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Site Management Plan for the Mr. C's Dry Cleaners Site

East Aurora
Erie County, New York
NYSDEC Site No. 915157

February 2015

Prepared for:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Division of Environmental Remediation
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Revisions to Final Approved Site Management Plan:

Revision	Date Submitted	Summary of Revisions	NYSDEC Approval Date
1	2012	Updated from January 2008, including format change to NYSDEC template.	
2	2013	Updated from December 2012, including 2013-2014 Heating Season Indoor Air & Sub-slab Vapor Sampling Plan	11/5/2013
3	2015	Updated from December 2013 to include updates and results of the Bioremediation Pilot Study and SSDS.	2/27/15

Table of Contents

Section **Page**

Table of Contents (cont.)

Section **Page**

Table of Contents (cont.)

Section **Page**

Appendix

Table of Contents (cont.)

Section **Page**

List of Tables

List of Figures

List of Abbreviations and Acronyms

AMSL	above mean sea level
AS/SVE	air sparging/soil vapor extraction
ATSDR	Agency for Toxic Substances and Disease Registry
BTEX	benzene, toluene, ethylbenzene, and xylenes
BGS	below grade surface
CFR	Code of Federal Regulations
cm/sec	centimeters per second
CPR	cardiopulmonary resuscitation
cVOC	chlorinated volatile organic compound
DCA	dichloroethane
DCE	cis-1,2-Dichloroethene
DER	Division of Environmental Remediation
DHC	*Dehalococcoides* spp.
DUSR	Data Usability Summary Report
EC	engineering control
EEEPC	Ecology and Environment Engineering, P.C.
ELAP	Environmental Laboratory Accreditation Program
EPA	(United States) Environmental Protection Agency
FS	Feasibility Study
GAC	granular activated carbon
IAQ	Indoor Air Quality
IC	institutional control
IEG	IYER Environmental Group, PLLC
µg/L	microgram(s) per liter
$\mu g/m^3$	micrograms per cubic meter
Matrix	Matrix Environmental, Inc.
mg/kg	milligram(s) per kilogram
Mr. C's	Mr. C's Dry Cleaners Site

List of Abbreviations and Acronyms (cont.)

MPI	Malcolm Pirnie, Inc.
MRL	minimum risk level
MSDS	Material Safety Data Sheet
MTBE	Methyl-tert-butyl ether
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
O&M	operation and maintenance
OM&M	operations, maintenance, and monitoring
OSHA	Occupational Safety and Health Administration
P&ID	process and instrumentation diagram
PCE	tetrachloroethene (also known as perchloroethene)
ppb	parts per billion
ppm	parts per million
PRR	Periodic Review Report
PSA	Preliminary Site Assessment
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RI	Remedial Investigation
ROD	Record of Decision
RP	Responsible Party
RSO	Remedial System Optimization
SMP	Site Management Plan
SCG	standards, criteria, and guidance value
SHASP	Site-Specific Health and Safety Plan
SPDES	State Pollution Discharge Elimination System
SSDS	Sub-slab Depressurization System
SVI	soil vapor intrusion
SVII	Soil Vapor Intrusion Investigation
TAGM	Technical and Administrative Guidance Memorandum
TCE	trichloroethene
TCL	target compound list

List of Abbreviations and Acronyms (cont.)

Tyree	The Tyree Organization, Ltd.
VC	vinyl chloride
VOC	volatile organic compound

1 Introduction and Description of Remedial Program

1.1 Introduction

This document is a required element of the remedial program for the Mr. C's Dry Cleaners Site (hereinafter referred to as the "site"), which is administered under the New York State Department of Environmental Conservation's (NYSDEC's) Inactive Hazardous Waste Disposal Site Remedial Program. The site was remediated by NYSDEC as part of its State Superfund Program to investigate and remediate inactive hazardous waste disposal sites throughout New York State. The State implemented the cleanup plan using money from the 1986 Environmental Quality Bond Act.

1.1.1 General

After completion of the remedial work described in the Construction Closure and Certification Report (EEEPC 2005a), some contamination was left in the subsurface at this site (hereafter referred to as "remaining contamination"). As part of the contractor's scope of work under Contract No. D004180, an Operations, Maintenance, and Monitoring (OM&M) Plan was prepared and accepted for the continued monitoring of the remaining contamination. As part of EEEPC Work Assignment No. D004442-13, a Site Management Plan (SMP) was developed and issued to NYSDEC in January 2008 (EEEPC 2008).

This Site Management Plan (SMP) was prepared in accordance with NYSDEC's Division of Environmental Remediation template (DER 10) requirements to manage the remaining contamination at the site until the Environmental Deed Restriction is extinguished in accordance with Environmental Conservation Law Article 71, Title 36. All reports associated with the site can be obtained by contacting NYSDEC or its successor agency managing environmental issues in New York State.

This SMP was prepared by Ecology and Environment Engineering, P.C. (EEEPC), on behalf of NYSDEC, in accordance with the requirements in *Technical Guidance for Site Investigation and Remediation* (NYSDEC 2010a) and the guidelines provided by NYSDEC. This SMP addresses the means for implementing the Institutional Controls (ICs) and Engineering Controls (ECs) that are required by the Environmental Deed Restriction for the site. The Environmental Deed Restriction, which was granted to NYSDEC and recorded with the Erie

County Clerk, requires compliance with this SMP and all ECs and ICs placed on the site.

1.1.2 Purpose

The site contains contamination left after completion of the remedial action. To protect public health and the environment during use of the site, ECs have been incorporated into the site remedy to control potential exposures to remaining contamination. The ICs place restrictions on site use and mandate operation, maintenance, monitoring and reporting measures for all ECs and ICs. This SMP specifies the methods necessary to ensure compliance with all ECs and ICs required by the Environmental Deed Restriction for contamination that remains at the site. This plan has been approved by NYSDEC, and compliance with this plan is required by the grantor of the Environmental Deed Restriction and the grantor's successors and assigns. This SMP may be revised only with the approval of NYSDEC.

This SMP provides a detailed description of all procedures required to manage remaining contamination at the site after completion of the remedial action, including (1) implementation and management of all ECs and ICs; (2) monitoring of site groundwater and other media; (3) operation and maintenance of the treatment system; (4) performance of periodic inspections and submittal of Periodic Review Reports (PRRs); and (5) defining criteria for termination of treatment system operations.

To address these requirements, this SMP includes three plans: (1) an Institutional Control and Engineering Control (IC/EC) Plan for implementation and management of EC and ICs; (2) a Site Monitoring Plan for implementation of site monitoring; and (3) an Operation and Maintenance (O&M) Plan for implementation of remedial collection, containment, treatment, and recovery systems (including, where appropriate, preparation of an O&M manual for complex systems).

This SMP also includes a description of PRRs to be used for the periodic submittal of data, information, and recommendations to NYSDEC.

It is important to note the following:

- This SMP details the site-specific implementation procedures that are required by the Environmental Deed Restriction. Failure to properly implement the SMP is a violation of the Environmental Deed Restriction, which is grounds for revocation of the Certificate of Completion; and
- Failure to comply with this SMP is a violation of Environmental Conservation Law, 6 New York Codes Rules and Regulations (NYCRR) Part 375, and is thereby subject to applicable penalties.

1.1.3 Revisions

Revisions to this plan will be proposed in writing to NYSDEC's project manager for this site. In accordance with the Environmental Deed Restriction for the site, NYSDEC will provide a notice of any approved changes to the SMP and append these notices to the SMP that is retained in its files.

1.2 Site Background

1.2.1 Site Location and Description

The site is located at 586 Main Street in the village of East Aurora, County of Erie, New York, and is identified as Section 164.20, Block 7 and Lot 24 on the village of East Aurora Tax Map in Deed Book 11124. The approximately 0.5-acre site includes paved and unpaved (lawns and soil fill) areas and is surrounded by residential, municipal, and light commercial properties. A general site location map is provided as Figure 1-1. Mr. C's is located in a one-story building on a concrete slab foundation with an adjacent paved parking lot. Mr. C's occupies the front portion of the building, along Main Street; the remainder of the building is occupied by other commercial businesses. The Mr. C's building is north of Main Street, east of Whaley Avenue, and bounded by commercial and residential properties to the north and east (see Figure 1-2).

The volatile organic compound (VOC) contaminant plume associated with the Mr. C's site extends beyond the immediate treatment system area; therefore, the remedial treatment system encompasses six individual remedial treatment operating units in the village of East Aurora:

- Mr. C's (NYSDEC Site Number 915157);
- the former Agway Store and Energy Products site located at 566 Main Street;
- the First Presbyterian Church located at 9 Paine Street;
- a private residence located 27 Whaley Avenue;
- a commercial building located at 572-576 Main Street; and
- a commercial building located at 578-580 Main Street.

A parcel map and information identifying the current property owners surrounding the Mr. C's site are presented in Appendix A. The map is based on village of East Aurora assessments records accessed in December 2014.

1.2.2 Site History

1.2.2.1 Mr. C's Site

Historic land use in the vicinity of the Mr. C's Dry Cleaners site was determined based on review of Sanborn Fire Insurance maps dating from 1912 to 1958 and interviews with the site owner, as documented in the feasibility study (FS) report for the site (MPI 1996). The site has been occupied by a dry cleaning operation since some time prior to 1970 and by other businesses (laundry, auto repair/spray painting, and a hotel) since 1912. Mr. C's Dry Cleaners has used the site since 1974. The existing building used by Mr. C's is believed to have been built around 1927.

Dry cleaning operations at Mr. C's utilized a solvent consisting primarily of tetrachloroethene, also known as perchloroethene (PCE). The RI (MPI 1995a) states that, prior to 1985, filters and sludge were disposed of in dumpsters behind the building and collected by the Village of East Aurora. Since 1985, all dry cleaning wastes have been disposed of through a commercial waste disposal firm (NYSDEC 1997).

In December 1991, NYSDEC investigated complaints of odors in a neighboring property southwest of the site. It was determined that condensate from the steam-flushing and vacuuming processes were being disposed of in the sanitary sewers. In 1992, NYSDEC completed a Preliminary Site Assessment (PSA) of the site, which confirmed that site-related contamination was present in nearby groundwater and sanitary sewers. As part of the PSA, NYSDEC also collected air samples from nearby basements, as well as soil vapor, groundwater, and sanitary sewer samples. The analytical results for the samples indicated the presence of PCE. The site was then designated a Class 2 Hazardous Waste Site (Site Number 915157) by NYSDEC, indicating that the site was believed to pose a significant risk to public health and the environment.

Malcolm Pirnie, Inc. (MPI) performed an RI/FS for the site between 1994 and 1996 (MPI 1996). A Record of Decision (ROD) was signed in 1997 that proposed in situ air stripping as the site remedy (see Appendix B). Pre-design investigations were performed in 1998 and 1999. An Explanation of Significant Differences was issued in April 2000 as justification for modification to the remedy proposed in the ROD (see Appendix B). Remedial design was completed in October 2000 by MPI (MPI 2000), and construction of an air stripper and a pump-and-treat system was completed in September 2002 under a publically bid Contract (D004180) by The Tyree Organization Ltd. Additional information on the remedial action is provided in Section 1.4, and a description of the treatment and monitoring systems is provided in Section 2. Between 2002 and 2012, several modifications and upgrades were made to the site's ECs and ICs as a part of OM&M; these are described in Section 2.

In 2009, the site was reclassified by NYSDEC to a Class 4 site (Site properly closed, requires continued management) that no longer presents a significant risk to public health and/or the environment.

As of May 2012, the former Mr. C's Dry Cleaners (now Benzinger's Dry Cleaning) has operated as a drop-off/pick-up facility only. Also in May 2012, aesthetic changes were made to the building in preparation for AT&T to move into the Mr. C's building. Changes included repaving the parking lot, removing exterior siding, repainting the side of the building, and interior renovations. Pursuant to the change in use, NYSDEC directed EEEPC to perform subslab vapor sampling for the protection of human health and safety; the sampling results are presented in Section 1.5.3. Note that changes in building use must be reported to NYSDEC, as described in Section 5 of this SMP.

The 1996 ROD anticipated that the site would be remediated within 10 years of implementing the site remedy. Nearly 10 years have passed since implementation, and while the treatment system is effective at removing contamination, the groundwater plume has not been diminished (refer to Section 1.5 for information on remaining contamination).

Baseline sampling was conducted in November 2012 by EEEPC for an enhanced bioremediation and bioaugmentation pilot study (Pilot Study) that was conducted by EEEPC at the site between May 2013 and June 2014 (EEEPC 2015a). PCE can be degraded by *Dehalococcoides* spp. (DHC) bacteria as a part of their metabolic reactions. Bioremediation using DHC results in the successive removal of chlorine atoms from the PCE molecule to form first trichloroethene (TCE), then dichloroethene (DCE), vinyl chloride (VC), and finally ethene.

The injection of Regenesis® 3DME and HRC primer electron donor material to enhance bioremediation was completed by Nature’s Way from May 20 to 30, 2013. Injection of a dechlorinating microbial culture, Regenesis® BDI PLUS, to augment the biological populations capable of PCE degradation was completed by Nature’s Way from July 15 to 19, 2013. Prior to the injections, Nature’s Way submitted a Class V Injection Permit application, which was approved by the USEPA Region 2 on May 15, 2013. Eight rounds of performance monitoring were conducted between July 2014 and June 2013. The results of the Pilot Study showed that the selected bioremediation technologies were effective at reducing PCE concentrations at the Site and confirmed that a complete degradation pathway exists to the non-hazardous degradation by-product of ethene. A bioremediation summary report (EEEPC 2015a) was issued to NYSDEC in January 2015. The pilot study is one component of the Remedial System Optimization (RSO) that will be performed to support future modifications to the ROD.

1.2.2.2 Agway Energy Products Site

In proximity to Mr. C’s site is the site of the former Agway Energy Products site, located at 866 Main Street, East Aurora, New York. The site was the location of a petroleum spill discovered in 1987. The Energy Products complex occupied the corner lot formed by Main Street and Whaley Avenue until October 1992, when operation as a motor fuel and retail gasoline outlet ceased. Following NYSDEC investigations at the site, buildings and associated underground storage tanks, the fuel pump island, and other on-site structures were demolished between February and March 1993 (Matrix 2003).

Upon completion of site demolition and restoration activities, the owner of the Agway property was required by the NYSDEC Region 9 Spills Program to install, operate, and monitor a small air sparging/soil-vapor extraction system. Matrix Environmental, Inc. (Matrix) installed the remedial system in September 2001 and operated it until June 2004. The operation and maintenance of the Agway air sparging/soil vapor extraction (AS/SVE) system was incorporated into the Mr. C’s OM&M scope of work in 2005.

The AS/SVE system was operated and maintained by EEEPC from 2005 to December 2011, when its use was discontinued with the approval of NYSDEC. The system was turned off when monitoring data indicated that the system had reached the limit of its effectiveness.

In November 2013, NYSDEC decided to dismantle the Agway AS/SVE system and prepare the equipment for removal and reuse at another NYSDEC site. Dismantling of the unit was performed by IYER Environmental Group, PLLC (IEG), of Orchard Park, New York, under EEEPC's work authorization. On December 6, 2013, the small shed that formerly housed the Agway air sparge system components was transported to the McKenna Landfill (a NYSDEC Region 8 site) by IEG as a part of the decommissioning of the Agway system. The system's equipment and controls were transported to the American Thermostat site (a NYSDEC Region 4 site) for reuse in a similar application.

Benzene, toluene, ethylbenzene, and xylenes (BTEX)-contaminated soils at the former Agway site spill area were originally removed from the surface to approximately 12 feet below grade surface (BGS) and replaced with clean fill in the mid-1990s. After groundwater monitoring wells were installed and sampled, additional groundwater treatment had to be performed. A subsurface treatment system consisting of an AS/SVE system was installed. The monitoring wells and system operated from 2000 to 2003.

As reported by Matrix in 2003, analytical results for samples from groundwater wells at the Agway site indicated that VOC levels in several wells exceeded the regulatory limits established by NYSDEC Technical and Administrative Guidance Memorandum (TAGM) 4046 Guidelines. Although the Matrix report states that no further action was required, the analytical data presented did not support the claim (Matrix 2003).

The 2003 Matrix report indicated that the analytical results for six of the seven monitoring wells sampled only for BTEX were below the state's groundwater quality standard, and that in the remaining well, the results were "slightly" above the standard. However, the analytical results for samples collected from on-site groundwater monitoring wells by EEEPC in September 2005 (EEEPC 2005b) indicated that BTEX and VOCs were still present at concentrations above groundwater quality standards. Groundwater contamination, primarily PCE due to the site's proximity and hydraulically downgradient location relative to the Mr. C's site, is remediated by the area-wide groundwater pumping wells that discharge into the Mr. C's treatment system.

1.2.2.3 First Presbyterian Church

The First Presbyterian Church and school buildings occupy the northwest corner property bordered by Main Street and Paine Avenue in the village of East Aurora, New York. The original church and community building were constructed circa 1926, and an adjoining school and administrative building were added on the west side in 1961.

Both structures have full basements with poured-concrete floors. The west end of the school basement contains several classroom areas for preschool children. Based on reports of chemical odors by church members, NYSDEC began environmental investigations at the site in October 1991.

Because of continuing complaints of chemical odors in the church basement, in July 2004 NYSDEC and the New York State Department of Health (NYSDOH) requested that EEEPC conduct a Soil Vapor Intrusion Investigation (SVII) at the site (EEEPC 2004a). Additional air filtration devices were installed in classroom areas while investigations into the source of the VOCs detected in the church continued. These studies revealed the presence of VOCs below the basement floor slabs in sufficient quantity to warrant the design and installation of sub-slab depressurization systems (SSDSs). The three SSDS units were installed in September 2004 by Mitigation Technologies, Inc., of Brockport, New York, through a subcontract agreement with OP-TECH Environmental Services, Inc., of Syracuse, New York, under the NYSDEC Spills program.

Analysis of indoor air samples collected on September 20, 2004 (EEEPC 2004a), indicated a substantial reduction in PCE levels immediately after system installation. Post-commissioning samples were collected again on January 25, 2005, to evaluate the performance of the SSDSs under “heating season” conditions. The analytical results from this sampling effort indicated almost complete removal of PCE in indoor air as a result of the continuous operation of the SSDSs. The analytical results of subsequent indoor air sampling conducted by the state confirmed the reduction of the air contaminants to levels below the current NYSDOH guidance value for PCE in indoor air (NYSDOH 2006).

The continued OM&M of the SSDSs has been incorporated into the Mr. C’s OM&M scope of work. The periodic maintenance performed from September 2004 to December 2011 included the replacement of the western SSDS fan in March 2007 and the southern SSDS fan in May 2008 due to problems with the fan bearings.

Routine inspection of the system indicates that the system is still operating within the parameters initially established for the facility.

1.2.2.4 27 Whaley Avenue

PSA studies performed by NYSDEC in 1992 confirmed the migration of groundwater contamination along the west side of Whaley Avenue to the residential area directly west of the Mr. C’s and Agway Energy Products sites. A majority of homes in the area are modest, two- and three-story wood-frame constructions with lot sizes averaging less than 0.5 acres.

In 2005, basement air samples were collected from homes in the Whaley Avenue corridor as part of periodic indoor air sampling program (EEEPC 2005c). The analytical results for samples collected from the 27 Whaley Avenue residence indicated the presence of PCE at levels approaching or slightly above the NYSDOH guidance value for residential homes (100 micrograms per cubic meter [µg/m^3]). As a result, the NYSDOH recommended installation of an air filtration device for the 27 Whaley Avenue residence, which was in place by January 2005. During the initial Indoor Air Quality (IAQ) review in May 2004 (EEEPC 2004a), the building was vacant and in the process of being purchased, and the unit was removed.

The residence at 27 Whaley Avenue consists of a poured-concrete foundation and wood framing. The building is presently configured as a double residence, capable of housing a family on both the first and second floors. The house is approximately 80 to 90 years old, and the back of the house was damaged by a fire on the second floor in the late 1990s. The building's heating system is re-circulated forced air heated by a natural gas furnace; it does not have central air conditioning.

In July 2004, a soil gas survey was conducted by EEEPC along the north side of Main Street, east and west of Whaley Avenue, and on the east and west side of Whaley Avenue, starting at Main Street and proceeding north approximately 600 feet (EEEPC 2004a). While a number of homes were sampled, only the results from the 27 Whaley Avenue residence exceeded the NYSDOH guidance value for PCE in sub-slab air (100 µg/m^3).

An SSDS was installed at the 27 Whaley Avenue structure in January 2005 by Mitigation Tech (a subcontractor to OP-Tech Environmental Services, Inc., of Tonawanda, New York) and has been operating since that time.

Subsequent indoor air sampling conducted in 2011 by EEEPC for NYSDEC confirmed that indoor air contaminants levels in the 27 Whaley Avenue residence had dropped to below the current NYSDOH guidance value for PCE in indoor residential air (EEEPC 2011). Routine inspection of the system indicates that the system is still operating within the parameters initially established for the facility. The continued OM&M of the SSDSs has been incorporated into the Mr. C's OM&M scope of work.

1.2.2.5 572-576 Main Street

In 2013, basement air samples were collected by EEEPC from commercial properties along Main Street in the vicinity of Mr. C's (EEEPC 2014a). The analytical results for samples collected from the 572-576 Main Street property indicated the presence of PCE at levels approaching or slightly above the NYSDOH guidance value (100 micrograms per cubic meter [µg/m^3]). As a result, the NYSDOH recommended installation of an SSDS unit for the 572-576 Main Street property; the device was installed and operating on August 29, 2014.

The three-story commercial property at 572-576 Main Street consists of a stone foundation and wood framing. The building's heating system uses recirculated forced air heated by a natural gas furnace; the building also has central air conditioning.

Two SSDS units were installed at the 572-576 Main Street structure in August 2014 by TREC Environmental (a subcontractor to Groundwater & Environmental Services, Inc., of Cheektowaga, New York) and has been operating since that time.

1.2.2.6 578-580 Main Street

In 2013, EEEPC collected basement air samples from commercial properties along Main Street in the vicinity of Mr. C’s (EEEPC 2014a). The analytical results for samples collected from the 578-580 Main Street property indicated the presence of PCE at levels approaching or slightly above the NYSDOH guidance value (100 $\mu g/m^3$). As a result, the NYSDOH recommended installation of a SSDS unit for the 578-580 Main Street property; the device was installed and began operating on August 29, 2014.

The commercial property at 578-580 Main Street consists of a block foundation and wood framing. The building’s heating system uses recirculated forced air heated by a natural gas furnace; the building also has central air conditioning.

An SSDS was installed at the 578-580 Main Street structure in August 2014 by TREC Environmental (a subcontractor to Groundwater & Environmental Services, Inc., of Cheektowaga, New York) and has been operating since that time.

1.2.2.7 586 Main Street, Mr. C’s Treatment Building, Suite 3

Sub-slab soil vapor samples were collected by EEEPC from beneath the Mr. C’s Treatment building on May 31, 2012. PCE was detected in the sub-slab soil vapor samples at concentrations significantly above the NYSDOH guidance for PCE (100 $\mu g/m^3$). The complete analytical results were reported to NYSDEC and NYSDOH in a letter report (EEEPC 2012a) and were included in the 2012 PRR.

A SSDS unit was installed in 586 Main Street (Suite 3) in August 2014 by IYER Environmental Group, PLLC, of Orchard Park, New York, and has been operating since that time.

1.2.3 Geologic Setting

1.2.3.1 Lithology

The site is situated on top of fill, which overlays glacial deposits dating from the last glacial period. The RI (MPI 1995a) identifies three consolidated stratigraphic units below the unconsolidated units. A geologic cross section from the Feasibility Study (FS) is presented as Figure 1-3. The stratigraphic units are described below.

A. **Unconsolidated Sediments.** Unconsolidated sediments at the site consist primarily of fill, glacial outwash, lacustrine deposits, and glacial till. During the RI, fill was found to a depth of approximately 11 feet BGS. Fill beneath the Mr. C's site was described as clayey silt with gravel overlying gravel with clayey silt and traces of brick fragments. The fill is underlain by 4 to 7 feet of glacial till composed of brown clayey silt with varying amounts of shale fragments.

B. **Gravel and Sand Outwash.** Glacial outwash was encountered in each RI borehole and grades from sandy gravel near the top of the unit to very fine sand at the base. The outwash is approximately 27.5 feet thick and consists of 2 to 26 feet of gravel at the top followed by 1.5 to 12 feet of medium-to-coarse sand with varying amounts of fine sand. Fine and very fine sands were encountered at the base of the outwash unit in most of the RI borings (MPI 1995a).

C. **Lacustrine Deposits.** The glacial outwash is underlain by lacustrine sandy silt. The lacustrine deposits were encountered at an elevation of approximately 888 feet above mean sea level (AMSL) and ranged in thickness from 11.5 and 14.5 feet. These deposits may liquefy when disturbed, are uniform, and are characterized by mostly silt and fine to very fine sand (MPI 1995a).

D. **Stratified Till and Sand.** A sequence of stratified, interbedded, fine-grained till and sand underlies the lacustrine deposits. It was encountered at 90 feet BGS in the deepest exploratory RI boring and was found to be approximately 49.5 feet thick. This sequence contains lenses of stratified medium- and fine-grained sand interbedded with clayey silt and silty clay till layers. The two lithologies are separated by a sharp contact with the sand layers varying in thickness from thin laminae to 3 feet and the till ranging in thickness from thin laminae to layers 5 to 11 feet thick (MPI 1995a).

E. **Bedrock**. Based on regional geologic information, bedrock beneath the site is mapped as the Upper Devonian Angola shale of the West Falls Group, which may be approximately 150 to 200 feet BGS (MPI 1995a). No borings or wells at the Mr. C's site encountered bedrock during drilling; the deepest boring extended to a depth of 90 feet. The site is situated on top of the buried bedrock valley of Cazenovia Creek.

1.2.3.2 Hydrostratigraphic Units

Three major hydrostratigraphic units are present beneath the site, including an unconfined aquifer of saturated outwash deposits (outwash aquifer); the underlying lacustrine aquifer; and a confining layer consisting of the stratified till deposits (MPI 1995a). The outwash and lacustrine aquifers are hydraulically connected, with nearly the same hydraulic heads. However, these aquifers are characterized by different hydraulic conductivities and porosities.

Groundwater flow in each hydrostratigraphic unit is generally toward the northwest. Local flow direction is affected by the batch operation of the existing groundwater pumping system. The direction of groundwater flow is shown on Figure 1-4.

A. **Outwash Aquifer.** The outwash aquifer is an unconfined aquifer with a saturated thickness of approximately 18 feet. Wells screened across the entire outwash aquifer exhibited a geometric mean hydraulic conductivity of 0.004 centimeter per second (cm/s) (MPI 1995a). Precipitation and infiltration are the main recharge sources for this aquifer, and there is potential exfiltration from sewers located above the water table. Vertical gradients are very slightly vertically downward, but the groundwater flow in the outwash aquifer is essentially horizontal (MPI 1996).

B. **Lacustrine Aquifer.** The lacustrine aquifer is a rather uniform aquifer with a saturated thickness of approximately 13 feet. Wells screened across the lacustrine aquifer exhibited hydraulic conductivities ranging from 1.5×10^{-4} to 4.9×10^{-4} cm/s (MPI 1995a). During the RI, groundwater flow appeared very similar to the outwash aquifer groundwater flow.

C. **Confining Stratified Till Unit.** This unit consists of interbedded layers of clayey till and sand. The average hydraulic conductivity for the unit was estimated to be 8.8×10^{-6} cm/s (MPI 1995a). A previously calculated upward vertical hydraulic gradient for this unit indicated that outwash and lacustrine aquifers are not the source of recharge to the stratified till unit (MPI 1995a).

1.3 Summary of Remedial Investigation Findings

An RI was performed from 1993 to 1995 in two phases to characterize the nature and extent of contamination at the site (MPI 1995a, 1995b). Generally, the RI determined the horizontal and vertical extents of the contamination and found that contaminants at the site consisted of PCE, petroleum hydrocarbons resulting from known petroleum spills, and other VOCs, including compounds resulting from PCE degradation.

The highest concentration of PCE was found in soil in the sub-surface near the Mr. C’s building by a sanitary sewer lateral. Consequently, the source of PCE in the soils beneath the Mr. C’s building was suspected to be leakage from a sanitary sewer lateral. However, sampling of the sewer yielded only trace concentrations of VOCs, so it was concluded that the PCE did not remain in the sewer and that there was no current source. Conceptually, contamination in the soils above the water table would move downward until it reached the groundwater table, where it would partially dissolve and move with the regional groundwater flow.

At the time of the RI, the groundwater plume extended from the Mr. C’s building to the west in two branches: one moving to the northwest and extending 300 to 400 feet beyond the Town of Aurora Public Library; and one moving to the southwest to slightly beyond the First Presbyterian Church. The RI defined the source plume as the groundwater plume in the northwestern direction that contained greater than 1,000 ppb of PCE in groundwater.

