily conform to the illustrations or descriptions.*

Except as provided below, no warranty or affirmation of fact, expressed or implied, other than as stated in the "LIMITED WARRANTY" above is made or authorized by Dayton.

Product Suitability. *Many jurisdictions have codes and regulations governing sales, construction, installation, and/or use of products for certain purposes, which may vary from those in neighboring areas. While Dayton attempts to assure that its products comply with such codes, it cannot guarantee compliance, and cannot be responsible for how the product is installed or used. Before purchase and use of a product, review the product applications, and all applicable national and local codes and regulations, and be sure that the product, installation, and use will comply with them.*

Certain aspects of disclaimers are not applicable to consumer products; e.g., (a) some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you; (b) also, some jurisdictions do not allow a limitation on how long an implied warranty lasts, consequently the above limitation may not apply to you; and (c) by law, during the period of this limited warranty, any implied warranties of implied merchantability or fitness for a particular purpose applicable to consumer products purchased by consumers, may not be excluded or otherwise disclaimed.

Prompt Disposition. *Dayton will make a good faith effort for prompt correction or other adjustment with respect to any product which proves to be defective within limited warranty. For any product believed to be defective within limited warranty, first write or call dealer from whom the product was purchased. Dealer will give additional directions. If unable to resolve satisfactorily, write to Dayton at address below, giving dealer's name, address, date, and number of dealer's invoice, and describing the nature of the defect. Title and risk of loss pass to buyer on delivery to common carrier. If product was damaged in transit to you, file claim with carrier.*

Manufactured for Dayton Electric Mfg. Co., 5959 W. Howard St., Niles, Illinois 60714 U.S.A.

Form 5S3902

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SPEEDAIRE®

REPAIR KIT (ENGLISH)
- Kit parts are circled on the exploded view.
- Kits are universal and may contain parts not used on your unit.
- Always replace used parts with identical parts from the kit.
- Also see the warning and complete instructions sent with your unit.

REPARATURSATZ (DEUTSCH)
- Die eingekreisten Nummern kennzeichnen die Teile die im Reparatursatz enthalten sind.
- Dieser Reparatursatz ist universell verwendbar und kann Teile, die in Ihrem Gerät nicht benötigt werden, enthalten.
- Gebrauchte Teile nur durch die jeweils identen Teile aus dem Reparatursatz ersetzen.
- Reparatur-, Betriebs- und Gefahrenhinweise des jweiligen Gerätes beachten.

REPERES DES PIECES DE RECHANGES (FRANÇAIS)
- Les pièces de rechanges sont les repères entourés d'un cercle sur la vue éclatée.
- Les kits de maintenance sont universels et certaines pièces peuvent être en supplément.
- Toujours remplacer les pièces usées par celles venant du kit de maintenance.
- Lire aussi la notice (précautions d'emploi et instructions) livrée avec les unités.

KIT DE REPARACÓN (ESPAÑOL)
- Las piezas del kit están señaladas en el despiece.
- Los kits son universales y pueden contener piezas que no se utilicen en su unidad.
- Siempre debe sustituir las piezas usadas por piezas idénticas del kit.
- Vea también las instrucciones completas y las advertencias que se han enviado junto con su unidad.

KITS DE REPARO (PORTUGUESE)
- Peças do kit estão identificadas na vista explodida.
- Os kits são universais e devem conter peças não utilizadas na sua unidade.
- Reponha sempre as peças utilizadas com as peças idênticas do kit.
- Veja também as advertências e instruções completas enviadas com sua unidade.

KIT DI RICAMBI (ITALIANO)
- I particolari compresi nel kit sono rappresentati sul disegno esploso dai numeri cerchiati.
- I kit sono universali e potrebbero contenere dei particolari non necessari sul Vostro apparecchio.
- Sostituire sempre tutti i particolari corrispondenti contenuti nel kit.
- E' importante seguire le istruzioni di installazione fornite insieme all'apparecchio.

REPARATIE-SET (NEDERLANDS)
- De omcircelde nummers zijn in de reparatie-set opgenomen.
- De reparatie-set zijn bedoeld voor meerdere apparaten en kunnen dus meer onderdelen bevatten dan benodigd.
- Vervang de gebruikte onderdelen door de identieke onderdelen van de reparatie-set.
- Zie ook de gebruiks- en installatie-voorschriften die bij de apparatuur behoort.

KORJAUSSARJA (SUOMI)
- Korjaussarjan osat on ympyröity räjäytyskuvassa
- Korjaussarjat ovat yleismaailmallisesti käytössä ja ne voivat sisältää osia, jotka eivät ole käytössä Teidän yksikössänne
- Vaihtakaa osat aina identtisiin korjaussarjan osiin
- Huomioikaa myös varoitukset ja noudattakaa yksikkönne mukana tulleita ohjeita.

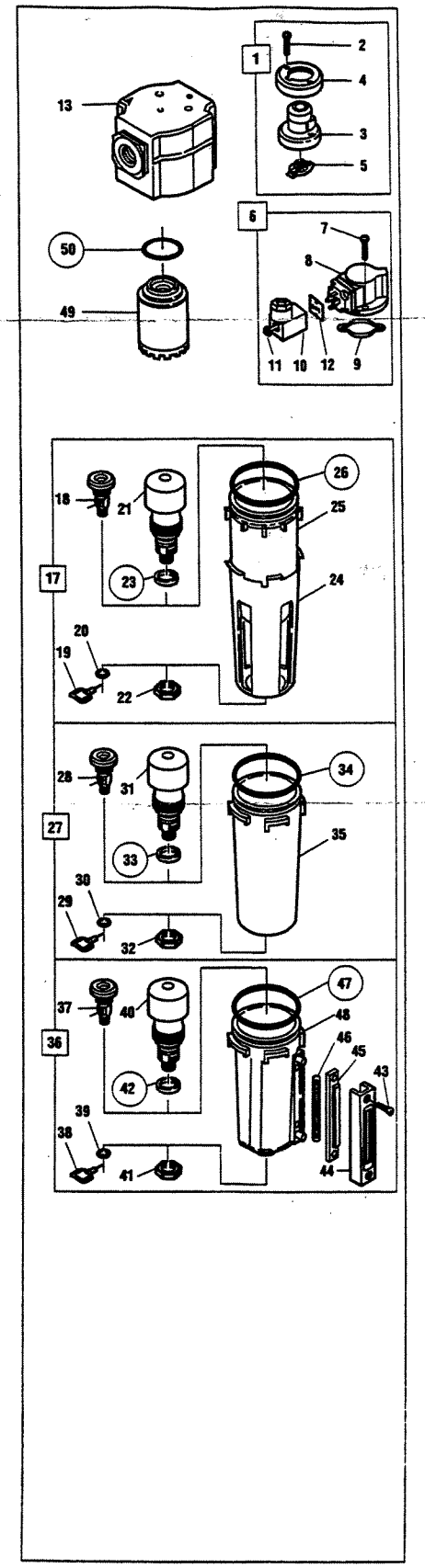
REPARASJONSSETT (NORWEGIAN)
- Reparasjonssettet inneholder de deler som er markert med en ring rundt nummer på spreng skisse
- Reparasjonssettet er identisk for flere produkter og kan derfor inneholde deler som er overflødig ved den aktuelle reparasjon
- Erstatt alltid brukte deler med identiske deler i reparasjonssettet
- Vi gjør forøvrig oppmerksom på tidligere vedlagte advarsler gitt i instruksjonsmanualen som fulgte produktet

SERVICESATS (SWEDISH)
- Delar som ingår i servicesats är inringade på bifogade sprängskiss
- Satserna är universella och kan innehålla detaljer som ej erfordras
- Erstatt alltid använd detalj med identisk detalj från servicesatsen
- Observera även varnings-/instruktionstext som bifogades enheten

RESERVEDELSSÆT (DANISH)
- Indholdet af reservedelssæt er vist på tegningen
- Indholdet er universelt, og kan derfor indeholde dele, der ikke benyttes i netop Deres komponent
- Udskift altid dele med de identiske reservedele
- Se også instruktionen der medfulgte Deres komponent

修理用キット (Japanese)
- ●キットのパーツは、分解図中で丸で囲って示してあります。
- ●キットは共通の物ですので、このユニットには使われないものが含まれている場合があります。
- ●使い古したパーツを交換する場合は、常にキットの中の同じ物を使用して下さい。
- ●また、送られたユニットに入っている注意書と指示を良くお読みください。

维修备件包 (Chinese)
- ・在分解示意图中，所有标号有圆圈的零件均附有备用件。
- ・维修备件包是通用的，因此，对于某些型号产品可能有多余备件。
- ・替换零件时，必须使用形状、尺寸、颜色相同的备件。
- ・维修时，请参阅随产品所附的使用保养说明书。



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Locking Leg Inserts "lock" into base to keep Shelf Units from sliding off grate surface.

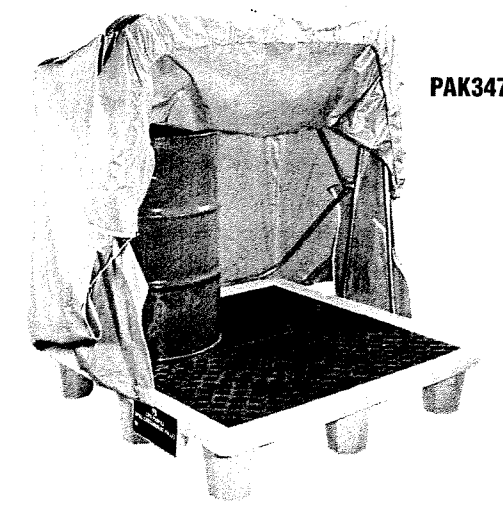
Stack 'em up! This Modular Storage Shelf adds extra contained storage for buckets and small containers.

Make the most of your contained storage space. Build up, not out! Just add this polyethylene Modular Storage Shelf to any poly pallet or deck. It provides self-draining storage for any container up to 19" high—leaks or drips are channeled into the pallet or deck sump below. Because it's all poly, this Storage Shelf is lightweight and chemical resistant. Interlocking legs permit Shelf units to be stacked up to 3 high; leg inserts lock into grate surface openings so Shelf won't slide.

Modular Shelf

Each	1-2	3+
PAK586 • 47 3/4" L x 14 3/4" W x 24" H • 35 lbs.	$119	$109

Protect your Pallets and Drums from rain and dirt.



PAK347

Quick Cover Tarps for 2- and 4-drum Pallets feature easy, one-person operation.

10 oz. vinyl Tarps fit most* of our 2-Drum and 4-Drum Poly Spill Pallets (shown on pages 212 and 213). Keeps rain out of sump, but leaves it visible to check for leaks. 51 inches of clearance from pallet surface to tarp for easy access to drum tops. Collapsible steel frame folds tarp out of way—one person can load and unload drums. Elasticized bottom edge; grommets for additional tie-down. Lifts easily for weekly drum inspections.

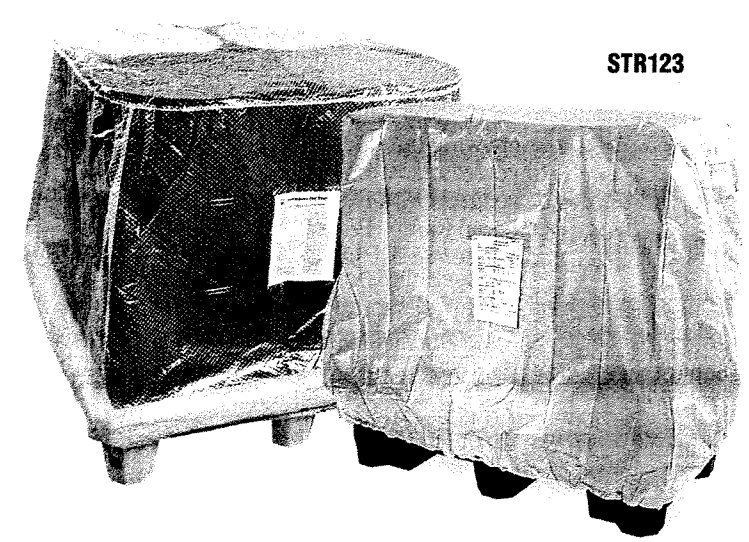
* Does not fit PAK 604.

Quick Cover Tarp

PAK362 •	for 2 Drum Poly Pallets 53" L x 28 3/4" W x 55" H • 20 lbs.	$199
PAK347 •	for 4 Drum Poly Pallets 53" L x 53" W x 55" H • 38 lbs.	$259

PAK442

STR123



Handy 2- and 4-drum Pallet Tarps leave sumps visible for quick inspection.

These Universal Pallet Tarps and Spill Pallet Covers are a quick, easy way to protect your spill pallets outdoors.

Universal Pallet Tarps are made of vinyl polyester with an elasticized bottom and grommets for tie-down.

Clear Pallet Tarps combine 2 layers of polyethylene with diamond cord grid for strength—these multiple layers resist punctures and tears. Clear material lets you check sumps without removing cover.

All models have UV-inhibitors to resist the effects of weather.

Clear MSDS pocket on front.

Universal 4-Drum Pallet Tarp

Each	1-5	6+
PAK381 • Yellow • 57" L x 57" W x 40" H • 8 lbs.	$123	$111
PAK442 • Clear • 57" L x 57" W x 40" H • 8 lbs.	$123	$111

Universal 2-Drum Pallet Tarp

Each	1-5	6+
STR123 • Yellow • 55" L x 31" W x 40" H • 5 lbs.	$99	$91
PAK443 • Clear • 55" L x 31" W x 40" H • 5 lbs.	$99	$91

ENSR

HEALTH AND SAFETY PLAN

Free Product Recovery
BOC Gases
Acton, Massachusetts

Prepared by: Kathleen Harvey

Approved by: _____ Date: _____
ENSR Regional Health and Safety Manager

Approved by: _____ Date: _____
ENSR Project Manager

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- Assuring that all personnel to whom this HASP applies have submitted a completed copy of the HASP receipt and acceptance form;
- Assuring that all personnel to whom this HASP applies have attended a pre-entry briefing prior to entering an exclusion zone;
- Maintaining a high level of health and safety consciousness among employees at the work site;
- Procuring and distributing the PPE needed for this project for ENSR employees;
- Procuring the air monitoring instrumentation required and performing air monitoring for ENSR activities;
- Verifying that all PPE and health and safety equipment is in good working order;
- Setting up and maintaining the decontamination zone and assuring proper cleanup of all site personnel;
- Notifying the PM of all noncompliance situations and stopping work in the event that an immediate danger situation is perceived;
- Monitoring and controlling the safety performance of all personnel within the established restricted areas to ensure that required safety and health procedures are being followed;
- Conducting accident/incident investigations and preparing accident/incident investigation reports;
- Conducting the pre-entry briefing as required by Section 10.2.1 of the HASP; and,
- Initiating emergency response procedures in accordance with Section 11.0 of this HASP.

1.2.4 ENSR Field Personnel and Contractor Personnel

All ENSR field personnel and contractor personnel covered by this HASP are responsible for following the health and safety procedures specified in this HASP and for performing their work

in a safe and responsible manner. Some of the specific responsibilities of the field personnel are as follows:

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

1.2.5 Subcontractors

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

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

1.3 Modification of the HASP

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

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

2. Site Description and History

2.1 Site Description

The BOC Gases facility is located at 37 Lawsbrook Road in Acton, Massachusetts. BOC Gases maintains and operates a gas production and distribution facility at this site. The site occupies approximately 40 acres and is situated adjacent to the W.R. Grace Co. industrial facility to the south. A housing development abuts the property to the northwest.

The land upon which BOC (formerly Air Reduction Company) is located was purchased by Air Reduction Company in 1948. Prior to this purchase, there were no industrial facilities present at the site's location. Since its initial operation, the BCO facility has been used to produce, store and distribute various compressed gases including helium, hydrogen, nitrogen and nitrous oxide. Currently, the site functions as a compressed gas distribution facility.

2.2 Diesel Fuel Source Area

Separate phase floating product was discovered in monitoring well MW-17S, located east of the office building at the BOC Gases facility, during subsurface investigation activities and reported to the Massachusetts Department of Environmental Protection (MADEP) on October 25, 1996. Additional wells and soil borings were installed in this area to assess the impact to soil and groundwater. Based on that assessment, it appears that the area impacted with free product is limited to the parking lot and adjacent wooded area immediately east of the office building.

Shortly after the release was detected, an Immediate Response Action (IRA) was enacted which gauged and removed product from MW-17S and further assessed the source and extent of the release. Upon completion of the IRA, the first Remedial Action Measure (RAM), consisting of multi-phase extraction pilot-testing, was implemented and completed. A second RAM involved the installation of a product recovery system to recover light non-aqueous phase liquids (LNAPL). The system was installed on May 26, 1999 and has been operating since that time.

3. Scope of Work

3.1 Free Product Recovery System Operation and Maintenance

The scope of work for this long-term field effort includes the operation, maintenance, and monitoring of the free product recovery system. The system consists of 6 air actuated bladder pumps placed in 6 six-inch recovery wells at a depth of approximately 50 feet. The pumps are operated by a compressor controlled by valves that cycle to collect and pump product to the surface where it is collected in 55-gallon drums for subsequent disposal. The pumps have hydrophobic membranes, through which the product flows but not groundwater. The compressor motor is powered by a dedicated 220V power supply that is equipped with a main shut-off and lock-out/tag-out capability. The 55-gallon drums are located on a spill containment pallet.