The following sections summarize site conditions when the RI was performed (1993-1995).

1.3.1 Soil Contamination

The site conceptual model indicated that the presence of PCE and/or its breakdown products in areas other than the source area would be the result of contaminant migration within groundwater; therefore, widespread soil sampling was not required. Instead, a soil gas investigation was performed in the parking lot of the Mr. C's building to identify the source areas of highly contaminated soil. PCE concentrations were below levels that would suggest such a source above the water table, except in two areas: near the sewer lateral and on the west side of the parking area, adjacent to the shoe repair building.

Three soil samples were collected from two soil borings: two soil samples, one at a depth of 6 to 8 feet BGS and one at a depth of 8 to 10 feet BGS, were collected from soil boring one (SB-1), which was installed adjacent to the sewer lateral; and one soil sample was collected from a depth of 6 to 8 feet BGS at soil boring two (SB-2), which was installed in the parking lot west of the Mr. C's Dry Cleaners building. The highest concentration of PCE (48,000 milligrams per kilogram [mg/kg]) was detected in the sample collected from SB-1 at 8 to 10 feet BGS, indicating that past leakage from the sewer lateral is the likely source of the contamination. However, PCE was not detected at concentrations above 5 micrograms per liter (µg/L) in samples collected from the sewer lateral, indicating that the sewer system was not likely influencing the migration of PCE at the time of the RI. The analytical results for the RI soil samples are summarized in Table 1-1.

Table 1-1 RI Soil Sample Analytical Results

Soil Boring	Depth	PCE (mg/kg)
TAGM 4046 Standard:		**1,400**
SB-1	6 to 8 feet	6,400
SB-1	8 to 10 feet	48,000
SB-2	8 to 10 feet	12,000

Note: In 2010, TAGM 4046 was replaced by CP-51/Soil Cleanup Guidance (NYSDEC 2010b).

1.3.2 Groundwater Contamination

During the RI, groundwater samples were collected from 40 locations across the study area and analyzed for the Target Compound List (TCL) of VOCs. Significant concentrations of PCE and PCE daughter products, including trichloroethene (TCE), 1,2-dichloroethane (1,2-DCA), 1,1-dichloroethene (1,1-DCE), and vinyl chloride (VC), were detected in the saturated portion of the outwash unit. PCE and its daughter products were detected at much lower concentrations in the lower lacustrine unit (see Table 1-2). VOC compounds, including BTEX, were detected in known petroleum spill areas on the former Agway property and the West Herr dealership property, neither of which are not part of the Mr. C's site.

Table 1-2 RI Groundwater Sample Analytical Results

Aquifer	Frequency of Detection of PCE and/or PCE Degradation Products	Highest Detected PCE Concentration (µg/L)
Groundwater Class GA Standard[1]:		**5**
Upper Outwash (source plume)	26 of 35 locations	8,200
Upper Outwash (southwest branch of plume)[2]		390
Base of the Outwash	20 of 27 locations	18,000
Lacustrine	3 of 8 locations	460

Note:

[1] New York State Department of Conservation. 1998. Division of Water Technical and Operational Guidance Series (1.1.1): Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, Division of Water, Albany, New York.

[2] Contamination was not detected in the lower units in the southwestern branch of the plume by the First Presbyterian Church.

Key:

PCE = tetrachloroethene (also known as perchloroethene)
µg/L = microgram(s) per liter

1.3.3 Indoor Air

Indoor air was sampled in March 1994 and April 1995 as part of the RI and again in May 1996 to screen for soil vapor intrusion, which resulted from the partitioning of contaminants in the underlying groundwater aquifer. Samples were collected from the First Presbyterian Church, the village hall, the Boys and Girls Club, Jackson's Bowling Alley, two private residences on Whaley Avenue, and two private residences on Fillmore Avenue. Prior to the implementing the remedy, PCE was detected in indoor air above the U.S. Environmental Protection Agency's (EPA's) mean indoor air concentration of 21 µg/m^3 in the basements of the two residences on Whaley Avenue, in the First Presbyterian Church, and in the bowling alley, as presented in Table 6-5 of the RI report (MPI 1995a).

1.3.3.1 Supplemental Indoor Air Sampling March 2013

EEEPC performed sub-slab vapor and indoor air sampling during the 2013 heating season at three commercial properties in East Aurora to evaluate soil vapor intrusion into structures adjacent to and downgradient of the Mr. C's site (EEEPC 2014a). The sites were selected based on the direction of groundwater flow and the fact that no prior sampling of these structures had been performed. Samples were collected at 572-576 Main Street, 578-580 Main Street, and 586 Main Street (Suite 3).

TCE exceeded 5 µg/m^3 in the basement air at only one building (572-576 Main Street), but TCE was not detected in the first floor air or subslab air samples. Therefore, according to NYSDOH *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (NYSDOH 2006) Soil Vapor/Indoor Air Matrix 1, only future monitoring is required unless another VOC contaminant of concern is found at elevated levels, such as PCE.

Elevated PCE concentrations were detected in the subslab air at 572-576 Main Street (13,600 µg/m^3) and 578-580 Main Street (102,000 µg/m^3). Based on the Soil Vapor/Indoor Air Matrix 2 presented in NYSDOH's *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (NYSDOH 2006), mitigation is recommended to address the elevated PCE concentrations in the subslab and indoor air for all three properties.

1.3.3.2 Supplemental Indoor Air Sampling February 2014

EEEPC performed sub-slab vapor and indoor air sampling during the 2014 heating season at one residence and five commercial properties in East Aurora to evaluate soil vapor intrusion into structures adjacent to and downgradient of the Mr. C's site (EEEPC 2014b). The sites were selected on the basis of groundwater flow and the estimated location and contaminant concentrations of the plume around the site. Samples were collected at 555 Fillmore Avenue, 586 Main Street (Suite 6), 589 Main Street, 591 Main Street, 594 Main Street, and 16 Paine Street.

The concentration of TCE exceeded 5 µg/m^3 in the subslab vapor at only one building (591 Main Street), but TCE was not detected in the indoor air samples. Therefore, according to NYSDOH Matrix 1 (NYSDOH, 2006), no further action is recommended to address TCE. However, one subslab vapor sample collected at 591 Main Street contained PCE at a concentration of 1,610 µg/m^3, and the second sample contained PCE at a concentration of 12 µg/m^3. In addition, the first-floor indoor air sample contained PCE at a concentration of 0.68 µg/m^3. Therefore, based on the highest readings from both sampling locations, NYSDOH Matrix 2 (NYSDOH, 2006) recommended mitigation be performed.

The concentrations of PCE detected in the subslab vapor at 555 Fillmore Avenue and 589 Main Street were less than 100 µg/m^3, and the corresponding indoor air PCE concentrations were less than 3 µg/m^3. Based on these results, NYSDOH Matrix 2 (NYSDOH, 2006) does not recommend further action be performed at 555 Fillmore Avenue or 589 Main Street.

At 586 Main Street (Suite 6), the subslab sample contained 882 µg/m^3 of PCE and the first floor air sample contained 7.66 µg/m^3 of PCE. Based on these results, NYSDOH Matrix 2 (NYSDOH, 2006) recommends that monitoring or mitigation be performed at this site.

At 594 Main Street, the subslab sample contained 2,080 µg/m^3 of PCE and the first floor air sample contained 103 µg/m^3 of PCE. Based on these results, NYSDOH Matrix 2 recommends that mitigation be performed at this site.

At 16 Paine Street, two samples were collected from both the basement and the first floor. One subslab vapor sample contained PCE at a concentration of 271 µg/m^3, and the second sample contained PCE at a concentration of 3.53 µg/m^3. One first-floor indoor air sample contained PCE at a concentration of 3.9 µg/m^3, and PCE was not detected the second sample. Therefore, based on the highest readings for both indoor locations, NYSDOH Matrix 2 (NYSDOH, 2006) recommends that monitoring or mitigation be performed at this location.

1.4 Summary of the Remedial Action

1.4.1 Remedial Goals

The remedial goals selected for the Mr. C's site, as stated in the ROD are:

- Mitigate human health risk by reducing the potential for inhalation of vapors in on-site and off-site basements;
- Mitigate the source area of the contaminant plume to prevent further migration of the chlorinated volatile organic compounds (cVOCs) and reduce volatilization into adjacent basements; and
- Achieve NYSDEC groundwater quality standards to the extent practicable.

Table 1 in the ROD sets forth initial groundwater and soil cleanup objectives for the Mr. C's site. A copy of the ROD is provided in Appendix B.

1.4.2 Selected Remedy

An FS completed by MPI in November 1996 recommended remediation of the source plume using in situ air stripping wells. A remedial action consisting of the installation of eight in situ air-stripping wells was selected, and a ROD was signed in March 1997 (see Appendix B). Additional predesign investigations were conducted by MPI in December 1998 and April 1999 to confirm the limits of the groundwater contamination plume.

An Explanation of Significant Differences was issued in April 2000 as justification for the modification of the selected remedy to a conventional groundwater pump-and-treat system, and is included in Appendix B with the ROD.

Remedial design, including the preparation of contract documents and drawings, was completed to a 65% level before MPI went out of contract with NYSDEC. EEEPC finalized the contract documents in January 2001, and the project was publicly bid in March 2001. The project was awarded to The Tyree Organization, Ltd. (Tyree), of Latham, New York, in May 2001.

The components of the selected remedy included the operation and maintenance of the treatment system and off-site indoor air filters (later replaced with SSDS units); periodic monitoring; and implementation of a monitoring program, including groundwater monitoring, to evaluate the effectiveness of the selected remedy.

1.4.3 Completion of the Remedy

The site was remediated in accordance with the NYSDEC-approved Remedial Design dated October 2000. The following actions were completed during implementation of the Remedial Design:

- Construction of eight pumping wells and 30 observation piezometers;

- Installation of approximately 1,100 linear feet of double-wall groundwater collection piping;
- Improvements within the designated groundwater treatment system space inside the Mr. C's building, including demolition and removal of existing utilities and fixtures;
- Construction of a groundwater treatment system consisting of a sequestering agent feed system, bag filters, a 3,000-gallon holding tank, a low-profile air stripper, and vapor-phase granular activated carbon (GAC);
- Installation of approximately 1,300 linear feet of 4-inch-diameter force main for the discharge of treated groundwater to Tannery Brook; and
- Execution of permanent access agreements and easements (i.e., institutional controls) for the long-term operation of the treatment systems and the network of groundwater pumping wells. All required permanent easements for system access, maintenance, and monitoring, including components on private properties, have been filed with the Erie County Clerk for the project. Refer to Appendix C for copies of the permanent individual property easements. Refer to Appendix D for copies of the private property access agreements.

Remedial activities were completed at the site on September 21, 2002, with the start-up of the groundwater treatment system.

O&M of the system was performed for 12 months by Tyree after the completion of construction. The O&M services portion of the construction contract was completed in September 2003. OM&M have been performed by EEEPC or their contractor since October 2003. EEEPC contracted O&M Enterprise, Inc., of North Tonawanda, New York, from October 2003 to October 2005 to perform operations, maintenance and monitoring services.

1.4.4 Modifications to the Remedy

Modifications to the original system were made based on an air modeling study performed by EEEPC in September 2004 (EEEPC 2004b). In September 2004, EEEPC prepared and submitted the *Review for the Necessity of Granular Activated-Carbon Units on the Influent Air Stream, Mr. C's Dry Cleaner's Site*. This review evaluated the potential ambient air impacts resulting from the operation of the Mr. C's Dry Cleaners site air stripper without the vapor-phase GAC treatment units. The results of the air modeling study demonstrated that the two vapor-phase GAC treatment units were unnecessary. The results were subsequently evaluated and accepted by NYSDEC in October 2004. In January 2005, the two vapor-phase GAC treatment units were decommissioned, removed from the Mr. C's Dry Cleaners remedial treatment system, and sent to another NYSDEC site for use. A new flow meter and totalizer were added to the effluent discharge line downstream of the effluent meter installed under the original scope of work. Under a new work assignment to EEEPC in 2007, O&M services were competitively bid in 2007 by EEEPC and awarded to IEG, of Orchard Park, New York, which continues to provide O&M services for the site.

1.5 Remaining Contamination

The remaining contamination at the Mr. C’s Dry Cleaners site is found primarily in groundwater, with a limited amount present in soil vapor. The following sections present the most recent soil, groundwater, soil vapor, and indoor air sampling results.

1.5.1 Soil Contamination

In 2012, EEEPC collected soil samples during construction of two new wells (EE-3 and EE-4) (EEEPC 2012b). Samples were collected to a depth of 12 feet in EE-4 and to a depth of 28 feet in EE-3. Two VOCs were detected in the boring for well EE-4, including PCE and methylene chloride. Ten VOCs were detected in the boring for well EE-3, including PCE, TCE, 1,1-DCE, cis-1,2-DCE, vinyl chloride, methylene chloride, acetone, benzene, toluene, and MTBE. All VOCs were detected at concentrations lower than the NYSDEC’s *CP-51 Soil Cleanup Guidance* values (NYSDEC 2010b), except for PCE, for which CP-51 does not provide a specific guidance value for PCE for comparison of the results. CP-51 does state that soil cleanup objectives for organic contaminants including VOCs are capped at 100 parts per million (ppm) for residential use, 500 ppm for commercial use, 1,000 ppm for industrial use. A summary of the detected results for PCE and total VOCs are presented in Table 1-3. The analytical results for these soil samples are presented in the closeout report for monitoring well installation (EEEPC 2012b).

1.5.2 Groundwater Contamination

In 2002 and 2003, Tyree collected groundwater samples from the monitoring well network surrounding the site to evaluate the effectiveness of the remedial action. In 2004, 2007, 2009, 2010, 2012, 2013, and 2014, EEEPC collected groundwater samples from the monitoring well network under the long-term groundwater monitoring program to define the cVOC concentrations and movement of the plume with respect to the cleanup operations. The sample results are summarized in the long-term groundwater monitoring reports issued to NYSDEC. Beginning in 2012, long-term groundwater monitoring results have also been reported in the PRRs.

Groundwater beneath the Mr. C’s site continues to contain elevated levels of several cVOCs, their breakdown by-products, and aromatic hydrocarbons. Based on the 2014 groundwater monitoring well report (EEEPC 2015b), the highest concentrations of these contaminants currently occur in an area measuring approximately 480 feet by 240 feet and centered on pumping well PW-6, which is located behind the Town of Aurora Library parking lot. The contaminated groundwater plume extends northwest from the former Agway site, presumably beyond pumping well PW-8. The total VOC concentrations in groundwater samples collected from monitoring wells along Fillmore Avenue (north of the plume) were just above or just below the NYSDEC Class GA groundwater standard for total VOCs (5 μg/L), with 6.2 μg/L of total VOCs detected at MPI-14B-R and 4.5 μg/L of total VOCs detected at MPI-13B-R. VOCs were not detected in the westernmost sentinel monitoring well MPI-15B.

Table 1-3 2012 Soil Sample Analytical Results

Soil Boring	Depth (ft BGS)	PCE (mg/kg)	Total VOCs (mg/kg)
EE-3	0 to 2	ND	5.7
EE-3	2 to 4	ND	5.1
EE-3	4 to 8	ND	3.8
EE-3	8 to 10	0.70	6.1
EE-3	10 to 12	ND	5.6
EE-3	12 to 14	1.3	6.56
EE-3	14 to 16	51	79.16
EE-3	16 to 18	850	899.70
EE-3	20 to 22	1,700	1,828.78
EE-3	22 to 24	54	304.62
EE-3	24 to 26	ND	34.33
EE-3	26 to 28	27	59.0
EE-4	0 to 2	ND	0.51
EE-4	6 to 8	ND	2.8
EE-4	8 to 10	1.6	4.0
EE-4	10 to 12	2.1	2.1

Key:
ft BGS = feet below ground surface
mg/kg = milligram per kilogram
ND = not detected
PCE = tetrachloroethene
VOCs = volatile organic compounds

The PCE plume occurs in approximately the same area as the total VOC plume; however, implementation of the Pilot Study has reduced hot-spot contamination at monitoring wells MPI-6S and MW-8. The PCE-contaminated groundwater plume now centers on pumping well PW-4.

Historically, PCE has been the primary cVOC detected in the groundwater samples. Following completion of the bioremediation Pilot Study, the detection of PCE degradation products has increased throughout the plume. The degradation product with the highest concentrations is cis-dichloroethene (cis-DCE). The results of the most recent (2014) groundwater well network sampling indicate the following:

- Six VOCs (PCE, TCE, cis-DCE, trans-DCE, vinyl chloride, and methyl-tert-butyl ether [MTBE]) were detected in the groundwater samples at levels that exceeded their NYSDEC Class GA groundwater standards and the guidance values[1] used to screen the groundwater data.

- Nine VOCs (1,1,1-trichloroethane, 1,1-dichloroethane, 1,1-dichloroethene, carbon disulfide, chloroform, chloromethane, cyclohexane, isopropylbenzene (cumene), and methylcyclohexane) were also detected in the groundwater samples. These compounds either have no applicable standard or guidance value, or were detected at levels below their NYSDEC Class GA groundwater standards and the guidance values used to screen the groundwater data.
- PCE was detected above the groundwater standard for total VOCs (5 µg/L) in 18 wells and four piezometers across the site. The highest concentration of PCE (2,700 µg/L, estimated) was detected in a sample collected from pumping well PW-5. Historically, the highest concentration of PCE has been detected in samples collected from monitoring wells MPI-6S and PW-6. The concentration of PCE in MPI-6S has been reduced from 6,800 µg/L in 2012 (before bioremediation) to 15 µg/L. Contamination at MPI-6S is now primarily cis-DCE, at 1,300 µg/L. Contaminant concentrations detected in samples collected from pumping well PW-6 were lower than the concentrations detected in samples collected from piezometer PZ-6A, which showed an increase in total VOC concentrations from 1,600 µg/L in 2013 to over 2800 µg/L in 2014.
- TCE was detected at concentrations above the groundwater standard for total VOCs (5 µg/L) in nine wells and three piezometers across the site. The highest concentration of TCE, 400 µg/L, was detected in a sample collected from piezometer PZ-6A.
- Cis-DCE was detected above the groundwater standard for total VOCs (5 µg/L) in 14 wells and three piezometers across the site. The highest concentration of cis-DCE, 1,300 µg/L, was detected in a sample collected from monitoring well MPI-6S.
- Trans-DCE was detected above the groundwater standard for total VOCs (5 µg/L) in three wells and one piezometer. The highest concentration of trans-DCE, 46 µg/L, was detected in a sample collected from monitoring well MW-8.
- Vinyl chloride was detected above its groundwater standard (2 µg/L) in seven wells. The concentrations of vinyl chloride have increased across the site since 2013. The highest concentration of vinyl chloride (380 µg/L) was detected in a sample collected from monitoring well MPI-6S.
- MTBE was detected above its groundwater standard (10 µg/L) in eight wells and two piezometers. The highest concentration of MTBE (240 µg/L) was detected in a sample collected from monitoring well MPI-4I.

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[1] New York State Department of Conservation. 1998. Division of Water Technical and Operational Guidance Series (1.1.1): *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations*, Division of Water, Albany, New York.

1.5.3 Sub-Slab Soil Vapor and Indoor Air

This section presents select results from the most recent sampling performed at the First Presbyterian Church, the residence at 27 Whaley Avenue, and the Mr. C's treatment building. The NYSDOH does not have guidance values for sub-slab or soil vapors. However, NYSDOH does have relevant guidance values for indoor air (5 µg/m^3 for TCE, and 100 µg/m^3 for PCE). Guidance values are taken from the NYSDOH's *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (NYSDOH 2006).

Sub-slab soil vapor and indoor air results can also be compared with the minimum risk levels (MRLs) for chronic exposure by inhalation, as set by the Agency for Toxic Substances and Disease Registry (ATSDR). An MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse non-cancer health effects over a specified duration of exposure. These substance-specific estimates, which are intended to serve as screening levels, are used by the ATSDR health assessors and other responders to identify contaminants and potential health effects that may be of concern.

First Presbyterian Church

Indoor air quality and sub-slab soil vapor samples were collected by EEEPC from within the First Presbyterian Church and the SSDS fan unit discharges on January 25, 2005; June 26, 2006; November 14, 2008; November 16, 2010; and December 12, 2011. Table 1-4 presents the analytical results for the most recent indoor air and sub-slab soil vapor samples; the table presents only the results for which chronic inhalation MRLs are available. PCE and TCE remain below NYSDOH guidance values and MRLs. In addition, the concentrations of PCE and TCE in indoor air samples were lower than in the soil vapor samples, which were obtained from the SSDS fan discharge.

The complete analytical results were reported to NYSDEC in the December 2011 Indoor Air Quality Report for the First Presbyterian Church (EEEPC 2012c) and are available upon request.

27 Whaley Avenue

Indoor air quality samples were collected by EEEPC from within the 27 Whaley Avenue residence and the SSDS fan unit discharge on February 14, 2005; June 26, 2006; January 21, 2009; and November 16, 2010. Table 1-4 presents the analytical results for the most recent indoor air samples; the table presents only the results for which chronic inhalation MRLs are available. Sub-slab soil vapor sampling is not part of the sampling program at 27 Whaley Avenue. PCE and TCE in indoor air remain below their guidance values and MRLs.

Table 1-4 Remaining Contamination in Sub-Slab Soil Vapor and Indoor Air

Compound	ATSDR MRL$^{(1,2)}$	Principal Uses	Range of Contaminants (µg/m^3)			
			Mr. C's Building	27 Whaley Avenue	First Presbyterian Church$^{(3)}$	
			(Soil Vapor)	(Indoor Air)	(Indoor Air)	(Soil Vapor)
Acetone	30.8 µg/m^3 (13 ppmv)	Plastics, fibers, drugs, solvents	20.9 - **313.67**	26.38 - **37.31**	7.82 - 17.56	18.53
Benzene	9.58 µg/m^3 (0.003 ppmv)	Solvent, chemical intermediate, gasoline additive	<15.95 U - <31.07 U	7.34 - 8.39	0.70 J - 0.96	0.57
Carbon tetrachloride	0.189 µg/m^3 (0.03 ppmv)	Refrigerant, propellant, pesticide, cleaning fluid and degreasing agent, component in fire extinguishers, and spot removers	<13.08 U - <79.26 U	**0.50 J -** <3.15 U	<0.63 U	<0.63 U
Chloroform	0.097 µg/m^3 (0.02 ppmv)	Chemicals, may form from chlorine and water	<8.71 U - <13.82 U	**0.29 J -** <2.43 U	<0.49 U	<0.49 U
Chloromethane	100 µg/m^3 (0.05 ppmv)	Chloromethane is an impurity in vinyl chloride; exposure could occur from disposal of vinyl chloride waste. Other sources of exposure are cigarette smoke, polystyrene insulation, aerosol propellants, and chlorinated swimming pools.	<7.75 U - <46.89 U	0.87 - <0.94 U	0.91 - 1.01	0.68
Ethylbenzene	0.26 µg/m^3 (0.06 ppmv)	Inks, insecticides, paints, solvents, production of styrene	<21.68 U - <51.16 U	**5.98 - 6.55**	<0.29 U	<0.29 U
Dichloromethane (aka Methylene Chloride)	1,040 µg/m^3 (0.3 ppmv)	Aerosol propellant, refrigerant	<15.38 U - <93.06 U	20.90 - 27.67	0.28 J - 0.52	0.28 J
N-Hexane	2.11 µg/m^3 (0.6 ppmv)	Solvents, gasoline, quick-drying glues such as rubber cement	**12.34 J - 85.32 J**	**14.63 - 18.16**	<0.16 U - 0.885	0.855
Toluene	300 µg/m^3 (0.08 ppmv)	Gasoline component, solvent, plastics manufacturing	<7.11 U - <42.9 U	32.17 - 35.78	1.02 - 1.99	0.87
PCE	270 µg/m^3 (0.04 ppmv)	Solvent/degreaser, chemical intermediate	**4,278.93 - 21,903.23**	2.71 J - 3.19	<0.41 U - 2.1	56.35

Table 1-4 Remaining Contamination in Sub-Slab Soil Vapor and Indoor Air

			Range of Contaminants (µg/m^3)			
			Mr. C's Building	27 Whaley Avenue	First Presbyterian Church(3)	
Compound	ATSDR MRL(1,2)	Principal Uses	(Soil Vapor)	(Indoor Air)	(Indoor Air)	(Soil Vapor)
TCE	540 µg/m^3 (0.1 ppmv)	Industrial solvent used primarily in metal degreasing and cleaning operations	18.81 J - <58.04 U	<0.28 U - <0.43 U	<0.28 U - <0.28U	3.76
1,4-Dichlorobenzene	600 µg/m^3 (0.1 ppmv)	Deodorant for restrooms, garbage cans, etc.; used to control moths, mold, and mildew	<12.93 U - <78.16 U	<1.02 U	0.6 - 0.9	<0.37 U
Xylenes (total xylenes – m, p, and o)	220 µg/m^3 (0.05 ppmv)	Used in a variety of consumer products, including gasoline, paint varnish, shellac, and rust preventatives	<33.66 U - <209.83 U	34.25 - 34.81	1.21 J - 1.43 J	1.09 J

Notes:

[1] The MRL presented is for an chronic inhalation exposure

[2] Occupational exposure limits are expressed in terms of mass per volume, or µg/m^3; to convert to ppm in terms of volume per volume, one ppm = (x mg/m3)(24.45)/gram molecular weight at 1 atmosphere and 25 degrees Celsius. (DHHS (NIOSH) Publication Number 2004-101)

[3] Soil vapor at the First Presbyterian Church was sampled at the west driveway fan discharge.

[4] Bolded values indicate detected concentrations above their MRL.

Key:

ATSDR = Agency for Toxic Substances and Disease Registry
J = estimated value
µg/m^3 = micrograms per cubic meter
MRL = minimal risk level
PCE = tetrachloroethene or perchloroethene
ppmv = parts per million by volume
TCE = trichloroethylene or trichloroethene
U = not detected; lab reporting limit shown

The complete analytical results were reported to NYSDEC in the November 2010 Indoor Air Quality Report for 27 Whaley Avenue (EEEPC 2011) and are available upon request.

572-576 Main Street

Subslab and indoor air quality samples were collected by EEEPC from within the 572-576 Main Street commercial property in March 2013. Based on the elevated PCE concentrations detected, an SSDS was installed in August 2014. Subsequent air monitoring to determine the effectiveness of the system has not been conducted.

578-580 Main Street

Subslab and indoor air quality samples were collected by EEEPC from within the 578-580 Main Street commercial property in March 2013. Based on the elevated PCE concentrations detected, an SSDS was installed in August 2014. Subsequent air monitoring to determine the effectiveness of the system has not been conducted.

586 Main Street (Suite 3): Mr. C’s Treatment Building

Sub-slab soil vapor samples were collected by EEEPC from beneath the Mr. C’s treatment building on May 31, 2012. One sample was collected inside the treatment operations area near the west door, and the other sample was collected between the bag filter and equalization tank. Table 1-4 presents the analytical results samples; the table presents only the results for which chronic inhalation MRLs are available. PCE was detected in both sub-slab soil vapor samples at concentrations significantly above the NYSDOH guidance for PCE (100 $\mu g/m^3$) and its MRL (270 $\mu g/m^3$). The complete analytical results were reported to NYSDEC in a letter report (EEEPC 2012a) and were included in the 2012 PRR. Based on the elevated PCE concentrations detected, an SSDS was installed in August 2014. Subsequent air monitoring to determine the effectiveness of the system has not been conducted.

16 Paine Street

Subslab and indoor air quality samples were collected by EEEPC from within the 16 Paine Street commercial property in February 2014. Based on the elevated PCE concentrations detected, an SSDS will be installed in 2015.

586 Main Street (Suite 6)

Subslab and indoor air quality samples were collected by EEEPC from within the 586 Main Street (Suite 6) commercial property in February 2014. Based on the elevated PCE concentrations detected, an SSDS will be installed in 2015.

591 Main Street

Subslab and indoor air quality samples were collected by EEEPC from within the 591 Main Street commercial property in February 2014. Based on the elevated PCE concentrations detected, an SSDS will be installed in 2015.

594 Main Street

Subslab and indoor air quality samples were collected by EEEPC from within the 594 Main Street commercial property in February 2014. Based on the elevated PCE concentrations detected, an SSDS will be installed in 2015.

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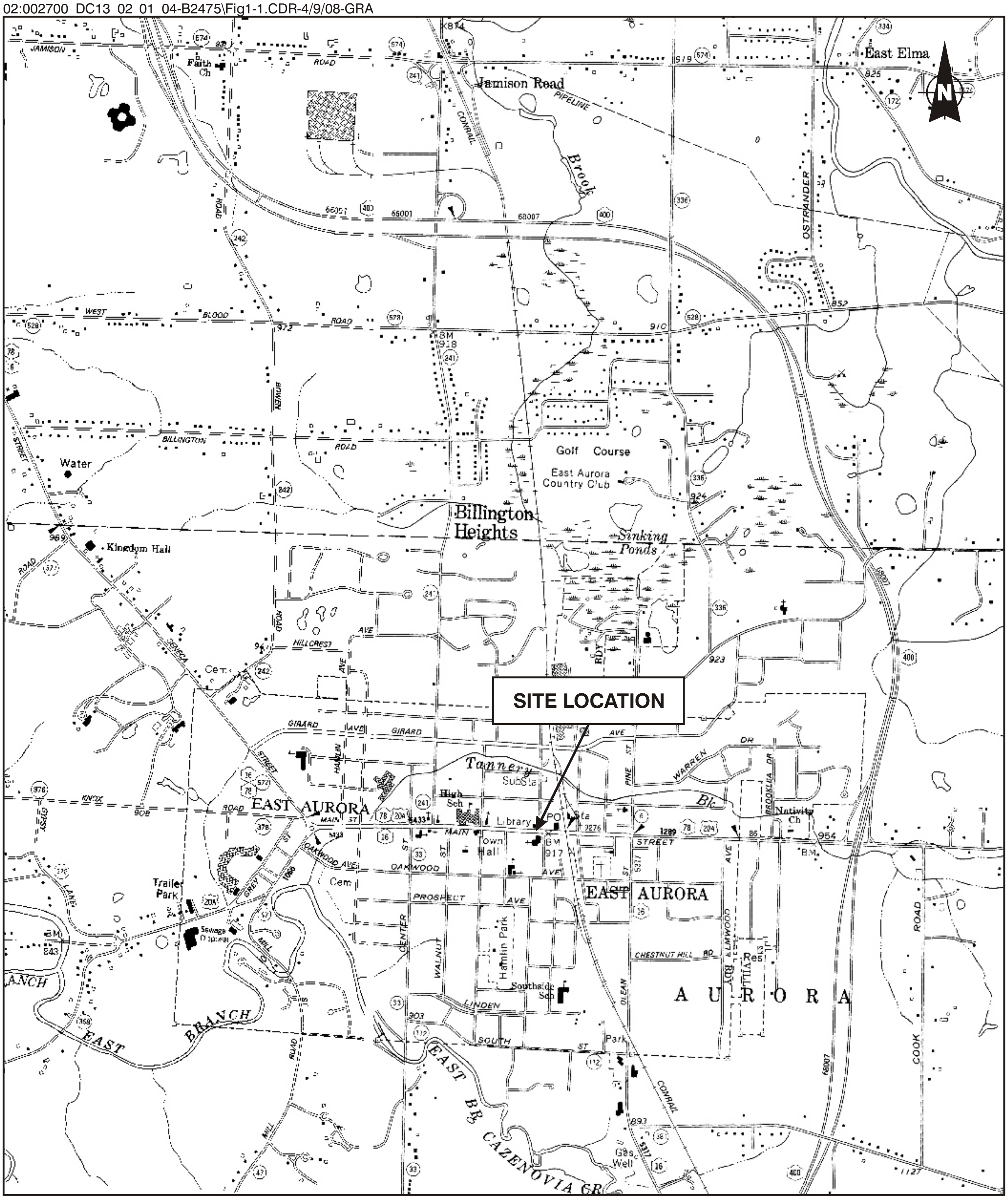
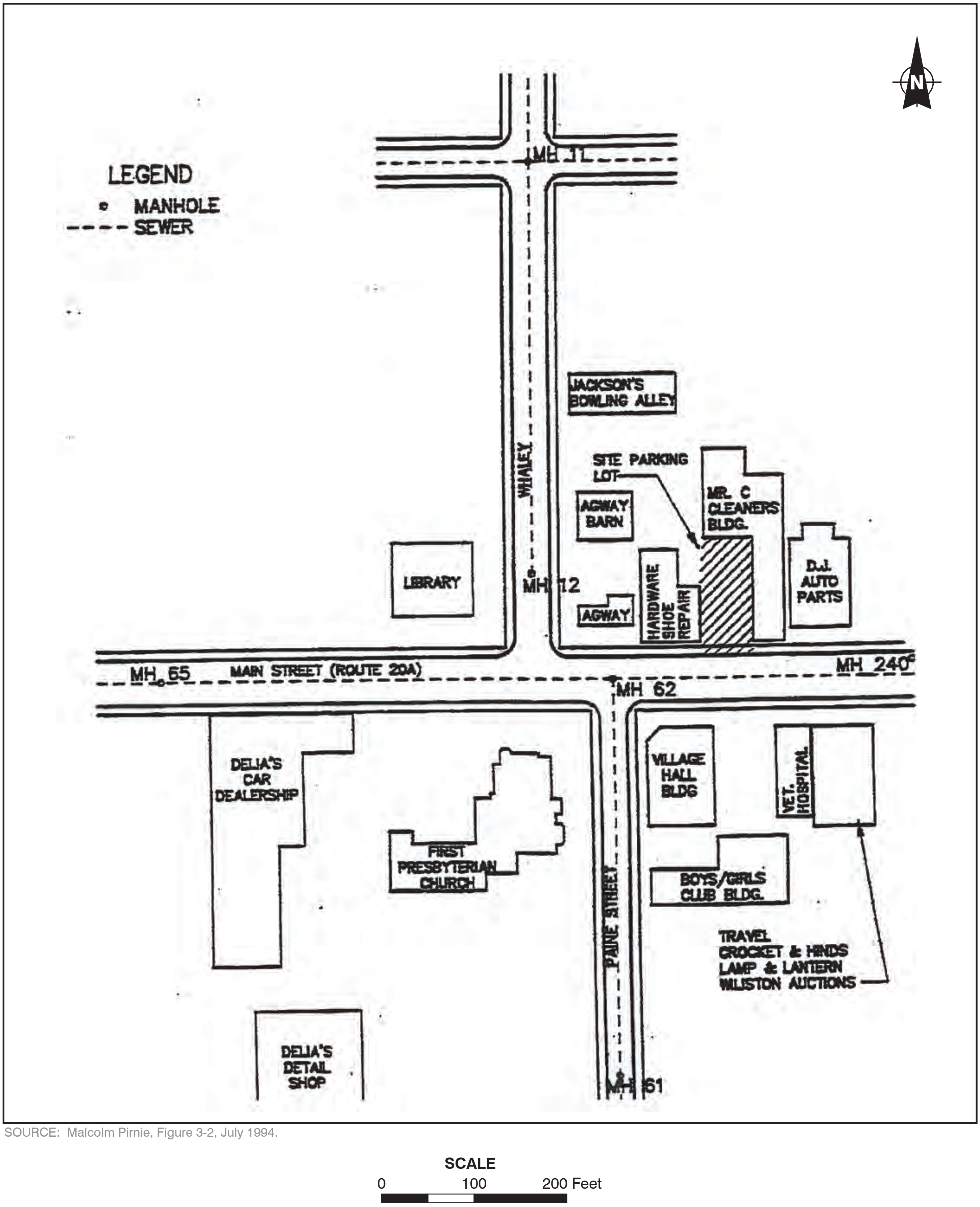


SOURCE: NYS Department of Transportation Raster Quadrangle, 1988.

Scale

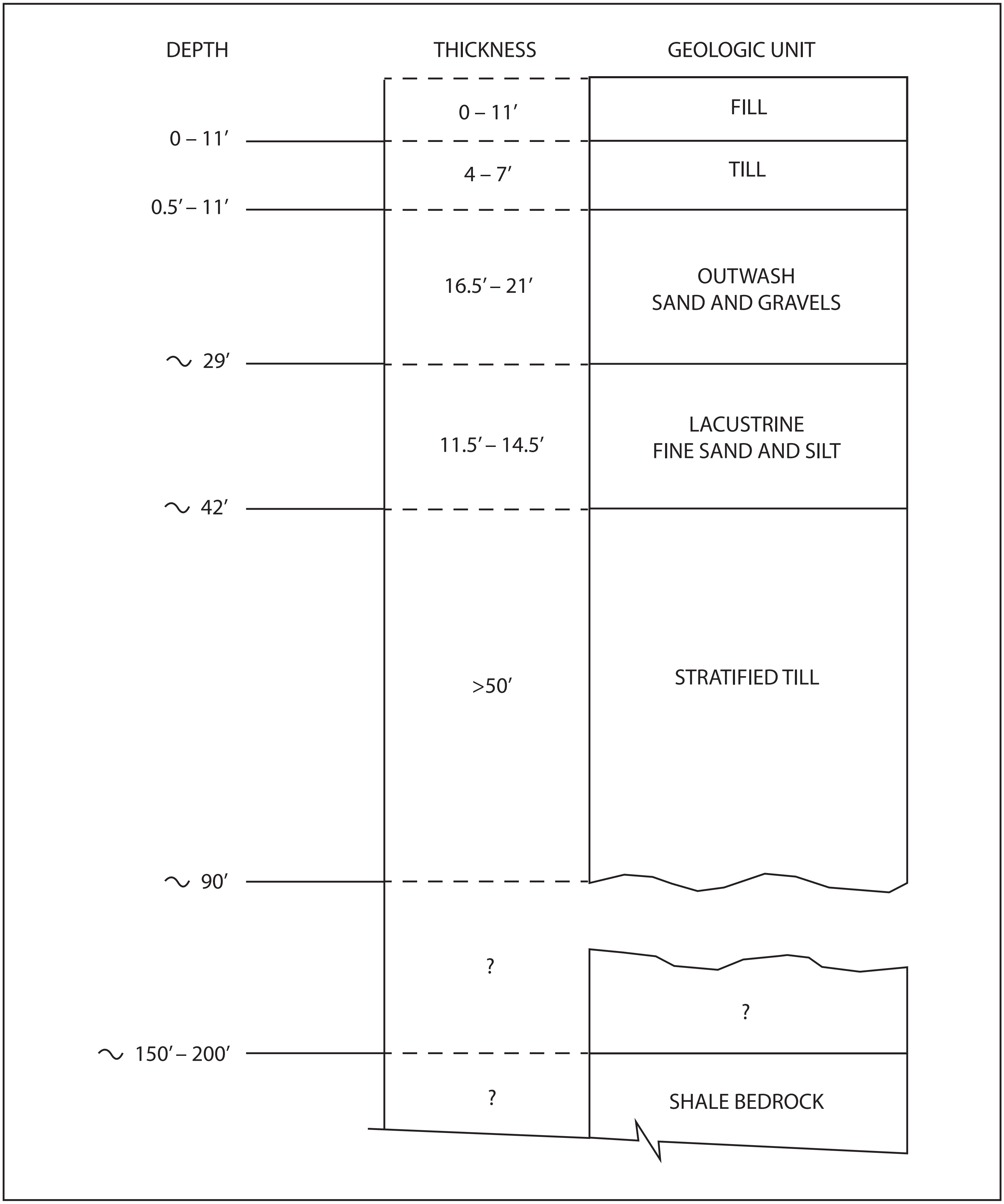
0 2,000 4,000 Feet

Figure 1-1 General Site Location Map



SOURCE: Malcolm Pirnie, Figure 3-2, July 1994.

Figure 1-2 Mr. C's Site Location Map



SOURCE: Malcolm Pirnie, Dec. 31-GEO

Figure 1-3 **Mr. C Cleaners Dry Cleaners Site Geologic Column**

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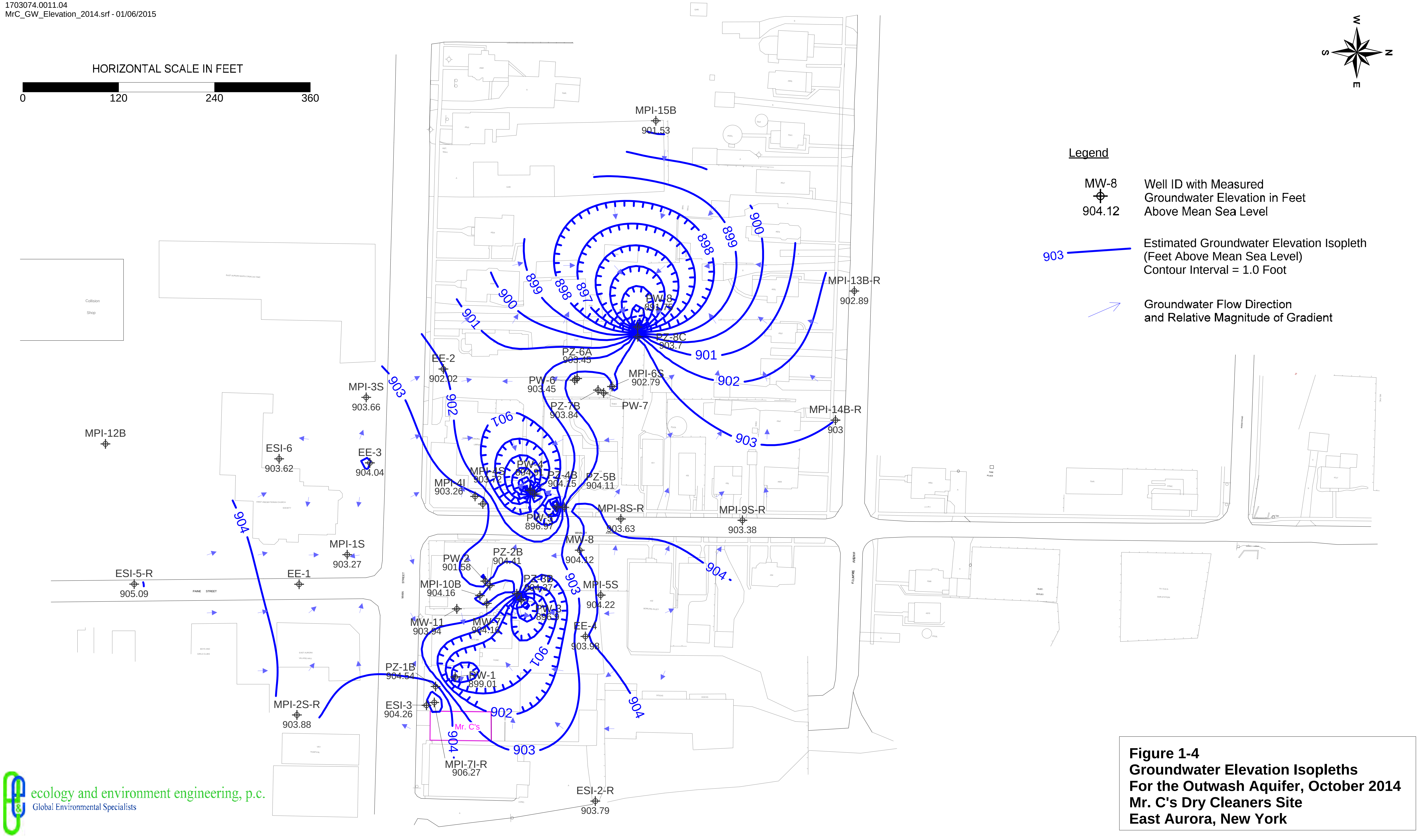
MrC_GW_Elevation_2014.srf - 01/06/2015



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Global Environmental Specialists

Figure 1-4
Groundwater Elevation Isopleths
For the Outwash Aquifer, October 2014
Mr. C's Dry Cleaners Site
East Aurora, New York

2 Institutional and Engineering Control Plan

2.1 Introduction

2.1.1 General

Since contaminated groundwater and soil vapor exists beneath the site, institutional controls and engineering controls (IC and ECs) are needed to protect human health and the environment. This section identifies the ICs and ECs in place at the site and describes the control plan for managing them. Because the ICs and ECs are components of the SMP, revisions to the IC/EC Plan are subject to approval by NYSDEC.

2.1.2 Description of the IC/EC Plan

The following IC/EC Plan describes: (1) all ICs and ECs on the site; (2) the basic implementation and intended role of each IC and EC; (3) the key components of the ICs to be set forth in the environmental deed restriction; (4) the features to be evaluated during each required inspection and periodic review; and (5) the plans and procedures to be followed for implementation of IC and ECs, such as the performance of a soil vapor intrusion evaluation prior to the construction of any enclosed buildings in the vicinity of the site where the potential for soil vapor intrusion is identified.

2.2 Institutional Controls

2.2.1 General

ICs are necessary to ensure the effectiveness of the remedial action. The main IC for the Mr. C’s site will be an environmental deed restriction or an environmental notice, which at the time of the writing of this SMP have not been finalized. This SMP will be updated to include information on the final ICs for the site.

The following or similar language should be added to the filed environmental notice: All requirements of the SMP and all referenced plans (latest revision) on file at the offices of NYSDEC Region 9 must be adhered to. This applies to all current and future property owners.

The ICs required by the environmental notice refer to non-physical mechanisms designed to:

- Restrict the use or development of the site;

- Limit human exposure to site contaminants;
- Prevent any action that would threaten the effectiveness or operation and maintenance of a remedy at or pertaining to the site; and
- Implement, maintain, and monitor ECs.

In addition to the ICs identified above, the environmental notice also stipulates the following:

- Compliance with the SMP;
- Restrictions on the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by NYSDOH;
- Periodic certification of ICs by the responsible party, unless such party is NYSDEC or NYSDEC's designee; and
- Restrictions on future property use that is no less restrictive than "restricted-residential use" as defined by 6 New York Codes, Rules and Regulations (NYCRR) Part 375.

2.2.2 Individual Property Easements and Access Agreements

As described in Section 1.4.3, permanent access agreements and easements were executed in conjunction with the completion of the remedy for the OM&M of site ECs. Refer to Appendix C for copies of the permanent individual property easements. Refer to Appendix D for copies of the private property access agreements.

2.2.3 Soil Vapor Intrusion Evaluation

Prior to the construction of any enclosed structures located over areas with remaining contamination, a soil vapor intrusion (SVI) evaluation will be performed to determine whether any mitigation measures are necessary to eliminate potential intrusion of vapors in the proposed structure. Alternatively, an SVI mitigation system may be installed as an element of the building foundation without first conducting an investigation. This mitigation system would include a vapor barrier and a passive sub-slab depressurization system capable of being converted to an active system.

Prior to conducting an SVI investigation or installing a mitigation system, a work plan will be developed and submitted to the NYSDEC and NYSDOH for approval. This work plan will be developed in accordance with the NYSDOH's *Guidance for Evaluating Vapor Intrusion in the State of New York* (NYSDOH 2006). Measures to be employed to mitigate potential vapor intrusion will be evaluated, selected, designed, installed, and maintained based on the SVI evaluation, the NYSDOH guidance, and construction details of the proposed structure.

Preliminary (i.e., unvalidated) SVI sampling data will be forwarded to NYSDEC and the NYSDOH for initial review and interpretation. Upon validation, the final data will be transmitted to the agencies, along with a recommendation for follow-up action, such as mitigation. The validated SVI data will also be transmitted to the property owner within 30 days of validation. If any indoor air test results exceed NYSDOH guidelines, relevant NYSDOH fact sheets will be provided to all tenants and occupants of the property within 15 days of receipt of the validated data.

SVI sampling results, evaluations, and follow-up actions will be summarized in the next PRR.

2.3 Engineering Controls

2.3.1 Engineering Control Systems

The engineering controls established at the Mr. C's Site consist of an on-site treatment system, pumping wells, a groundwater monitoring well network, an on-site SSDS, and four off-site SSDSs. The ECs shall continue to be operated, maintained, and monitored until the site is deemed by NYSDEC to be no longer capable of discharging contamination or affecting human health and permission to discontinue these controls is granted, in writing, by NYSDEC.

2.3.1.1 On-Site Air-Stripper Treatment System

The VOC treatment system consists of a 3,000-gallon holding tank, in-line bag filters, groundwater feed pumps, a five-tray air stripper, and effluent pumps to the Tannery Brook discharge. A sequestering agent is metered into the influent side of the system to prevent excessive iron deposition and foaming of the stripper trays. A building sump and sump pump, also part of the system, are designed to allow wash water and emergency eye wash collected in the sump from the treatment bay floor slab to be pumped back to the holding tank for processing through the treatment system. Stripper maintenance is performed monthly, including replacement of bag filters, pump lubrication, and monitoring of the sequestering agent feed rate. Blower maintenance, winterization of the system, and pumping of water from influent and effluent manholes are performed on an as-required basis.

The system process and instrumentation diagram (P&ID) is provided as Figure 2-1. Modifications to the groundwater treatment system and its layout have been made since the time of the original remedial design. The current layout of the treatment system is presented on Figure 2-2.

The groundwater treatment system is capable of processing a maximum of 150 gallons of groundwater per minute on a continuous basis. The system includes a sequestering agent feed system, bag filters, a 3,000-gallon holding tank, and a low-profile air stripper. Discharge piping for the system consists of approximately 1,300 linear feet of 4-inch-diameter force main, with three inspection manholes along Whaley Avenue and an outfall structure located at the corner of Ridge Road and Whaley Avenue, which discharges into Tannery Brook. Remedial treatment system record drawings are provided in Appendix E.

Procedures for monitoring the system are included in the Monitoring Plan (Section 3 of this SMP). Procedures for operating and maintaining the on-site treatment system are documented in the Operation and Maintenance Plan (Section 4 of this SMP).

2.3.1.2 Pumping Well Network

The groundwater treatment system for the Mr. C's site includes a network of eight groundwater pumping wells. Each groundwater extraction well is equipped with a Grundfos well pump and level transducer, which is placed 2 feet above the pump intake. The transducers are programmed to turn the pumps on and off at various water levels in order to maintain a cone of depression in the water table and to extract as much of the groundwater contamination as possible.

There are currently eight active pumping wells around the Mr. C's site. A list of pumping wells and their construction details are provided in Table 2-1. Pumping wells are identified with either "PW" or "RW" for recovery well.

Piezometers were installed in close proximity to the pumping wells, generally spaced at 5-, 10-, 15-, and 20-foot intervals. The piezometers serve to visually monitor groundwater levels around the extraction wells for the creation of a cone of depression in the groundwater table around the well pump. (See Figure 2-3 for as-built locations of clean-out manholes, pumping chambers, pumping wells, piezometers, electric boxes, and discharge point locations.)

Procedures for monitoring the pumping well network are included in the Monitoring Plan (Section 3 of this SMP). Procedures for operating and maintaining the pumping wells are included in the Operation and Maintenance Plan (Section 4 of this SMP).

2.3.1.3 Groundwater Well Network

A network of monitoring wells has been installed to monitor both up-gradient and down-gradient groundwater conditions at the site. There are currently 26 active monitoring wells around the Mr. C's Dry Cleaners Site. Groundwater wells are labeled according to the original company that installed them – MPI for Malcolm Pirnie, Inc., MW for Matrix Environmental, ESI for Environmental Science, Inc., and EE for EEEPC. EEEPC also replaced eight wells in 2012, for which the original label was kept, but an "R" qualifier was added (ESI-2-R, MPI-2S-R, MPI-7I-R, MPI-8S-R, MPI-9S-R, MPI-13B-R, and MPI-14B-R).

Groundwater monitoring wells are flush-mounted. Figure 2-4 shows typical well construction details, and a summary of monitoring well construction details is presented in Table 2-1. Available boring logs, construction logs, and decommissioning logs are presented in Appendix F. Maps of the groundwater monitoring well network showing well locations and associated analytical data are presented on Figures 2-5a and 2-5b.

Table 2-1 Well Construction Summary, Mr. C's Dry Cleaners, East Aurora, New York

Well ID	Well Casing/ Screen Inner Diameter (inches)	Total Well Depth (ft TOIC)	TOIC Casing Elevation (ft AMSL)	Ground Elevation (ft AMSL)	Screen Interval (ft BGS)	Sand Pack Interval (ft BGS)	Top of Seal (ft BGS)	Unit Screened	Northing[a]	Easting[a]
EE-1	2	26.37	913.46	913.63	23 - 28	21 - 28.5	15	OA	1008368.502	1140146.786
EE-2	2	31.34	916.3	916.51	22 - 32	20 - 32	15	OA	1008549.179	1139877.201
EE-3	2	28	914.64	914.9	18-28	16-28	14	OA	1008457.12	1139994.78
EE-4	2	14.25	916.69	916.9	5-15	3-15	0.5	OA	1008726.94	1140212.13
ESI-2-R	2	18.9	917.44	917.7	9-19	7-19	5	OA	1008739.35	1140418.33
ESI-3	2	15.42	915.85	916.41	7 - 17	6 - 18	4.1	OA	1008527.962	1140298.338
ESI-5-R	2	14.55	912.19	912.5	5-15	3-15	1	OA	1008162	1140146.65
ESI-6	2	15.93	914.48	914.92	7 - 17	6 - 18	3.8	OA	1008343.484	1139989.729
MPI-1S	2	18.64	915.08	915.38	9 - 19	7.2 - 19.5	5.3	OA	1008428.703	1140109.692
MPI-2S-R	2	18.4	915.63	915.9	8-18	6-18	4	OA	1008365.76	1140310.44
MPI-3S	2	17.41	914.4	914.79	8 - 18	5.7 - 18.5	3.7	OA	1008452.501	1139912.758
MPI-4S	2	20.24	914.82	915.12	11 - 21	8.8 - 21.5	6.8	OA	1008598.538	1140046.256
MPI-4I	2	41.5	915.66	916.12	32 - 42	29.8 - 42.5	4	LA	1008588.814	1140036.833
MPI-5S	2	17.34	916.45	916.78	8 - 18	5.9 - 18.4	3.9	OA	1008746.102	1140160.367
MPI-6S	2	21.65	915.03	915.35	12.3 - 22.3	10 - 23	7.9	OA	1008760.202	1139899.182
MPI-7I-R	2	38.5	915.44	915.8	28.9-38.9	26.5-39	24.5	LA	1008537.71	1140294.84
MPI-8S-R	2	17.4	913.96	914.5	8-18	6-18	4	OA	1008771.32	1140064.97
MPI-9S-R	2	16.52	913.38	914	8-18	6-18	4	OA	1008923.5	1140066.68
MPI-10B	2	31.11	915.68	916.07	16.5 - 31.5	13 - 32	11	OA	1008594.937	1140161.039
MPI-12B	2	34.62	911.19	911.44	20 - 35	15 - 35	11.5	OA	1008126.058	1139971.023
MPI-13B-R	2	29.5	912.69	913.2	16.5-31.5	14.5-31.5	12.5	LA	1009063.59	1139779.59
MPI-14B-R	2	28.2	913.71	914	15-30	13-30	11	LA	1009039.96	1139941.28
MPI-15B	2	28.15	913.72	913.7	NA	NA	NA	OA	1008815.15	1139566.43
MW-7	2	13.97	915.96	916.34	5 - 14.5	NA - 15	3	OA	1008603.486	1140170.72
MW-8	2	13.57	915.62	915.97	5 - 14.5	NA - 15	3	OA	1008719.861	1140104.112
MW-11	2	17.91	914.39	914.4	NA	NA	NA	--	1008565.98	1140177.64
RW-1	6	24.48	NA	NA	17.9 - 27.9	10 - 30	7	OA	1008563.899	1140262.844
PW-2	4	29.02	NA	NA	NA - 32	NA	NA	OA	1008601.547	1140142.874
PW-3	4	28.67	NA	NA	NA - 32	NA	NA	OA	1008646.528	1140166.174
PW-4	4	29.04	NA	NA	NA - 32	NA	NA	OA	1008657.699	1140029.129
PW-5	4	28.47	NA	NA	NA - 32	NA	NA	OA	1008691.158	1140049.864

Table 2-1 Well Construction Summary, Mr. C's Dry Cleaners, East Aurora, New York

Well ID	Well Casing/ Screen Inner Diameter (inches)	Total Well Depth (ft TOIC)	TOIC Casing Elevation (ft AMSL)	Ground Elevation (ft AMSL)	Screen Interval (ft BGS)	Sand Pack Interval (ft BGS)	Top of Seal (ft BGS)	Unit Screened	Northing[a]	Easting[a]
PW-6	4	28.3	NA	NA	NA - 32	NA	NA	OA	1008713.539	1139891.103
PW-7	4	26.49	NA	NA	NA - 32	NA	NA	OA	1008749.764	1139907.169
PW-8	4	26.82	NA	NA	NA - 32	NA	NA	OA	1008792.235	1139824.621
Decommissioned Wells										
ESI-5	2	12.32	912.64	912.9	5 - 15	4 - 16	2	OA	1008162	1140146.65
MPI-2S	2	9.52	NA	NA	8 - 18	6 - 18.5	3.8	OA	1008365.76	1140310.44
MPI-4D	8	NA	NA	915.97	66-76	64-77.5	60	--	1008607.54	1140038.781
MPI-7I	2	13.37	916.14	916.42	29.5 - 39.5	27.1 - 40	5.3	LA	1008537.71	1140294.84
MPI-8S	2	6.54	NA	NA	8 - 18	6 - 18.5	4	OA	1008771.32	1140064.97
MPI-13B	2	31.43	913.25	913.49	17 - 32	15 - 32	10	OA	1009063.59	1139779.59
Abandoned or Missing Wells										
ESI-1 Replacement	2	19.74	916.99	917.35	10.5 - 20.5	8 - 21	4	OA	1008522.429	1140447.504
ESI-2	2	NA	NA	NA	9 - 19	8 - 20	6	OA	1008739.35	1140418.33
ESI-4	2	26.37	NA	NA	5 - 15	4 - 16	2	OA	NA	NA
MW-1	2	NA	NA	NA	12 - 22	10.6 - 22	9	OA	1008619.702	1140120.901
MW-2	2	NA	NA	NA	10 - 15	NA	NA	OA	1008631.906	1140098.904
MW-3	4	NA	NA	NA	7 - 17	6.1 - 18	3.7	OA	1008584.312	1140095.979
MW-4	4	16.67	914.02	914.47	7.3 - 17.3	6.6 - 18	4.7	OA	NA	NA
MW-5	2	NA	NA	NA	10 - 15	NA	NA	OA	1008538.419	1140130.518
MW-6	2	NA	NA	NA	5 - 14.5	NA - 15	3	OA	1008586.532	1140110.819
MW-9	2	NA	NA	NA	5 - 14.5	NA - 15	3	OA	1008700.677	1140221.924
MW-10	2	NA	NA	NA	4 - 13.5	NA - 14	2	OA	1008543.146	1140160.301
MW-14	2	NA	NA	NA	NA - 18.2 (TOIC)	NA	NA	OA	1008587.34	1140174.681
MPI-1D	NA	NA	NA	NA	NA	NA	NA	--	NA	NA
MPI-5D	**Borehole only – no well construction log**									
MPI-5I	NA	NA	NA	NA	32 - 42	30 – 42.5	8	OA	1008745.758	1140168.687
MPI-7D	**Borehole only – no well construction log**									
MPI-9S	2	NA	NA	NA	8 - 18	6.5 - 18.5	4.5	OA	1008923.5	1140066.68
MPI-11B	2	NA	NA	NA	15 - 30	13 - 30.5	8.5	OA	1008806.891	1139663.098

Table 2-1 Well Construction Summary, Mr. C’s Dry Cleaners, East Aurora, New York

Well ID	Well Casing/ Screen Inner Diameter (inches)	Total Well Depth (ft TOIC)	TOIC Casing Elevation (ft AMSL)	Ground Elevation (ft AMSL)	Screen Interval (ft BGS)	Sand Pack Interval (ft BGS)	Top of Seal (ft BGS)	Unit Screened	Northing[a]	Easting[a]
MPI-14B	2	27.54	913.18	913.68	15 - 30	11 - 30	8.5	OA	1009039.96	1139941.28
OW-B	2	26.41	NA	NA	22.5 - 27.5	10.5 - 27.5	8	OA	1008734.848	1139901.616
RW-2	4	NA	NA	NA	18 - 28	10 - 28	8	OA	1008725.751	1139901.252

Note:

Wells in *italic text* were previously abandoned or destroyed, or were otherwise not locatable in 2011.