- Performing routine measurements of depth to groundwater, depth to product, product thickness in recovery wells and other monitoring wells;
- Collecting groundwater samples from recovery and monitoring wells;
- De-energizing the product recovery system to maintain the pumps and compressor. This will include repair/replacement of valves, tubing, filters, coalescers, etc, as well as blowout clearing of lines;
- Change out of motor oil for the compressor;
- Change over of product effluent tubing from full drums to empty drums when necessary; and,
- Oversight and documentation of recovered oil disposal by a licensed transporter

4. Chemical Hazard Assessment and Controls

4.1 Chemical Hazards

4.1.1 Diesel Fuel

Diesel fuel is generally considered to be of moderate to low toxicity. Federal or recommended airborne exposure limits have not been established for the vapors of diesel fuel. Inhalation of the vapor or mist may cause headache, dizziness, nausea, vomiting and a loss of coordination. Inhalation of high concentrations of the vapors may cause extensive pulmonary edema. Chronic direct skin contact with the liquids may produce skin irritation as a result of defatting. Repeated skin contact may also cause irritation of the hair follicles and block the sebaceous glands. This produces a rash of acne pimples and spots, usually on the arms and legs.

4.1.2 Hazardous Substances Brought On-Site by ENSR

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

4.2 Chemical Exposure and Control

4.2.1 Chemical Exposure Potential

A remediation system is currently operating in this area to remove free product from groundwater. Therefore, there is the potential for employees to be exposed to petroleum vapors during the installation of monitoring wells in this area. Direct dermal contact with contaminated soil and/or groundwater or LNAPL is also a potential route of exposure for the field team.

4.2.2 Chemical Exposure Control

ENSR will use several methods to control the potential for chemical exposure during the proposed well installation and sampling program:

- ENSR may conduct air monitoring to determine the presence of petroleum hydrocarbons during the operation of the system. As a precaution, if exposures exceed the action levels as defined in Section 6.1, respiratory protection as discussed in Section 7.2, will be donned.

5. Physical Hazards and Controls

5.1 Utility Hazards

5.1.1 Underground Utilities

Massachusetts law requires that, at least 72 hours prior to initiation of any subsurface work, a utility clearance be performed at the site. ENSR will contact DIG SAFE (1-888-344-7233) to request a mark-out of underground utilities in the proposed drilling and excavation areas. Work will not begin until the required utility clearances have been performed. Public utility clearance organizations typically do not mark-out underground utility lines that are located on private property. As such, ENSR must exercise due diligence and try to identify the location of any private utilities on the properties being investigated. ENSR can fulfill this requirement in several ways, including:

- obtaining as-built drawings for the areas being investigated from the property owner;
- visually reviewing each proposed drilling locations with the property owner or knowledgeable site representative;
- performing a geophysical survey to locate utilities or hiring a private line locating firm to determine the location of utility lines that are present at the property;
- identifying a no-drill zone; or
- hand digging in the proposed boring locations if insufficient data is available to accurately determine the location of the utility lines

5.1.2 Overhead Utilities

Be particularly aware of overhead power lines in the work area. Any vehicle or mechanical equipment capable of having parts of its structure elevated (drill rig, crane etc.) near energized overhead lines shall be operated so that a clearance of at least 10 feet is maintained. If the voltage is higher than 50kV, the clearance shall be increased 4 inches for every 10kV over that voltage.

5.2 Site Clearing

It may be necessary to clear portions of the site to install the proposed monitoring wells. In accordance with 29 CFR 1910.266, the following safety precautions will be followed during site clearing and tree felling:

5.2.1 Hand tools

If hand tools are used to remove low-lying brush, be sure that:

- All hand tools must be in safe condition. Tools must be inspected by the user daily.
- Handles must be sound, straight and tight-fitting.
- Driven tools must be dressed to remove any mushrooming.
- Cutting tools must be kept sharp and properly shaped.
- All clearing activities shall terminate during electrical storms and periods of high winds.
- Dead, broken or rotted limbs or trees (widow makers) shall be felled first.

5.2.2 Chain Saws

When using a chain saw to remove smaller trees or limbs, the following safety requirements will be implemented:

- Chain saws must be inspected daily to assure that all handles and guards are in place and tight, that all controls function properly and that the muffler is operative.
- Start the saw only on the ground or when otherwise firmly supported.
- Clear brush which might interfere with clear footing before starting to cut.
- Shut off the saw when carrying it for a distance greater than from tree to tree or when surface is slippery or heavy with underbrush. The saw must be at idle speed when carried short distances.
- Do not use the saw to cut directly overhead or a distance at which the operator no longer has a safe grip on the saw. Always use two hands to operate the saw.

5.2.3 Felling Trees Manually

If employees are felling trees manually, implement the following safety standards:

- Before cutting begins, survey the work area for dead limbs, the lean of the tree to be cut, wind conditions and the location of other trees

- Remove lodged trees (tree has not fallen to the ground after being spearated from its stump) as soon as possible. Never work under a lodged tree.

- The distance between workers should be maintained at twice the height of the trees being felled.

- Access covers and doors must not be opened until the drum or disk is at a complete stop.

- Infeed and discharge ports shall be designed to prevent employee contact with disc, knives and blower blades.

5.3 Drilling Hazards

Use of a drill rig to install monitoring wells will require all personnel in the vicinity of the operating rig to wear steel-toed boots, hardhats, hearing protection and safety eyewear. Personnel shall not remain in the vicinity of operating equipment unless it is required for their work responsibilities. Additionally, the following safety requirements must be adhered to:

- All drill rigs and other machinery with exposed moving parts must be equipped with an operational emergency stop device. Drillers and geologists must be aware of the location of this device. This device must be tested prior to job initiation and periodically thereafter. The driller and helper shall not simultaneously handle augers unless there is a standby person to activate the emergency stop.

- The driller must never leave the controls while the tools are rotating unless all personnel are kept clear of rotating equipment.

- A long-handled shovel or equivalent must be used to clear drill cuttings away from the hole and from rotating tools. Hands and/or feet are not to be used for this purpose.

- A remote sampling device must be used to sample drill cuttings if the tools are rotating or if the tools are readily capable of rotating. Samplers must not reach into or near the rotating equipment. If personnel must work near any tools which could rotate, the driller must shut down the rig prior to initiating such work.

- Drillers, helpers and geologists must secure all loose clothing when in the vicinity of drilling operations.

- Only equipment which has been approved by the manufacturer may be used in conjunction with site equipment and specifically to attach sections of drilling tools together. Pins that protrude excessively from augers shall not be allowed

- No person shall climb the drill mast while tools are rotating.

- No person shall climb the drill mast without the use of ANSI-approved fall protection (approved belts, lanyards and a fall protection slide rail) or portable ladder which meets the requirements of OSHA standards.

5.4 Noise

Use of a drill rig may expose the field team to noise levels that exceed the OSHA PEL of 90 dBA for an 8 hour day. Exposure to noise can result in the following:

- Temporary hearing losses where normal hearing returns after a rest period;

- Interference with speech communication and the perception of auditory signals;

- Interference with the performance of complicated tasks; and,

- Permanent hearing loss due to repeated exposure resulting in nerve destruction in the hearing organ.

Since personal noise monitoring will not be conducted during the proposed activities, employees must follow this general rule of thumb:

If the noise levels are such that you must shout at someone 5 feet away from you, you need to be wearing hearing protection. Employees can wear either disposable earplugs or earmuffs but all hearing protection must have a minimum noise reduction rating (NRR) of 27 db.

5.5 Back Safety

Using the proper techniques to lift and move heavy pieces of equipment is important to reduce the potential for back injury. The following precautions should be implemented when lifting or moving heavy objects:

- Use mechanical devices to move objects that are too heavy to be moved manually

- If mechanical devices are not available, ask another person to assist you.
- Bend at the knees, not the waist. Let your legs do the lifting.
- Do not twist while lifting
- Bring the load as close to you as possible before lifting
- Be sure the path you are taking while carrying a heavy object is free of obstructions and slip,trip and fall hazards.

5.6 Heat Stress

Types of Heat Stress

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

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

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

Early Symptoms of Heat-Related Health Problems:

- decline in task performance
- excessive fatigue

- incoordination
- decline in alertness
- unsteady walk
- reduced vigilance
- muscle cramps
- dizziness

Susceptibility to Heat Stress Increases due to:

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

People unaccustomed to heat are particularly susceptible to heat fatigue. First timers in PPE need to gradually adjust to the heat.

The Effect of Personal Protective Equipment

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

Measures to Avoid Heat Stress:

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

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

- Avoid double shifts and/or overtime.

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

Heat Stress Monitoring Techniques

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

Check radial pulse rates by using fore-and middle fingers and applying light pressure to the pulse in the wrist for one minute at the beginning of each rest cycle. If the pulse rate exceeds 110 beat/minute, shorten the next work cycle by one-third and keep the rest period the same. If, after the next rest period, the pulse rate still exceeds 110 beats/minute, shorten the work cycle again by one-third.

5.7 Poisonous Plants and Insects

Persons working on the site should be aware of the possible presence of poisonous plants and insects. **Poison ivy** is a climbing plant with leaves that consist of three glossy, greenish leaflets. Poison ivy has conspicuous red foliage in the fall. Small yellowish-white flowers appear in May through July at the lower leaf axils of the plant. White berries appear from August through November. Poison ivy is typically found east of the Rockies. **Poison oak** is similar to poison ivy but its leaves are oak-like in form. Poison oak occurs mainly in the south and southwest. **Poison sumac** typically occurs as a small tree or shrub and may be 6-20 feet in height. The bark is smooth, dark and speckled with darker spots. Poison sumac is typically found in swampy areas and east of the Mississippi. The leaves have 7-13 smooth-edged leaflets and drooping clusters of ivory-white berries appear in August and last through spring.

The leaves, roots, stems and fruit of these poisonous plants contain an oil called urushiol. Contact with the irritating oil causes an intensely itching skin rash and characteristic, blister-like lesions. The oil can be transmitted on soot particles when burned and may be carried on the fur of animals, equipment and apparel.

Proper identification of these plants is the key to preventing contact and subsequent dermatitis. Wear long sleeves and pants when working in wooded areas. In areas of known infestation, wear Tyvek coveralls and gloves. Oils are easily transferred from one surface to another. If you come in contact with these poisonous plants, wash all exposed areas immediately with cool water to remove the oils. Some commercial products such as Tecnu's Poison Oak-n-Ivy Cleanser claim to further help with the removal of oils.

Ticks are bloodsuckers, attaching themselves to warm-blooded vertebrates to feed. Deer ticks, which are associated with the transmission of Lyme's Disease (ticks transmit the bacteria that causes the disease) have been observed in New England and Mid-Atlantic states. Not all ticks carry the disease. Furthermore, an infected tick must attach itself for at least 24 hours before it can transmit disease. AS such, personnel should carefully inspect themselves each day for the presence of ticks or any rashes. This is important since prompt removal of the tick can prevent disease transmission. Female deer ticks are about one-quarter inch in length and are black and brick red in color. Males are smaller and all black.

Removal of the tick is important in that the tick should not be crushed and care must be taken so that the head is also removed. If the head is not completely removed or if the tick is allowed to remain for days feeding on human blood, a condition known as **tick paralysis** can develop, which is due to a neurotoxin which the tick apparently injects while engorging. This neurotoxin acts upon the spinal cord causing incoordination, weakness and paralysis.

One characteristic symptom of Lyme Disease is a bulls-eye rash that develops around the bite site. The rash appears in about 60-80% of all Lyme disease cases. Contact your RHSM immediately if you develop such a rash.

Tick season lasts from April through October; peak season is May through July. Wear light-colored clothing (easier to spot ticks) with long sleeves and make sure that shirts are tucked into pants and pants are tucked into socks or boots. Ticks have a tendency to crawl upwards. These procedures will make it more difficult for a tick to reach your skin. Studies have determined that repellants containing DEET as a main ingredient are most effective against mosquitoes and ticks. DEET can be directly applied to the exposed skin of adults and/or clothing. Permonone is another repellent however, it can only be directly applied to clothing.

6. Air Monitoring

6.1 Direct Reading Instruments

Instrument I – Flameionization Detector

A flameionization detector (FID), such as a Photovac MicroFID, will be used to screen the work area for petroleum during well installation. As a precaution, if the FID indicates sustained (15 minute) breathing zone vapor concentrations in excess of 50 units or more, respiratory protection, as described in Section 7.2 of this document, will be donned.

6.2 Personal Air Sampling

Personal air sampling will not be conducted by ENSR during the activities covered by this HASP.

6.3 Calibration and Recordkeeping

Equipment used by ENSR will be calibrated in accordance with the quality assurance plan and ENSR's standard operating procedures. A log of readings will be kept in the field notebook. Daily calibration information will also be recorded in the field notebook.

7. Personal Protective Equipment

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

7.1 Chemical Protective Clothing

PPE Item	Task 1	Task 2
Hard Hat	✓	
Steel Toed Safety Shoes	✓	✓
Safety Glasses with Sideshields	✓	✓
Inner PVC/Outer Nitrile Gloves	*	✓
Hearing Protection	✓	

Task 1 – Well Installation/Soil Sampling
* Nitrile will be worn when handling soils directly

Task 2 – Well Gauging/ Groundwater Sampling

7.2 Respiratory Protection

Employees should anticipate the need to don Level C respiratory protection as described below. Employees will be required to wear respirators if worker breathing zone FID concentrations are sustained (15 minutes) above the action limits.

Task	Action Limit	Respiratory Protection
System maintenance and well measurements	50 units above background on the FID	Half mask air-purifying respirator with organic vapor cartridges

Respiratory protection should also be donned if odors become objectionable at any time or if respiratory tract irritation is noticed. All employees who are expected to don respiratory protection must have successfully passed a qualitative or quantitative fit-test within the past year for the brand, model and size respirator they plan to don during the proposed activities.

7.3 Other Protective Equipment

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

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

8. Site Control

To prevent both exposure of unprotected personnel and migration of contamination due to tracking by personnel or equipment, work areas along with personal protective equipment requirements will be clearly identified.

8.1 Designation of Zones

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

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

8.1.1 Exclusion Zone

An exclusion zone will be established around each well installation location. This zone will serve to protect ENSR employees from traffic and will protect employee's of the facility from any chemical or physical hazards that are associated with the implementation of the proposed investigation. The perimeter of the exclusion zone will be marked with Caution tape or indicated by traffic cones. All personnel entering these areas must wear the prescribed level of protective equipment.

8.1.2 Contamination Reduction Zone

The decontamination zone will be established adjacent to the work area. Personnel will remove contaminated gloves and other disposable items in this area and place them in a plastic bag until they can be properly disposed of.

8.1.3 Support Zone

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

8.2 Safety Practices

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

- The "buddy system" will be used at all times by all field personnel. No one is to perform field work alone. Standby team member must be intimately familiar with the procedures for initiating an emergency response.
- Eating, drinking, chewing gum or tobacco, smoking or any practice that increases the probability of hand-to-mouth transfer and ingestion of materials is prohibited in the immediate work area and the decontamination zone.
- Smoking is prohibited in all work areas. Matches and lighters are not allowed in these areas.
- Hands and face must be thoroughly washed upon leaving the work area and before eating, drinking or any other activities.
- Beards or other facial hair that interfere with respirator fit are prohibited.
- The use of alcohol or illicit drugs is prohibited during the conduct of field operations.
- All equipment must be decontaminated or properly discarded before leaving the site in accordance with the project work plan.

9. Decontamination

9.1 Personal Decontamination

Proper decontamination is required of all personnel before leaving the site. Decontamination will occur within the contamination reduction zone. Disposable PPE will be removed in the decontamination zone and placed in lined garbage bags.

If worn, respirators will be cleaned after each use with respirator wipe pads and will be stored in plastic bags after cleaning.

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

10. Medical Monitoring and Training Requirements

10.1 Medical Monitoring

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

10.2 Health and Safety Training

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

10.2.1 Pre-Entry Briefing

The SSO will conduct a pre-entry briefing before site activities begin. HASP receipt and acceptance sheets will be collected at this meeting. Short safety refresher meetings will be conducted, as needed, throughout the duration of the project. Attendance of the pre-entry meeting is mandatory and will be documented by the ENSR SSO. An attendance form is presented in Attachment B.

11. Emergency Response

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

The basic elements of an emergency evacuation plan include:

- employee training,
- alarm systems,
- escape routes,
- escape procedures,
- critical operations or equipment,
- rescue and medical duty assignments,
- designation of responsible parties,
- emergency reporting procedures and
- methods to account for all employees after evacuation.

11.1 Employee Training

Employees must be instructed in the site-specific aspects of emergency evacuation. On-site refresher or update training is required anytime escape routes or procedures are modified or personnel assignments are changed.

11.2 Alarm Systems/Emergency Signals

An emergency communication system must be in effect at all sites. The most simple and effective emergency communication system in many situations will be direct verbal communications. Each site must be assessed at the time of initial site activity and periodically as the work progresses. Verbal communications must be supplemented anytime voices can not be clearly perceived above ambient noise levels (i.e., noise from heavy equipment; drilling rigs, backhoes, etc.) and anytime a clear line-of-sight can not be easily maintained amongst all ENSR personnel because of distance, terrain or other obstructions.

Verbal communications will be adequate to warn employees of hazards associated with the immediate work area. Phones are available at the facility to facilitate communications with local emergency responders.

11.3 Escape Routes and Procedures

The escape route from the site will be via the driveway to the facility and Lawsbrook Rd.

11.4 Rescue and Medical Duty Assignments

The phone numbers of the police and fire departments, ambulance service, local hospital, and ENSR representatives are provided in the emergency reference sheet. This sheet will be posted in the site vehicle.

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

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

11.5 Designation of Responsible Parties

The SSO is responsible for initiating emergency response. In the event the SSO can not fulfill this duty, the alternate SSO will take charge. All personnel on site are responsible for knowing the escape route from the site and where to assemble after evacuation.

11.6 Employee Accounting Method

The SSO is responsible for identifying all ENSR personnel on-site at all times. On small, short duration jobs this can be done informally as long as accurate accounting is possible. On all other sites a formal log-in and log-out procedure must be implemented.

11.7 Accident Reporting and Investigation

Any incident (other than minor first aid treatment) resulting in injury, illness or property damage requires an accident investigation and report. The investigation should be conducted as soon

as emergency conditions are under control. The purpose of the investigation is not to attribute blame but to determine the pertinent facts so that repeat or similar occurrences can be avoided. An ENSR accident investigation form is presented in Attachment C of this HASP. The injured ENSR employee's supervisor and the RHSM should be notified immediately of the injury. If a subcontractor employee is injured, they are required to notify the ENSR SSO. Once the incident is under control, the subcontractor will submit a copy of their company's accident investigation report to the ENSR SSO.

EMERGENCY REFERENCES

Ambulance:	911
Fire:	911
Police:	911
Medical Services:	978-369-1400 Emerson Hospital Nine Acres Corner Concord, MA
Directions to Hospital:	Make a right onto Lawsbrook Rd. Follow to Main Street (Route 62). Follow Route 62 to the intersection with Rt. 2. Take the 2nd right (Nine Acres Corner) off of Rt.2. The entrance to the hospital is the 1st left off of Nine Acres Corner.
On Site Telephone:	Phones are available at the site.

ENSR Project Representatives:

ENSR/WESTFORD, MA	978-589-3000
-Kathleen Harvey (RHSM)	x 3325
-Mary Beth Hayes (PM)	x 3092

BOC Representatives:

-Mike Resh (Mgr. Env. Remediation)	908-771-1452
-James Hall (Plant Manager)	978-263-3918

Massachusetts Department of Environmental Protection:

-Mark Matys	508-792-7653 x 3832

Acton Board of Health:

- Sharon Walker Mastenbrook	978-264-9634

Attachment A

Health and Safety Plan Receipt and Acceptance Form

Health and Safety Plan Receipt and Acceptance Form

Supplemental Phase II Comprehensive Site Assessment
BOC Gases
Acton, Massachusetts

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

Name (Print) _____

Signature _____ Date: _____

Representing (Print) _____
Company Name

Attachment B

Health and Safety Plan Pre-Entry Briefing Attendance Form

Health and Safety Plan Pre-Entry Briefing Attendance Form

Supplemental Phase II Comprehensive Site Assessment
BOC Gases
Acton, Massachusetts

Briefing Conducted By: _____

Date Performed: _____

Printed Name	Signature	Representing

Attachment C

Supervisor's Accident Investigation Report Form

SUPERVISOR'S ACCIDENT INVESTIGATION REPORT

Injured Employee _____ Job Title _____

Home Office _____ Division/Department _____

Date/Time of Accident _____

Location of Accident _____

Witnesses to the Accident _____

Injury Incurred? _____ Nature of Injury _____

_____

Engaged in What Task When Injured? _____

_____

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

Were Other Persons Involved/Injured? _____

_____

How Did the Accident Occur? _____

_____

_____

_____

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

_____

_____

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

_____

_____

Supervisor's Signature _____ Title _____ Date _____

Reviewer's Signature _____ Title _____ Date _____

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

TEN BASIC SAFETY [illegible]

AIRCO PROPERTY AND PLANT

ACTON, MASSACHUSETTS

1. SAFETY GLASSES MUST BE WORN (CONTRACTORS INCLUDED) IN ALL AREAS OF THE PLANT WITH EXCEPTION OF:

   * REST ROOMS
   * BREAK ROOMS
   * OFFICES

2. STEEL TOE SAFETY SHOES AND WORK GLOVES MUST BE WORN WHILE PERFORMING WORK DUTIES.

3. WORK UNIFORMS SUPPLIED BY THE COMPANY WILL BE WORN DURING WORKING HOURS.

4. SMOKING IS NOT PERMITTED ANYWHERE IN THE PLANT, EXCEPT IN THE FOLLOWING DESIGNATED AREAS:

   * BREAK ROOMS
   * BOILER ROOMS
   * OFFICES

5. THE SPEED LIMIT ON AIRCO PLANT PROPERTY IS 10 MPH (THIS INCLUDES THE DRIVEWAY ENTRANCE).

6. EMPLOYEES MUST IMMEDIATELY (NO LATER THAN THE END OF THEIR SHIFT) REPORT ALL:

   * PERSONAL INJURY (NO MATTER HOW SLIGHT)
   * ACCIDENTS
   * SPILLAGE
   * CONTAMINATION
   * PROPERTY DAMAGE

   TO THEIR SUPERVISOR

7. EMPLOYEES SHALL IMMEDIATELY REPORT ALL DEFECTIVE EQUIPMENT, INCLUDING CUSTOMER EQUIPMENT, TO THEIR SUPERVISORS.

8. EMPLOYEES SHALL NOT USE OR POSSESS ILLEGAL DRUGS OR ALCOHOLIC BEVERAGES WHILE ON PREMISES.

9. EMPLOYEES MUST NOT REPORT TO WORK UNDER THE INFLUENCE OF ALCOHOL OR ILLICIT DRUGS.

10. IT IS EVERYONE'S RESPONSIBILITY TO MAINTAIN GOOD HOUSEKEEPING PRACTICES IN AND AROUND THEIR WORK AREA.

6/92

6.10 Oxygen and compressed gas cylinders must be kept away from heat and open flames. Oxygen cylinders must be stored and secured separately from fuel gases and other combustibles by a distance of at least twenty (20) feet.

6.11 Cylinders and hoses must be placed where they are not exposed to sparks and slag from burning operations.

6.12 Do not strike an arc on cylinders, drop them or use them as rollers.

6.13 Cylinders must be transported and used in an upright position. They must be secured to prevent falling by chain, suitable strap or a rigid retaining bar.

6.14 Protective caps must be screwed down hand-tight when gauges and regulators are not in use and cylinder is considered in storage. Pressure regulators must be used on all cylinders.

6.15 Keep oil and grease away from oxygen regulators, hose and fittings. Never attempt to use grease or oil to lubricate the valve, regulator or fittings. Keep oily or greasy rags away from oxygen equipment.

6.16 Cylinders cannot be lifted or lowered with slings or by the protective cap. Cylinders must be raised and lowered with approved rigging gear.

6.17 Do not use acetylene at more than 15 psi gauge pressure. Do not store acetylene cylinders or use them with the cylinders lying down. This can result in the release of liquid acetone.

7.0 CRANES, DERRICKS AND HOISTS FOR LIFTING

7.1 Minimum clearances between equipment and overhead crane power rails, electrical feeders and transmission lines must conform to applicable Federal, State codes and local facility requirements.

7.2 A Contractor employee shall be designated to observe clearance of equipment used near power lines and give timely warning for all operations so the operator can maintain the required clearance. The required clearance can vary between 10 feet and 16 feet depending on the voltage.

7.3 Grounding of all mobile equipment working in proximity to power lines must conform to code or practice.

7.4 Blocks, sheaves, swivels, hooks, slings, clamps and cables shall be in good condition and free of defects. Proof of inspection should be required from the Contractor.

7.5 Double chokes must be used on all lifts.

7.6 A single Contractor employee shall act as signalman, using standard hand signals on all lifts.

7.7 All loads must have a minimum 3/8" tag line attached to limit load swing. The tag line must be attended when the load is suspended.

7.8 No one is permitted to place any body part under a suspended load.

7.9 Area where lift is being made must be secured to preclude unauthorized personnel from entering the area.

7.10 Personnel are not permitted to pass or work under the boom of any crane or ride on a crane hook or crane load.

7.11 Only by specific approval by the Company Representative, may a Contractor employee operate any of the Airco overhead cranes.

7.12 Personnel are not permitted to go up on overhead cranes or runways for any purpose without the approval of the Company Representative.

11.0 LADDERS

11.1 Ensure through preuse inspections that ladders are free from such defects as loose or broken steps or rungs, cracks or other weak places in the side rails, broken or frayed ropes on extension ladders and missing or damaged safety feet.

11.2 Ensure that ladders are set on solid and level footing and extend at least three (3) feet (three rungs) above the landing or the level to be reached.

11.3 Ladders must be set so the base of the ladder is 1/4 of the vertical height away from the wall. The ladder must be tied off at the top. The bottom of the ladder must be braced or someone positioned to secure the base of the ladder.

11.4 When climbing up or down a ladder, always face the ladder and hold onto it with both hands. When material must be handled, hoist or lower it with a hand line in a safe manner to prevent dropping it.

11.5 Both feet must be kept on the ladder rungs.

11.6 Only one person is allowed on a ladder at a time.

11.7 If it is necessary to place a ladder in or over a doorway, barricade the door and post warning signs.

11.8 Metal ladders are not permitted.

11.9 Stepladders must be set level on all four feet, with spreaders locked in place. Do not use as a straight ladder.

11.10 Never stand on the top or the first step from the top of a stepladder.

12.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

12.1 Contractor personnel must comply with the local PPE use requirements.

12.2 Full length trousers and a shirt with sleeves are required to be worn at all times.

13.0 ELECTRICAL

13.1 All electrical connections are to be made by a qualified electrician.

13.2 No one will enter any electrical station, motor control center or cubicle without prior clearance from the Company Representative.

13.3 All electrical hand tools and electrical equipment must be ground fault protected.

13.4 Electrical extension cords must be equipped with ground fault circuit interrupter. Worn or frayed cords must not be used.

13.5 Electrical extension cords must be suspended over aisles and/or walkways. The suspension must be at least seven (7) feet high.

13.6 Electrical extension cords, their receptacles and attachment plugs must conform to the electrical classification of the area of usage.

13.7 Bulbs on temporary lights must be equipped with guards and approved for hazardous locations, as applicable.

14.0 CONFINED SPACE ENTRY

14.1 Before entering a confined space, the Airco Company Representative must be notified.

14.2 The Company Representative will review the precautions necessary for safe entry with the Contractor Representative.

14.3 A permit must be issued and displayed prior to any confined space work taking place.

1.0 GENERAL

Airco Distributor and Cylinder Gases is a Division of Airco Gases and the parent company is The BOC Group, Inc. The Corporate headquarters is located at 575 Mountain Avenue, Murray Hill, NJ. The telephone number is (908) 464-8100.

Airco Gases is a manufacturer of compressed gases with numerous industrial and medical applications.

1.1 Facility Description

The facility is comprised of 5 distinct function areas. Each function is described and each area indicated on the appropriate plot plans with maximum anticipated quantities of hazardous materials stored and/or used there:

Note: Plot plans are located in the Appendix K, Plot Plans at the end of this document.

A. Compressed Gas Filling Plant

The filling plant performs primarily all of the manufacturing, cylinder maintenance, storage and distribution functions. These functions are performed in 4 building(s). The building(s) and function areas are identified respectively on the plot plan by: The function that is performed in that building. Example: Acetylene Plant, Hydrogen Plant, Cylinder Fill Building, Compressor Building.

Normal hours of production are 8:00 am to 12:00 pm, Monday through Friday.

B. Administrative Offices

The offices are used to facilitate administrative functions. This function area is identified on the plot plan by: "Office".

C. Adjacent Property

There are private homes bordering the driveway leading into the Plant. Approximately twelve to sixteen homes border this area. The East side is bordered by a desserted block manufacturing site. The North side is bordered by a B&M rail line and the West side is bordered by wooded area.

3.3 Attendance

Following a facility evacuation, at the assembly area each supervisor will perform a roll call of all their subordinates to account their whereabouts. The receptionist/telephone operator or other specific designee will bring a copy of a current personnel list formatted by work shift and the Visitor Log which will be used for further accounting of visitor personnel. A list shall be developed by the designated responder of all potentially unaccounted for personnel and provided to the emergency response coordinator.

Designated wardens will perform a search of the facility premises for personnel not accounted for.

3.4 Notification

In the event of a Class 1 emergency or as determined by the emergency response coordinator the designated responder shall make the following notifications as necessary:

o Acton Fire Department	Telephone:	263-9191
o Emerson Hospital (Concord)	Telephone:	369-1400
o Acton Police Department	Telephone:	263-2911

In the event a hazardous material release, (or threatened release), occurs that is above the reporting threshold quantity and/or poses a significant hazard to public safety the required agencies shall be contacted and the following information provided.

o Significant hazard hazardous material/waste release

Agency: National Response Center	Telephone:	(800) 424-8802
* Agency: State Emergency Response Commission	Telephone:	(617) 932-7600
Agency: Local Emergency Planning Commission (Acton Fire Department)	Telephone:	(508) 264-9645

o Discharges to waterways

* Agency: Department of Environmental Protection	Telephone:	(617) 932-7600

(* DEP - Woburn, MA)

Provide the following information:

- o Exact location of the release, (or threatened release)
- o Name of person making notification
- o Hazardous material involved
- o Estimation of the hazardous material quantity involved
- o Potential hazards, if known
- o Community precautions measures, (this includes evacuation)
- o If a waterway is contaminated, which one

3.5 Fires

Incipient fires are to be immediately extinguished by the nearest fire extinguisher. Fires beyond safe control require notification of the emergency response coordinator and the Fire Department. Utilize necessary personal protective equipment. If possible, any incompatibles should be safely isolated.

3.6 Releases

3.6.1 Flammable Liquid - Necessary personal protective equipment shall be utilized as indicated in Appendix D of this document. The flammable liquid absorbent material will be used to dike the spill, secure potentially exposed storm and sewer drains and absorb the spill. Incompatibles exposed due to the spill that can be moved clear, will be. All hazardous waste shall be properly disposed of in approved containers.

3.6.2 Non-flammable Liquid - Necessary personal protective equipment shall be utilized as indicated in Appendix D of this document. The non-flammable liquid absorbent material will be used to dike the spill, secure potentially exposed storm and sewer drains and absorb the spill. Incompatibles exposed due to the spill that can be moved clear, will be. All hazardous waste shall be properly disposed of in approved containers.

3.6.3 Flammable Gas Cylinder - Necessary personal protective equipment shall be utilized as indicated in Appendix D of this document. From a distance, spray water on the leaking cylinder and on surrounding cylinders to drench them without movement to keep the cylinders and area cool. If the gas has not ignited and is leaking around the valve stem or outlet, if possible close the valve outlet, (this may stop the leak). If the cylinder is indoors, consider moving it outdoors. If it is not possible to move the cylinder, consider moving the surrounding cylinders and incompatibles clear. See CGA SB-4-1990, Handling Acetylene Cylinders in Fire Situations for further reference.

3.6.4 Refrigerated Liquid - Necessary personal protective equipment shall be utilized as indicated in Appendix D of this document. If possible and time permits move equipment away that may be damaged by extreme cold, such as, tires or cylinders and allow the liquid to dissipate. If the release is oxygen keep ignition sources, flammables and combustibles away.

3.6.5 Personal Protective Equipment - Personal protective equipment necessary to respond to each type of hazardous material release is listed Appendix D of this document. The list is developed for each hazardous material that potentially could release.

3.7 Natural Disasters

3.7.1 Earthquakes - In the event or an earthquake, indoor personnel will calmly proceed to a clear and reinforced area, such as under a desk or next to a support column for protection against objects from falling overhead. Those outdoors will proceed to an area away from machinery and hazardous materials storage, such as, the middle of a parking lot.

APPENDIX D

Personal Protective Equipment List

The personal protective equipment listed below by hazard class, is required when a response to a release occurs:

Flammable Liquid	Non-flammable Liquid
Nomestat suit (large spills)	Non-permeable acid resistant gloves (butyl or PVC)
Non-combustible & heat resistant gloves	PVC apron
Heat resistant face shield	Face shield
Safety glasses	Safety glasses
Hard hat	SCBA above the IDLH
SCBA above the IDLH	

Flammable Gas Cylinder	Refrigerated Liquids
Nomestat suit	Loose fitting leather gloves
Non-combustible gloves	Loose fitting cotton clothing
Fire boots	- Long sleeve shirts
Heat resistant face shield	- Full length pants (over boots)
Safety glasses	Face Shield (heat resistant if flammable)
Hard hat	Safety glasses
SCBA above the IDLH	Hard Hat

(Use Nomestat, heat resistant and non-combustibles for flammables)

APPENDIX F

Emergency Classifications List

Class 1 Emergencies (Large Release)

Acetylene gas fire from acetylene storage area
Hydrogen gas related fire from liquid hydrogen storage tank
Nitrous oxide gas related fire from liquid nitrous oxide storage tank
Building fire
Serious gas or liquid release from liquid hydrogen storage tank
Serious gas or liquid release from liquid nitrous oxide storage tank
Serious instability of a liquid storage tank
Serious structural building damage
Toxic gas release above the TLV/PEL
Highly toxic gas release above the TLV/PEL
Corrosive gas release above the TLV/PEL
Hydrogen gas related fire from liquid hydrogen storage tank/hydrogen compressor

Class 2 Emergencies (Small Release)

Combustible fire
Cylinder fire
Flammable liquid spill minimal exposure
Non-flammable liquid spill minimal exposure
Caustic liquid spill

PLANT SMOKING POLICY
ACTON, MASSACHUSETTS

SMOKING IS NOT PERMITTED ANYWHERE IN THE PLANT, OR PLANT YARD EXCEPT IN THE FOLLOWING DESIGNATED AREAS:

* BREAKROOMS
* BOILER ROOMS
* OFFICES

BEFORE GOING OUTSIDE OF THESE AREAS, MAKE SURE THAT YOUR CIGARETTE, ETC., HAS BEEN PROPERLY EXTINGUISHED, AND PUT IN A PROPER RECEPTACLE. PLEASE DO NOT PUT OUT OR THROW CIGARETTE BUTTS ON THE FLOOR OR GROUND.

THIS POLICY APPLIES TO EVERYBODY WHO ENTERS THIS LOCATION, INCLUDING NON-AIRCO EMPLOYEES.