[a] Coordinates system is New York State Plane West Zone (feet). Coordinates are either from Clear Creek Land Surveying, LLC survey on May 31, 2012, or estimated in AutoCAD relative to the May 2012 surveyed locations.

Key:

AMSL = above mean sea level
BGS = below ground surface
ft = feet
LA = Lacustrine aquifer
NA = not available
OA = outwash aquifer
TOIC = top of inner casing

Procedures for monitoring the groundwater monitoring well network are included in the Monitoring Plan (Section 3 of this SMP). Procedures for operating and maintaining the monitoring wells are included in the Operation and Maintenance Plan (Section 4 of this SMP) and Appendix I.

2.3.1.4 Subslab Depressurization Systems (SSDSs)

Five active SSDSs have been installed at the following properties to support remedial activities at the Mr. C's site:

- 9 Paine Street (First Presbyterian Church) – Fall 2004;
- 27 Whaley Avenue (private residence) - Fall 2004;
- 572-576 Main Street (commercial building) – August 2014;
- 578-580 Main Street (commercial building) – August 2014
- 586 Main Street, Suite 3 (Mr. C's Treatment Building) – April 2014.

The locations of the three-fan SSDS system at the First Presbyterian Church, the single-fan system at 27 Whaley Avenue, the two-fan system at 572-576 Main Street, the single-fan system at 578-580 Main Street, and the single-fan system at 586 Main Street (Suite 3) are shown on Figures 2-6 through 2-10, respectively.

The systems currently operate in a continuous mode, 24 hours per day, 365 days per year. The record drawings prepared as a part of the SSDS installation documentation are provided in Appendix G. Agreements allowing for system access, maintenance, and monitoring, including components on private properties, have been retained for the project (see Appendix D).

The procedures for monitoring the off-site SSDSs are included in the Monitoring Plan (Section 3 of this SMP). The procedures for operating and maintaining the SSDSs are included in the Operation and Maintenance Plan (Section 4 of this SMP) and Appendix J.

2.3.1.5 Agway AS/SVE System (Decommissioned)

The AS/SVE system at the Agway site was operated and maintained by EEEPC from 2005 to December 2011, when its operation was discontinued with the approval of NYSDEC. Drawings for the Agway AS/SVE system are provided as Appendix H for informational purposes only.

2.3.2 Criteria for Completion of Remediation

Generally, remedial processes are considered completed when effectiveness monitoring indicates that the remedy has achieved the remedial action objectives identified by the ROD or other post-remedial decision documents. The framework for determining when remedial processes are complete is provided in Section 6.6 of NYSDEC's *Technical Guidance for Site Investigation and Remediation* (NYSDEC 2010a).

2.3.2.1 On-Site Treatment System, Pumping Wells, and Monitoring Well Network

The on-site air stripping treatment system and associated groundwater monitoring activities will continue until the concentrations of the remaining groundwater contaminants are found to be consistently below NYSDEC standards or have become asymptotic at an acceptable level, as determined by NYSDEC, over an extended period. Monitoring will continue until permission to discontinue is granted, in writing, by NYSDEC. If groundwater contaminant levels become asymptotic at a level that is not acceptable to NYSDEC, additional source removal, changes in treatment, and/or control measures will be evaluated.

2.3.2.2 Off-Site SSDSs

Operation of the SSDSs will not be discontinued unless written approval is granted by NYSDEC. In the event that monitoring data indicate an SSDS is no longer required, a proposal to discontinue the SSDS will be submitted by the property owner to NYSDEC and the NYSDOH.

2.4 Inspections and Notifications

2.4.1 Inspections

Inspections of all remedial components installed at the site will be conducted at the frequency specified in the SMP Monitoring Plan schedule (refer to Section 3). A comprehensive sitewide inspection will be conducted annually, regardless of the frequency of the PRR. The inspections will determine and/or document the following:

- Whether the ECs continue to perform as designed;
- Whether the ECs continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Environmental Easement;
- Achievement of remedial performance criteria;
- Sampling and analysis of appropriate media during monitoring events;
- Whether site records are complete and up to date; and
- Changes, or needed changes, to the remedial or monitoring system.

Inspections will be conducted in accordance with the procedures set forth in the Monitoring Plan of this SMP (Section 3) and Appendices I and J. The reporting requirements are outlined in the PRR section of this plan (Section 5).

If an emergency occurs, such as a natural disaster or an unforeseen failure of any of the ECs, the site will be inspected by a qualified environmental professional, as determined by NYSDEC, within 5 days of the event to verify the effectiveness of the EC and ICs implemented at the site.

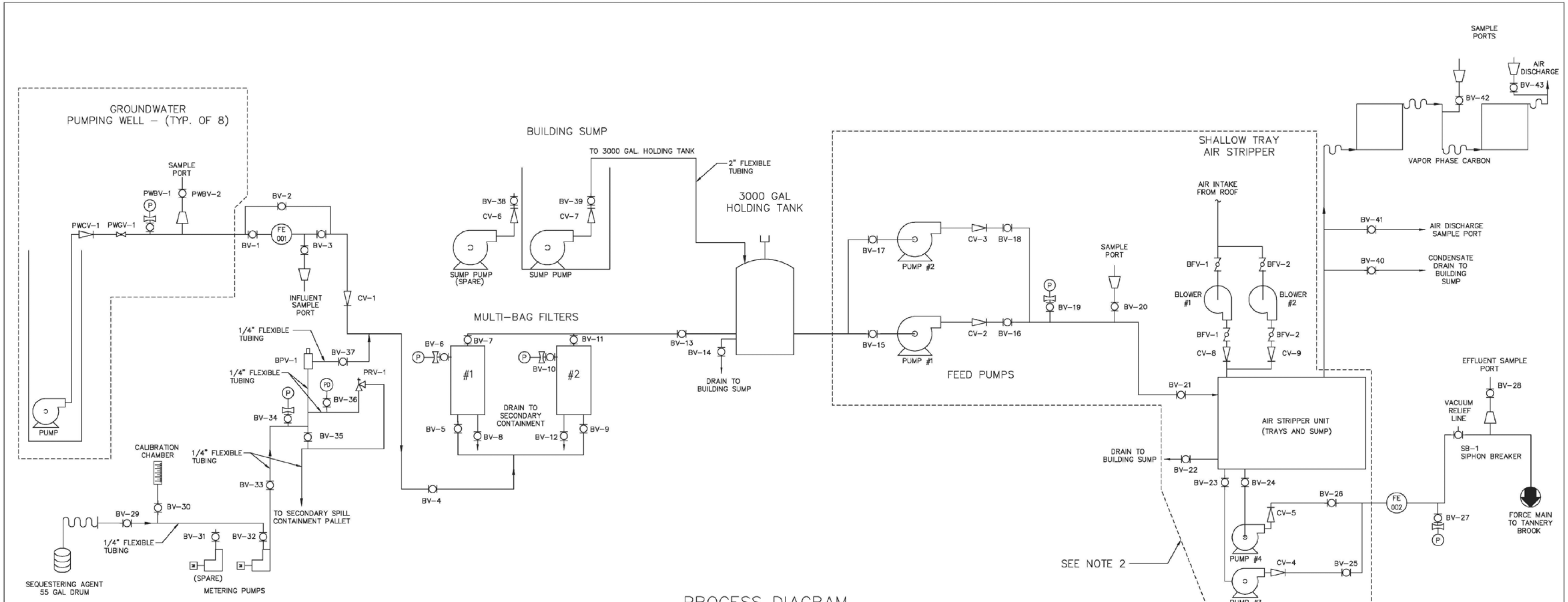
2.4.2 Notifications

The following notifications will be submitted, as needed, by the property owner(s) or designee to NYSDEC:

- Sixty-day advance notice of any proposed changes in site use, as required under the terms of the Environmental Deed Restriction, 6 NYCRR Part 375, and/or Environmental Conservation Law.
- Notice within 48-hours of any damage to or defect in the foundation structures that reduces or has the potential to reduce the effectiveness of an EC. In addition, NYSDEC will be given 48-hour notice prior to implementing any action to mitigate the damage or defect.
- Verbal notice by noon of the following day of any emergency, such as a fire, flood, or earthquake, that reduces or has the potential to reduce the effectiveness of ECs in place at the site, with written documentation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact on the environment and the public.
- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action shall be submitted to NYSDEC within 45 days and shall describe and document actions taken to restore the effectiveness of the ECs.

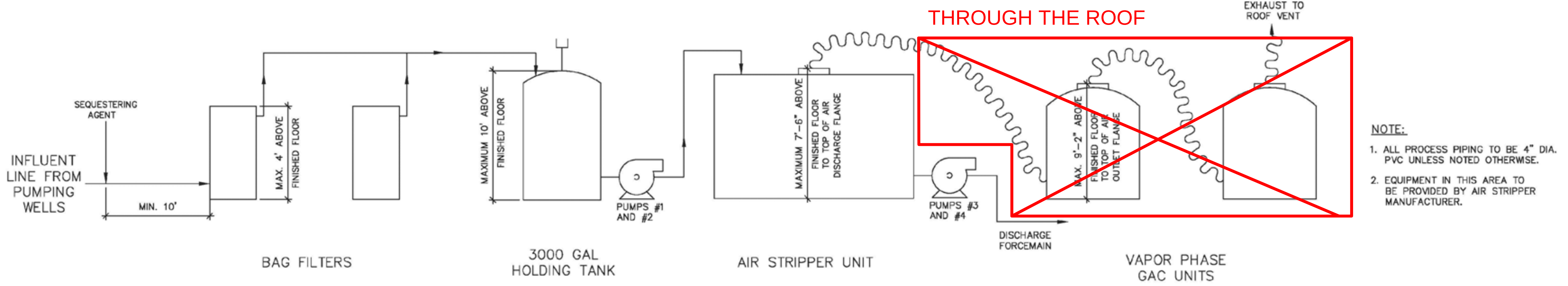
Any change in site ownership or the responsibility for implementing this SMP will include the following notifications:

- NYSDEC will be notified, in writing, at least 60 days prior to any such change in ownership or responsibility. The notification must include the prospective purchaser’s name, contact representative, and contact information. It will also include a certification that the prospective purchaser has been provided with a copy of the administrative documents and all approved work plans and reports, including this SMP.
- Within 15 days after the transfer of all or part of the site, the new owner’s name, contact representative, and contact information will be confirmed in writing.

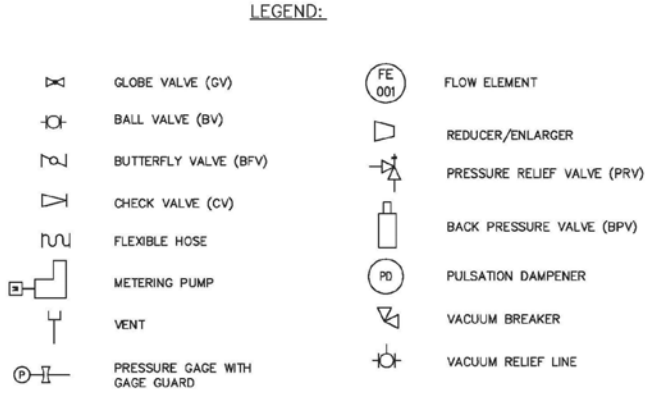


PROCESS DIAGRAM

DECOMMISSIONED & REMOVED JANUARY 2005
SYSTEM EFFLUENT AIR DISCHARGED
THROUGH THE ROOF



PROCESS SECTION



NOTE:

1. ALL PROCESS PIPING TO BE 4" DIA. PVC UNLESS NOTED OTHERWISE.
2. EQUIPMENT IN THIS AREA TO BE PROVIDED BY AIR STRIPPER MANUFACTURER.

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

8108 ADMIN E:\ACAD\PROJ\0266362\REMEDIAL DESIGN\0266G001 Scale: 1:1 Date: 03/22/2000 Time: 09:02

MALCOLM PIRNIE

REVISIONS			
NO.	BY	DATE	REMARKS

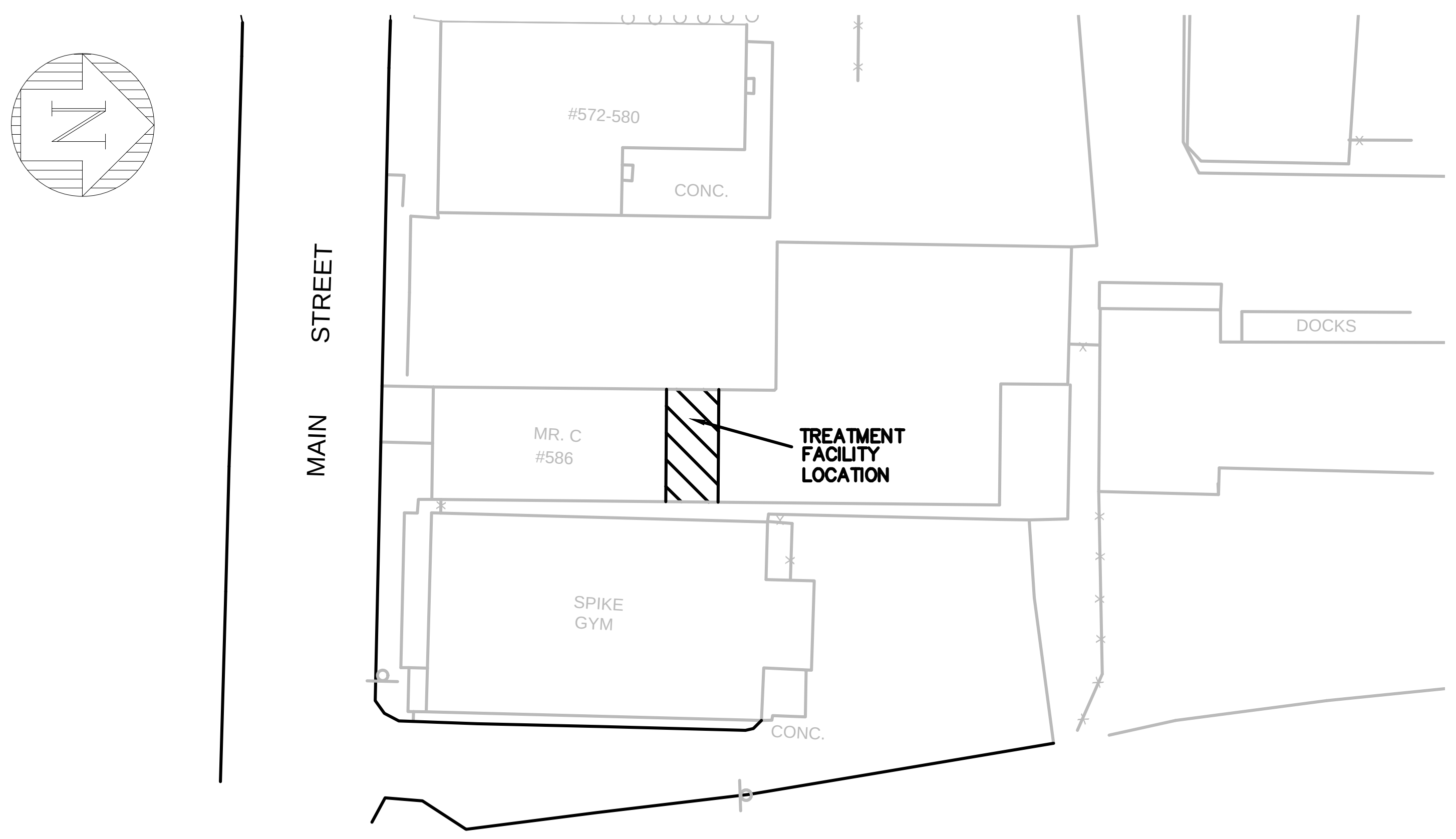
DES ____
DWN ____
CKD ____

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
MR. C'S DRY CLEANERS SITE, EAST AURORA, NEW YORK
CONTRACT NUMBER D004180
REMEDIAL DESIGN

GROUNDWATER TREATMENT SYSTEM
PROCESS DIAGRAM AND SECTION
NOT TO SCALE

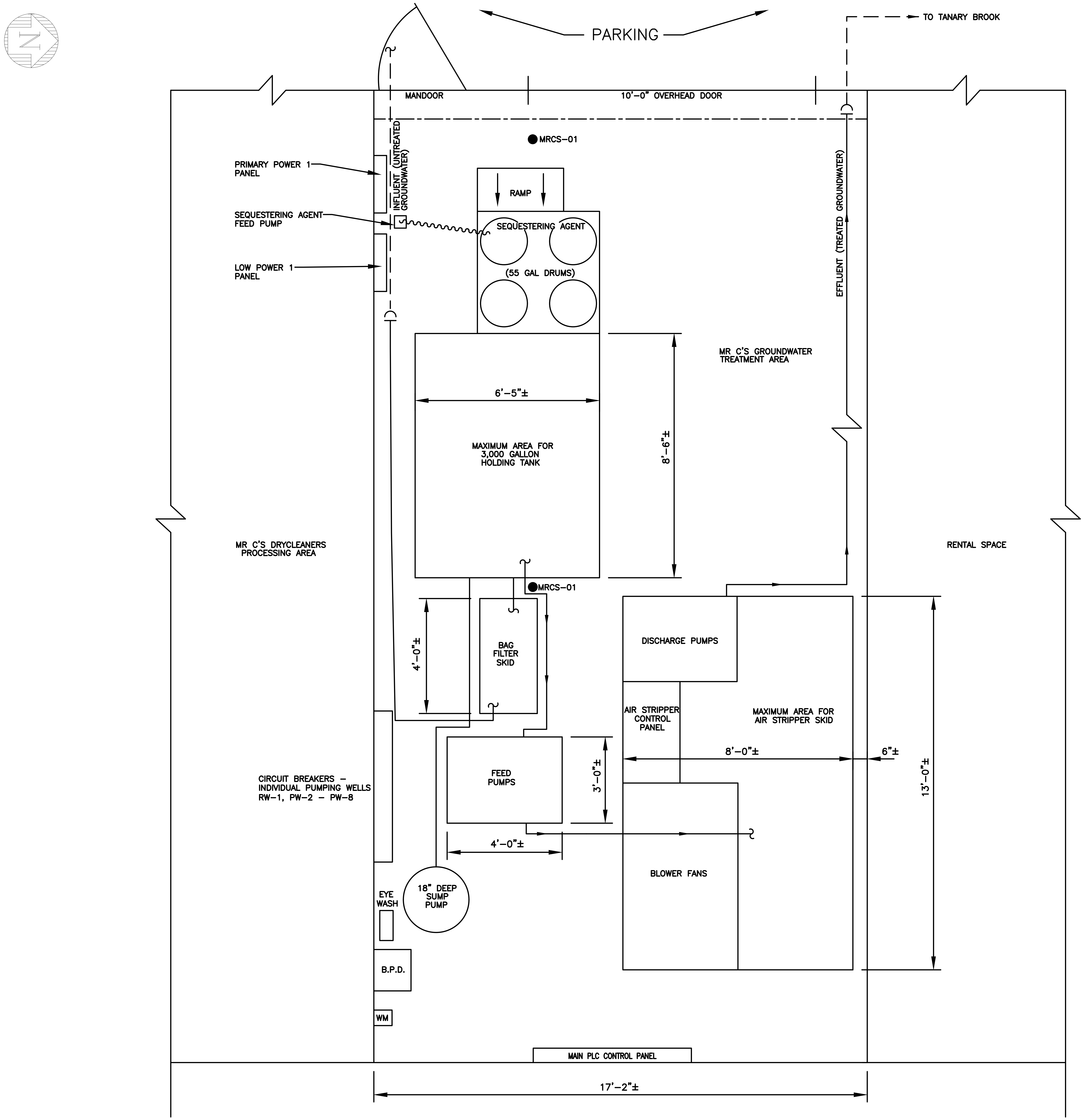
DATE OCTOBER 2000
G SHEET 4 OF 7
CAD REF. NO. 0266G001

FIGURE 2-1



SITE LOCATION MAP

SCALE" 1" = 50'-0"



FLOOR PLAN

SCALE" 1/2" = 1'-0"

LEGEND

● MRCS-01	SUB-SLAB AIR SAMPLE
B.P.D.	BACKFLOW PREVENTION DEVICE
WM	WATER METER
PLC	PROCESS LOGIC CONTROLS

SCALE IN FEET

0 100 200 300

IT IS A VIOLATION OF NEW YORK STATE EDUCATION LAW TO ALTER THIS DOCUMENT BY MEANS INCONSISTENT WITH SECTION 7209 OF SAID LAW.

DWG NO.	DATE	DESCRIPTION

REFERENCE DRAWINGS

NO.	DATE	DWN	APP'D	DESCRIPTION
A	8-10-12	KMK	MS	ISSUED FOR REVIEW PURPOSES ONLY

REVISIONS

ecology and environment
engineering p.c.

DESIGNED BY M STEFFAN	CHECKED BY M STEFFAN
DRAWN BY KM KRAJEWSKI	APPROVED BY M STEFFAN

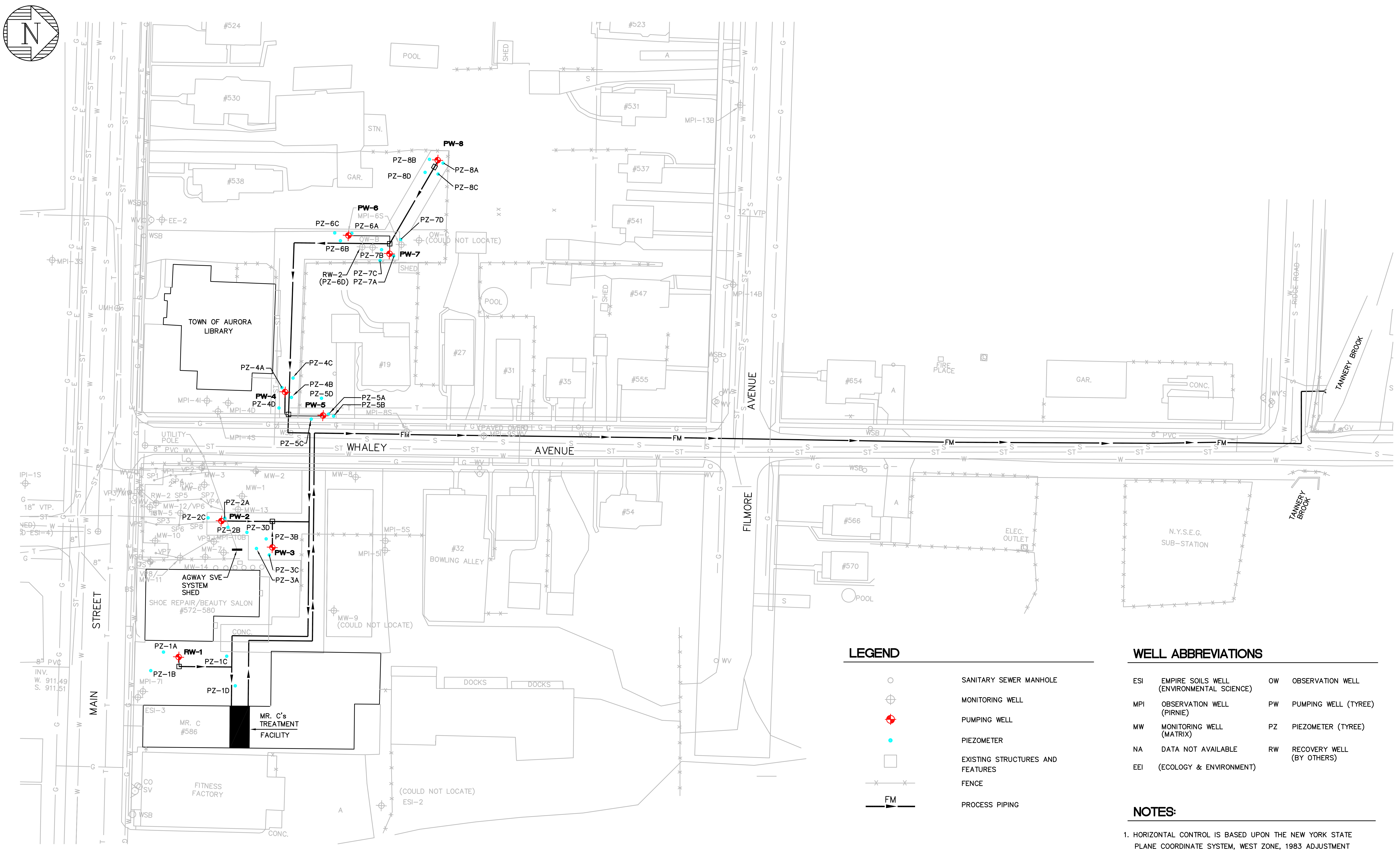
MR C'S DRY CLEANERS
NYSDEC CONTRACT No. D008513

EAST AURORA ERIE NEW YORK

FIGURE 2-2
SUBSLAB AIR SAMPLE LOCATIONS

SCALE	FIRST ISSUED	CAD FILE NO.	SHEET NO.	REV.
AS NOTED	8/10/12	GWTP FPLAN.dwg	Sheet X of X	A

F:\MR C's\GWTP floorplan\GWTP FLOOR PLAN_2014.dwg
BUFFplot: 6/25/12 KMK



LEGEND

○	SANITARY SEWER MANHOLE
⊕	MONITORING WELL
⊕	PUMPING WELL
●	PIEZOMETER
☐	EXISTING STRUCTURES AND FEATURES
—x—x—	FENCE
—FM→—	PROCESS PIPING

WELL ABBREVIATIONS

ESI	EMPIRE SOILS WELL (ENVIRONMENTAL SCIENCE)	OW	OBSERVATION WELL
MPI	OBSERVATION WELL (PIRNIE)	PW	PUMPING WELL (TYREE)
MW	MONITORING WELL (MATRIX)	PZ	PIEZOMETER (TYREE)
NA	DATA NOT AVAILABLE	RW	RECOVERY WELL (BY OTHERS)
EEI	(ECOLOGY & ENVIRONMENT)		

NOTES:

1. HORIZONTAL CONTROL IS BASED UPON THE NEW YORK STATE PLANE COORDINATE SYSTEM, WEST ZONE, 1983 ADJUSTMENT (NAD 83) AND WAS OBTAINED FROM A MAP PREPARED BY WENDEL DUCHSCHERER ARCHITECTS AND ENGINEERS PC (NYS SITE No. 9-15-157) NYSDEC CONTRACT No. D004180.
2. ELEVATIONS ARE BASED UPON NORTH GEODETIC VERTICAL DATUM, 1929 (NGVD 1929).
3. BENCHMARK IS LOCATED NEAR THE NORTH EAST CORNER OF MAIN STREET AND PAINE STREET, BEING A BRASS DISC SET IN THE TOP OF CONCRETE BASE – ELEVATION 916.64'

SCALE IN FEET
0 60 120 180

IT IS A VIOLATION OF NEW YORK STATE EDUCATION LAW TO ALTER THIS DOCUMENT BY MEANS INCONSISTENT WITH SECTION 7209 OF SAID LAW.