ONLY THROUGH YOUR HELP WILL WE KEEP THIS LOCATION

- *ACCIDENT FREE* -

REMEMBER, SAFETY IS EVERYBODY'S BUSINESS

THANK YOU,

ACTON SAFETY COMMITTEE

BOC GASES

Location: Acton, Ma. Date revised: Apr 27th 2001

B O C GASES
General safety / work rules

1. Smoking is permitted in designated areas only.
2. All personal protective equipment (PPE) will be worn in accordance with BOC standards.
3. All accidents, injuries, near misses, property damage, and / or unsafe conditions on equipment or in the work area are to be reported immediately to your supervisor.
4. Personnel must obtain managers approval, for work related outside medical treatment.
5. Employees are prohibited from interfering in any way with the prescribed operations or use of safety devices, emergency equipment, or safe work practices at any time.
6. Employees are prohibited from using equipment they are not trained to use.
7. All personnel will keep their work areas clean and orderly.
8. Climbing or standing on equipment is forbidden, only OSHA approved ladders, scaffolds, or man lifts can be used to access elevated areas.
9. Use proper lifting techniques and get help with heavy items.
10. Do not use tools or equipment that is broken or defective or improperly guarded and that do not meet original manufactures specification and report these to your manager.
11. Personnel must never permit oil or grease from any source to come into contact with oxygen or other cryogenic equipment or parts, if oil or grease comes into contact with oxygen or cryogenic equipment or parts contact your supervisor immediately.
12. Only oxygen compatible and oxygen clean parts are to be used in all oxygen services.
13. Personnel performing hazardous work must comply with "HAZARDUOS WORK PERMIT POLICY " permits can only be issued by authorized personnel.
14. Personnel working on equipment covered by the lockout / tag-out policy (loss control manual section 1400) will utilize lockout / tag-out procedures to isolate all energy sources.

A division of The BOC Group, Inc.
A Delaware Corporation

15. Compressed gas cylinders and chemical containers will be stored and segregated in compliance with OSHA, CGA, BOC guidelines.

16. All gas cylinders will be nested or secured at all times, cylinders not in use will have the caps securely in place, all cylinders will be identified by label for contents and condition.

17. Drivers must follow all requirements in the BOC driver manual and the DOT Motor Carrier Safety Regulations handbook.

18. Personnel operating motor vehicles will be professional and courteous. At all times safe driving performance is expected.

19. All personnel driving a forklift must be certified annually.

20. Jack stands must be used for all freestanding trailers.

21. All flammable trailers must be properly grounded when not in use.

22. All personnel will use the proper carts when handling liquid or gas cylinders.

23. All personnel will ensure customer vehicles meet industry standard prior to loading hazardous material.

24. All personnel will use only approved dock plates with handles, position stops or other means to secure from movement.

25. All cylinder straps and pallet straps must be in good working order or replaced prior to use.

26. All full nitrous oxide must be stored in a locked cage or building.

27. When a forklift is not in use the forklift blade's must be in the fully lowered position.

If any of the facilities work rules are violated the following disciplinary actions will take place:

- ❑ A Verbal warning will be given
- ❑ A written warning will be given
- ❑ A Final warning and suspension will be given
- ❑ Termination

Please speak with your Supervisor with any questions you may have regarding these rules.

APPROVAL: _____ _____ 5/4/2001 5/4/01

Plant Manager Regional Operations Manager Date

REV	DATE	REVISION DESCRIPTION	BY	CHK	APP
1	04-19-96	FOR USE	SR		

Attachment 4100-2 Contractor Safety Review

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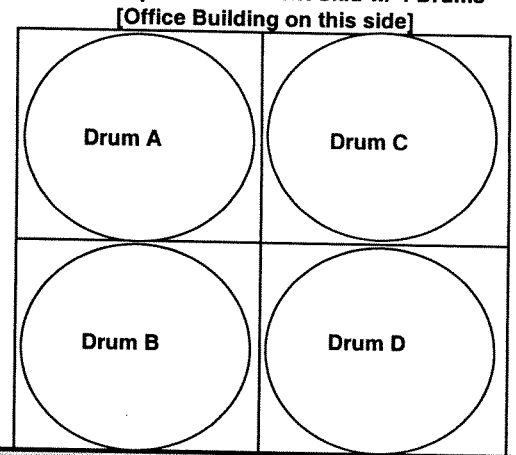
Appendix C
Product Recovery Summary
BOC Gases Free Product Recovery in Drums
BOC Gases
Acton, MA

Top View of Spill Containment Skid w/ 4 Drums
[Office Building on this side]



Date	ID	Total Liquid Depth in Drum, in	Product Depth in Drum, in	Product in Drum, gal (1 in =1.72 gal)	Water Depth in Drum, in	Water in Drum, gal (1 in = 1.72 gal)	Total Volume in Drum, gal (1 in = 1.72 gal)
6/4/99	Drum A	9.10	5.50	9.46	3.60	6.19	15.65
6/7/99	Drum A	6.90	4.20	7.22	2.70	4.64	11.87
6/8/99	Drum A	8.90	4.40	7.57	4.50	7.74	15.31
6/11/99	Drum A	8.90	4.80	8.26	4.10	7.05	15.31
6/14/99	Drum A	9.13	4.13	7.10	5.00	8.60	15.70
6/21/99	Drum A	8.80	3.60	6.19	5.20	8.94	15.14
6/23/99	Drum A	8.80	3.60	6.19	5.20	8.94	15.14
6/25/99	Drum A	14.50	5.90	10.15	8.60	14.79	24.94
7/6/99	Drum A	24.40	8.20	14.10	16.20	27.86	41.97
7/27/99	**Drum A**	**33.00**	**9.80**	**16.86**	**23.20**	**39.90**	**56.76**
Drum A is sealed, drum B is hooked up to the system.							
8/3/99	Drum B	4.00	NM		NM		6.88
8/4/99	Drum B	9.00	NM		NM		15.48
8/9/99	Drum B	16.00	NM		NM		27.52
8/9/99	Drum B	19.00	NM		NM		32.68
8/16/99	Drum B	21.25	NM		NM		36.55
8/17/99	Drum B	24.63	13.50	23.22	11.13	19.14	42.36
8/18/99	**Drum B**	**26.88**	**15.13**	**26.02**	**11.75**	**20.21**	**46.23**

Appendix C
Product Recovery Summary
BOC Gases Free Product Recovery in Drums
BOC Gases
Acton, MA

Date	ID	Total Liquid Depth in Drum, in	Product Depth in Drum, in	Product in Drum, gal (1 in =1.72 gal)	Water Depth in Drum, in	Water in Drum, gal (1 in = 1.72 gal)	Total Volume in Drum, gal (1 in = 1.72 gal)
Drum B is sealed, drum C is hooked up to the system.							
8/19/99	Drum C	2.13	0.25	0.43	1.88	3.23	3.66
8/20/99	Drum C	4.50	2.13	3.66	2.38	4.09	7.74
8/23/99	Drum C	5.63	3.38	5.81	2.25	3.87	9.68
8/24/99	Drum C	7.75	5.63	9.68	2.13	3.66	13.33
8/25/99	Drum C	9.50	6.00	10.32	3.50	6.02	16.34
8/26/99	Drum C	10.50	6.25	10.75	4.25	7.31	18.06
8/27/99	Drum C	11.25	6.50	11.18	4.75	8.17	19.35
8/30/99	Drum C	11.38	6.50	11.18	4.88	8.39	19.57
8/31/99	Drum C	11.50	7.00	12.04	4.50	7.74	19.78
9/3/99	Drum C	12.75	7.88	13.55	4.88	8.39	21.93
9/10/99	Drum C	13.13	NM		NM		22.58
10/5/99	Drum C	16.00	NM		NM		27.52
10/11/99	Drum C	17.50	NM		NM		30.10
10/13/99	Drum C	18.20	8.40	14.45	9.80	16.86	31.30
10/18/99	Drum C	21.80	11.60	19.95	10.20	17.54	37.50
11/3/99	Drum C	21.10	11.00	18.92	10.10	17.37	36.29
11/18/99	Drum C	21.00	11.00	18.92	10.00	17.20	36.12
12/6/99	Drum C	20.50	NM		NM		35.26
12/16/99	**Drum C**	**23.00**	**13.00**	**22.36**	**10.00**	**17.20**	**39.56**
Drum C is sealed, drum D is hooked up to the system.							
12/21/99	Drum D	2.38	2.38	4.09	0.00	0.00	4.09
12/23/99	Drum D	3.25	2.50	4.30	0.75	1.29	5.59
1/11/00	**Drum D**	**3.50**	**3.50**	**6.02**	**0.00**	**0.00**	**6.02**
1/11/00	**Product/water mixture disposed off-site this pickup**			**71.25**		**77.31**	**148.57**
1/18/00	Drum A	2.50	2.50	4.30	0.00	0.00	4.30
2/3/00	Drum A	7.38	7.38	12.69	0.00	0.00	12.69
2/18/00	**Drum A**	**31.00**	**7.75**	**13.33**	**23.25**	**39.99**	**53.32**
On 2/18/00 Drum A is sealed, drum B is hooked up to the system.							
4/10/00	**Drum B**	**33.00**	**13.63**	**23.44**	**19.38**	**33.33**	**56.76**
Drum B is sealed, drum C is hooked up to the system.							
4/18/00	**Drum C**	**27.13**	**27.00**	**46.44**	**0.13**	**0.22**	**46.66**
Drum C is sealed, drum D is hooked up to the system.							
4/21/00	**Drum D**	**20.75**	**20.75**	**35.69**	**0.00**	**0.00**	**35.69**

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Date	ID	Total Liquid Depth In Drum, In	Product Depth In Drum, In	Product in Drum, gal (1 In =1.72 gal)	Water Depth In Drum, In	Water In Drum, gal (1 In = 1.72 gal)	Total Volume In Drum, gal (1 in = 1.72 gal)
4/21/00	Product/water mixture disposed off-site this pickup			118.90		73.53	192.43
	Product/Water Disposed to Date			190.15		150.84	340.99
Drum B is hooked up to the system.							
4/28/00	Drum B	32.00	32.00	55.04	0.00	0.00	55.04
Drum B is sealed, drum A is hooked up to the system.							
5/12/00	Drum A	16.00	16.00	27.52	0.00	0.00	27.52
Drum A is sealed, drum C is hooked up to the system.							
5/17/00	Drum C	19.00	3.50	6.02	15.50	26.66	32.68
5/22/00	Drum C	22.00	6.00	10.32	16.00	27.52	37.84
Drum C is sealed, drum D is hooked up to the system.							
7/7/00	Drum D	2.00	2.00	3.44	0.00	0.00	3.44
7/7/00	Product/water mixture disposed off-site this pickup			96.32		27.52	123.84
7/7/00	Product & Water Disposed to Date			286.47		178.36	464.83
	System shut down between 7/7/00 and 10/10/00 as no product was observed in the recovery wells.						
10/10/00	System is turned back on based on product levels detected in wells RW-2,3,4, and 5 on 9/27/00						
11/7/00	Drum A	32.25	0.50	0.86	31.75	54.61	55.47
	Drum B	22.75	22.13	38.06	0.68	1.16	39.22
	Drum C	24.88	1.63	2.80	23.25	39.99	42.79
11/16/00	Drum D	19.50	19.50	33.54	0.00	0.00	33.54
11/27/00	Drum A	32.25	0.50	0.86	31.75	54.61	55.47
	Drum B	22.75	22.13	38.06	0.68	1.16	39.22
	Drum C	24.88	1.63	2.80	23.25	39.99	42.79
	Drum D	31.75	31.75	54.61	0.00	0.00	54.61
	Pallet					27.50	
11/28/00	Product/water mixture disposed off-site this pickup			96.32		123.26	219.58
	Total Recovery Since Last RAM Status Report (#3 on 9/7/00)			96		123	220
	Product/Water Disposed to Date			382.79		301.63	684.41

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12/1/00	Drum A	4.25	0.25	0.43	4.00	6.88	7.31
12/15/00	Drum A	14.50	6.00	10.32	8.50	14.62	24.94
12/19/00	Drum A	21.75	14.25	24.51	7.50	12.90	37.41
12/21/00	**Drum A**	**25.00**	**17.00**	**29.24**	**8.00**	**13.76**	**43.00**
Drum B is connected to the system							
12/28/00	Drum B	9.75	9.75	16.77	0.00	0.00	16.77
1/5/01	Drum B	19.63	19.63	33.76	0.00	0.00	33.76
1/8/01	**Drum B**	**31.00**	**31.00**	**53.32**	**0.00**	**0.00**	**53.32**
Drum C is connected to the system							
1/16/01	**Drum C**	**31.00**	**3.25**	**5.59**	**27.75**	**47.73**	**53.32**
Drum D is connected to the system							
1/19/01	**Drum D**	**28.00**	**3.25**	**5.59**	**24.75**	**42.57**	**48.16**
Drum E is connected to the system							
2/2/01	**Drum E**	**30.75**	**1.50**	**2.58**	**29.25**	**50.31**	**52.89**
2/2/01	**Product/water disposed off-site (most water was frozen).**			**87.72**		**63.21**	**150.93**
2/2/01	**Product\Water Disposed to Date**			**470.51**		**364.84**	**835.34**
3/29/01	Drum A	9.50	1.50	2.58	8.00	13.76	16.34
	Drum B	11.50	0.50	0.86	11.00	18.92	19.78
	Drum C	30.00	1.50	2.58	28.50	49.02	51.60
	Drum D	5.25	0.50	0.86	4.75	8.17	9.03
	Drum E	1.75	1.00	1.72	0.75	1.29	3.01
				8.60		**91.16**	
4/2/01	Drum A	0.00	0.00	0.00	0.00	0.00	0.00
	Drum B	28.00	3.50	6.02	24.50	42.14	48.16
	Drum C	30.00	1.50	2.58	28.50	49.02	51.60
	Drum D	0.00	0.00	0.00	0.00	0.00	0.00
	Drum E	0.00	0.00	0.00	0.00	0.00	0.00
Drum A is connected to the system							

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Date	ID	Total Liquid Depth In Drum, In	Product Depth in Drum, in	Product in Drum, gal (1 In =1.72 gal)	Water Depth in Drum, In	Water in Drum, gal (1 In = 1.72 gal)	Total Volume in Drum, gal (1 In = 1.72 gal)
4/6/01	Drum A	3.75	1.00	1.72	2.75	4.73	6.45
4/13/01	Drum A	5.00	1.75	3.01	3.25	5.59	8.60
	Drum B	24.63	1.75	3.01	22.88	39.35	42.36
	Drum C	30.13	1.63	2.80	28.50	49.02	51.82
	Drum D	0.00	0.00	0.00	0.00	0.00	0.00
	Drum E	0.00	0.00	0.00	0.00	0.00	0.00
System de-activated							
10/15/01	Drum A	5.00	1.88	3.23	3.13	5.38	8.60
System activated							
10/16/01	Drum A	22.00	2.38	4.09	19.63	33.76	37.84
10/16/01	**Drum A**	**26.25**	**3.00**	**5.16**	**23.25**	**39.99**	**45.15**
10/16/01	**Drum B**	**25.00**	**2.00**	**3.44**	**23.00**	**39.56**	**43.00**
10/16/01	**Drum C**	**30.25**	**2.00**	**3.44**	**28.25**	**48.59**	**52.03**
Drum D connected to the system							
11/20/01	**Drum D**	**32.38**	**6.50**	**11.18**	**25.88**	**44.51**	**55.69**
System de-activated							
11/26/01	Drum E is connected to the system		System activated				
11/30/01	Drum E	15.00	6.00	10.32	9.00	15.48	25.80
11/30/01	Drum E	19.50	7.25	12.47	12.25	21.07	33.54
System activated							
System activated							
12/3/01	**Drum E**	**33.00**	**5.50**	**9.46**	**27.50**	**47.30**	**56.76**
System de-activated							
Drum A connected to system							
12/4/01	**Product/water mixture disposed off-site this pickup**			**32.68**		**219.95**	**252.63**
12/4/01	**Product & Water Disposed to Date**			**503.19**		**584.78**	**1087.97**

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12/7/01	Drum A	33.00	NM		NM		
12/7/01	Pumped the contents of the pallet (product) into Drum E.						
12/7/01	Drum E	24.00	23.00	39.56	1.00	1.72	41.28
Drum B connected to the system							
1/11/02	Drum B	14.88	8.50	14.62	6.38	10.97	25.59
1/14/02	Drum B	24.63	8.88	15.27	15.75	27.09	42.36
1/15/02	Drum B	26.13	9.50	16.34	16.63	28.60	44.94
1/16/02	Drum B	28.00	11.50	19.78	16.50	28.38	48.16
1/18/02	Drum A	32.38	0.13	0.22	32.25	55.47	55.69
Drum C connected to the system							
1/18/02	Drum C	1.38	1.38	2.37	0.00	0.00	2.37
1/23/02	Drum C	9.88	4.13	7.10	5.75	9.89	16.99
1/25/02	Drum C	16.75	5.25	9.03	11.50	19.78	28.81
2/1/02	Drum C	18.00	6.25	10.75	11.75	20.21	30.96
2/4/02	Drum C	18.25	6.50	11.18	11.75	20.21	31.39
2/8/02	Drum C	18.25	4.75	8.17	11.75	20.21	28.38
2/11/02	Drum C	18.75	7.13	12.26	11.63	20.00	32.25
2/15/02	Drum C	18.75	7.13	12.26	11.63	20.00	32.25
2/18/02	Drum C	18.13	6.25	10.75	11.88	20.43	31.18
2/19/02	Drum C	18.25	6.50	11.18	11.75	20.21	31.39
2/20/02	Drum C	21.38	6.50	11.18	14.88	25.59	36.77
3/4/02	Drum C	21.00	6.13	10.54	14.88	25.59	36.12
	Drum C overflowed into the pallet. Since the oil was on top this meant the oil thickness in the drum decreased.						
3/5/02	Drum C	33.25	0.38	0.65	32.88	56.55	57.19
Drum D connected to the system							
3/7/02	Drum D	33.25	0.00	0.00	32.88	56.55	56.55
				21		197	
3/13/02	**Product/water mixture disposed off site this pickup**			**60.20**		**198.66**	**258.86**
	Product Disposed From Pallet			**66.00**			**324.86**
3/13/02	**Product/Water Disposed to Date**			**629.39**		**783.44**	**1412.83**

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Date	ID	Total Liquid Depth in Drum, in	Product Depth in Drum, in	Product in Drum, gal (1 in =1.72 gal)	Water Depth in Drum, in	Water in Drum, gal (1 in = 1.72 gal)	Total Volume in Drum, gal (1 in = 1.72 gal)
Drum A connected to the system							
3/14/02	Drum A	10.63	1.38	2.37	9.25	15.91	18.28
3/18/02	Drum A	10.88	1.50	2.58	9.38	16.13	18.71
3/20/02	Drum A	29.63	2.75	4.73	26.88	46.23	50.96
Drum B connected to the system.							
3/22/02	Drum B	27.13	0.88	1.51	26.25	45.15	46.66
Drum C connected to the system.							
3/25/02	Drum C	31.13	1.00	1.72	30.13	51.82	53.54
Drum D connected to the system.							
3/27/02	Drum D	5.50	1.75	3.01	3.75	6.45	9.46
3/29/02	Drum D	7.13	3.38	5.81	3.75	6.45	12.26
3/13/02	**Product/water mixture disposed off site this pickup**			**13.76**		**149.64**	**163.40**
3/13/02	**Product & Water Disposed to Date**			**643.15**		**933.08**	**1576.23**
Drum A connected to the system							
4/1/02	Drum A	31.38	4.75	8.17	26.62	45.79	53.97
Drum B connected to the system							
4/2/02	Drum B	30.63	1.75	3.01	28.88	49.67	52.68
4/8/02	Drum B	32.75	2.25	3.87	30.50	52.46	56.33
Drum C connected to the system							
4/11/02	Drum C	29.88	3.50	6.02	26.38	45.37	51.39
Drum D connected to the system							
4/12/02	Drum D	3.88	2.00	3.44	1.88	3.23	6.67
4/15/02	Drum D	6.75	2.38	4.09	4.38	7.53	11.61
4/19/02	Drum D	29.38	4.13	7.10	25.25	43.43	50.53
7/24/02	**Product/water mixture disposed off site**			**25.16**		**187.05**	**212.21**
7/24/02	**Product & Water Disposed to Date**			**668.30**		**1120.13**	**1788.43**

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Drum A connected to the system							
7/24/02	Drum A	3.25	3.25	5.59	0.00	0.00	5.59
7/26/02	Drum A	17.75	17.75	30.53	0.00	0.00	30.53
7/30/02	Drum A	25.50	25.50	43.86	0.00	0.00	43.86
Drum B connected to the system							
7/30/02	Drum B	4.38	0.63	1.08	3.75	6.45	7.53
7/30/02	Drum B	15.63	11.38	19.57	4.25	7.31	26.88
8/2/02	Drum B	22.25	18.00	30.96	4.25	7.31	38.27
8/6/02	Drum B	28.88	24.63	42.36	4.25	7.31	49.67
Drum C connected to the system							
8/9/02	Drum C	9.00	9.00	15.48	0.00	0.00	15.48
8/14/02	Drum C	16.13	16.13	27.74	0.00	0.00	27.74
8/16/02	Drum C	20.63	20.63	35.48	0.00	0.00	35.48
Drum D connected to the system							
8/26/02	Drum D	16.13	16.13	27.74	0.00	0.00	27.74
8/27/02	Drum D	20.25	20.25	34.83	0.00	0.00	34.83
8/30/02	Drum D	29.38	29.38	50.53	0.00	0.00	50.53
8/30/02	**Product/water mixture disposed off site this period**			**172.22**		**7.31**	**179.53**
8/30/02	**Product & Water Disposed to Date**			**840.52**		**1127.44**	**1967.96**
Drum A connected to the system							
9/4/02	Drum A	7.50	7.50	12.90	0.00	0.00	12.90
9/6/02	Drum A	12.25	12.25	21.07	0.00	0.00	21.07
9/9/02	Drum A	18.63	18.63	32.04	0.00	0.00	32.04
9/11/02	Drum A	23.13	23.13	39.78	0.00	0.00	39.78
9/13/02	Drum A	26.13	26.13	44.94	0.00	0.00	44.94
9/23/02	Drum A	32.75	25.50	43.86	7.25	12.47	56.33
9/9/02	Drum B	4.50	1.13	1.94	3.38	5.81	7.74
9/16/02	Drum B	10.13	6.75	11.60	3.38	5.81	17.42
9/18/02	Drum B	18.50	10.25	17.63	8.25	14.19	31.82
9/23/02	Drum B	30.63	11.38	19.57	19.25	33.11	52.68

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Drum B is sealed, drum C is hooked up to the system.							
9/23/02	Drum C	33.50	0.00	0.00	33.50	57.62	57.62
Drum C is sealed, drum D is hooked up to the system.							
9/30/02	Drum D	4.88	4.88	8.39	0.00	0.00	8.39
10/10/02	Drum D	28.00	0.00	0.00	28.00	48.16	48.16
10/10/02	Drum E	22.50	9.63	16.56	12.88	22.15	38.70
10/11/02	**Product/water mixture disposed off site this period**			**79.98**		**173.51**	**253.49**
10/11/02	**Product & Water Disposed to Date**			**920.50**		**1300.94**	**2221.44**
Drum A is hooked up to the system.							
10/15/02	Drum A	3.25	0.75	1.29	2.50	4.30	5.59
10/16/02	Drum A	8.25	5.75	9.89	2.50	4.30	14.19
10/18/02	Drum A	12.13	9.63	16.56	2.50	4.30	20.86
10/21/02	Drum A	20.63	18.13	31.18	2.50	4.30	35.48
10/23/02	Drum A	27.38	24.88	42.79	2.50	4.30	47.09
Drum B is hooked up to the system.							
10/24/02	Drum B	3.25	3.25	5.59	0.00	0.00	5.59
10/25/02	Drum B	5.38	5.38	9.25	0.00	0.00	9.25
10/28/02	Drum B	12.50	12.50	21.50	0.00	0.00	21.50
11/1/02	Drum B	18.38	18.38	31.61	0.00	0.00	31.61
11/4/02	Drum B	21.13	21.13	36.34	0.00	0.00	36.34
11/8/02	Drum B	29.00	29.00	49.88	0.00	0.00	49.88
Drum D is hooked up to the system.							
11/11/02	Drum D	5.50	5.50	9.46	0.00	0.00	9.46
11/15/02	Drum D	5.50	11.00	18.92	0.00	0.00	18.92
11/18/02	Drum D	5.50	13.88	23.87	0.00	0.00	23.87
11/20/02	Drum D	5.50	19.63	33.76	0.00	0.00	33.76
11/22/02	Drum D	5.50	27.00	46.44	0.00	0.00	46.44
Drum C is hooked up to the system.							
11/25/02	Drum C	5.50	4.00	6.88	1.25	2.15	9.03
11/30/02	Drum C	5.50	9.38	16.13	2.75	4.73	20.86
12/2/02	Drum C	5.50	12.25	21.07	3.00	5.16	26.23

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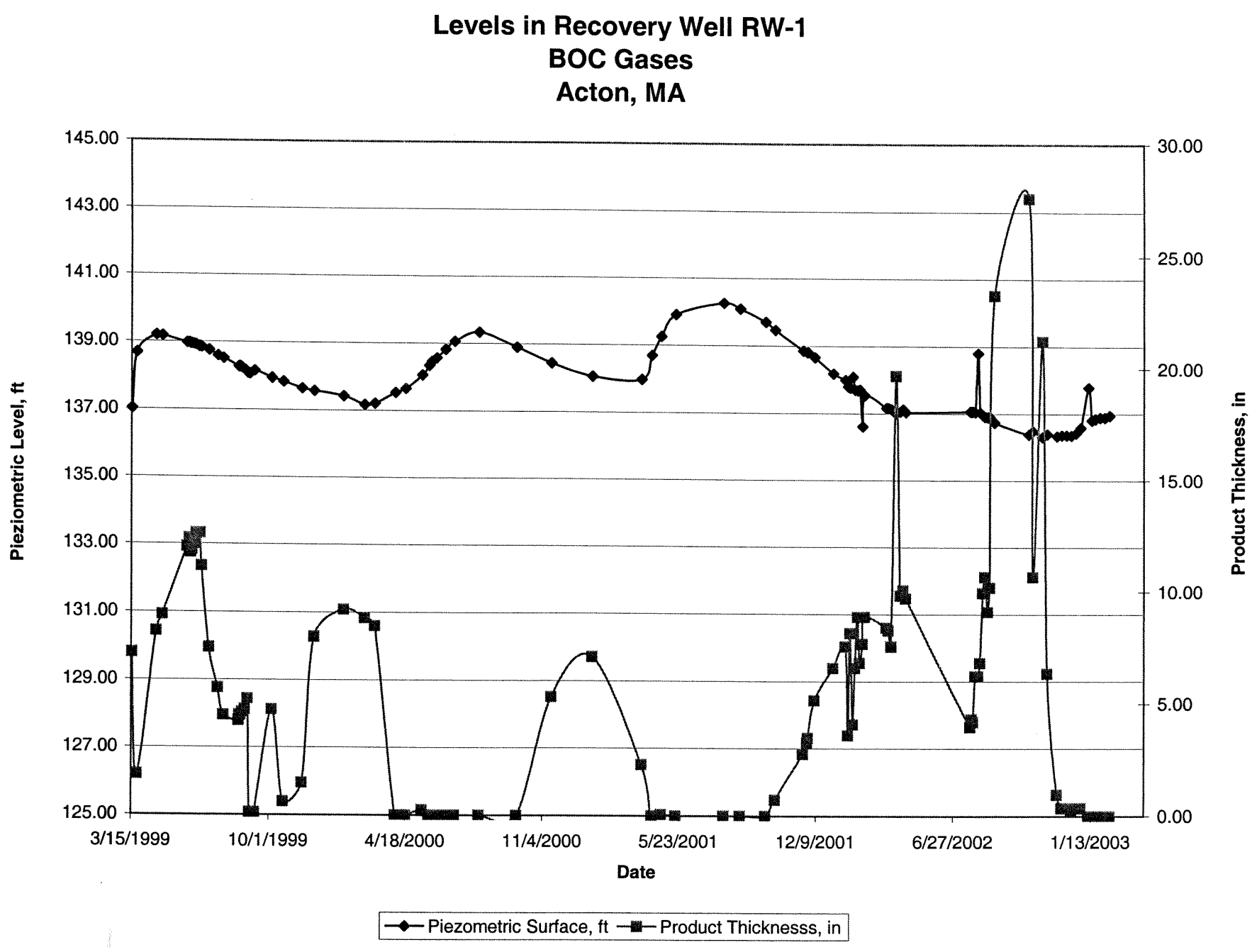
12/4/02	Drum C	5.50	17.38	29.89	3.00	5.16	35.05
12/6/02	Drum C	5.50	17.38	29.89	3.00	5.16	35.05
12/9/02	Drum C	5.50	27.25	46.87	3.00	5.16	52.03
						Frozen: Not transferred	
12/9/02	**Product/water mixture disposed off site this period**			**185.98**			**185.98**
12/9/02	**Product & Water Disposed to Date**			**1106.47**		**1300.94**	**2407.42**
Drum A is hooked up to the system.							
12/9/02	Drum A	5.50	4.00	6.88	0.00	0.00	6.88
12/13/02	Drum A	5.50	13.25	22.79	4.00	6.88	29.67
12/16/02	Drum A	5.50	20.25	34.83	5.50	9.46	44.29
Drum B is hooked up to the system.							
12/19/02	Drum B	5.50	7.75	13.33	0.00	0.00	13.33
12/23/02	Drum B	5.50	15.25	26.23	0.50	0.86	27.09
12/27/02	Drum B	5.50	32.25	55.47	0.75	1.29	56.76
Drum C is hooked up to the system.							
12/30/02	Drum C	5.50	18.50	31.82	3.00	5.16	36.98
12/31/02	Drum C	5.50	23.50	40.42	3.00	5.16	45.58
Drum D is hooked up to the system.							
12/31/02	Drum D	5.50	1.00	1.72	3.00	5.16	6.88
1/3/03	Drum D	5.50	17.25	29.67	4.00	6.88	36.55
1/10/03	**Product/water mixture disposed off site this period**			**160.39**		**22.79**	**183.18**
1/10/03	**Product & Water Disposed to Date**			**1266.86**		**1323.73**	**2590.60**
1/10/03	Drum D	5.50	0.00	0.00	4.00	6.88	6.88
1/15/03	Drum D	5.50	9.25	15.91	15.00	25.80	41.71
Drum A is hooked up to the system.							
1/20/03	Drum A	5.50	4.75	8.17	7.00	12.04	20.21
1/24/03	Drum A	5.50	12.63	21.72	6.75	11.61	33.325
1/27/03	Drum A	5.50	18.88	32.47	6.50	11.18	43.645
Drum B is hooked up to the system.							
1/31/03	Drum B	8.68	8.68	14.92	0.00	0.00	14.921
2/3/03	Drum B	14.75	14.75	25.37	0.00	0.00	25.37
2/7/03	Drum B	23.50	23.50	40.42	0.00	0.00	40.42
2/10/03	Drum B	25.63	28.63	49.24	0.00	0.00	49.235

Appendix C
Product Recovery Summary
BOC Gases Free Product Recovery in Drums
BOC Gases
Acton, MA

Date	ID	Total Liquid Depth in Drum, in	Product Depth in Drum, in	Product in Drum, gal (1 in =1.72 gal)	Water Depth in Drum, in	Water in Drum, gal (1 in = 1.72 gal)	Total Volume in Drum, gal (1 in = 1.72 gal)
Drum C is hooked up to the system.							
2/10/03	Drum C	3.00	0.00	0.00	3.00	5.16	5.16

Note:
1. From 6/25/99 through 8/3/99 product recovery system was not operational. Wells RW-1, 2, 4, 6 were periodically bailed with large hand bailer. Recovered product was drummed.
2. Interface Probe was used to measure drum contents up to 6/9/99. On 6/11/99 ENSR switched to using water level paste applied to a yard stick.
3. One inch equals approximately 1.72 gallons of liquid.



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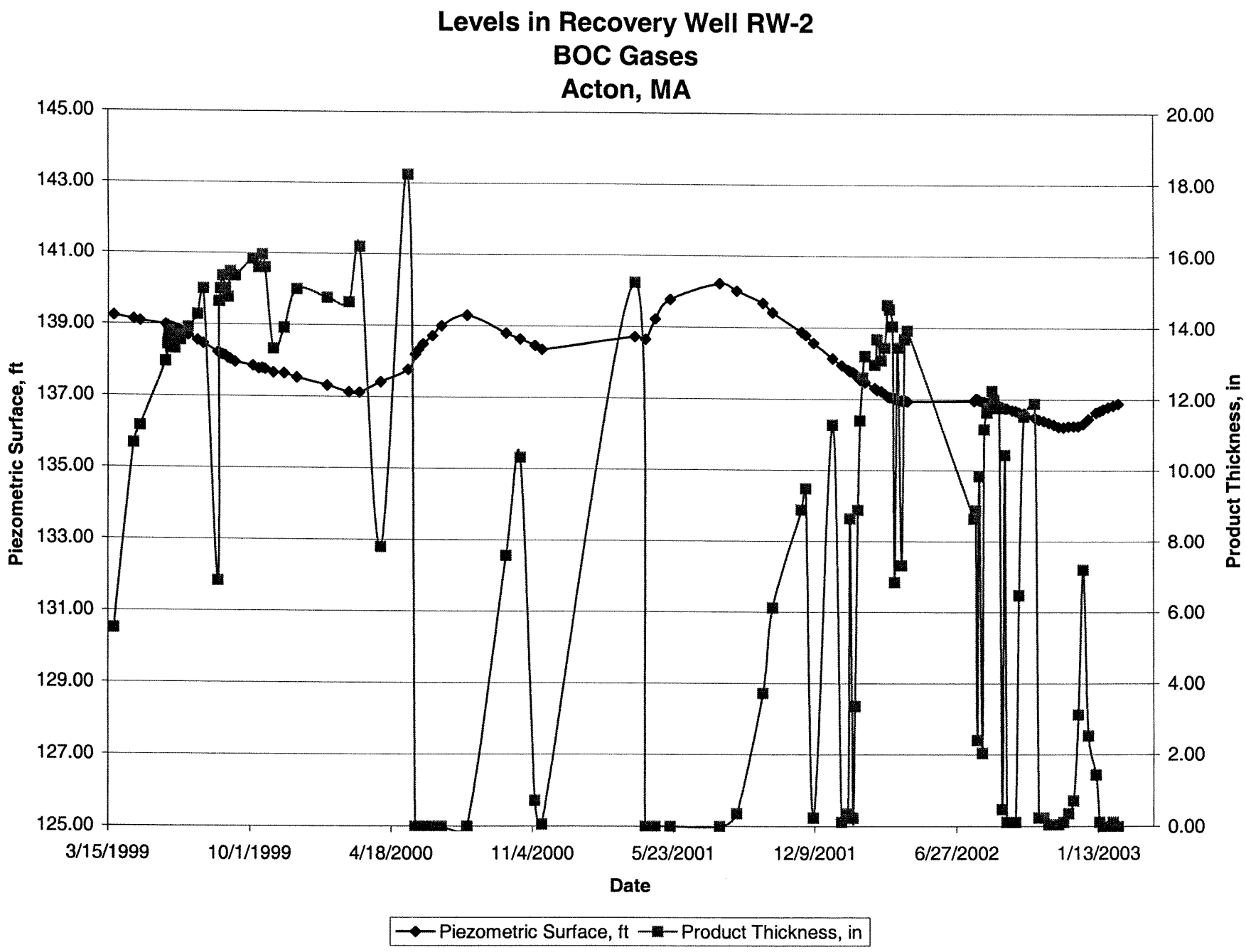
2/13/2003