DWG NO.	DATE	DESCRIPTION	NO.	DATE	DWN	APP'D	DESCRIPTION
DEC 31 ISO.dwg	7/18/94	ISOPOTENTIAL MAP AND CROSS SECTIONS 4/13/94 GROUNDWATER LEVELS MALCOLM PIRNIE INC.					
0266G003.dwg	10/17/00	REMEDIAL DESIGN PIPING AND WELL LAYOUT PLAN MALCOLM PIRNIE INC.	A		JJK	DJM	
REFERENCE DRAWINGS			REVISIONS				

ecology and environment engineering, p.c.

DESIGNED BY JJ KOHLER	CHECKED BY MG STEFFAN
DRAWN BY JJ KOHLER	APPROVED BY D.J. MILLER P.E.

MR. C'S DRY CLEANERS SITE

ERIE COUNTY
EAST AURORA, NY

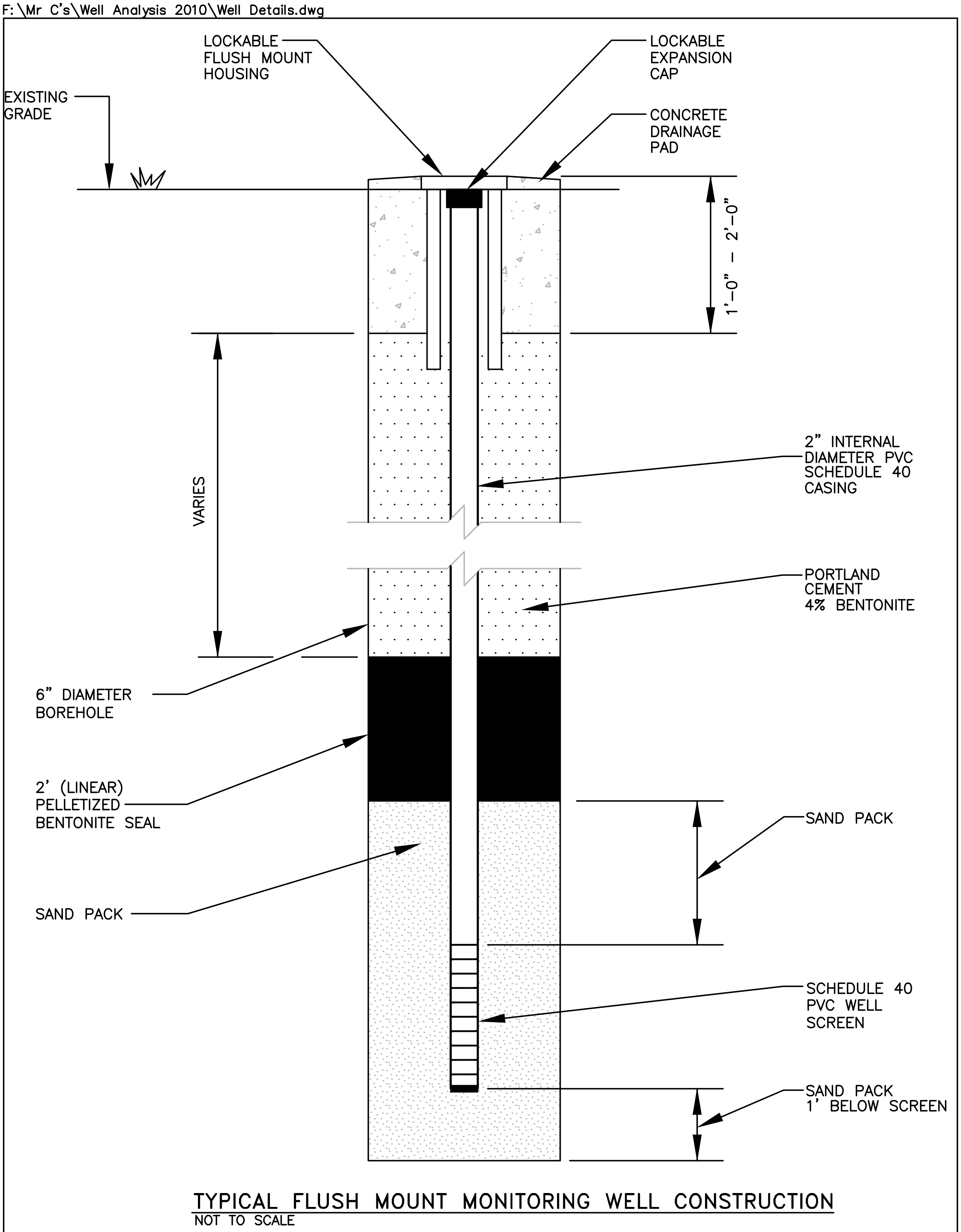
GW PUMPING WELL AND PIEZOMETER LOCATIONS

SCALE	DATE ISSUED	C.A.D. FILE NO.	DRAWING NO.	REV.
1"=60'	9/11/07	IEG Well Map.dwg	Sheet 1 of 1	A

FIGURE 2-3

F:\MrC\well analysis dec 2003\lyer well map.dwg
BUFFplot: 9/12/07 JJK

F:\Mr C's\Well Analysis 2010\Well Details.dwg



ecology and environment

FIGURE 2-4
TYPICAL FLUSH MOUNT MONITORING WELL
MR.C'S DRY CLEANERS SITE
EAST AURORA, NEW YORK

EE-2	6/04	8/07	5/09	5/10	2/12	10/13	10/14
Chloroform	0.346 ug/L	ND	ND	ND	ND	ND	ND
Methyl tert-butyl ether	1660 ug/L	670 ug/L	130 ug/L	83 ug/L(J)	54 ug/L	52 ug/L	31 ug/L
Methylene chloride	0.208 ug/L	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.387 ug/L	ND	ND	ND	ND	ND	2.2 ug/L(J)
Trihalomethanes, Total	0.346 ug/L	ND	ND	NA	ND	ND	ND
Vinyl chloride	–	ND	38 ug/L	12 ug/L(J)	18 ug/L	9.9 ug/L(J)	8.2 ug/L
cis-1,2-Dichloroethene	–	ND	ND	6.7 ug/L(J)	190 ug/L	210 ug/L	260 ug/L
1,1-Dichloroethane	NA	NA	NA	NA	1.0 ug/L(J)	ND	0.96 ug/L(J)
1,1-Dichloroethene	NA	NA	NA	NA	.98 ug/L(J)	ND	1.1 ug/L(J)
Chloromethane	NA	NA	NA	NA	1.0 ug/L(J)	ND	ND
trans-1,2-Dichloroethene	NA	NA	NA	NA	1.2 ug/L(J)	ND	3.4 ug/L(J)
Trichloroethene	NA	NA	NA	NA	25 ug/L	71 ug/L	74 ug/L

PW-6	5/02	10/03	6/04	8/07	5/09	5/10	2/12	10/14
Methyl tert-Butyl Ether	8 ug/L	ND	45.5 ug/L	18 ug/L	37 ug/L	27 ug/L	4.0 ug/L(J)	ND
Trichloroethene	3 J ug/L	ND	41.3 ug/L	100 ug/L	120 ug/L	82 ug/L	79 ug/L	0.97 ug/L(J)
Tetrachloroethene	37 ug/L	ND	463 ug/L	1100 ug/L	340 ug/L(J)	970 ug/L(J)	1000 ug/L	23 ug/L
Ethylbenzene	5 J ug/L	ND	ND	ND	ND	ND	ND	ND
Xylene	2 J ug/L	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	ND	ND	11.6 ug/L	50 ug/L	300 ug/L(J)	130 ug/L	76 ug/L	7.9 ug/L
trans-1,2-Dichloroethene	ND	ND	0.400 ug/L	ND	3.9 ug/L(J)	ND	ND	ND
1,1-Dichloroethane	ND	ND	0.150 ug/L	ND	ND	ND	0.59 ug/L(J)	ND
1,1-Dichloroethene	ND	ND	0.861 ug/L	ND	ND	ND	ND	ND

PZ-6A	10/14
Methyl tert-butyl ether	26 ug/L
trans-1,2-Dichloroethene	5.8 ug/L
1,1-Dichloroethene	2.2 ug/L(J)
Vinyl chloride	1.1 ug/L(J)
cis-1,2-Dichloroethene	930 ug/L
Trichloroethene	400 ug/L
Tetrachloroethene	1500 ug/L

PW-7	5/02	10/03	6/04	8/07	5/09	5/10	2/12	10/13	10/14
Acetone	280 ug/L	ND	ND	ND	ND	ND	ND	ND	ND
Methyl tert-Butyl Ether	85 J ug/L	ND	35.0 ug/L	5.2 ug/L(J)	ND	2.8 ug/L(J)	ND	ND	1.5 ug/L(J)
2-Butanone	680 ug/L	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	63 J ug/L	ND	ND	ND	ND	ND	ND	ND	ND
Xylene	290 ug/L	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	160 ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Trichloroethene	92 J ug/L	10 ug/L	41.5 ug/L	94 ug/L	29 ug/L	68 ug/L(J)	8.9 ug/L	8.5 ug/L(J)	1.1 ug/L(J)
Tetrachloroethene	4200 ug/L	800 ug/L	2760 ug/L	2400 ug/L	1400 ug/L(J)	950 ug/L(J)	550 ug/L	300 ug/L	4.0 ug/L(J)
1,1-Dichloroethene	ND	ND	1.06 ug/L	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	ND	ND	7.92 ug/L	25 ug/L	5.7 ug/L	17 ug/L(J)	2.2 ug/L (J)	4.9 ug/L(J)	99 ug/L
Toluene	ND	ND	0.186 ug/L	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	ND	ND	0.776 ug/L	ND	ND	ND	ND	ND	ND
Vinyl chloride	ND	ND	0.171 ug/L	ND	ND	ND	ND	ND	13 ug/L

MPI-15B	5/02	6/04	8/07	5/09	5/10	2/12	10/13	10/14
2-Butanone	NS	1.61 ug/L	ND	ND	ND	180 ug/L	ND	ND
Methyl tert-butyl ether	NS	6.39 ug/L	6.3 ug/L(J)	7.4 ug/L	3.3 ug/L(J)	4.1 ug/L(J)	7.4 ug/L	6.2 ug/L
Acetone	NA	NA	NA	NA	NA	2300 ug/L	ND	ND
Chloromethane	NA	NA	NA	NA	NA	1.5 ug/L(J)	ND	ND
Tetrachloroethene	NA	NA	NA	NA	NA	1.1 ug/L(J)	ND	ND

PW-8	5/02	9/03	6/04	8/07	5/09	5/10	2/12	10/13	10/14
1,1-Dichloroethene	ND	2 ug/L	0.302 ug/L	ND	ND	ND	ND	ND	1.6 ug/L(J)
2-Butanone	ND	46 ug/L	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	4 ug/L	66 ug/L	25.2 ug/L	15 ug/L	28 ug/L	12 ug/L	11 ug/L	20 ug/L(J)	23 ug/L
trans-1,2-Dichloroethene	ND	2 ug/L	0.722 ug/L	ND	ND	ND	ND	ND	2.8 ug/L(J)
Tetrachloroethene	43 ug/L	110 ug/L	243 ug/L	150 ug/L	200 ug/L(J)	100 ug/L	140 ug/L	360 ug/L	260 ug/L
cis-1,2-Dichloroethene	1 ug/L	5 ug/L	8.45 ug/L	13 ug/L	30 ug/L	15 ug/L	13 ug/L	91 ug/L	980 ug/L
Methyl tert-Butyl Ether	16 ug/L	79 ug/L	10.1 ug/L	3.5 ug/L(J)	4.2 ug/L(J)	5.1 ug/L	2.3 ug/L(J)	4.4 ug/L(J)	14 ug/L
Acetone	26 ug/L	ND	ND	ND	ND	ND	ND	ND	ND
Xylene	10 ug/L	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	3 ug/L	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND	ND	190 ug/L
Carbon Disulfide	–	–	–	7.2 ug/L(J)	ND	ND	ND	ND	ND

PZ-8C	10/14
Vinyl chloride	63 ug/L
Methyl tert-butyl ether	33 ug/L
cis-1,2-Dichloroethene	30 ug/L
Trichloroethene	2.0 ug/L(J)
Tetrachloroethene	22 ug/L

LEGEND

⊕	SANITARY SEWER MANHOLE
⌖	MONITORING WELL
●	PUMPING WELL
•	PIEZOMETER
☐	EXISTING STRUCTURES AND FEATURES
—x—x—	FENCE
PAINE STREET	MAJOR AREA STREETS
⊗	WELLS CIRCLED = NOT FOUND (EITHER ABANDONED, DECOMMISSIONED, OR MISSING)

WELL ABBREVIATIONS

EEI	(ECOLOGY & ENVIRONMENT)	PW	PUMPING WELL (TYREE)
ESI	EMPIRE SOILS WELL (ENVIRONMENTAL SCIENCE)	PZ	PIEZOMETER (TYREE)
MPI	OBSERVATION WELL (MALCOLM-PIRNIE)	RW	RECOVERY WELL (BY OTHERS)
MW	MONITORING WELL (MATRIX)	SP	SPARGE POINT
NA	DATA NOT AVAILABLE	VP	VAPOR COLLECTION POINT
OW	OBSERVATION WELL	MPI-7IR	REPLACEMENT WELL

ANALYTICAL ABBREVIATIONS

ug/L	MICROGRAMS PER LITER
ND	NOT DETECTED
NS	NOT SAMPLED
NA	NOT ANALYZED
–	NOT ANALYZED OR NOT DETECTED
(J)	ESTIMATED VALUE
(U)	ANALYZED FOR BUT NOT DETECTED AT THE DETECTION LIMIT INDICATED

NOTES:

1. ONLY DETECTED COMPOUNDS ARE PRESENTED.
2. HORIZONTAL CONTROL IS BASED UPON THE NEW YORK STATE PLANE COORDINATE SYSTEM, WEST ZONE, 1983 ADJUSTMENT (NAD 83).
3. ELEVATIONS ARE BASED UPON NORTH GEODETIC VERTICAL DATUM, 1929 (NGVD 1929).
4. BENCHMARK IS LOCATED NEAR THE NORTHEAST CORNER OF MAIN STREET AND PAINE STREET, BEING A BRASS DISC SET IN THE TOP OF CONCRETE BASE – ELEVATION 916.64'
5. ALL ANALYTICAL WORK PERFORMED IN JUNE 2004 WAS ANALYZED USING METHOD 524.1 FOR VOLATILE ORGANIC COMPOUNDS.
6. AUGUST 2007 ANALYTICAL WORK PERFORMED USING CLP METHOD OLM04.2.

MPI-3S	5/02	9/03	6/04	8/07	5/09	5/10	2/12	10/13	10/14
Benzene	ND	1 ug/L	ND	ND	ND	ND	ND	ND	ND
Methyl tert-Butyl Ether	1700 ug/L	560 ug/L	390 ug/L	240 ug/L	190 ug/L (J)	110 ug/L(J)	81 ug/L	54 ug/L	45 ug/L
Tetrachloroethene	ND	ND	0.495 ug/L	ND	ND	2.6 ug/L(J)	ND	ND	1.9 ug/L(J)
1,2-Dichloroethane	ND	1.4 ug/L	0.538 ug/L	ND	ND	ND	ND	2.2 ug/L(J)	ND

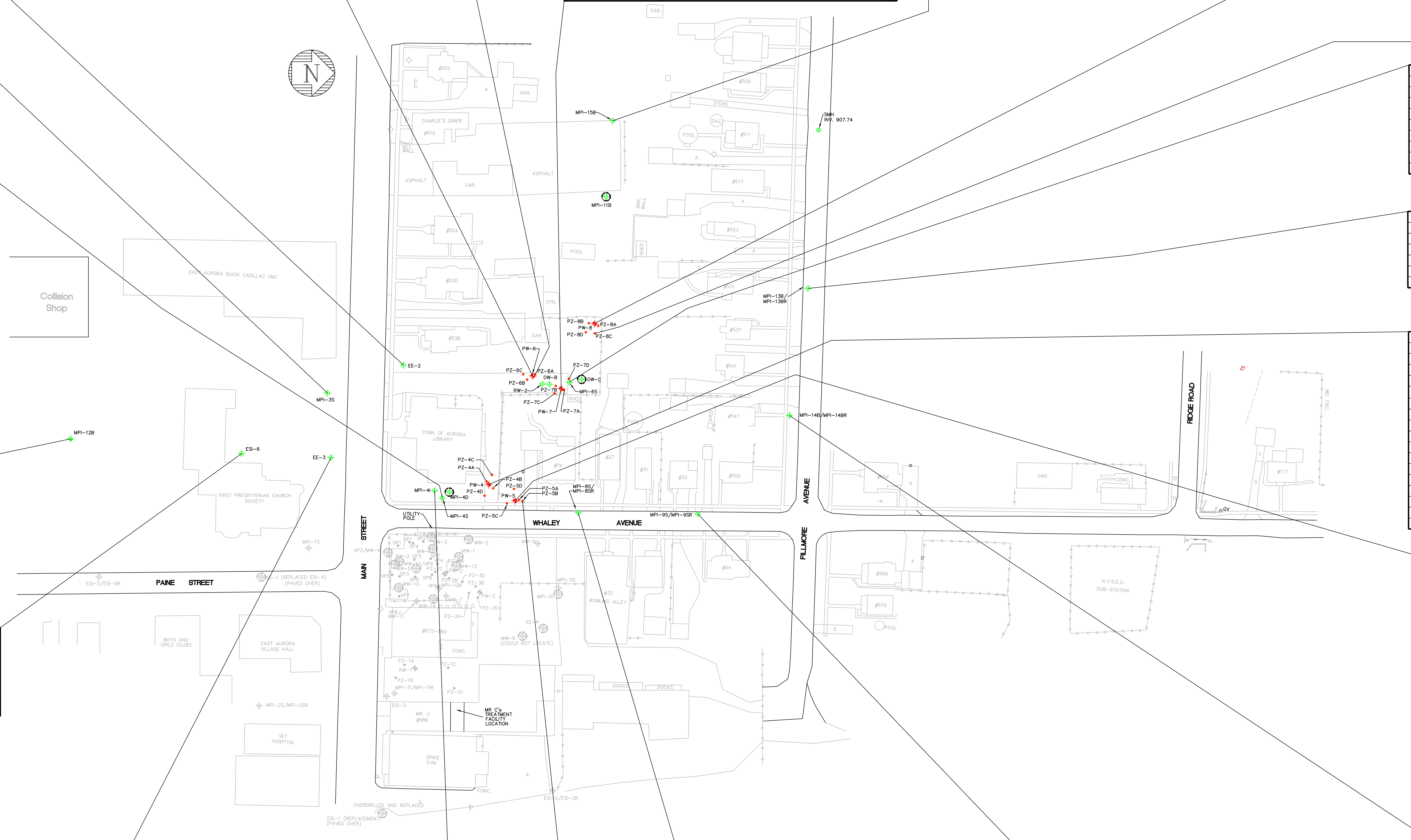
MPI-4S	5/02	9/03	6/04	8/07	5/10	2/12	10/13	10/14
Tetrachloroethene	2 ug/L	2 ug/L	1.63 ug/L	5.0 ug/L	2.3 ug/L(J)	ND	3.3 ug/L(J)	4.3 ug/L(J)
cis-1,2-Dichloroethene	14 ug/L	16 ug/L	97.8 ug/L	140 ug/L	61 ug/L	ND	65 ug/L	55 ug/L
Methyl tert-Butyl Ether	8 ug/L	11 ug/L	4.26 ug/L	ND	ND	ND	ND	ND
Vinyl Chloride	4 ug/L	ND	5.53 ug/L	20 ug/L	6.0 ug/L	ND	11 ug/L	8.6 ug/L
Acetone	9 ug/L	ND		ND	ND	ND	ND	ND
1,1-Dichloroethene	1 ug/L	ND		ND	ND	ND	ND	ND
Benzene	5 ug/L	ND	1.22 ug/L ND	ND	ND	ND	ND	ND
2-Butanone	3 ug/L	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	0.722 ug/L	ND	ND	2.7 ug/L(J)	ND	ND
Isopropylbenzene	ND	ND	0.108 ug/L ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	ND	ND	1.05 ug/L	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	4.27 ug/L	2.4 ug/L	1.1 ug/L(J)	ND	ND	1.2 ug/L(J)
Trihalomethanes, Total	NA	NA	0.722 ug/L	ND	NA	ND	ND	ND
Bromodichloromethane	NA	NA	NA	NA	NA	3.4 ug/L(J)	ND	ND
Bromoform	NA	NA	NA	NA	NA	1.2 ug/L(J)	ND	ND
Dibromochloromethane	NA	NA	NA	NA	NA	3.5 ug/L(J)	ND	ND

MPI-6S	5/02	9/03	6/04	8/07	5/09	5/10	2/12	10/13	10/14
Acetone	ND	20 ug/L	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	15 ug/L	125 ug/L	58 ug/L	94 ug/L	69 ug/L	30 ug/L(J)	3.2 ug/L(J)	1.5 ug/L(J)
Tetrachloroethene	ND	1200 ug/L	3480 ug/L	4900 ug/L	8100 ug/L(J)	6200 ug/L(J)	6800 ug/L	40 ug/L	15 ug/L
cis-1,2-Dichloroethene	ND	2 ug/L	3.26 ug/L	3.8 ug/L(J)	14 ug/L	27 ug/L	ND	27 ug/L	1300 ug/L
Methyl tert-Butyl Ether	1000 ug/L	23 ug/L	2.59 ug/L	ND	1.8 ug/L(J)	3.6 ug/L(J)	ND	ND	ND
trans-1,2-Dichloroethene	ND	ND	0.48 ug/L	ND	ND	ND	ND	ND	16 ug/L
2-Butanone	NA	NA	1.28 ug/L	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	0.167 ug/L	ND	ND	ND	ND	ND	3.2 ug/L(J)
Vinyl Chloride	–	–	–	–	–	–	–	1.5 ug/L(J)	380 ug/L

MPI-13B/MPI-13BR	5/02	9/03	6/04	8/07	6/12	10/13	10/14
Trichloroethene	ND	0.57 ug/L	ND	ND	0.8 ug/L(J)	ND	0.81 ug/L(J)
Benzene	ND	1.4 ug/L	ND	ND	ND	ND	ND
Tetrachloroethene	ND	3.2 ug/L	0.403 ug/L	5.0 ug/L(J)	3.6 ug/L(J)	4.5 ug/L(J)	3.7 ug/L(J)
2-Butanone	NA	NA	0.979 ug/L	ND	ND	ND	ND
Acetone	NA	NA	4.01 ug/L	ND	ND	ND	ND
Carbon disulfide	NA	NA	0.440 ug/L	ND	ND	ND	ND

PW-4	5/02	10/03	6/04	8/07	5/09	5/10	2/12	10/13	10/14
Trichloroethene	ND	35 ug/L	57.9 ug/L	74 ug/L(J)	100 ug/L	120 ug/L	170 ug/L	110 ug/L	170 ug/L
Tetrachloroethene	50 ug/L	200 ug/L	2850 ug/L	1600 ug/L	2400 ug/L(J)	2300 ug/L(J)	2200 ug/L(J)	1800 ug/L	2600 ug/L
cis-1,2-Dichloroethene	ND	490 ug/L	8.68 ug/L	19 ug/L	34 ug/L	36 ug/L	44 ug/L	28 ug/L(J)	190 ug/L(J)
Acetone	100 ug/L	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	1400 ug/L	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	210 ug/L	ND	ND	ND	ND	ND	ND	ND	ND
Xylene	1200 ug/L	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	360 ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Methyl tert-butyl ether	ND	ND	22.0 ug/L	23 ug/L	64 ug/L	33 ug/L	0.95 ug/L(J)	ND	9.3 ug/L
Toluene	ND	ND	0.193 ug/L	ND	ND	ND	ND	ND	ND
Vinyl chloride	ND	ND	0.981 ug/L	3.3 ug/L(J)	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	0.680 ug/L	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	0.485 ug/L	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	0.211 ug/L	ND	ND	ND	ND	ND	ND
Benzene	ND	ND	0.121 ug/L	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	ND	ND	1.2 ug/L	ND	3.9 ug/L(J)	ND	1.8 ug/L(J)	ND	2.1 ug/L(J)
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND	ND	1.4 ug/L(J)

PW-5	5/02	10/03	6/04	8/07	5/09	5/10	2/12	10/13	10/14
Acetone	200 ug/L	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	3300 ug/L	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	170 ug/L	2000 ug/L	3220 ug/L	2000 ug/L	4000 ug/L(J)	4300 ug/L(J)	3100 ug/L(J)	700 ug/L	2700 ug/L
Ethylbenzene	310 ug/L	ND	0.209 ug/L	ND	ND	ND	ND	ND	ND
Styrene	510 ug/L	ND	NA	ND	ND	ND	ND	13 ug/L	ND
Trichloroethene	ND	99 ug/L	78.6 ug/L	95 ug/L	140 ug/L	190 ug/L	87 ug/L	ND	69 ug/L
cis-1,2-Dichloroethene	ND	8 ug/L	8.17 ug/L	21 ug/L	21 ug/L	16 ug/L	16 ug/L	ND	170 ug/L
Xylene	1100 ug/L	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	0.801 ug/L	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	0.346 ug/L	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	0.194 ug/L	ND	ND	ND	ND	ND	0.62 ug/L(J)
Benzene	ND	ND	0.114 ug/L	ND	ND	ND	ND	ND	ND
Methyl tert-butyl ether	ND	ND	10.1 ug/L	3.7 ug/L(J)	2.6 ug/L(J)	4.8 ug/L(J)	ND	ND	ND
trans-1,2-Dichloroethene	ND	ND	2.61 ug/L	6.5 ug/L(J)	12 ug/L	6.4 ug/L	5.9 ug/L	ND	4.2 ug/L(J)
Vinyl chloride	ND	ND	0.415 ug/L	ND	ND	ND	ND	ND	ND



MPI-12B	5/02	9/03	6/04	8/07	5/09	5/10
cis-1,2-Dichloroethene	NS	NS	3.46 ug/L	9.4 ug/L(J)	16 ug/L	17 ug/L
Methyl tert-butyl ether	NS	NS	341 ug/L	170 ug/L	90 ug/L	110 ug/L
Tetrachloroethene	NS	NS	0.422 ug/L	ND	2.8 ug/L(J)	ND
Trichloroethene	NS	NS	0.294 ug/L	ND	ND	ND

ESI-6	5/02	9/03	6/04	8/07	5/09	5/10	2/12	10/13	10/14
1,1-Dichloroethane	ND	0.67 ug/L	0.616 ug/L	ND	ND	ND	1.0 ug/L(J)	ND	1.3 ug/L(J)
Trichloroethene	44 ug/L	16 ug/L	19.2 ug/L	14 ug/L	17 ug/L	10 ug/L(J)	13 ug/L	38 ug/L	22 ug/L
Tetrachloroethene	1180 ug/L	230 ug/L	514 ug/L	240 ug/L	320 ug/L(J)	140 ug/L(J)	200 ug/L(J)	480 ug/L	410 ug/L
cis-1,2-Dichloroethene	130 ug/L	26 ug/L	23.6 ug/L	20 ug/L	37 ug/L	5.9 ug/L(J)	17 ug/L	160 ug/L	59 ug/L
Methyl tert-Butyl Ether	48 ug/L	53 ug/L	29.2 ug/L	7.5 ug/L(J)	7.4 ug/L	3.5 ug/L(J)	ND	ND	ND
trans-1,2-Dichloroethene	ND	ND	0.290 ug/L	ND	ND	ND	ND	ND	ND
Vinyl chloride	ND	ND	0.605 ug/L	ND	ND	ND	ND	ND	ND