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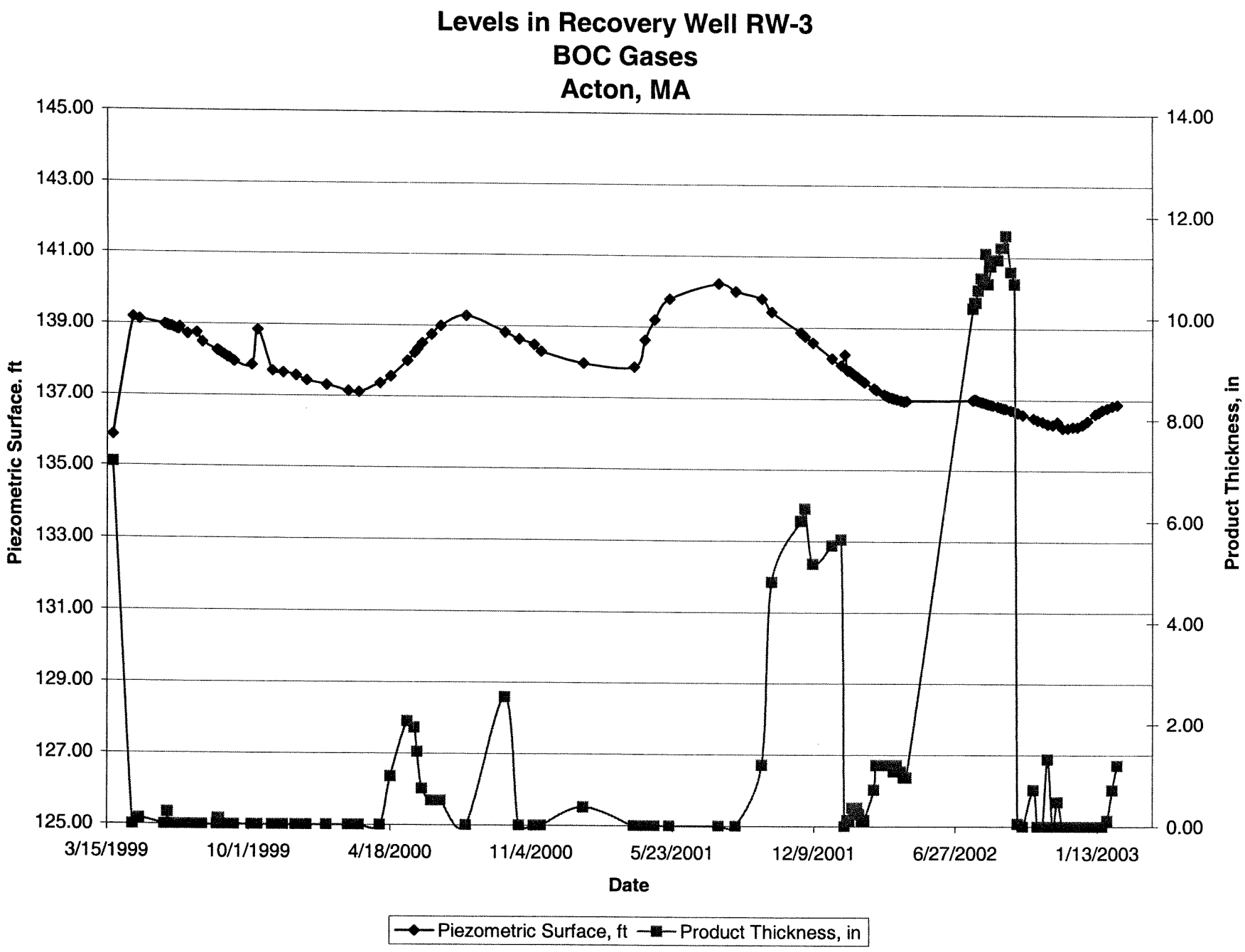

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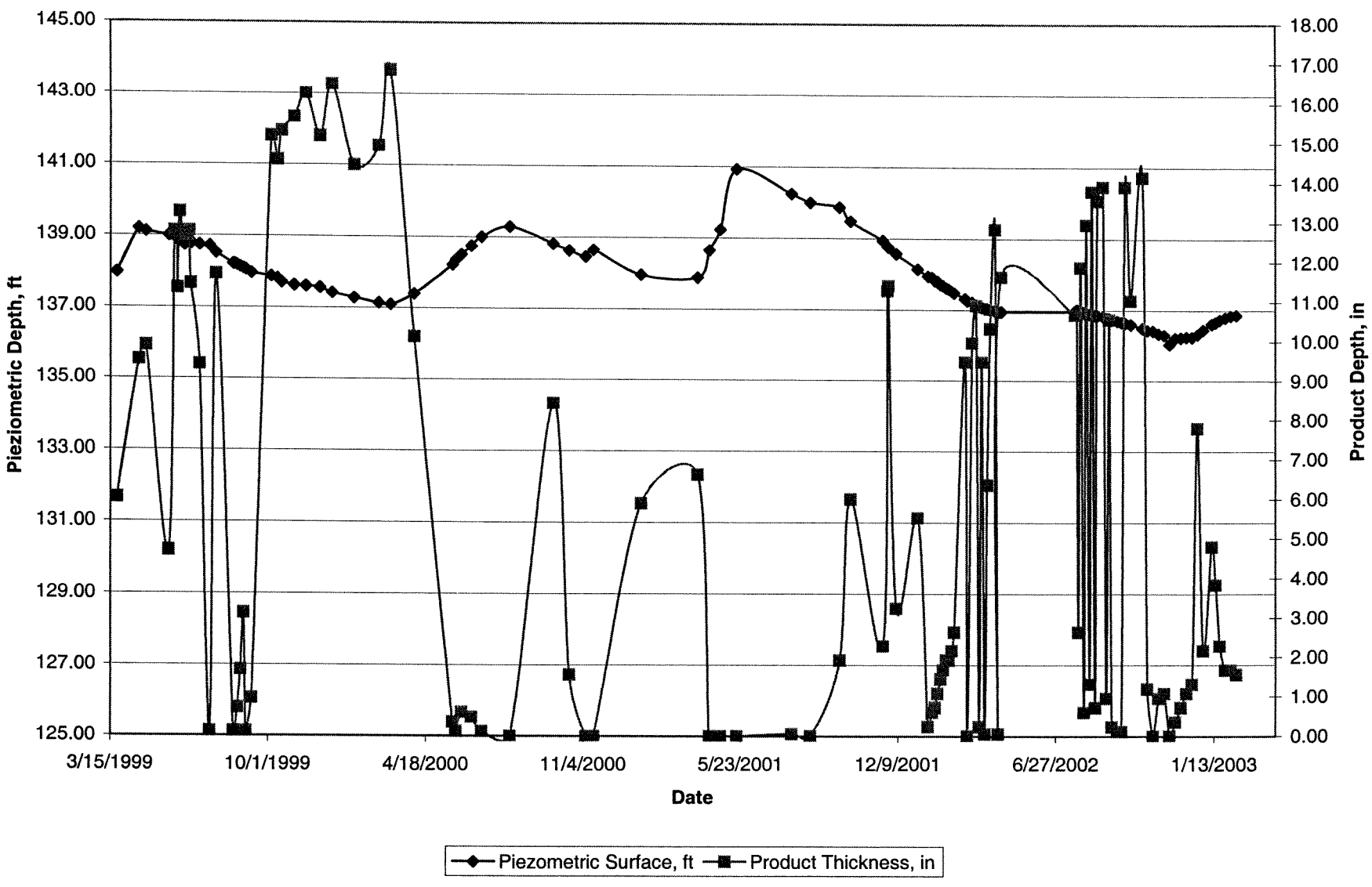
Levels in Recovery Well RW-4
BOC Gases
Acton, MA



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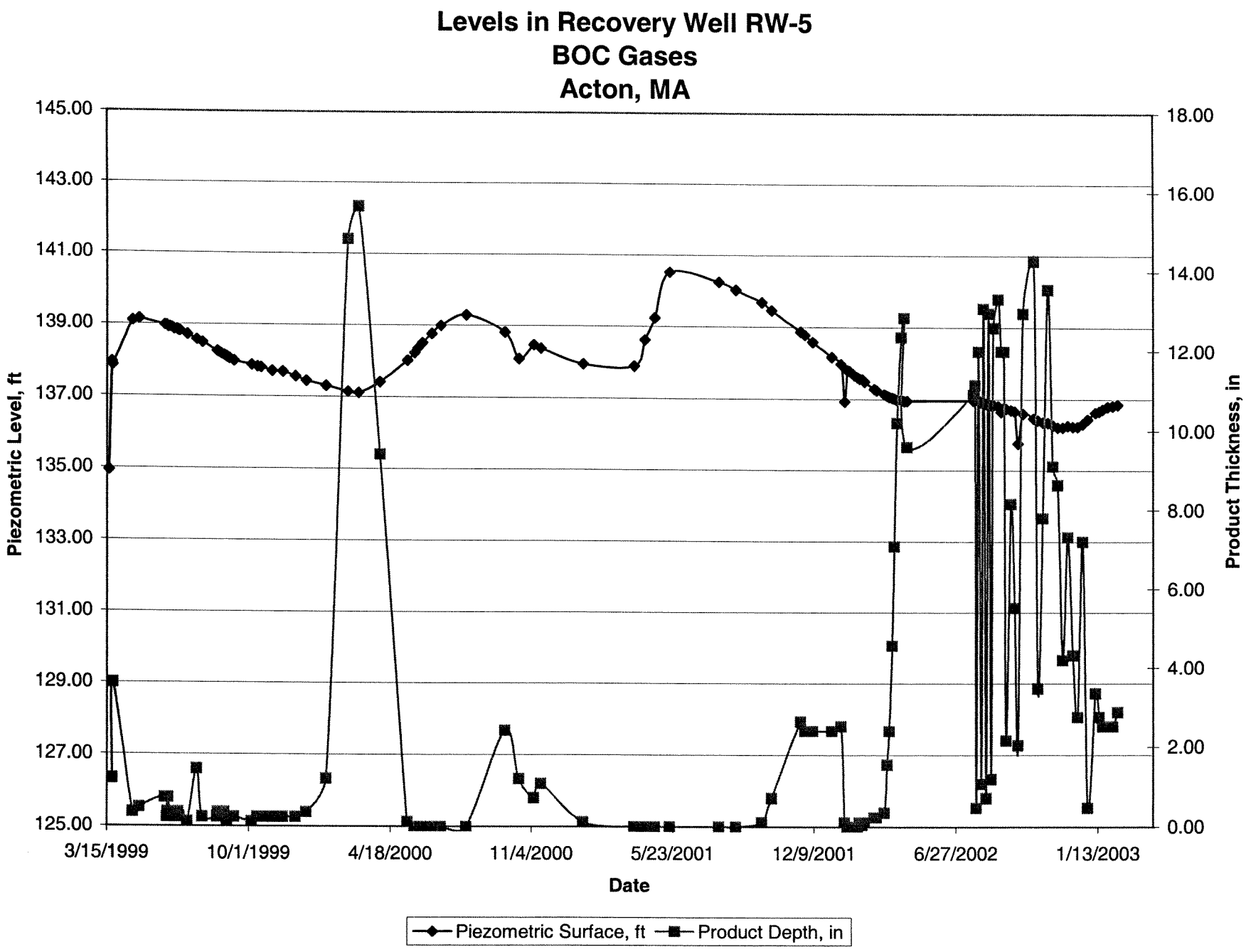

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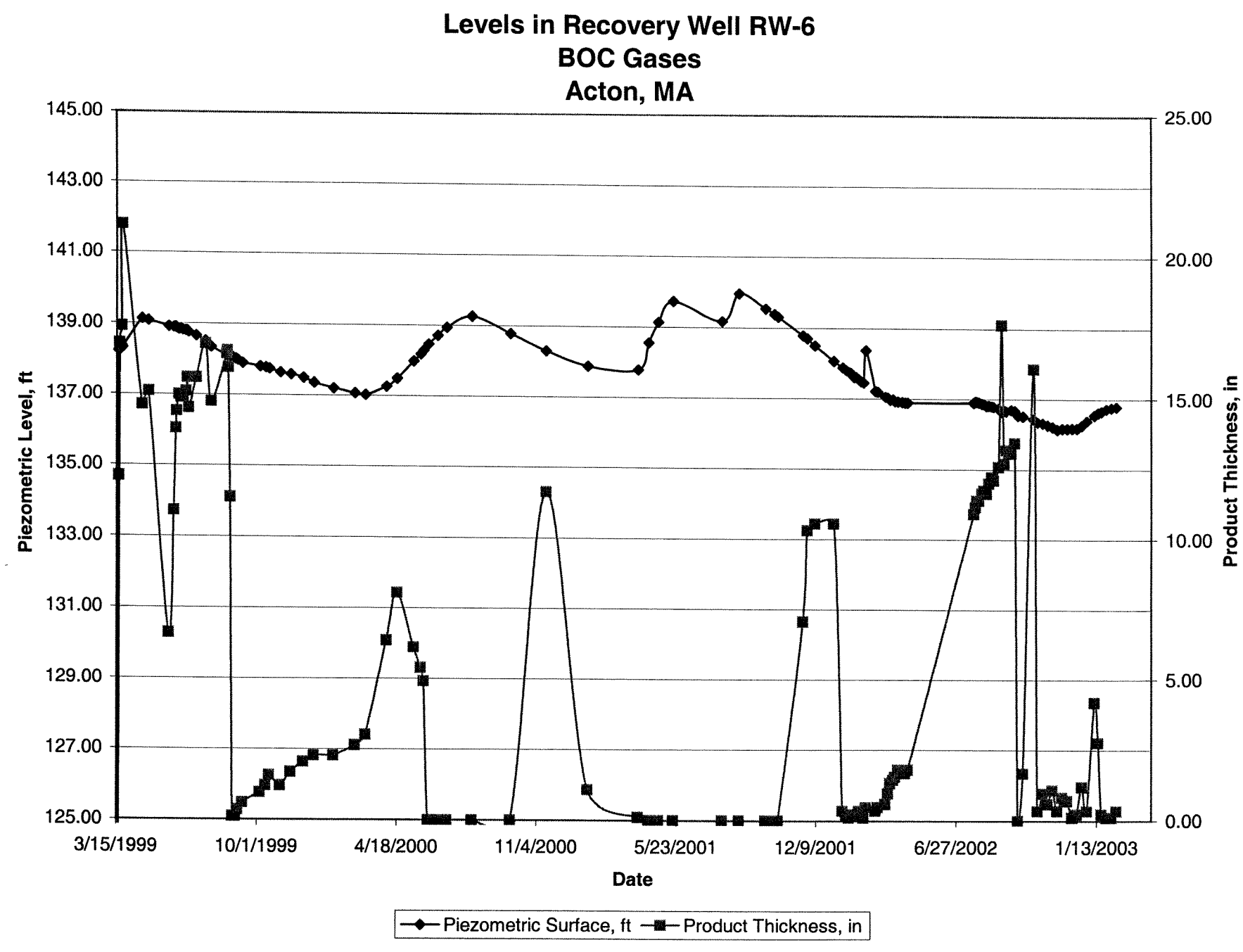
2/13/2003



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2/13/2003

1.0 General

1.1 Ensure that all contractor work performed complies with the federal or state-approved Occupational Safety and Health Act (OSHA) as well as other applicable federal, state, and local standards and company loss prevention policies/procedures and rules.

1.2 Smoke only in areas designated by the company. Observe location smoking rules.

1.3 Report all injuries and emergencies to the contractor and company representatives immediately.

1.4 Do not bring cameras into BOC Gases facilities unless approved by the company representative.

1.5 Do not allow explosives of any type on the site unless specifically approved by the company representative.

1.6 Comply with all posted instruction signs such as *Warning, Caution,* or *Restricted Area.*

1.7 Do not allow any horseplay, running, or scuffling.

2.0 Housekeeping

2.1 Maintain housekeeping practices meeting BOC Gases minimum housekeeping standards at all times.

2.2 Keep oily or greasy rags in metal containers supplied by the contractor.

2.3 Keep all walkways, exits, operating areas, and roadways clear and free of tripping hazards.

2.4 Arrange hoses, welding cables, rope, cable, etc., so that they do not present tripping hazards to personnel in general walking areas.

2.5 Keep all emergency equipment (e.g., fire extinguishers, SCBA equipment, fire blankets, safety showers, eyewash stations) free from any obstruction or blockage.

2.6 Store all material in accordance with local regulations and where it shall not interfere with normal facility operations or create a hazard. Storage locations shall be approved by the company representative.

2.7 Store and label all wastes in accordance with local regulations. Work with BOC personnel to ensure that spills are cleaned up promptly.

3.0 Fire Protection

3.1 To report a fire, do the following:

- Notify the company representative if time permits. Telephone the local fire department at 911.
- Slowly and clearly state your name and location and that you want to report a fire.
- Don't terminate the call until the fire department hangs up to ensure transmission.

3.2 Report all fires as outlined above. If a small fire is discovered in the contractor working area, contractor personnel should attempt to extinguish it with portable equipment. If the fire is large, contractor personnel must sound an alarm, evacuate the work area, and proceed to a safe, predetermined area. Take a head count and notify the company representative. Do not return to work until instructed by the company representative.

3.3 Report all fires, emergencies (including hazardous-material spills), or adverse conditions, regardless of their magnitude, to the company representative.

3.4 If local facility fire extinguishing equipment is used, immediately notify the company representative in charge of the work.

3.5 Maintain a minimum of 15 feet clearance around all fire hydrants. Do not allow contractor employees to use location fire hoses or fire hydrants except for emergencies unless approved by the company representative.

3.6 Store all flammable liquids in approved safety cans with flame arresters bearing FM/UL approval. Clearly mark all containers with their contents.

4.0 Overhead Work

4.1 Require the contractor to provide safety belts or harnesses with the appropriate fall protection device for their employees, who must wear them when working six feet or more above floor level unless work is performed on approved ladders or scaffolds.

4.2 Barricade or tape off areas underneath overhead work with signs placed to warn of danger of falling objects.

4.3 Do not leave loose material, tools, or equipment overhead.

4.4 Never drop or throw materials or equipment from elevated work areas.

5.0 Excavations and Openings

5.1 Protect open manholes, catch basins, pits, floor openings, and excavations with adequate barricades and warning devices.

5.2 Shore or slope excavations and trenches in accordance with OSHA standards
(29 CFR 1926, Subpart P).

5.3 Do not store materials within three feet of the edge of any excavation.

5.4 Procure a confined space permit before entering an excavation or opening.

5.5 Before allowing any excavation work, have the company representative ascertain the existence and location of any underground lines.

6.0 Welding and Burning

6.1 Have the company representative approve work areas where burning or welding is done, and obtain a hazardous work permit (HWP) from BOC Gases before doing any work. In addition, do any welding or burning in an oxygen or flammable gas area under the direct supervision of the contractor representative as approved by the company representative.

6.2 Require the contractor to furnish fire extinguishers (CO_2 or dry chemical), and keep them in the immediate area where the burning or welding is taking place.

6.3 Consider a fire watch as part of the precautions required by the HWP.

6.4 Require the contractor to provide proper and adequate shielding to protect all personnel from the arc's rays when employees are welding.

6.5 Make sure all weldments are grounded near the point of welding.

6.6 The contractor shall provide ventilation as necessary. Personnel should use proper respiratory protection, as needed.

6.7 Personnel must wear the appropriate eye, face, head, and body protection necessary to safely perform the task.

6.8 Visually inspect cables and hoses daily and be sure they are free of defects. Inspect gauges and torches before using them.

6.9 Ensure that cylinder valves are tightly closed at all times when not in use. Hoses must not be left under pressure.

6.10 Keep oxygen and compressed gas cylinders away from heat and open flames. Store oxygen cylinders and secure them at least 20 feet away from fuel gases and other combustibles.

6.11 Place cylinders and hoses where they are not exposed to sparks and slag from burning operations.

6.12 Do not strike an arc on cylinders, drop them, or use them as rollers.

6.13 Transport and use cylinders in an upright position. Prevent them from falling by securing them with chains, suitable straps, or rigid retaining bars.

6.14 Screw protective caps hand-tight when gauges and regulators are not in use and a cylinder is considered in storage. Use pressure regulators on all cylinders.

6.15 Keep oil and grease away from oxygen regulators, hoses, and fittings. Never attempt to use grease or oil to lubricate the valve, regulator, or fittings. Keep oily or greasy rags away from oxygen equipment.

6.16 Do not lift or lower cylinders with slings or by the protective cap. Raise and lower cylinders with approved rigging gear.

6.17 Do not use acetylene at more than 15 psi gauge pressure. Do not store acetylene cylinders or use them with the cylinders lying down. This can result in the release of liquid acetone.

7.0 Cranes, Derricks, and Hoists for Lifting

7.1 Ensure that minimum clearances between equipment and overhead crane power rails, electrical feeders, and transmission lines conform to applicable federal and state codes and local facility requirements.

7.2 Designate a contractor employee to observe clearance of equipment used near power lines and give timely warning for all operations so the operator can maintain the required clearance. The required clearance can vary between 10 and 16 feet, depending on the voltage.

7.3 Ensure that grounding of all mobile equipment working in proximity to power lines conforms to code or practice.

7.4 Ensure that blocks, sheaves, swivels, hooks, slings, clamps, and cables are in good condition and free of defects. Require proof of inspection from the contractor.

7.5 Use double chokes on all lifts.

7.6 Ensure that a single contractor employee acts as the signal person, using standard hand signals on all lifts.

7.7 Ensure that all loads have a minimum 3/8-inch tag line attached to limit load swing. Make sure that the tag line is attended when the load is suspended.

7.8 Do not allow anyone to place any body part under a suspended load.

7.9 Secure area where lift is being made to preclude unauthorized personnel from entering the area.

7.10 Do not permit personnel to pass or work under the boom of any crane or ride on a crane hook or crane load.

7.11 Do not allow a contractor employee to operate a BOC Gases overhead crane except with special permission of the company representative.

7.12 Do not allow personnel to go up on overhead cranes or runways for any purpose without the approval of the company representative.

8.0 Explosive Power-Actuated Tools

8.1 Do not permit explosive power-actuated tools to be used on BOC Gases property without special permission for each instance from the company representative.

8.2 Follow these practices if permission is granted:

- Ensure that the contractor uses qualified personnel as operators of explosive power-actuated tools and that they thoroughly understand the equipment and the safety requirements for its use.
- Rope off the work area and post appropriate warning signs when firing is in progress.
- Require warning signs, roping off when possible, and a safety watch at floor level for overhead firing. Require the contractor to provide the safety watch, who shall not be assigned other duties while firing is in progress.
- Require operators and assistants to wear the tool manufacturer's recommended eye and face protection when firing these tools.
- Do not allow explosive powered tools to be fired unless equipped with a protective shield (safety pad) or barrel attachment fitted to the particular tool and used in a way that prevents pins from ricocheting and controls flying particles.
- Ensure that operators using these tools exert every effort to control penetration into various materials by selecting the proper cartridge or plug, by using light metal discs, or by personal knowledge of the inherent characteristics of each tool. Check the other side of the job and use a suitable barricade to stop pins where any doubt exists about the thickness or resistance of material to be penetrated.

9.0 Vehicles

9.1 Make sure that contractor vehicles operating within the plant are kept in safe operating condition, including backup alarms, brakes, horns, and lights.

9.2 Provide a safety watch when backing up mobile equipment.

9.3 Ensure that plant traffic rules, signs, and speed limits are observed at all times.

9.4 Do not block aisles, doorways, and intersections unless permission is granted by the company representative.

9.5 Turn off engines when vehicle is not going to be used immediately.

9.6 Obtain BOC approval prior to conducting vehicle maintenance on BOC property.

10.0 Lockout/Tagout

10.1 Require lockout/tagout before allowing maintenance or service to be performed on any equipment, machinery, or systems where the unexpected energization, startup, or release of stored energy could cause injury or accident.

10.2 Notify the company representative each time lockout/tagout is required.

10.3 Ensure that the company representative provides the contractor with the BOC Gases authorized personnel to initiate the lockout/tagout.

10.4 Ensure that the location's authorized individual locks and tags the energy isolation devices in the proper position to prevent the transfer of energy.

10.5 Ensure that contractor personnel also install their own locks and tags.

10.6 Ensure that the contractor complies with the BOC Gases lockout/tagout hazardous energy control procedure.

11.0 Ladders

11.1 Ensure through pre-use inspections that ladders are free from such defects as loose or broken steps or rungs, cracks, or other weak places in the side rails, broken or frayed ropes on extension ladders, and missing or damaged safety feet.

11.2 Ensure that ladders are set on solid and level footing and extend at least three feet (three rungs) above the landing or the level to be reached.

11.3 Ensure that ladders are set so the base of the ladder is 1/4 of the vertical height away from the wall. Tie off the ladder at the top. Brace the bottom of the ladder or position someone to secure the base of the ladder.

11.4 When climbing up or down a ladder, always face the ladder and hold onto it with both hands. When material must be handled, hoist or lower it with a hand line in a safe manner to prevent dropping it.

11.5 Keep both feet on the ladder rungs.

11.6 Allow only one person on a ladder at a time.

11.7 If it is necessary to place a ladder in or over a doorway, barricade the door and post warning signs.

11.8 Do not permit metal ladders to be used.

11.9 Set stepladders level, on all four feet, with spreaders locked in place. Do not use them as a straight ladder.

11.10 Never stand on the top or the first step from the top of a stepladder.

12.0 Personal Protective Equipment (PPE)

12.1 Ensure that contractor personnel comply with the location's PPE use requirements. STEEL TOED BOOTS / SAFETY GLASSES / GLOVES

12.2 Require workers to wear full-length trousers and a shirt with sleeves at all times.

13.0 Electrical

13.1 Ensure that all electrical connections are made by a qualified electrician.

13.2 Do not allow anyone to enter any electrical station, motor control center, or cubicle without prior clearance from the company representative.

13.3 Ensure that all electrical hand tools and electrical equipment are ground-fault protected.

13.4 Equip all electrical extension cords with ground-fault circuit interrupters. Do not use worn or frayed cords.

13.5 Ensure that electrical extension cords that must be suspended over aisles and/or walkways are at least seven feet high.

13.6 Ensure that electrical extension cords, their receptacles, and attachment plugs conform to the electrical classification of the area of usage.

13.7 Ensure that bulbs on temporary lights are equipped with guards and approved for hazardous locations, as applicable.

14.0 Confined Space Entry

14.1 Notify the BOC Gases company representative before entering a confined space.

14.2 Ensure that the company representative reviews the precautions necessary for safe entry with the contractor representative.

14.3 Ensure that a permit is issued and displayed before any confined space work is allowed.

15.0 Machinery and Tools

15.1 Do not permit internal combustion engines to be used inside buildings without permission of the company representative. If use of the equipment is approved, ensure that the contractor representative or his/her designated person continuously monitors the environment for carbon monoxide.

15.2 Visually inspect hand tools before use to ensure they are free of defects. In addition, ensure that hand tools are properly grounded or double insulated.

16.0 Paints and Solvents

16.1 Maintain adequate ventilation at all times where paints or solvents are used.

16.2 Ensure that personnel use the proper respiratory protection and protective clothing based on the toxicity of the material.

16.3 Ensure that any sprinkler heads present are adequately covered before any ceiling spray painting is done.

16.4 Ensure that disposal is done in accordance with local regulations.

REV	DATE	REVISION DESCRIPTION	BY	CHK	APP
1	04-19-96	FOR USE	SR		

Attachment 4100-3 **Contractor Injury and Illness Log**

Contractor Name: _____

Address: _____

_____

Vendor No.: _____ BOC Gases Location: _____

Date	Contractor Employee	Occupation/Job Assignment	Nature of Injury/Illness

Entry made by _____

Company Representative

ACTON BOARD OF HEALTH
APPLICATION for HAZARDOUS MATERIALS PERMIT

gal Name of Facility or Establishment: BOC Gases

Address: 37 Lawsbrook Road, Acton, MA 01720

ling Address: Same as above.

siness Telephone: (978) 263-7769

porate Officers: The BOC Group Inc., 575 Mountain Avenue, Murray Hill, NJ 07974 (908) 665-2400

ergency Contact Person: Daniel Benoit, Plant Manager

nergency Telephone (Day): (978) 263-7769 **Emergency Telephone (Night):** (978) 537-3735

e of Business: Distribution and Stocking of Compressed Gases.

***Aquifer Location:**
- ☐ well protection [1]
- ☐ recharge protection [2]
- ☐ aquifer protection [3]
- ☐ watershed protection [4]

***Watershed District:**
- ☐ Fort Pond
- ☐ Nashoba Brook

**Maps available at Acton Health Department.*

ype(s) of Permits Needed:
- ☑ remedial action following a discharge: [# 5 (*discharge*), # 6 (*remediation*)]
- ☐ small or large scale generator (or > 100 kg/220 lbs/25 gal/mo: material or waste):
  - [generator: # 3 (*mat.*); # 1 (*waste*) (*lrg.*), # 2 (*waste*) (*sm.*)]
  - [user: # 4 (*mat.*), # 7 (*waste*)]
- ☐ storage (> 25 gal or lb) > 24 hrs: [# 8, # 9 (*mat.*), # 12, # 13 (*waste*)]
- ☐ storage, use, generation of *extremely* hazardous material
- ☐ storage of hazardous material or waste *overnight in trucks*
- ☐ storage of prepackaged hazardous material (> 50 gal or lb): [# 10 (*lrg.*), # 11 (*sm.*)]
- ☐ UST storage of flammable or combustible materials
  - ☐ change in material stored
  - ☐ removal of underground tank

her Requirements:

____ MSDSs for all chemicals listed on application
____ emergency or contingency plan for an accidental spill
____ site plan of premises showing areas where are chemicals are stored (including tanks and piping)
____ copies of all disposal manifests (or other documents) showing proper disposal measures
____ evidence of date(s) of purchase for all storage systems
____ all relevant documentation (permits and citations):

____ Generator Status (LQG, SQG, VSQG)
____ Used Oil Burner Permit (Class A Recycling Permit)
____ Non-hazardous Industrial Wastewater Holding Tank Permit (BWP IW 29)
____ Other

---------- Do Not Complete below This Line ----------

☐ representatives at Board of Health application review hearing (date:) .....

Recommended Conditions: .....

Signature/Date: .....

Massachusetts Department of Environmental Protection **BWSC-108**
Bureau of Waste Site Cleanup

COMPREHENSIVE RESPONSE ACTION TRANSMITTAL FORM & PHASE I COMPLETION STATEMENT

Pursuant to 310 CMR 40.0484 (Subpart D) and 40.0800 (Subpart H)

Release Tracking Number: 2 - 11461

A. SITE LOCATION:

Site Name: (optional) BOC Gases - Free Product at MW-17S

Street: 37 Lawsbrook Road Location Aid:

City/Town: Acton ZIP Code: 01720

Related Release Tracking Numbers that this Form Addresses:

Tier Classification: (check one of the following) ☐ Tier IA ☐ Tier IB ☑ Tier IC ☐ Tier II ☐ Not Tier Classified

If a Tier I Permit has been issued, state the Permit Number: W000707

B. THIS FORM IS BEING USED TO: (check all that apply)

FEB 18 2003

☐ Submit a **Phase I Completion Statement**, pursuant to 310 CMR 40.0484 (complete Sections A, B, C, G, H, I and J).

☐ Submit a **Phase II Scope of Work**, pursuant to 310 CMR 40.0834 (complete Sections A, B, C, G, H, I and J).

☐ Submit a final **Phase II Comprehensive Site Report and Completion Statement**, pursuant to 310 CMR 40.0836 (complete Sections A, B, C, D, G, H, I and J).

☐ Submit a **Phase III Remedial Action Plan and Completion Statement**, pursuant to 310 CMR 40.0862 (complete Sections A. B. C. G. H. I and J).

☑ Submit a **Phase IV Remedy Implementation Plan**, pursuant to 310 CMR 40.0874 (complete Sections A, B, C, G, H, I and J).

☑ Submit an **As-Built Construction Report**, pursuant to 310 CMR 40.0875 (complete Sections A, B, C, G, H, I and J).

☑ Submit a **Phase IV Final Inspection Report and Completion Statement**, pursuant to 310 CMR 40.0878 and 40.0879 (complete Sections A, B, C, E, G, H, I and J).

☐ Submit a periodic **Phase V Inspection & Monitoring Report**, pursuant to 310 CMR 40.0892 (complete Sections A, B, C, G, H, I and J).

☐ Submit a final **Phase V Inspection & Monitoring Report and Completion Statement**, pursuant to 310 CMR 40.0893 (complete Sections A, B, C, F, G, H, I and J).

You must attach all supporting documentation required for each use of form indicated, including copies of any Legal Notices and Notices to Public Officials required by 310 CMR 40.1400.

C. RESPONSE ACTIONS:

☐ Check here if any response action(s) that serves as the basis for the Phase submittal(s) involves the use of Innovative Technologies. (DEP is interested in using this information to create an Innovative Technologies Clearinghouse.)

Describe Technologies: Not applicable

D. PHASE II COMPLETION STATEMENT:

Specify the outcome of the Phase II Comprehensive Site Assessment:

☐ Additional Comprehensive Response Actions are necessary at this Site, based on the results of the Phase II Comprehensive Site Assessment.

☐ The requirements of a Class A Response Action Outcome have been met and a completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.

☐ The requirements of a Class B Response Action Outcome have been met and a completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.

☐ Rescoring of this Site using the Numerical Ranking System is necessary, based on the results of the final Phase II Report.

E. PHASE IV COMPLETION STATEMENT:

Specify the outcome of Phase IV activities:

☐ Phase V operation, maintenance or monitoring of the Comprehensive Response Action is necessary to achieve a Response Action Outcome. (This site will be subject to a Phase V Operation, Maintenance and Monitoring Annual Compliance Fee.)

☐ The requirements of a Class A Response Action Outcome have been met. No additional operation, maintenance or monitoring is necessary to ensure the integrity of the Response Action Outcome. A completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.

☐ The requirements of a Class C Response Action Outcome have been met. No additional operation, maintenance or monitoring is necessary to ensure the integrity of the Response Action Outcome. A completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.

SECTION E IS CONTINUED ON THE NEXT PAGE

Massachusetts Department of Environmental Protection **BWSC-108**
Bureau of Waste Site Cleanup

COMPREHENSIVE RESPONSE ACTION TRANSMITTAL FORM & PHASE I COMPLETION STATEMENT
Pursuant to 310 CMR 40.0484 (Subpart D) and 40.0800 (Subpart H)

Release Tracking Number: 2 - 11461

E. PHASE IV COMPLETION STATEMENT: (continued)

☑ The requirements of a Class C Response Action Outcome have been met. Further operation, maintenance or monitoring of the remedial action is necessary to ensure that conditions are maintained and that further progress is made toward a Permanent Solution. A completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.

Indicate whether the operation and maintenance will be Active or Passive. (Active Operation and Maintenance is defined at 310 CMR 40.0006.):

◉ Active Operation and Maintenance ○ Passive Operation and Maintenance

(Active Operation and Maintenance makes the Site subject to a Post-RAO Class C Active Operation and Maintenance Annual Compliance Fee.)