MPI-14B/MW-14BR	5/02	9/03	6/04	8/07	2/12	10/13	10/14
Vinyl chloride	ND	ND	1.06 ug/L	ND	ND	ND	ND
cis-1,2-Dichloroethene	ND	ND	2.93 ug/L	2.8 ug/L(J)	1.3 ug/L(J)	ND	ND
Methyl tert-butyl ether	ND	ND	2.99 ug/L	ND	ND	ND	ND
Tetrachloroethene	1 ug/L	ND	0.175 ug/L	ND	10 ug/L(J)	2.5 ug/L(J)	6.2 ug/L
Trichloroethene	ND	ND	0.191 ug/L	ND	1.0 ug/L(J)	ND	ND
trans-1,2-Dichloroethene	ND	ND	1.60 ug/L	ND	ND	ND	ND
Acetone	ND	ND	4.06 ug/L	9.6 ug/L(J)	ND	ND	ND
1,2-Dichloroethane	ND	ND	0.340 ug/L	ND	ND	ND	ND
Chloromethane	NA	NA	NA	NA	0.6 ug/L(J)	ND	ND

EE-3 (NEW)	2/12	10/13	10/14
cis-1,2-Dichloroethene	0.7 ug/L(J)	11 ug/L	20 ug/L
Methyl tert-butyl ether	29 ug/L	18 ug/L	23 ug/L(J)
Tetrachloroethene	3.3 ug/L(J)	1.4 ug/L(J)	1.1 ug/L(J)
Vinyl chloride	13 ug/L	2.1 ug/L(J)	ND

MPI-4I	5/02	9/03	6/04	8/07	5/09	5/10	2/12	10/14
Trichloroethene	120 ug/L	280 ug/L	137 ug/L	580 ug/L	180 ug/L	120 ug/L(J)	2.2 ug/L(J)	41 ug/L
Tetrachloroethene	160 ug/L	690 ug/L	556 ug/L	1300 ug/L	640 ug/L(J)	400 ug/L(J)	14 ug/L(J)	150 ug/L
cis-1,2-Dichloroethene	16 ug/L	48 ug/L	49.4 ug/L	160 ug/L	780 ug/L(J)	880 ug/L(J)	74 ug/L	650 ug/L
Methyl tert-Butyl Ether	140 ug/L	40 ug/L	26.3 ug/L	23 ug/L	13 ug/L	14 ug/L(J)	ND	240 ug/L
trans-1,2-Dichloroethene	ND	ND	1.53 ug/L	21 ug/L	4.4 ug/L(J)	2.0 ug/L(J)	ND	2.1 ug/L(J)
Vinyl chloride	ND	ND	0.196 ug/L	ND	ND	ND	13 ug/L	130 ug/L
1,1-Dichloroethene	–	–	–	ND	ND	1.0 ug/L(J)	ND	ND
Benzene	NA	NA	NA	NA	NA	NA	.62 ug/L(J)	ND

PZ-5B	10/14
trans-1,2-Dichloroethene	8.0 ug/L(J)
cis-1,2-Dichloroethene	6.0 ug/L(J)
Trichloroethene	66 ug/L
Tetrachloroethene	2100 ug/L

MPI-8S/MPI-8SR	5/02	9/03	6/04	8/07	6/12	10/13	10/14
cis-1,2-Dichloroethene	NA	NA	NA	NA	5.0 ug/L	10 ug/L	37 ug/L
Methyl tert-butyl ether	NA	NA	NA	NA	0.58 ug/L(J)	ND	ND
Tetrachloroethene	NA	NA	NA	NA	180 ug/L	120 ug/L	130 ug/L
trans-1,2-Dichloroethene	NA	NA	NA	NA	1.6 ug/L(J)	1.3 ug/L(J)	1.8 ug/L(J)
Trichloroethene	NA	NA	NA	NA	22 ug/L	17 ug/L	18 ug/L
Vinyl chloride	NA	NA	NA	NA	ND	ND	0.55 ug/L(J)

MPI-9S/MPI-9SR	5/02	9/03	6/04	8/07	6/12	10/13	10/14
Tetrachloroethene	NA	NA	NA	NA	.75 ug/L(J)	ND	1.7 ug/L(J)

SEE FIGURE 2-5b FOR SUMMARY OF MONITORING WELL INFORMATION EAST OF WHALEY AVE AND PAINE STREET.

SCALE IN FEET
0 60 120 180

DWG NO.	DATE	DESCRIPTION
DEC 31 ISO.dwg	7/18/94	ISOPOTENTIAL MAP AND CROSS SECTIONS 4/13/94 GROUNDWATER LEVELS MALCOLM PIRNIE INC.
0266G003.dwg	10/17/00	REMEDIAL DESIGN PIPING AND WELL LAYOUT PLAN MALCOLM PIRNIE INC.

REFERENCE DRAWINGS

NO.	DATE	DWN	APP'D	DESCRIPTION
F	12/29/14	KMK	MGS	UPDATED PER OCT 2014 SAMPLE EVENT
E	12/5/13	KMK	MGS	UPDATED PER OCT 2013 SAMPLE EVENT
D	7/20/12	KMK	MGS	UPDATED PER FEB/JUNE 2012 SAMPLE EVENT
C	6/8/10	KMK	MGS	UPDATED PER MAY 2010 SAMPLE EVENT
B	6/30/09	KMK	MGS	UPDATED PER MAY 2009 SAMPLE EVENT
A	12/6/07	KMK	MGS	UPDATED PER AUGUST 2007 SAMPLE EVENT

REVISIONS

FIGURE 2-5a
SUMMARY OF GROUNDWATER ANALYTICAL DATA
MR.C'S DRY CLEANERS SITE LOCATION MAP (WEST)
EAST AURORA, NEW YORK

ecology and environment engineering p.c.

F:\MrC\well Analysis November 2014\Results_revised 12-4-13_East.dwg

MW-4	5/02	9/03	6/04	9/05	8/07
Vinyl Chloride	ND	47 ug/L	41.0 ug/L	590 ug/L	ND
Trichloroethene	23 ug/L	54 ug/L	27.9 ug/L	7.0 ug/L	ND
Benzene	24 ug/L	46 ug/L	4.80 ug/L	21.0 ug/L	5.4 ug/L(J)
trans-1,2-Dichloroethene	1 ug/L	7 ug/L	2.87 ug/L	3.4 ug/L	ND
Tetrachloroethene	130 ug/L	95 ug/L	278 ug/L	5.3 ug/L	ND
cis-1,2-Dichloroethene	200 ug/L	250 ug/L	515 ug/L	570 ug/L	2.5 ug/L(J)
Acetone	3 ug/L	ND	ND	ND	ND
Ethylbenzene	2 ug/L	ND	4.42 ug/L	7.7 ug/L	ND
Xylene-Total	170 ug/L	ND	0.704 ug/L	ND	1.3 ug/L
1,3,5 - Trimethylbenzene	120 ug/L	ND	NA	ND	ND
tert - Butylbenzene	2 ug/L	ND	0.447 ug/L	ND	ND
1,2,4 - Trimethylbenzene	10 ug/L	ND	0.243 ug/L	ND	ND
Isopropylbenzene	ND	ND	1.76 ug/L	3.4 ug/L	4.2 ug/L(J)
n-Propylbenzene	ND	ND	2.94 ug/L	ND	ND
m,p-Xylene	NA	ND	0.282 ug/L	0.55 ug/L	ND
o-Xylene	NA	ND	0.422 ug/L	0.8 ug/L	ND
sec-Butylbenzene	ND	ND	1.15 ug/L	ND	ND
Toluene	3 ug/L	ND	0.373 ug/L	2.3 ug/L	ND
1,1-Dichloroethene	ND	ND	0.320 ug/L	1.2 ug/L	ND
Cyclohexane	ND	ND	ND	75.0 ug/L	110 ug/L
Methylcyclohexane	ND	ND	ND	22.0 ug/L	22.0 ug/L
Methyl tert-butyl ether	ND	ND	ND	ND	ND

MW-6	5/02	9/03
Trichloroethene	ND	2 ug/L
Tetrachloroethene	68 ug/L	74 ug/L
cis-1,2-Dichloroethane	ND	2 ug/L

MW-7	5/02	9/03	6/04	9/05	8/07	5/09	5/10	2/12	10/13	10/14
Trichloroethene	ND	8 ug/L	4.34 ug/L	3.2 ug/L	ND	1.4 ug/L(J)	1.5 ug/L(J)	ND	ND	3.8 ug/L(J)
Tetrachloroethene	240 ug/L	3300 ug/L	1170 ug/L	2000 ug/L	830 ug/L	700 ug/L(J)	770 ug/L(J)	670 ug/L(J)	910 ug/L	1100 ug/L
cis-1,2-Dichloroethene	ND	ND	3.73 ug/L	0.76 ug/L	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	0.379 ug/L	ND	ND	ND	ND	ND	ND	ND
Methyl tert-butyl ether	ND	ND	0.315 ug/L	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	–	–	ND	ND	ND	1.7 ug/L(J)	1.9 ug/L(J)	ND	ND	ND

PZ-3B	10/14
trans-1,2-Dichloroethene	0.78 ug/L(J)
cis-1,2-Dichloroethene	1.9 ug/L(J)
Trichloroethene	7.9 ug/L
Tetrachloroethene	150 ug/L

MW-8	5/02	9/03	6/04	9/05	8/07	5/09	5/10	2/12	10/13	10/14
Trichloroethene	720 ug/L	16 ug/L	10.4 ug/L	100.0 ug/L	590 ug/L	16 ug/L	14 ug/L	92 ug/L	12 ug/L	1.7 ug/L(J)
trans-1,2-Dichloroethene	50 ug/L	1 ug/L	0.481 ug/L	3.8 ug/L	24 ug/L	12 ug/L	6.4 ug/L	11 ug/L(J)	28 ug/L	46 ug/L
Tetrachloroethene	3900 ug/L	310 ug/L	299 ug/L	570.0 ug/L	960 ug/L	210 ug/L(J)	200 ug/L(J)	250 ug/L(J)	3.4 ug/L(J)	1.3 ug/L(J)
cis-1,2-Dichloroethene	40 ug/L	5 ug/L	2.36 ug/L	15.0 ug/L	390 ug/L	9.4 ug/L	6.5 ug/L	15 ug/L(J)	81 ug/L	15 ug/L
2-Butanone	ND	ND	1.88 ug/L	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	0.157 ug/L	ND	ND	ND	ND	ND	ND	ND
Methyl tert-butyl ether	ND	ND	0.135 ug/L	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	ND	ND	ND	ND	35 ug/L	ND	2.0 ug/L(J)	ND	15 ug/L	7.2 ug/L
Methylcyclohexane	–	–	–	–	2.5 ug/L	ND	ND	ND	ND	ND
Acetone	–	–	–	–	–	–	–	–	22 ug/L	ND

PW-3	5/02	9/03	6/04	9/05	8/07	5/09	5/10	2/12	10/13	10/14
Trichloroethene	ND	6 ug/L	7.32 ug/L	8.9 ug/L	7.2 ug/L(J)	6 ug/L	4.6 ug/L(J)	4.3 ug/L(J)	3.6 ug/L(J)	4.4 ug/L(J)
Tetrachloroethene	820 ug/L	850 ug/L	595 ug/L	560 ug/L	290 ug/L	300 ug/L(J)	260 ug/L	220 ug/L(J)	170 ug/L	220 ug/L
cis-1,2-Dichloroethene	ND	6 ug/L	6.43 ug/L	4.0 ug/L	2.8 ug/L(J)	4.3 ug/L(J)	3.5 ug/L(J)	ND	ND	ND
Methyl tert-Butyl Ether	ND	4 ug/L	0.401 ug/L	ND	ND	ND	ND	ND	ND	ND
Acetone	51 ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	350 ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	20 ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylene	120 ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	11 ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	0.407 ug/L	ND	ND	ND	ND	ND	ND	ND
Benzene	ND	ND	0.148 ug/L	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	0.133 ug/L	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	ND	ND	2.94 ug/L	3.4 ug/L	5.0 ug/L(J)	6.2 ug/L	3.2 ug/L(J)	ND	ND	ND
Trihalomethanes, Total	NA	NA	0.133 ug/L	ND	ND	NS	NA	ND	ND	ND
Vinyl chloride	ND	ND	ND	1.7 ug/L	ND	ND	ND	ND	ND	ND

MPI-1S	5/02	9/03	6/04	8/07	5/09	5/10	2/12	10/13	10/14
Trichloroethene	ND	1.5 ug/L	9.87 ug/L	6.5 ug/L(J)	1.2 ug/L(J)	ND	1.4 ug/L(J)	3.2 ug/L(J)	2.4 ug/L (J)
Tetrachloroethene	10 ug/L	41 ug/L	123 ug/L	97 ug/L	54 ug/L	40 ug/L	44 ug/L(J)	49 ug/L	56 ug/L
cis-1,2-Dichloroethene	ND	0.86 ug/L	3.90 ug/L	ND	1.1 ug/L(J)	1.3 ug/L(J)	1.3 ug/L(J)	2.4 ug/L(J)	2.8 ug/L (J)
Vinyl chloride	ND	ND	0.346 ug/L	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	0.337 ug/L	ND	ND	ND	ND	ND	ND
Chloromethane	NA	NA	NA	NA	NA	NA	.74 ug/L(J)	ND	ND

MPI-5S	5/02	9/03	6/04	8/07	5/09	5/10	2/12	10/13	10/14
Vinyl Chloride	NA	5 ug/L	1.98 ug/L	15 ug/L	2.7 ug/L(J)	2.9 ug/L(J)	6.1 ug/L	ND	ND
Trichloroethene	NA	6 ug/L	3.66 ug/L	2.7 ug/L(J)	3.6 ug/L(J)	3.7 ug/L(J)	6.9 ug/L	7.1 ug/L	5.3 ug/L
trans-1,2-Dichloroethene	NA	2 ug/L	3.87 ug/L	6.0 ug/L(J)	10 ug/L	6.2 ug/L	6.8 ug/L	4.2 ug/L(J)	5.2 ug/L
Tetrachloroethene	NA	36 ug/L	38.3 ug/L	4.9 ug/L(J)	15 ug/L(J)	16 ug/L	29 ug/L(J)	24 ug/L	24 ug/L
cis-1,2-Dichloroethene	NA	5 ug/L	3.81 ug/L	8.4 ug/L(J)	7.7 ug/L	4.2 ug/L(J)	6.0 ug/L	8.5 ug/L	7.8 ug/L
Methyl tert-butyl ether	NA	ND	0.114 ug/L	ND	ND	ND	ND	ND	ND
2-Butanone	NA	ND	0.994 ug/L	ND	ND	ND	ND	ND	ND
Benzene	NA	ND	0.304 ug/L	ND	ND	ND	ND	ND	ND

MPI-5I	5/02	9/03
Methyl tert-Butyl Ether	NA	4 ug/L

MW-5	5/02	9/03
Xylene	5700 ug/L	ND
Vinyl Chloride	ND	7 ug/L
Trichloroethene	21 ug/L	ND
Benzene	220 ug/L	15 ug/L
trans-1,2-Dichloroethene	ND	ND
Tetrachloroethene	83 ug/L	2 ug/L
cis-1,2-Dichloroethene	48 ug/L	16 ug/L
Methyl tert-Butyl Ether	ND	3 ug/L
Toluene	160 ug/L	3 ug/L
Ethylbenzene	25 ug/L	ND
1,3,5 - Trimethylbenzene	470 ug/L	ND
1,2,4 - Trimethylbenzene	920 ug/L	ND

EE-4	2/12	10/13	10/14
cis-1,2-Dichloroethene	3.3 ug/L(J)	ND	ND
trans-1,2-Dichloroethene	8.6 ug/L	1.2 ug/L(J)	1.9 ug/L(J)
Tetrachloroethene	.68 ug/L(J)	ND	1.8 ug/L(J)
Vinyl chloride	4.6 ug/L(J)	ND	1.2 ug/L(J)
Cyclohexane	8.4 ug/L	5.3 ug/L	ND
Isopropylbenzene	3.3 ug/L(J)	2.9 ug/L(J)	2.2 ug/L(J)
Methylcyclohexane	17 ug/L	11 ug/L	8.3 ug/L
Trichloroethene	.81 ug/L(J)	ND	ND

ESI-5/ESI-5R	5/02	9/03	6/04	8/07	5/09	5/10	6/12	10/13	10/14
Tetrachloroethene	ND	0.52 ug/L	0.196 ug/L	4.6 ug/L(J)	ND	ND	ND	ND	ND

ESI-4/EE-1	5/02	9/03	6/04	8/07	5/09	5/10
Chloroform	ND	0.54 ug/L	0.521 ug/L	ND	ND	ND
1,1,1-Trichloroethane	0.7 ug/L	2.4 ug/L	14.7 ug/L	9.6 ug/L(J)	12 ug/L	7.5 ug/L
Trichloroethene	0.5 ug/L	3.6 ug/L	ND	ND	ND	ND
Tetrachloroethene	14 ug/L	63 ug/L	5.91 ug/L	3.1 ug/L(J)	4.5 ug/L(J)	3.8 ug/L(J)
cis-1,2-Dichloroethene	ND	1.2 ug/L	ND	ND	ND	ND
Methyl tert-butyl ether	ND	ND	8.51 ug/L	4.2 ug/L(J)	1.6 ug/L(J)	ND
Trihalomethanes, Total	NA	NA	0.521 ug/L	ND	ND	NA
1,1-Dichloroethane	ND	ND	1.16 ug/L	ND	ND	ND
1,1-Dichloroethene	ND	ND	0.284 ug/L	ND	ND	ND
2-Butanone	NA	NA	0.965 ug/L	ND	ND	ND
Benzene	ND	ND	0.325 ug/L	ND	ND	ND
Acetone	NA	ND	1.85 ug/L	ND	ND	ND

RW-1	5/02	9/03	6/04	8/07	5/09	5/10	2/12	10/13	10/14
Chloroform	ND	ND	0.839 ug/L	ND	1 ug/L(J)	ND	.61 ug/L(J)	ND	ND
cis-1,2-Dichloroethene	ND	ND	2.31 ug/L	ND	2.4 ug/L(J)	ND	1.0 ug/L(J)	ND	ND
1,1-Dichloroethane	ND	ND	0.275 ug/L	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	0.531 ug/L	ND	1.3 ug/L(J)	ND	1.3 ug/L(J)	1.1 ug/L(J)	ND
Trihalomethanes, Total	NA	NA	0.839 ug/L	ND	1 ug/L(J)	NA	ND	ND	ND
Trichloroethene	ND	1 ug/L	2.09 ug/L	ND	1.5 ug/L(J)	ND	1.5 ug/L(J)	1.1 ug/L(J)	1.1 ug/L(J)
Tetrachloroethene	4 ug/L	74 ug/L	410 ug/L	140 ug/L	190 ug/L(J)	54 ug/L	250 ug/L(J)	94 ug/L	180 ug/L
Methyl tert-Butyl Ether	ND	3 ug/L	1.03 ug/L	ND	ND	ND	ND	ND	ND
Chloromethane	NA	NA	NA	NA	NA	NA	.91 ug/L(J)	ND	ND

MPI-7I/MPI-7IR	5/02	9/03	6/04	8/07	5/09	5/10	2/12	10/13	10/14
Trichloroethene	NA	2 ug/L	1.54 ug/L	ND	6.5 ug/L	ND	ND	ND	ND
Tetrachloroethene	NA	4 ug/L	5.13 ug/L	2.9 ug/L(J)	490 ug/L(J)	ND	1.8 ug/L(J)	2.4 ug/L(J)	2.0 ug/L(J)
cis-1,2-Dichloroethene	NA	8 ug/L	8.53 ug/L	12 ug/L	18 ug/L	10 ug/L	ND	ND	ND
2-Butanone	NA	ND	1.17 ug/L	ND	ND	ND	ND	ND	ND
Methyl tert-butyl ether	NA	ND	0.178 ug/L	ND	ND	ND	ND	ND	ND
Vinyl chloride	NA	ND	0.223 ug/L	ND	ND	ND	ND	ND	ND
Chloroform	–	–	–	ND	11 ug/L(J)	ND	ND	ND	ND
1,1,1-Trichloroethane	–	–	–	ND	1.1 ug/L(J)	ND	ND	ND	ND
Bromodichloromethane	–	–	–	ND	1.9 ug/L(J)	ND	ND	ND	ND
Chloromethane	NA	NA	NA	NA	NA	NA	1.4 ug/L(J)	ND	ND

MW-10	5/02	9/03
Acetone	ND	14 ug/L
cis-1,2-Dichloroethene	ND	3 ug/L
Tetrachloroethene	12 ug/L	ND

PW-2	5/02	9/03	6/04	9/05	8/07	5/09	5/10	2/12	10/13	10/14
Trichloroethene	ND	11 ug/L	5.57 ug/L	4.4 ug/L	9.3 ug/L(J)	7.5 ug/L	6.5 ug/L	2.2 ug/L(J)	ND	3.4 ug/L(J)
Tetrachloroethene	430 ug/L	1400 ug/L	1090 ug/L	2000 ug/L	1300 ug/L	1200 ug/L(J)	910 ug/L(J)	770 ug/L(J)	770 ug/L	620 ug/L
cis-1,2-Dichloroethene	ND	5 ug/L	3.82 ug/L	2.0 ug/L	ND	2.8 ug/L(J)	1.3 ug/L(J)	ND	ND	ND
Methyl tert-Butyl Ether	ND	3 ug/L	0.617 ug/L	ND	ND	ND	ND	ND	ND	ND
Acetone	14 ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	24 ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylene	65 ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	ND	ND	0.290 ug/L	ND	ND	4.1 ug/L(J)	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	0.344 ug/L	ND	ND	ND	ND	ND	ND	ND

MPI-2S/MPI-2SR	4/94	1/95	6/04	2/12	10/13	10/14
1,1,1 Trichloroethane	14 ug/L	12 u/L	NS	4.1 ug/L(J)	2.9 ug/L(J)	3.4 ug/L(J)
Benzene	ND	2 ug/L	NS	ND	ND	ND
Chloroform	NA	NA	NA	1.8 ug/L(J)	1.4 ug/L(J)	1.3 ug/L(J)
Tetrachloroethene	NA	NA	NA	1.9 ug/L(J)	2.4 ug/L(J)	2.9 ug/L(J)

MW-11	5/10	2/12	10/13	10/14
cis-1,2-Dichloroethene	3.4 ug/L(J)	1.2 ug/L(J)	ND	ND
Trichloroethene	6 ug/L	5.8 ug/L	ND	5.2 ug/L
Tetrachloroethene	1600 ug/L(J)	1500 ug/L(J)	2400 ug/L	1500 ug/L
Chloromethane	NA	0.68 ug/L(J)	ND	ND
trans-1,2-Dichloroethene	NA	1.2 ug/L(J)	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND

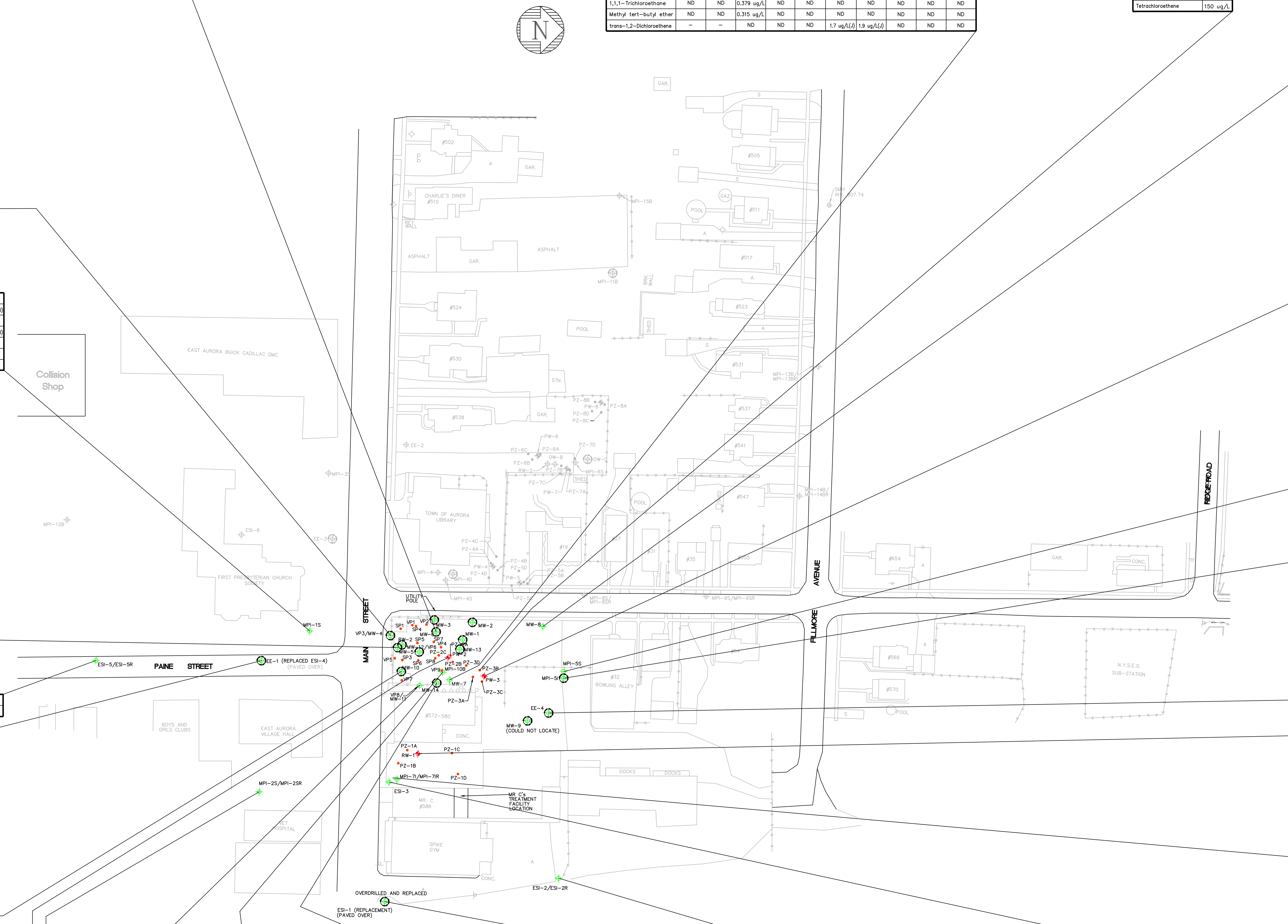
MPI-10B	5/02	9/03	6/04	8/07	5/09	5/10	2/12	10/13	10/14
Trichloroethene	ND	1 ug/L	5.03 ug/L	ND	5.1 ug/L	4.3 ug/L(J)	3.6 ug/L(J)	4.4 ug/L(J)	3.8 ug/L(J)
Benzene	ND	3 ug/L	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	82 ug/L	320 ug/L	1070 ug/L	790 ug/L	450 ug/L(J)	250 ug/L(J)	250 ug/L(J)	210 ug/L	220 ug/L
cis-1,2-Dichloroethene	ND	2 ug/L	5.09 ug/L	ND	3.3 ug/L(J)	1.3 ug/L(J)	1.1 ug/L(J)	ND	ND
Methyl tert-Butyl Ether	ND	2 ug/L	1.89 ug/L	ND	ND	ND	1.1 ug/L(J)	ND	ND
Trihalomethanes, Total	NA	NA	0.149 ug/L	ND	ND	NA	ND	ND	ND
trans-1,2-Dichloroethene	ND	ND	0.588 ug/L	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	0.149 ug/L	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	0.24 ug/L	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	0.926 ug/L	ND	ND	ND	ND	ND	ND

MW-14	5/02	9/03	6/04
Tetrachloroethene	NS	NS	180 ug/L

ESI-2/ESI-2R	5/92	4/94	2/12	10/13	10/14
Tetrachloroethene	1 ug/L	NS	1.1 ug/L(J)	1.8 ug/L(J)	ND
Chloromethane	NA	NA	.89 ug/L(J)	ND	ND

ESI-1/ESI-1 (REPLACEMENT)	5/92	1/93	4/94	6/04	8/07
1,2 Dichloroethene	2 ug/L	ND	ND	NA	ND
Trichloroethene	2 ug/L	ND	3 ug/L	1.28 ug/L	ND
Tetrachloroethene	2 ug/L	0.9 ug/L	ND	1.47 ug/L	9.3 ug/L(J)
Carbon disulfide	NA	NA	ND	0.557 ug/L	ND
Chloroform	NA	NA	ND	0.485 ug/L	ND
cis-1,2-Dichloroethene	NA	NA	NA	0.103 ug/L	ND

ESI-3	5/02	9/03	6/04	8/07	5/10	2/12	10/13	10/14
1,1,1Trichloroethane	ND	1 ug/L	0.882 ug/L	2.0 ug/L(J)	ND	2.0 ug/L(J)	ND	ND
Trichloroethene	ND	2 ug/L	7.03 ug/L	ND	ND	.77 ug/L(J)	ND	ND
Tetrachloroethene	220 ug/L	440 ug/L	655 ug/L	250 ug/L	250 ug/L	200 ug/L(J)	260 ug/L	180 ug/L
cis-1,2-Dichloroethene	ND	4 ug/L	12.4 ug/L	2.8 ug/L	ND	ND	ND	ND
Methyl tert-Butyl Ether	9 ug/L	1 ug/L	1.02 ug/L	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	0.469 ug/L	ND	ND	.76 ug/L(J)	ND	1.1 ug/L(J)
Chloroform	ND	ND	1.14 ug/L	2.4 ug/L	ND	.84 ug/L(J)	ND	ND
Trihalomethanes, Total	NA	NA	1.14 ug/L	ND	NA	ND	ND	ND
Chloromethane	NA	NA	NA	NA	NA	.95 ug/L(J)	ND	ND



LEGEND

⊕	SANITARY SEWER MANHOLE
⊕	MONITORING WELL
⊕	PUMPING WELL
●	PIEZOMETER
☐	EXISTING STRUCTURES AND FEATURES
—x—x—	FENCE
PAINE STREET	MAJOR AREA STREETS
⊕	WELLS CIRCLED = NOT FOUND (EITHER ABANDONED, DECOMMISSIONED, OR MISSING)

WELL ABBREVIATIONS

EEI	(ECOLOGY & ENVIRONMENT)	PW	PUMPING WELL (TYREE)
ESI	EMPIRE SOILS WELL (ENVIRONMENTAL SCIENCE)	PZ	PIEZOMETER (TYREE)
MPI	OBSERVATION WELL (MALCOLM-PIRNIE)	RW	RECOVERY WELL (BY OTHERS)
MW	MONITORING WELL (MATRIX)	SP	SPARGE POINT
NA	DATA NOT AVAILABLE	VP	VAPOR COLLECTION POINT
OW	OBSERVATION WELL	MPI-7IR	REPLACEMENT WELL

ANALYTICAL ABBREVIATIONS

ug/L	MICROGRAMS PER LITER
ND	NOT DETECTED
NS	NOT SAMPLED
NA	NOT ANALYZED
–	NOT ANALYZED OR NOT DETECTED
(J)	ESTIMATED VALUE
(U)	ANALYZED FOR BUT NOT DETECTED AT THE DETECTION LIMIT INDICATED

NOTES:

1. ONLY DETECTED COMPOUNDS ARE PRESENTED.
2. HORIZONTAL CONTROL IS BASED UPON THE NEW YORK STATE PLANE COORDINATE SYSTEM, WEST ZONE, 1983 ADJUSTMENT (NAD 83).
3. ELEVATIONS ARE BASED UPON NORTH GEODETIC VERTICAL DATUM, 1929 (NGVD 1929).
4. BENCHMARK IS LOCATED NEAR THE NORTHEAST CORNER OF MAIN STREET AND PAINE STREET, BEING A BRASS DISC SET IN THE TOP OF CONCRETE BASE – ELEVATION 916.64'
5. ALL ANALYTICAL WORK PERFORMED IN JUNE 2004 WAS ANALYZED USING METHOD 524.1 FOR VOLATILE ORGANIC COMPOUNDS.
6. AUGUST 2007 ANALYTICAL WORK PERFORMED USING CLP METHOD OLM04.2.

SEE FIGURE 2-5a FOR SUMMARY OF MONITORING WELL INFORMATION WEST OF WHALEY AVE AND PAINE STREET.

SCALE IN FEET

0 60 120 180

DWG NO.	DATE	DESCRIPTION
DEC 31 ISO.dwg	7/18/94	ISOPOTENTIAL MAP AND CROSS SECTIONS 4/13/94 GROUNDWATER LEVELS MALCOLM PIRNIE INC.
0266G003.dwg	10/17/00	REMEDIAL DESIGN PIPING AND WELL LAYOUT PLAN MALCOLM PIRNIE INC.

REFERENCE DRAWINGS

NO.	DATE	DWN	APP'D	DESCRIPTION
F	12/29/14	KMK	MGS	UPDATED PER OCT 2013 SAMPLE EVENT
E	12/5/13	KMK	MGS	UPDATED PER OCT 2013 SAMPLE EVENT
D	7/20/12	KMK	MGS	UPDATED PER FEB/JUNE 2012 SAMPLE EVENT
C	6/8/10	KMK	MGS	UPDATED PER MAY 2010 SAMPLE EVENT
B	6/30/09	KMK	MGS	UPDATED PER MAY 2009 SAMPLE EVENT
A	12/6/07	KMK	MGS	UPDATED PER AUGUST 2007 SAMPLE EVENT

REVISIONS

FIGURE 2-5b
SUMMARY OF GROUNDWATER ANALYTICAL DATA
MR.C'S DRY CLEANERS SITE LOCATION MAP (EAST)
EAST AURORA, NEW YORK

ecology and environment engineering p.c.

F:\MrC\well analysis april 2014\Air filtering equipment locations_4-7-14.dwg

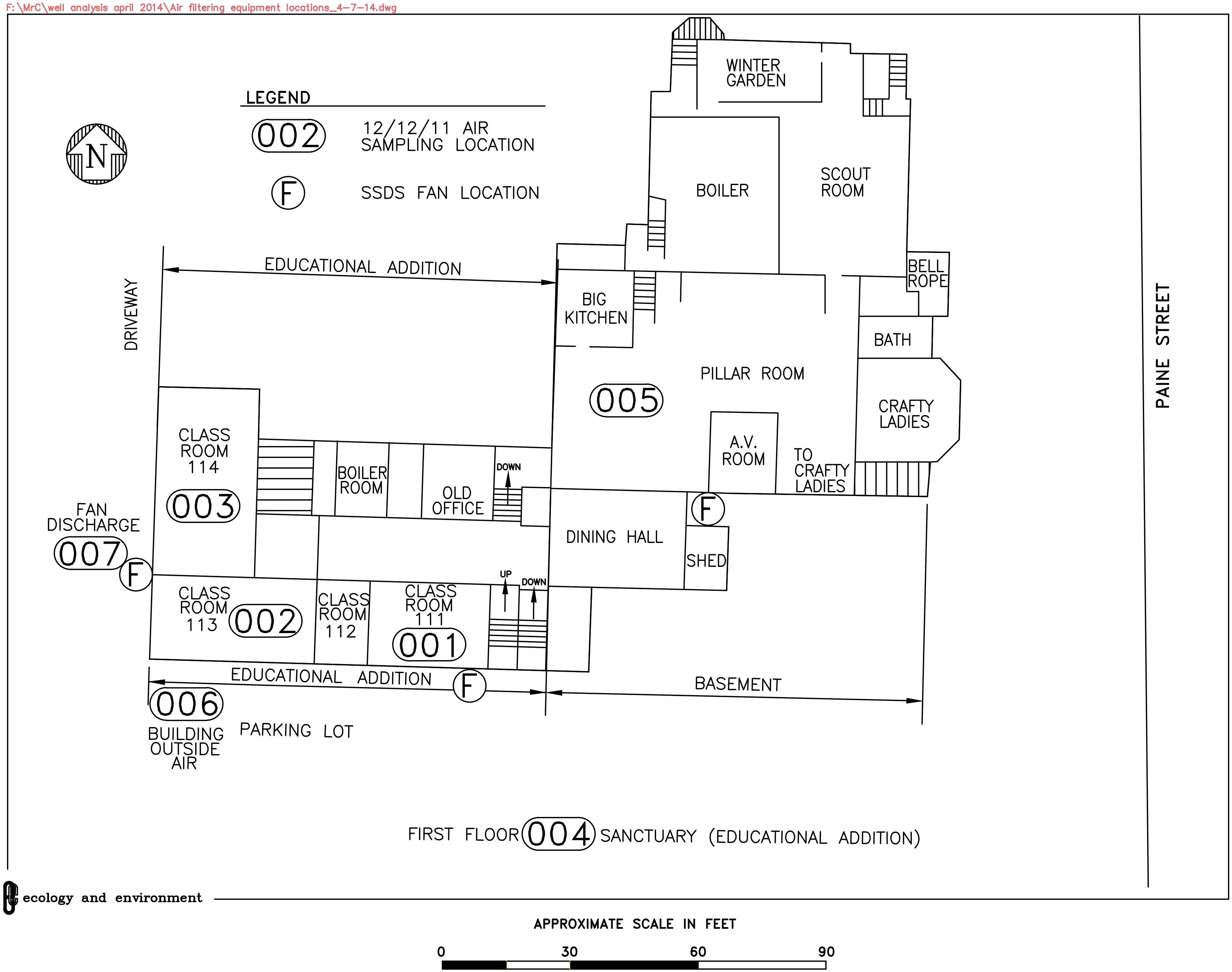
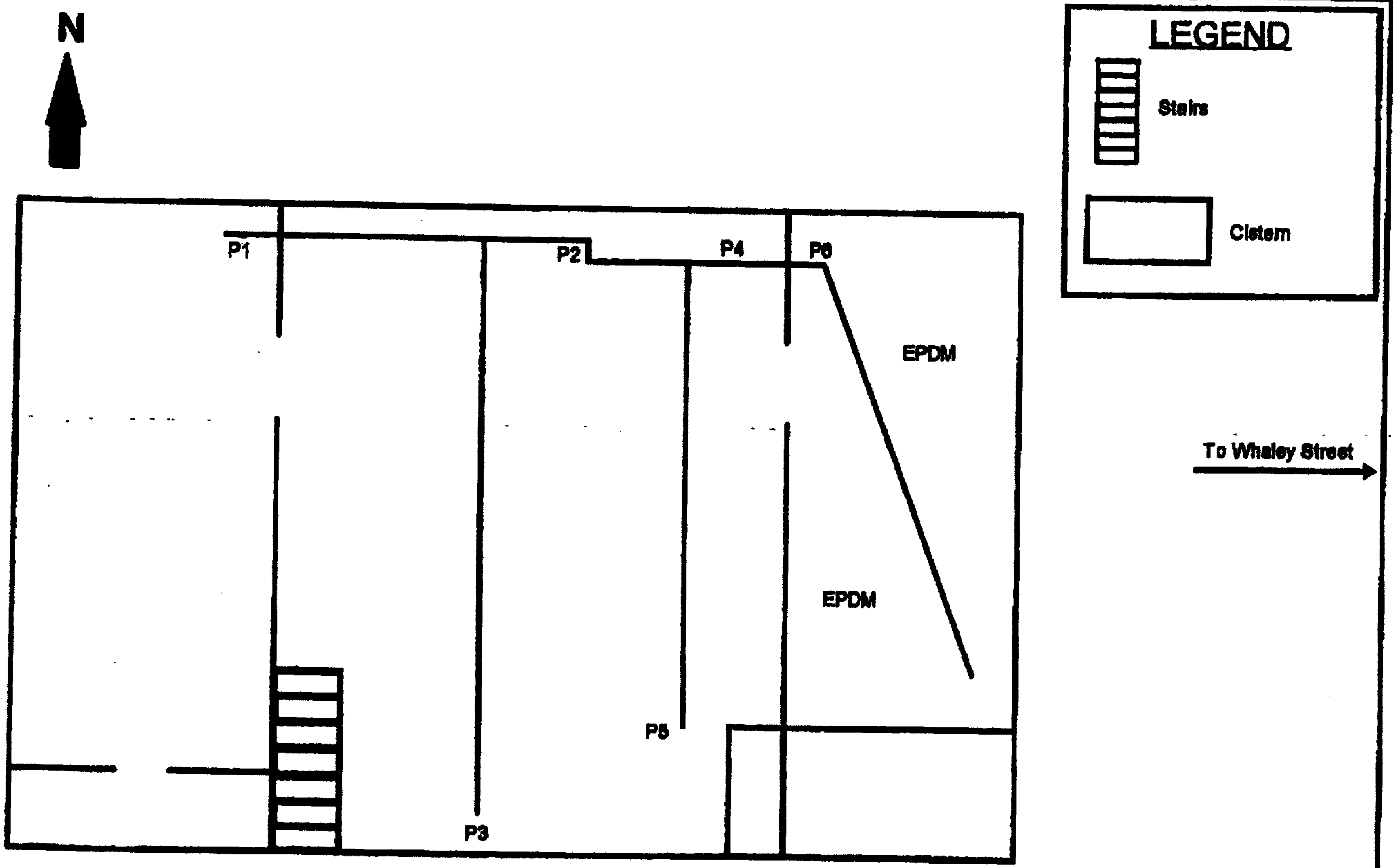


FIGURE 2–6
AIR SAMPLING LOCATIONS
PRESBYTERIAN CHURCH, EAST AURORA, NEW YORK



OP-TECH ENVIRONMENTAL SERVICES, INC.

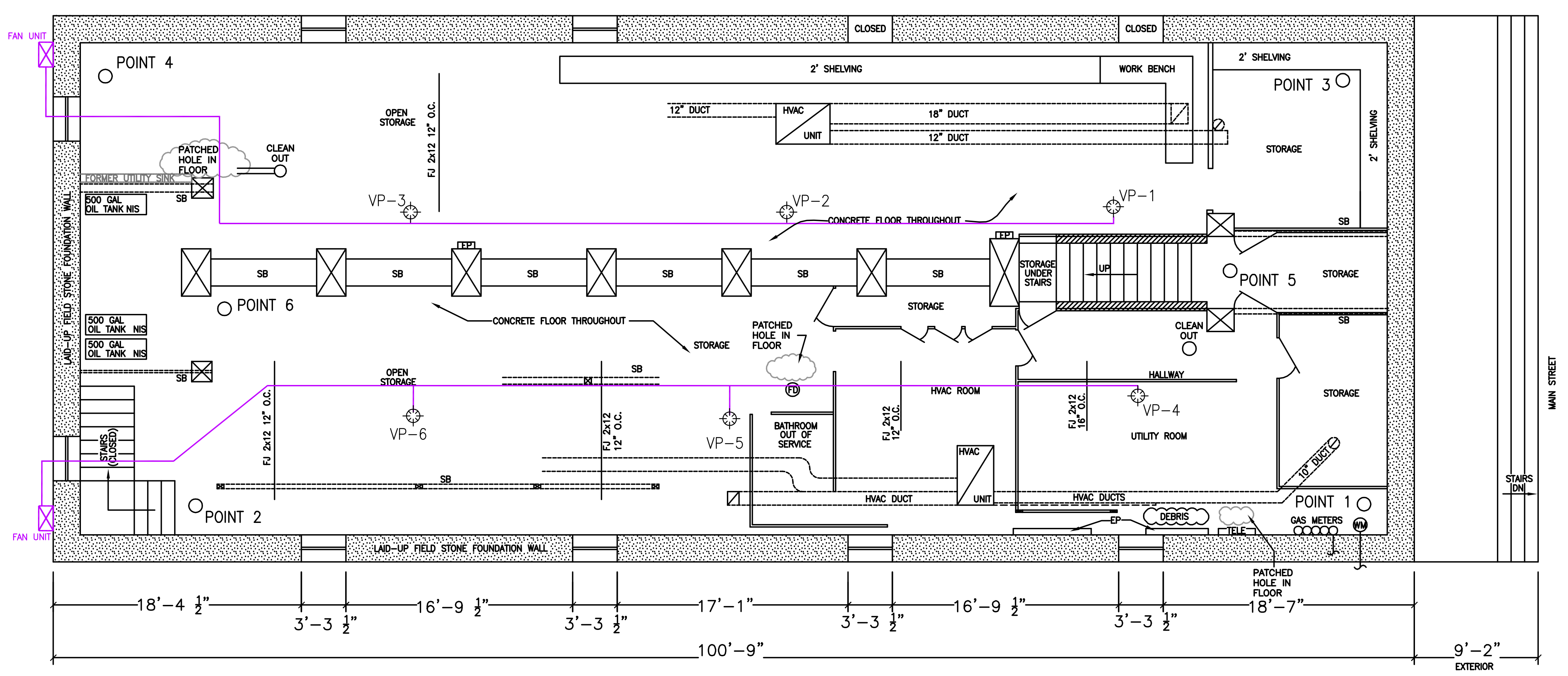
27 Whaley Street **Basement**	**NYSDEC Region 9** **27 Whaley Street** **East Aurora, NY**	**Date:** February 2005	**Project No.:** FDCH 0003
		Scale: Not To Scale	**Figure No.:** 1
		Drawn By: LG/jaw	**Location:** East Aurora, NY

M:\Graphics\0900-Buffalo\NYSDEC\East Aurora (Mr. C's Dry Cleaners)\East Aurora (Mr. C's Cleaners) SM.dwg, B-10 (572-576 MAINSTREET(DOEING PROPERTY)), 11/6/2014 11:01:17 AM, WShea

GES®

LEGEND

WM	WATER METER
SB	SUPPORT BEAM
FD	FLOOR DRAIN
GM	GAS METER
⊗⊠	SUPPORT COLUMN
▨	FIELDSTONE, CONCRETE, OR BRICK FOUNDATION
◪	HVAC DUCTWORK THROUGH FLOOR
⌖	SUCTION POINT – SSDS UNIT
—	CONVEYANCE PIPE HUNG FROM BOTTOM OF FLOOR JOIST (PROVIDE SUPPORT AS REQUIRED)
⊠	SSDS FAN LOCATION
POINT 3 ○	COMMUNICATION TEST POINT



GENERAL NOTES

1. BASEMENT FEATURES WERE MEASURED IN THE FIELD AND THEIR LOCATIONS ARE APPROXIMATE.
2. DRAWING WAS CREATED FROM BASEMENT PLAN VIEW CREATED BY ECOLOGY & ENVIRONMENT ENGINEERING.

DRAFTED BY: W.G.S. (N.J.)
CHECKED BY:
REVIEWED BY:

SSDS LAYOUT

NYSDEC
DOEING PROPERTY
572-576 MAIN STREET
EAST AURORA, NEW YORK

NORTH

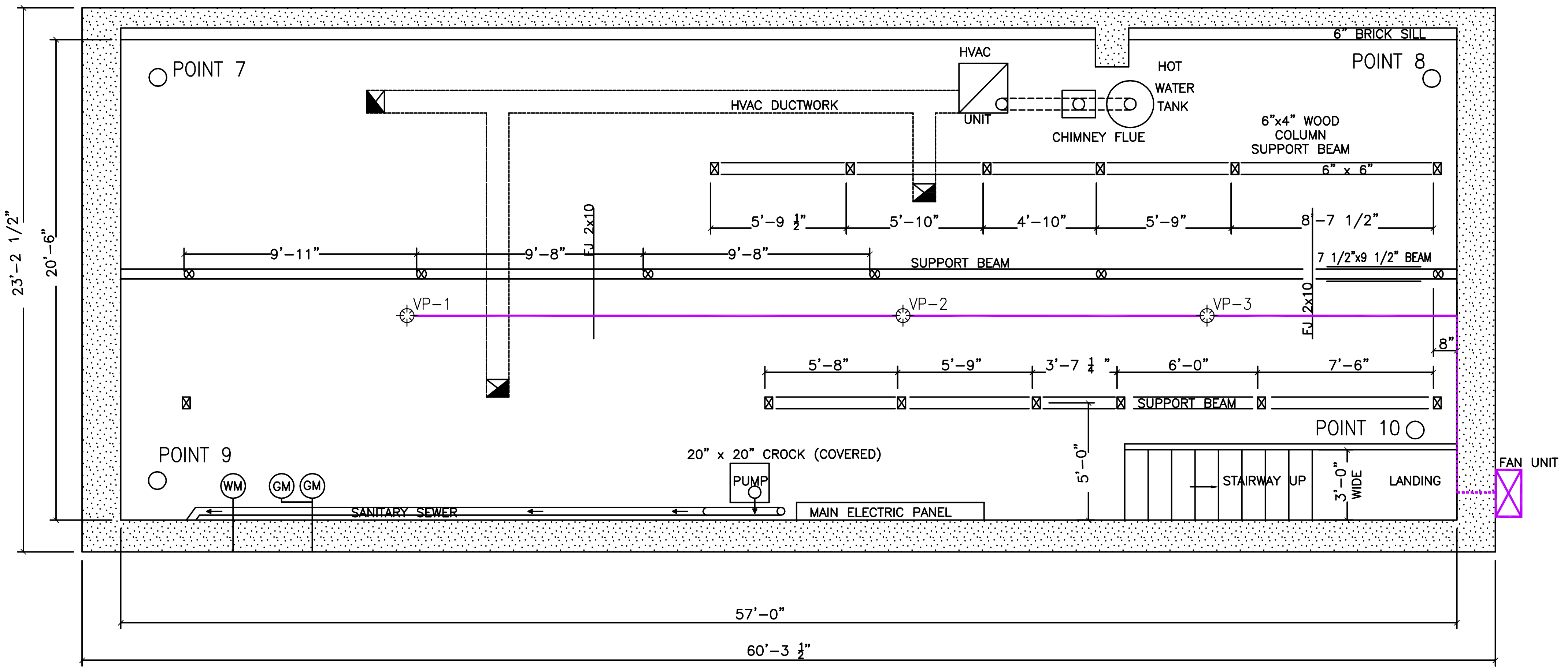
Groundwater & Environmental Services, Inc.
495 AERO DRIVE, SUITE 3, CHEEKTOWAGA, NEW YORK 14225

SCALE IN FEET
0 APPROXIMATE 10

DATE
11-6-14

FIGURE

M:\Graphics\0900-Buffalo\NYSDEC\East Aurora (Mr. C's Dry Cleaners)\East Aurora (Mr. C's Dry Cleaners) SM.dwg, B- (578-580 MAIN STREET(BROWNSCHILDE PROPERTY)), 11/6/2014 10:59:39 AM, WShea



LEGEND

WM	WATER METER
SB	SUPPORT BEAM
FD	FLOOR DRAIN
GM	GAS METER
⊗ ⊠	SUPPORT COLUMN
▨	FIELDSTONE, CONCRETE, OR BRICK FOUNDATION
◪	HVAC DUCTWORK THROUGH FLOOR
⌖	SUCTION POINT – SSDS UNIT
—	CONVEYANCE PIPE HUNG FROM BOTTOM OF FLOOR JOIST
⊠	SSDS LOCATION
POINT # ○	COMMUNICATION TEST POINT

GENERAL NOTES

1. BASEMENT FEATURES WERE MEASURED IN THE FIELD AND THEIR LOCATIONS ARE APPROXIMATE.

2. DRAWING WAS CREATED FROM BASEMENT PLAN VIEW CREATED BY ECOLOGY & ENVIRONMENT ENGINEERING.

DRAFTED BY: W.G.S. (N.J.)
CHECKED BY:
REVIEWED BY:

SSDS LAYOUT

NYSDEC
BROWNSHIDLE PROPERTY
578–580 MAIN STREET
EAST AURORA, NEW YORK

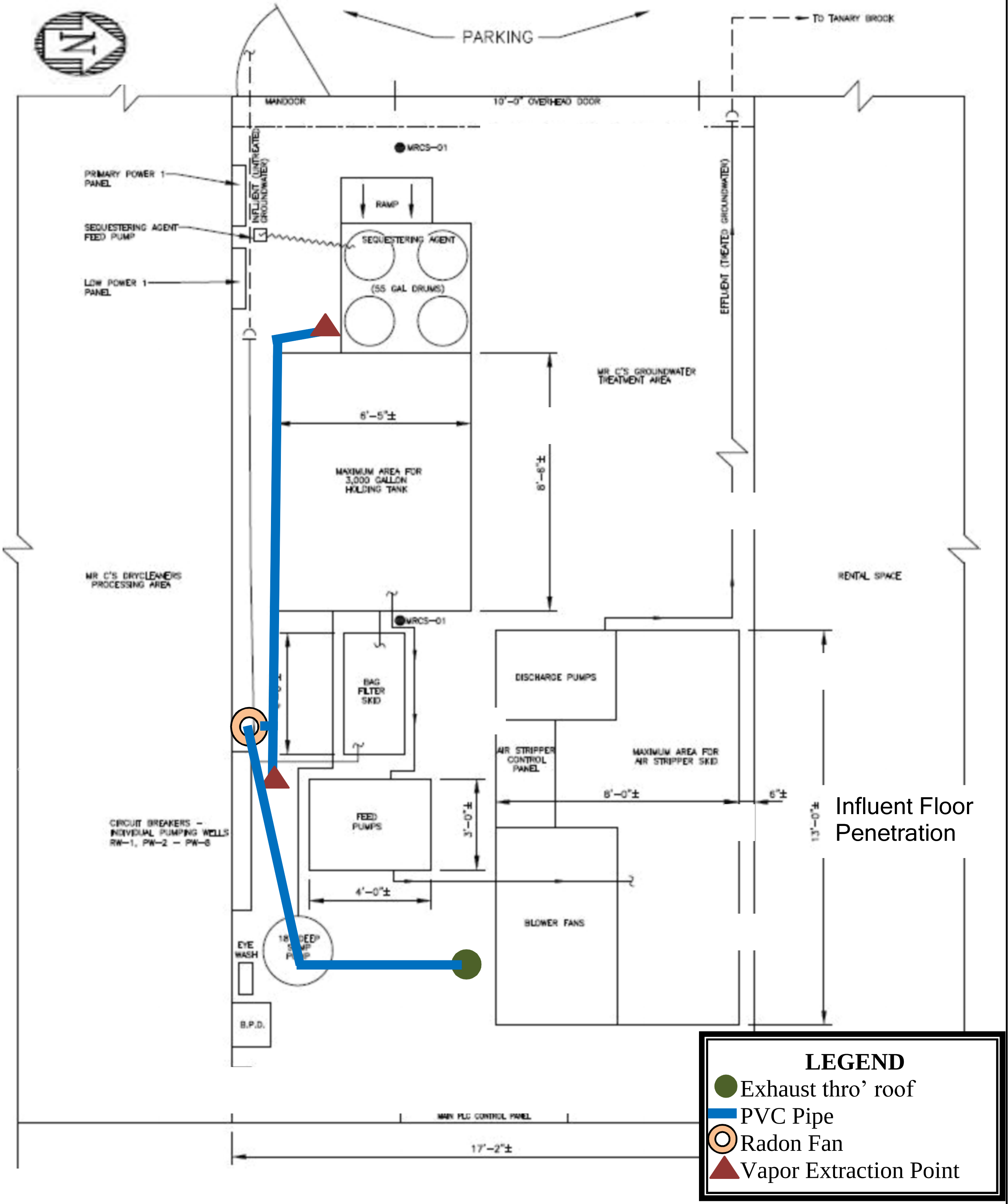
Groundwater & Environmental Services, Inc.
495 AERO DRIVE, SUITE 3, CHEEKTOWAGA, NEW YORK 14225

NORTH

SCALE IN FEET
0 APPROXIMATE 6

DATE
11–6–14

FIGURE

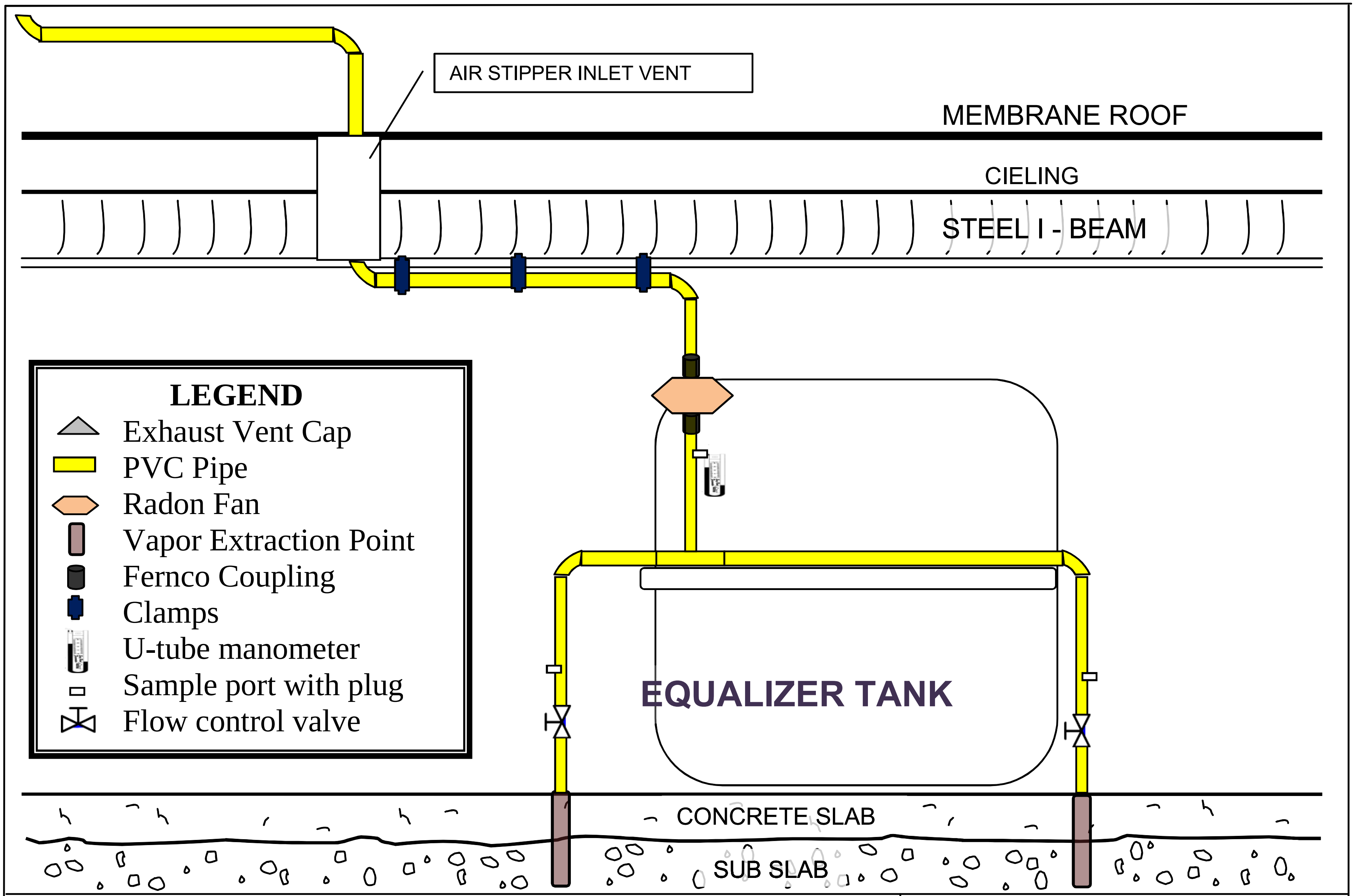


Mr C's DRY CLEANERS SITE

SUB SLAB VAPOR EXTRACTION SYSTEM LAYOUT

FIGURE 1

IEG



Mr C's DRY CLEANERS SITE
SUB SLAB VAPOR EXTRACTION SYSTEM LAYOUT

FIGURE 2

IEG

3 Site Monitoring Plan

3.1 Introduction

The overall goals of this remediation effort are provided in Section 1 of this SMP. As part of the remediation effort, the monitoring of groundwater, soil vapors, and other media, including sampling and analysis, shall be performed in a manner acceptable to NYSDEC. This section provides a summary and a description of the site monitoring and sampling plans for groundwater and soil vapor/indoor air. These monitoring activities must continue until the remedial objectives have been achieved, or until NYSDEC determines that continued operation is technically impracticable or infeasible.