F. PHASE V COMPLETION STATEMENT:

Specify the outcome of Phase V activities:

☐ The requirements of a Class A Response Action Outcome have been met and a completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.

☐ The requirements of a Class C Response Action Outcome have been met. No additional operation, maintenance or monitoring is necessary to ensure the integrity of the Response Action Outcome. A completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.

☐ The requirements of a Class C Response Action Outcome have been met. Further operation, maintenance or monitoring of the remedial action is necessary to ensure that conditions are maintained and that further progress is made toward a Permanent Solution. A completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.

Indicate whether the operation and maintenance will be Active or Passive. (Active Operation and Maintenance is defined at 310 CMR 40.0006.):

○ Active Operation and Maintenance ○ Passive Operation and Maintenance

(Active Operation and Maintenance makes the Site subject to a Post-RAO Class C Active Operation and Maintenance Annual Compliance Fee.)

G. LSP OPINION:

I attest under the pains and penalties of perjury that I have personally examined and am familiar with the information contained in this transmittal form, including any and all documents accompanying this submittal. In my professional opinion and judgment based upon application of (i) the standard of care in 309 CMR 4.02(1), (ii) the applicable provisions of 309 CMR 4.02(2) and (3), and (iii) the provisions of 309 CMR 4.03(5), to the best of my knowledge, information and belief,

> *if Section B indicates that a **Phase I, Phase II, Phase III, Phase IV or Phase V Completion Statement** is being submitted*, the response action(s) that is (are) the subject of this submittal (i) has (have) been developed and implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) complies(y) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> *if Section B indicates that a **Phase II Scope of Work** or a **Phase IV Remedy Implementation Plan** is being submitted*, the response action(s) that is (are) the subject of this submittal (i) has (have) been developed in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) complies(y) with the identified provisions of all orders, permits, and approvals identified in this submittal:

> *if Section B indicates that an **As-Built Construction Report** or a **Phase V Inspection and Monitoring Report** is being submitted*, the response action(s) that is (are) the subject of this submittal (i) is (are) being implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) complies(y) with the identified provisions of all orders, permits, and approvals identified in this submittal.

I am aware that significant penalties may result, including, but not limited to, possible fines and imprisonment, if I submit information which I know to be false, inaccurate or materially incomplete.

☐ Check here if the Response Action(s) on which this opinion is based, if any, are (were) subject to any order(s), permit(s) and/or approval(s) issued by DEP or EPA. If the box is checked, you MUST attach a statement identifying the applicable provisions thereof.

LSP Name: Christopher G. Mariano LSP #: 9197

Telephone: 978 589-3000 Ext.: 3135

FAX: (optional) 978 589-3100

Signature: Christopher G. Mariano

Date: 2/14/03

Stamp: COMMONWEALTH OF MASSACHUSETTS — CHRISTOPHER G. MARIANO No. 9197 — REGISTERED LICENSED SITE PROFESSIONAL

Massachusetts Department of Environmental Protection **BWSC-108**
Bureau of Waste Site Cleanup

COMPREHENSIVE RESPONSE ACTION TRANSMITTAL FORM & PHASE I COMPLETION STATEMENT
Pursuant to 310 CMR 40.0484 (Subpart D) and 40.0800 (Subpart H)

Release Tracking Number: 2 - 11461

H. PERSON UNDERTAKING RESPONSE ACTION(S):

Name of Organization: BOC Gases

Name of Contact: Michael Resh Title: Manager Environmental Remediation

Street: 100 Mountain Avenue

City/Town: Murray Hill State: NJ ZIP Code: 07974

Telephone: 908 771-1452 Ext.: FAX: (optional) 908 771-1203

☐ Check here if there has been a change in the person undertaking the Response Action.

I. RELATIONSHIP TO SITE OF PERSON UNDERTAKING RESPONSE ACTION(S): (check one)

☑ RP or PRP Specify: ◉ Owner ○ Operator ○ Generator ○ Transporter Other RP or PRP:

☐ Fiduciary, Secured Lender or Municipality with Exempt Status (as defined by M.G.L. c. 21E, s. 2)

☐ Agency or Public Utility on a Right of Way (as defined by M.G.L. c. 21E, s. 5(j))

☐ Any Other Person Undertaking Response Action Specify Relationship:

J. CERTIFICATION OF PERSON UNDERTAKING RESPONSE ACTION(S):

I, Michael Resh, attest under the pains and penalties of perjury (i) that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this transmittal form, (ii) that, based on my inquiry of those individuals immediately responsible for obtaining the information, the material information contained in this submittal is, to the best of my knowledge and belief, true, accurate and complete, and (iii) that I am fully authorized to make this attestation on behalf of the entity legally responsible for this submittal. I/the person or entity on whose behalf this submittal is made am/is aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate, or incomplete information.

By: Michael Resh (signature) Title: Manager Environmental Remediation

For: MICHAEL RESH for BOC Gases (print name of person or entity recorded in Section H) Date: 02/13/03

Enter address of the person providing certification, if different from address recorded in Section H:

Street:

City/Town: State: ZIP Code:

Telephone: Ext.: FAX: (optional)

YOU MUST COMPLETE ALL RELEVANT SECTIONS OF THIS FORM OR DEP MAY RETURN THE DOCUMENT AS INCOMPLETE. IF YOU SUBMIT AN INCOMPLETE FORM, YOU MAY BE PENALIZED FOR MISSING A REQUIRED DEADLINE.

6 Magnolia Drive
Acton, MA 01720
(978) 263-7370
February 3, 2003

Mr. Michael Resh, Manager Environmental Remediation
BOC Gases
100 Mountain Avenue
Murray Hill, NJ 07974

Re: Draft Public Involvement Plan
BOC Gases, Acton, MA Facility
37 Lawsbrook Road, RTN 2-0816

Dear Mr. Resh,

Thank you very much for issuing the Draft Public Involvement Plan for RTN 2-0816 at BOC Gases, 37 Lawsbrook Road in Acton, MA; and for holding the public meeting on January 16, 2003 to review this plan. As you know, there is public interest in understanding the contamination issues at the BOC Gases site, as well as at nearby properties. Thank you for the information that you have provided/are providing to help the public achieve this goal.

After reading the draft PIP I have three main comments/requests:

1. Please provide additional historical documents to the Public Repository at the Acton Memorial Library.

The PIP cites various investigations performed since 1987, including hydrogeologic investigations, soil sampling, ground water monitoring, and detection of VOCs, SVOCs, etc. To understand the issues at the site it would be helpful to be able to read the original documents from BCM, ENSR, IT, etc., even though some of the data may also be included/summarized in the upcoming Phase II Comprehensive Site Assessment.

All of the references cited in the draft PIP provide information relevant to the site. At a minimum, please provide the additional documents listed in the **attached (Table 1)**, to the Library Repository.

2. For members of the public who are unfamiliar with the BOC site and with the State regulatory process, please make Section 2.2.3 "Response Actions on the BOC Property" **more reader friendly, without excluding relevant information.** Helpful changes could include:

a. **the addition of RTN summary Tables**, (similar to the ones shown at the Jan. 16th meeting). These Tables could include: the RTN (release tracking number), the specific contaminants found, contaminant location, relevant documents, and dates of: initial detection, ground water or other monitoring, and remediation actions including start and end dates, etc.

b. beginning Section 2.2.3 with a **concise but inclusive summary of all the issues on the site; before getting into the specifics.** (The PIP does a nice job of this for the former Foster Masonry site, [in two paragraphs summarizing information on underground storage tanks, floor drains, chemicals used onsite, discharge practices, contaminants found, etc.—pg. 2-6]; and also for RTN #2-00816, in the last paragraph of this section on page 2-10.)

c. **providing a glossary of terms and acronyms**

d. **making changes to Figure 1.** including increasing font size so that labeling of buildings, the Duck Pond, Lime Pond, monitoring wells, etc. is easily legible; clearly indicating the BOC

Gases property boundary and the location of neighboring properties (former Foster Masonry Site, W.R. Grace, etc.), and delineating any groundwater divides.

3. Please be more specific when referring to the contamination on site, especially VOCs. This can still be done in a concise way. "X contaminant was found at Y concentration range at/near Z location." The draft PIP currently includes very vague statements such as: "Impact was observed to areas of the groundwater." (p. 2-6); "Analytical results of the new wells also indicated various VOCs and semi-volatile compounds in certain locations." (p. 2-7); "The results indicated selected VOCs and semi-volatile organics in selected monitoring wells." (p. 2-8) It would not be difficult to make these three statements, (for example), more specific, and it would be very helpful to the reader who is interested in the history of VOC detection at the site.

Additional detailed comments on the Draft PIP are as follows:

4. Are there any current activities at BOC Gases that could be producing odors, noted by at least one neighbor? (Production activities are described on page 2-2.)

5. p. 2-1 Are there other records to document production history, in addition to the 1957, 1973, and 1981 aerial photos?

6. p. 2-2 Could you please further define the groundwater divide between the Lawsbrook Aquifer and the Sinking Pond Aquifer? What percentage of BOC Gases is in each? It was my understanding from W.R. Grace documents that the groundwater divide generally runs along the MBTA rail line, and that very little, if any of the BOC Gases property is within the Sinking Pond Aquifer. Does BOC Gases have either current or historical evidence that the groundwater divide is/has been located elsewhere? (Please show this water divide [and its shift?] on Figure 1.)

7. p. 2-3 The third bullet point notes "changes in pumping of groundwater for domestic water supply by local residents in the vicinity of the site" Are any details available?

8. p. 2-3 The fourth bullet point, and the final paragraph on this page both refer to the groundwater recovery system at the W.R. Grace facility. Very little of the BOC Gases property—a sliver of the most southwesterly corner was determined by Grace to be within its ARS (Aquifer Restoration System) capture zone. (See Figures 7.3 and 7.5 in the Draft Remedial Investigation Report for the W.R. Grace Site; HSI GeoTrans, August 30, 2002.)

9. p. 2-3 The fifth bullet point refers to "injection scenarios" at the AWD well field. Are any details available?

10. p. 2-5 It's interesting to note that the BOC Gases PIP and the Initial Site Characterization Report for W.R. Grace (HSI Geotrans, 1998) cited the same report (Pine and Swallow, 1986), as evidence that the OTHER one was the likely source of TCE contamination. What accounts for this discrepancy? Please include the two studies cited in the PIP as looking at this issue, (GZA, 1985; and Pine and Swallow, 1986), in the Library Repository.

11. p.2-5 Fourth paragraph: "These compounds [chlorinated solvents, primarily VDC & vinyl chloride] were not customarily used by BOC Gases." Was there ANY use or storage of chlorinated solvents on the BOC Gases site?

12. p. 2-5: The final paragraph refers to an "unconfirmed landfill" site to the north/northeast of BOC Gases. Are any details available? Is the location in Acton? Concord? How close to the AWD public wells? What is the source of this information?

13. p.2-6 At the top of the page the former Foster Masonry plant is identified as having been located immediately to the west of BOC Gases, and in the next paragraph—to the northeast of BOC.

14. p.2-6 The two paragraph summary of the Foster Masonry site includes details on the number of underground storage tanks, and their contents, floor drains, specific disposal practices and contaminants used on site, the addition of algaecides, and detergents in wash water and the use of boiler and fuel additives including naptha, TCA, and TCE. Please provide similar details for the BOC Gases site.

15. p.2-6 Section 2.2.3: The first paragraph in this section refers to a MADEP, (then Mass. DEQE), Consent Order to cease discharging industrial wastes to the Duck Pond and Lime Pond, etc. Discharges were analyzed and groundwater monitoring wells were installed. The PIP states that "Impact was observed" to groundwater. Please be more specific. What contaminants were found in the wastewater discharge? In the groundwater? Who carried out this sampling/made these observations?

16. p.2-6 Section 2.2.3: Last paragraph on this page. Who "determined that the discharges had not resulted in the deterioration of the water quality."? Did state regulators agree with this assessment? (Additional investigations and remedial actions were required in the Duck Pond area in subsequent years.)

17. p.2-7 Top of the page: Please be more specific about the "contamination in the base of the glacial aquifer and the top of the bedrock aquifer". What specific contaminants were found? Is this the first time chlorinated solvents were detected at BOC?

18. p. 2-7 Subsequent paragraphs on page 2-7 refer to VOCs, metals, etc. found in BOC septic sludge in 1988, and to VOCs and SVOCs found in monitoring wells in 1990. Did the VOCs, in either or both cases, include vinyl chloride, benzene, or VDC? What other specific contaminants were found? Please include the BCM reports (Jan. 1988, Sept. 1988, Nov. 1988, and Sept. 1990—See attached Table 1.) in the Library Repository.

19. p.2-8 IT Corporation performed a Preliminary Site Assessment, conducted field investigations and submitted a Phase II CSA Scope of Work and Sampling Plan. IT's monitoring found "selected √OCs and semi-volatile organics in selected monitoring wells". (Specifics?) Please include the IT reports (1991, Oct. 1991, 1992, April 1992, and May 1993—See attached Table 1.) in the Library Repository.

20. p. 2-9 Since 1994 ENSR has taken a number of actions on the site including conducting additional groundwater monitoring, which "confirmed earlier results by others". (Specifics?) In addition to the ENSR Reports already provided, please include additional ENSR Reports, in the Library Repository. (June 1995, July 1995, August 1995, June 1986, October 1996, July 1997, July 2000, and February 2000—see attached Table 1.)

21. p. 2-9 Was asbestos or other contamination found in the former Lime Pond area?

22. p. 2-9 Were there issues that prompted the closure of Septic Tank #2, and the disconnection and sealing of drain lines at the Acetylene plant?

23. p.2-9 The last paragraph on this page refers to "potential petroleum and solvent sources". What specifically were the potential solvent sources? Were solvents present in underground storage tanks? "...there was no evidence of solvent impact to the bedrock aquifer..." Were solvents found at shallower depths? Specifics?

24. p. 2-10 Other Releases, Pentachlorophenol: What was the probable source of the PCP? The MCL for PCP is 1ppb. Was the 4.9ppb detected in March 1996 the maximum concentration detected? In what location(s)/monitoring well(s)? What detection limits were used?

25. p. 2-11 What were the "background levels for PCP"? Were any of the fencing materials installed as a "short term measure" in 1994 wooden, and therefore a potential source of PCP, a wood preservative? Has any sampling for PCP been conducted since 1997?

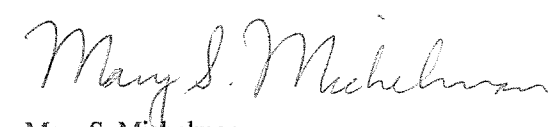
26. p. 2-11 The No. 2 heating oil release is still being remediated. How much has been recovered to date, and how much remains onsite?

27. p. 4-4 Please include the Phase II CSA Report, and/or any other new documents, in the Public Repository even if they are submitted before the PIP Plan is finalized.

28. p. 4-5, Section 4.6 Response to Comments. Please produce a comprehensive verbatim collection of all comments received from the public, DEP, municipal sources, etc. and provide a written response to each individual comment. Please provide copies of this comprehensive document to each party who submitted comments, as well as to the Library Repository.

Thank you again for all your help!

Sincerely,



Mary S. Michelman

cc: Mark Baldi, MADEP
Marc Casey, ENSR, LSP
Jane Ceraso, Acton Water District
Derrick Golden, EPA
Doug Halley, Acton Health Director
Dan Keefe, MADEP
Don Johnson, Acton Town Manager
James Moody, MADEP
Art Taddeo, ENSR, Project Manager

Table 1. Please include the following additional documents in the Public Repository at the Acton Memorial Library for:

BOC Gases
Acton, MA Facility
37 Lawsbrook Road
Draft Public Involvement Plan, RTN # 2-0816

1. BCM, 1988. Hydrogeologic Investigation. Airco Gases Division, Acton facility. January 1988.
2. BCM, 1988. Hydrogeologic Investigation, Addendum 1. September 1988.
3. BCM, 1988. Engineering Report. Prepared for Airco Gases, November 1988.
4. BCM, 1990. Results of Additional Hydrogeologic Investigation. Airco Gases Division, Acton Massachusetts facility. September 1990.
5. ENSR, 1995. Groundwater sampling results for BOC Gases facility, Acton MA. June 1995.
6. ENSR, 1995. Results of Soil Investigation at Former Duck Pond, August 1995.
7. ENSR, 1995. Duck Pond Area, Final Release Abatement Measure Plan, Site #2-0816. July 1995.
8. ENSR 1996. Draft work plan for Phase II site investigation Site #2-0816, Transition Permit #84870. June 1996.
9. ENSR, 1996. Former Lime Pond Closure Report, October 1996.
10. ENSR, 1997. Duck Pond Area, RAM Completion Report, Site #2-0816. July 1997.
11. ENSR, 2000. Closure of Septic Tank #2 Letter, July 27, 2000.
12. ENSR, 2000. Acetone Release Partial Response Action Outcome, February 7, 2000.
13. Goldberg-Zoino & Associates, Inc. 1985, Lawsbrook Aquifer Contamination Study, Prepared for: Acton Water District, Acton, MA. March, 1985.
14. IT Corporation, 1991. Preliminary assessment and limited site investigation, Airco Specialty Gases; Acton, Massachusetts facility. October 1991.
15. IT Corporation, 1992. Response to short term measures/results of initial field investigation, Airco Gases; Acton, Massachusetts. 1992.
16. IT Corporation, 1992. Work Plan for Duck Pond Area, April 1992.
17. IT Corporation, 1993. Comprehensive site assessment scope of work. May 1993.
18. MADEP, Short Term Measure Acetone Spill Area Letter, July 10, 1992.
19. MADEP, Short Term Measure Acetone Spill Area Letter, August 18, 1992.
20. Pine and Swallow Associates, 1986. Reconnaissance contaminant hydrology; southern Lawsbrook Aquifer. May 1986.