3.1.1 General

This Site Monitoring Plan describes the measures for evaluating the performance and effectiveness of the remedy to reduce or mitigate contamination at the site and all affected site media identified below. This Monitoring Plan may be revised only with the written approval of NYSDEC. The SMP and the latest revisions to the SMP shall be filed with NYSDEC.

3.1.2 Purpose and Frequency

Monitoring programs are in place for the groundwater plume, the on-site treatment system, and off-site SSDSs. No monitoring program is in place for on-site or off-site soils.

The Site Monitoring Plan describes the methods to be used for the following:

- Sampling and analysis of all appropriate media;
- Assessing compliance with applicable NYSDEC standards, criteria and guidance, particularly ambient groundwater standards;
- Assessing achievement of the remedial performance criteria;
- Periodically evaluating site information to confirm that the remedy continues to be effective in protecting public health and the environment; and
- Preparing the necessary reports for the various monitoring activities.

To adequately address these issues, the Site Monitoring Plan provides information on:

- Sampling locations, protocol, and frequency;
- Analytical sampling program requirements, including independent validation of analytical data;
- Quality Assurance/Quality Control (QA/QC) requirements; and
- Reporting requirements.

3.2 Remedial Performance Monitoring Requirements

Annual monitoring of the performance of the remedy and overall reduction in groundwater contamination is conducted and reported in the PRR. Any future modifications to the monitoring frequency will be determined by NYSDEC.

Monitoring includes inspections of site ECs and sampling of site media. The Analytical Program for the Mr. C's site includes the analysis of groundwater, indoor air (for vapor intrusion), and treated effluent discharge water from the treatment system. Table 3-1 presents the schedule of routine inspections to be performed under each monitoring program. Sampling protocols for these monitoring programs are described in Section 3.3.

Table 3-1 Mr. C's Inspection Schedule

Monitoring Program	Inspection Frequency[1]	ECs[2,3]
Groundwater	Annually	Monitoring wells
Treatment System	Bi-monthly, or as needed	Air stripper and its components, pumping wells, piezometers
Vapor Intrusion	Annually, or as needed	SSDS components, seals

Notes:

[1] The inspection frequency will be as indicated unless otherwise specified by NYSDEC.

[2] Specific requirements for inspections are described in Section 4 of this plan.

[3] Reporting requirements are summarized in Section 5 of this plan.

Procedures for operating and maintaining the Mr. C's on-site remedial treatment system, including inspection requirements, are documented in the O&M Plan (Section 4 of this SMP).

Additional monitoring was performed by EEEPC between November 2012 and June 2014 as part of the Bioremediation Pilot Study. Baseline samples were analyzed for VOCs, DHC species and functional genes, dissolved gases (methane, ethane, and ethene), total organic carbon (TOC), major anions (sulfate and nitrate), total manganese, and ferrous and ferric Iron. Performance samples were analyzed for VOCs, DHC species and functional genes, dissolved gases (methane, ethane, and ethene), and total organic carbon (TOC). Monitoring was performed in general accordance with the field sampling plan, which is provided as Appendix A to the bioremediation summary report (EEEPC 2015a). The sampling and analyses were performed as part of the standalone Pilot Study; therefore, these are not required as a continuing part of site OM&M. However, E & E presented recommendations for continued monitoring of VOCs, TOC, and dissolved gases in select performance monitoring wells in the bioremediation summary report. If supplemental monitoring were to identify cis-DCE or VC-stall, this would require mitigation actions to reduce off-site migration and volatilization of these mobile and hazardous chemicals.

3.2.1 Treatment System Monitoring Program

The treatment system performance must be monitored to confirm that the remedy continues to be effective in achieving remedial goals. Monitoring of the treatment system performance will be performed as follows:

- Compare treated effluent sample results to the State Pollution and Discharge Elimination System (SPDES) Equivalency Permit requirements to assess the extent to which the treatment system is protective of human health and the environment;
- Compare the influent and effluent VOC concentrations to assess the efficiency of the treatment system at removing VOCs; and
- Evaluate trends in contaminant levels in the groundwater plume and the extent of the plume to determine whether the remedy continues to be effective in achieving remedial goals. Groundwater contaminant levels will be compared with NYSDEC Class GA groundwater standards.

Sampling protocols are described in Section 3.3 of this plan. The requirements for the treatment system inspection and maintenance, including the pumping and monitoring wells, are presented in Section 4 of this plan.

3.2.2 Soil Vapor Intrusion Monitoring Program

Vapor intrusion must be monitored to confirm that the remedy continues to be effective in protecting public health and mitigating human health risk by reducing the potential for inhalation of vapors in on-site and off-site basements. Monitoring will include annual inspections and sampling at existing SSDSs and additional investigations as needed. The requirements for soil vapor intrusion evaluation are presented in Section 2.2.3. The requirements for SSDS inspections and maintenance are presented in Section 4 of this plan.

The sampling requirements for soil vapor and indoor air are described in Section 3.3. The effectiveness of the vapor mitigation systems will be assessed by comparing sample results to the NYSDOH guidance values (NYSDOH 2006) and ASTDR MRLs for chronic inhalation.

3.3 Sampling Protocols

Sampling requirements for the main monitoring programs at the site are summarized in Table 3-2 and outlined in detail in Sections 3.3 and 3.4.

Table 3-2 Mr. C's Sampling Schedule and Analytical Methods

Monitoring Program	Sampling Frequency[1]	Matrix	Analysis
Groundwater	Annually	Groundwater	VOCs by EPA Method 8260B
Treatment System	Monthly, or as needed	Water (influent and effluent)	VOCs by EPA Method 8260B Hardness by EPA Method 130.2 pH by EPA Method 150.1
Vapor Intrusion	As needed	Air	VOCs by TO-15

Notes:

[1] The sampling frequency will be as indicated unless otherwise specified by NYSDEC.

3.3.1 Air-Stripper Sampling Protocol

The site O&M subcontractor will be responsible for sampling and analysis of the treatment system performance. The subcontractor shall utilize the existing sampling ports located on the treatment system to obtain performance samples. Performance samples shall be shipped to a NYSDOH Environmental Laboratory Accreditation Program (ELAP) -certified laboratory for all compliance analyses. All samples will be preserved as required and shipped in a timely manner to ensure analysis within maximum holding times. All samples will be shipped under a standard chain-of-custody for sign-off release for all parties handling the environmental samples prior to laboratory receipt.

The O&M subcontractor shall collect one influent groundwater sample to the air stripper, after the equalization tank, and one effluent sample after the air stripper. Samples will be analyzed for VOCs by EPA Method 8260B, hardness by EPA Method 130.2, and pH by EPA Method 150.1.

The site effluent discharge criteria were initially established as a SPDES Equivalency Permit during the design phase of the Contract Documents in 2000. The influent and effluent from the remedial treatment system have been sampled and analyzed since the system became operational in September 2002. In February 2005, based on 30 months of historical analytical information prepared and submitted by EEEPC, the permit was modified by NYSDEC Region 9 to eliminate analyses for metals, total dissolved solids, and suspended solids. The current effluent criteria used for the site and analytical compliance results from the remedial treatment system at the Mr. C's site are presented in Table 3-3.

Table 3-3 Mr. C's Dry Cleaners Site, Effluent Criteria and Analytical Compliance Criteria

Parameter	Daily Maximum[1]	Units
Flow	216,000	Gpd
pH	6.0 to 9.0	standard units
1,1-Dichloroethene	10	µg/L
1,2-Dichloroethane	10	µg/L
Trichloroethene	10	µg/L
Tetrachloroethene	10	µg/L
Vinyl Chloride	10	µg/L
Benzene	5	µg/L
Ethylbenzene	5	µg/L
Methylene Chloride	10	µg/L
1,1,1-Trichloroethane	10	µg/L
Toluene	5	µg/L
MTBE	NA	µg/L
o-Xylene	5	µg/L
m, p-Xylene	10	µg/L
Total Xylenes	NA	µg/L
Iron, total	600	µg/L
Aluminum	4,000	µg/L
Copper	48	µg/L
Lead	11	µg/L
Manganese	2,000	µg/L
Silver	100	µg/L
Vanadium	28	µg/L
Zinc	230	µg/L
Total Dissolved Solids	850	mg/L
Total Suspended Solids	20	mg/L
Hardness	NA	mg/l
Cyanide, Free	10	µg/L

Notes:

[1] "Daily Maximum" excerpted from Attachment E of Addendum 1 to the Construction Contract Document.

[2] Shaded parameters were deleted by NYSDEC in February 2005

3.3.2 Groundwater Sampling Protocols

Groundwater monitoring will be performed on an annual basis to assess the performance of the remedy. The sampling frequency may be modified only with the approval NYSDEC. The SMP will be modified to reflect any changes in sampling plans approved by NYSDEC.

Groundwater samples shall be collected annually from the active groundwater monitoring wells and pumping wells listed in Table 2-1, and the groundwater levels in the wells shall be recorded when the sampling is performed. The samples shall be analyzed for VOCs by EPA Method 8260B and by an ELAP-certified laboratory.

The groundwater sampling procedures for the Mr. C's network of wells is found in Appendix I.

3.3.3 Sub-slab Soil Vapor and Indoor Air Sampling Protocols

EEEPC will be responsible for the sampling and analysis of sub-slab soil vapor and indoor air at various locations as directed by NYSDEC/DOH. The sampling schedule will be determined by NYSDEC/NYSDOH, and the sampling and analysis will be performed in accordance with the requirements of Appendix J of the SMP.

Air sampling will be performed using an evacuated stainless steel Summa® canister, and analysis for VOCs will be performed using gas chromatographic analysis in accordance with EPA Method TO-15. Using this method, compounds can be detected at part per billion, and analysts can identify individual compounds by comparing its spectrum to more than 130,000 stored spectra.

3.4 Quality Assurance/Quality Control

All sampling and analyses shall be performed in accordance with the requirements of the generic Quality Assurance Project Plan (QAPP) prepared for the site (see Appendix K). Site-specific requirements will be considered in the development of a sampling work plan or field sampling plan, which will be generated prior to conducting the Mr. C's site monitoring programs. The main components of the generic QAPP include the following:

- QA/QC objectives for data measurement;
- Sampling program:
  - Sample containers will be properly washed and decontaminated, and appropriate preservative will be added (if applicable) prior to their use by the analytical laboratory. Containers with preservative will be tagged as such;
  - Sample holding times will be in accordance with the NYSDEC Analytical Service Protocols; and
  - Field QC samples (e.g., trip blanks, coded field duplicates, and matrix spike/matrix spike duplicates) will be collected as necessary;
- Sample tracking and custody;
- Calibration procedures:
  - All field analytical equipment will be calibrated immediately prior to each day's use. Calibration procedures will conform to manufacturer's standard instructions; and

  - The laboratory will follow all calibration procedures and schedules as specified in EPA Method SW-846 (EPA 1995) and subsequent updates that apply to the instruments used for the analytical methods;

- Analytical procedures;
- Preparation of a Data Usability Summary Report (DUSR), which will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and chain-of-custody procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method;
- Internal QC and checks;
- QA performance and system audits;
- Preventative maintenance procedures and schedules; and
- Corrective action measures.

3.5 Reporting Requirements

Forms and any other information generated during regular monitoring events and inspections shall be kept on file with the owner or site representative. All forms and other relevant reporting formats used during the monitoring/inspection events will be subject to approval by NYSDEC and submitted at the time of the PRR, as specified below.

- All monitoring results will be reported annually to NYSDEC in the PRR. A letter report will also be prepared (if required by NYSDEC), subsequent to each sampling event. The letter report will include, at a minimum:
- The date of the event;
- The names of the personnel who conducted the sampling;
- A description of the activities performed;
- The type of samples collected (e.g., sub-slab vapor, indoor air, outdoor air);
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation);
- Sample results with comparison to appropriate standards, criteria, and guidance values (SCGs);
- A figure identifying sample type and sampling locations;
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format into the EQuIS database);
- Any relevant observations, conclusions, or recommendations; and
- A determination as to whether groundwater conditions have changed since the last reporting event.

Deliverables shall be submitted in either hard copy or digital format as required by NYSDEC.

4 Operation and Maintenance Plan

4.1 Introduction

This O&M Plan describes the ECs in place at the former Mr. C's Site and provisions for the continued proper O&M of the remedy components (see Table 4-1 for general system performance requirements). The ECs include the air-stripping treatment system, two SSDSs to mitigate soil vapor exposure, and monitoring wells for use in evaluating contaminant trends.

Table 4-1 General System Performance Requirements

System Parameter	Performance Required
General	▪ System operation at least 90% during the 12-month O&M reporting period.[1] ▪ Maximization of all treatment operating systems to achieve the regulatory discharge requirements and site cleanup goals.
Groundwater Extraction/Recovery System	Monitor water levels in pumping wells and observation piezometers and maintain a positive cone of depression around each pumping well.
Groundwater Treatment System	Meet NYSDEC SPDES limits for treated groundwater discharged to Tannery Brook.

Note:

[1] System up-time percentage shall be measured by dividing the total number of operational hours achieved in the month by the total numbers of hours in that month.

NYSDEC shall be notified prior to the performance of any repair work on or replacement of a monitoring well. All such work shall be documented in the subsequent PRR.

4.2 Mr. C's On-Site Treatment System

The Mr. C's treatment system is described in Section 2.3.1. A copy of the system P&ID is provided as Figure 2-1, and a copy of the treatment building layout is provided as Figure 2-2.

Normal O&M work shall consist of regularly scheduled bi-monthly site visits to inspect general system operations, record discharge readings, and perform general system balancing and maintenance requirements. Monthly samples shall be taken and submitted to a third-party laboratory for analysis of the influent and effluent groundwater (see Section 3.3).

The O&M subcontractor shall be responsible for the performance of regularly scheduled O&M activities. In addition, the O&M contractor shall respond to and repair treatment system shutdowns, pump failures, and level control issues on an as-needed basis, as further outlined below. The O&M subcontractor shall provide the necessary labor, equipment, materials, and health and safety protection to successfully operate, maintain, and monitor the overall treatment system at the Mr. C's Dry Cleaners site.

Any changes or improvements to the system components or control must be described in full along with any associated manufacturer's literature and a description of preventative maintenance in the form of O&M Manual Addenda, which will be incorporated into the SMP.

4.2.1 Air-Stripper Operation, Cleaning, and Repairs

The air-stripper shall be maintained to achieve an operation up-time of at least 90% during each 12-month monitoring period. System up-time percentage shall be measured by dividing the total number of operational hours achieved in the month by the total numbers of hours in that month or reporting period. The air-stripper will be operated in a way to maximize the ability of the air-stripper to remove VOCs and to meet the SPDES Equivalency Permit limits for treated groundwater discharged to Tannery Brook. See Table 4-2 for the system monitoring frequencies and Table 3-3 for the SPDES discharge limits.

Table 4-2 Treatment System Monitoring Frequencies

Parameter	Treatment Facility Influent	Bag Filters	Air Stripper Influent	Blower Inlet	Air Stripper Air Discharge	Air Stripper Effluent
Temperature	NA	NA	NA	NA	NA	Bi-monthly
pH	NA	NA	Monthly	NA	NA	Monthly
Pressure	NA	Bi-monthly	Bi-monthly	Bi-monthly	NA	Bi-monthly
Flow Rate	Bi-monthly	NA	NA	NA	Bi-monthly	Bi-monthly
VOCs Concentrations	NA	NA	Monthly	NA	NA	Monthly
Total VOCs Removed	NA	NA	Calculate	NA	NA	Calculate
Hardness	NA	NA	Monthly	NA	NA	Monthly

The air-stripper shall be inspected bi-weekly to determine and document its physical condition and to identify the maintenance necessary to ensure that it remains operational. A copy of the system and support equipment O&M manual is included as Appendix L. Sample inspection forms are included in Appendix M. Repairs or equipment replacement should be completed within 10 days after inspection.

Normal system O&M shall include replacement of bag filters and review and control of the sequestering agent as necessary; recording pressure and vacuum gauge readings; and recording system flow measurements from blowers and fans, etc. Any discrepancies or irregularities in system operation shall be corrected and so noted in the weekly reports.

The air stripper and associated equipment shall be cleaned and maintained in accordance with the manufacturer's required frequencies, or more frequently, based on actual site conditions that may be encountered during OM&M. Disposal of on-site solid wastes derived from filters and debris shall be performed only with the written permission of EEEPC's project manager.

Local power outages or equipment failure can affect operation of the remedial treatment system. To limit these downtimes, the system has an auto-dialer that sends an alarm to the OM&M subcontractor and EEEPC if an equipment failure, power outage, or a high water level in the equalization tank occurs. In addition, the treatment facility can be called at (716) 652-0094 to check on the status of the equipment in the building.

If an emergency occurs, such as a natural disaster or an unforeseen failure of any of the ECs, the site shall be inspected by a qualified environmental professional, as determined by NYSDEC, within 5 days of the event to verify the effectiveness of the EC/ICs implemented at the site.

4.2.2 Pumping Well Operations, Cleaning, and Repairs

The pumping wells will be operated in a way to maximize the ability of the air-stripper to remove VOCs and to meet the SPDES Equivalency Permit limits for treated groundwater discharged to Tannery Brook. See Table 4-3 for pumping well monitoring frequencies.

Normal operation and maintenance of the system shall include maintaining a positive cone of depression around each pumping well. Routine inspections of the pumping wells will require O&M personnel to record water levels and pressures in project-installed piezometers and pumping wells according to the frequency specified on Table 4-3.

Table 4-3 Pumping Well Monitoring Frequencies

Parameter	Pumping Wells (each)	Piezometers (each)
Pressure	Bi-monthly	NA
Groundwater Elevations	Monthly	Monthly

The pumping wells and electrical boxes shall be inspected bi-monthly for operating conditions during each bi-monthly inspection event. Sample inspection forms for the site pumping wells are included in Appendix I, K, and M. Where conditions warrant pump repair and replacement, level transducer adjustment or replacement, or electrical lead replacement, these services shall be performed during the normal system operation and maintenance period.

Any repair and/or replacement of a monitoring well shall be performed based on an assessment of its structural integrity and overall performance. Repairs or equipment replacement shall be completed within 10 days after inspection.

Some minor problems that may be encountered during inspection, and typical solutions, include the following:

- Level transducer problems – adjust or replace as necessary;
- Electrical lead malfunction – adjust or replace as necessary;
- Missing or deteriorated well identification markings – re-label as necessary;
- Cracked anti-percolation pad – replace with new pad;
- Rusty cap lock – replace;
- Casings that have peeling paint or are rusty – remove loose paint and rust and repaint;
- Bent casings – repair if possible. If the casing cannot be repaired to allow for sampling, then the pumping well may have to be decommissioned and replaced (to be determined by NYSDEC); and
- Leaking seals or cap – replace with watertight items.

If an emergency occurs, such as a natural disaster or an unforeseen failure of any of the ECs, the site shall be inspected by a qualified environmental professional, as determined by NYSDEC, within 5 days of the event to verify the effectiveness of the ECs/ICs implemented at the site.

4.3 Groundwater Monitoring Wells

4.3.1 Monitoring Well Repairs

The groundwater monitoring well network must be maintained to permit annual monitoring in accordance with Section 3, Site Monitoring Plan. Inspections of the monitoring wells should be conducted prior to scheduled sampling times to allow scheduled sampling to proceed as planned (see Section 3 for inspection frequencies). Any repair and/or replacement of a monitoring well shall be performed based on an assessment of its structural integrity and overall performance. Repairs or equipment replacement shall be completed within 10 days after inspection.

Some minor problems that may be encountered during inspection, and typical solutions, include the following:

- Missing or deteriorated well identification markings – re-label as necessary;
- Cracked anti-percolation pad – replace with new pad;
- Rusty cap lock – replace;
- Casings that have peeling paint or are rusty – remove loose paint and rust and repaint;
- Bent casings – repair if possible. If the casing cannot be repaired to allow for sampling, then the monitoring well may have to be decommissioned and replaced (to be determined by NYSDEC); and
- Leaking seals or cap – replace with watertight items.

If biofouling or silt accumulation occurs in an on- or off-site monitoring well, the well should be physically agitated, surged, and then redeveloped. If the redevelopment renders the well unusable, the monitoring well shall be properly decommissioned and replaced in accordance with this SMP.

If an emergency occurs, such as a natural disaster or an unforeseen failure of any of the ECs, the site shall be inspected by a qualified environmental professional, as determined by NYSDEC, within 5 days of the event to verify the effectiveness of the ECs/ICs implemented at the site.

4.3.2 Groundwater Monitoring Well Decommissioning

If a monitoring well is determined to be unusable for obtaining samples because of damage or any other reason, the well shall be decommissioned as described in NYSDEC's *Groundwater Monitoring Well Decommissioning Procedures* (NYSDEC 2009).

Well decommissioning without replacement shall be performed only with the prior approval of NYSDEC. Well abandonment shall be performed in accordance with NYSDEC's latest version of the *Groundwater Monitoring Well Decommissioning Procedures* (NYSDEC 2009). Monitoring wells that are decommissioned because they have become unusable shall be reinstalled in the nearest available location approved by NYSDEC.

4.3.3 Installation of New or Replacement Groundwater Monitoring Wells

If it is determined that a new or replacement monitoring well needs to be installed, the well(s) shall be installed as described in the EPA's *Handbook of Suggested Practices for the Design and Installation of Groundwater Monitoring Wells* (EPA 1989) and agreed to by NYSDEC. If the new monitoring well is intended to replace an existing monitoring well, the new monitoring well shall be installed approximately 5 feet from the existing monitoring well and to the same depth of the monitoring well it is replacing. If the new monitoring well is for a new location, the well location and depth will be determined by NYSDEC. A typical flush-mount groundwater monitoring well is shown on Figure 2-4.

4.4 Off-Site SSDS Operation and Maintenance

Off-site SSDSs are operated by the property owners of the buildings in which they are installed. In accordance with the notification requirements in the Institutional and Engineering Control Plan in Section 2 of this SMP, property owners are responsible for providing power to the systems and for reporting maintenance requests and changes in property ownership or use to NYSDEC.

All monitoring wells and components of the SSDSs shall be inspected annually to determine their physical condition and to identify necessary maintenance required to allow the monitoring wells to remain operational. The annual inspection of the facility and SSDSs will also be used to assess whether any structural or facility changes have occurred that could affect the operation of the SSDSs. Inspections of the SSDSs should be conducted prior to scheduled sampling times to allow scheduled sampling to proceed as planned (see Section 3 for Media Monitoring Programs). The results of the inspections must be documented on a monitoring well inspection checklist. Inspection forms are included in Appendix I.

Any minor problems with the physical condition of the existing monitoring wells (problems that will not prevent or interfere with sampling) should be identified during each inspection. Some minor problems that may be encountered during inspection, and typical solutions, include the following:

- Missing or deteriorated mitigation system labels – re-label as necessary;
- Fan bearing issues or broken fans – replace as necessary;
- Cracked sub-slab or compromised floor seal – re-seal with approved sealant;
- Compromised conduit and pipe supports – replace as necessary; and
- Leaking or cracked piping or joints – seal or replace with air-tight couplings.

If an emergency occurs, such as a natural disaster or an unforeseen failure of any of the ECs, the site shall be inspected by a qualified environmental professional, as determined by NYSDEC, within 5 days of the event to verify the effectiveness of the ECs/ICs implemented at the site.

5

Inspections, Reporting, and Certifications

5.1 Site Inspections

Inspections of all remedial components installed at the site shall be conducted at the frequency specified in the SMP Monitoring Plan schedule (see Table 3-1). A comprehensive sitewide inspection shall be conducted annually, regardless of the frequency of the PRR. The inspections will determine and document the following:

- Whether the ECs continue to perform as designed;
- Whether these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Environmental Deed Restriction (one filed);
- Achievement of remedial performance criteria;
- Sampling and analysis of appropriate media during monitoring events;
- Whether site records are complete and up to date; and
- Changes, or needed changes, to the remedial or monitoring system.

Inspections shall be conducted in accordance with the procedures set forth in the Monitoring Plan of this SMP (see Section 3). The reporting requirements are outlined in the Periodic Review Reporting section of this plan (see Section 5.2).

If an emergency occurs, such as a natural disaster or an unforeseen failure of any of the ECs, the site shall be inspected by a qualified environmental professional, as determined by NYSDEC, within 5 days of the event to verify the effectiveness of the ECs/ICs implemented at the site.

5.1.1 Sitewide Inspection

Sitewide inspections shall be performed at least once a year and after all severe weather conditions that may affect ECs. Based on the results of the inspection, a report shall be compiled that provides sufficient information to assess the following:

- Compliance with all ICs, including changes in site use;
- The condition and effectiveness of all ECs;
- General site conditions at the time of the inspection;
- The site management activities being conducted, including, where appropriate, confirmation sampling and health and safety inspections performed as part of the sitewide inspection;
- Compliance with the permits and schedules included in this SMP; and
- Whether site records are up-to-date.

Sitewide inspections shall be performed as scheduled, and interim inspections shall be performed as needed. Inspection reports (scheduled and interim) shall be submitted to NYSDEC in a timely manner. All inspection reports shall be included as part of the annual PRR.

5.1.2 Inspection Frequency

All inspections shall be conducted at the frequencies specified in the schedules provided in Section 3, Site Monitoring Plan, of this SMP (see Table 3-1). At a minimum, a sitewide inspection shall be conducted annually (see Section 5.1.1).

Inspection frequency is subject to change with the approval of NYSDEC. Unscheduled inspections and/or sampling may take place when a suspected failure of the air-stripper system has been reported or an emergency occurs that is deemed likely to affect the operation of the system.

All inspection and monitoring reports shall be sent to:

Mr. William Welling
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau E
625 Broadway, Albany, New York 12233-7016

5.1.3 Inspection Forms, Sampling Data, and Maintenance Reports

Information obtained during all inspections and monitoring events shall be recorded on the appropriate forms for each respective sampling work plan (see Appendix M for inspection forms).

5.1.4 Evaluation of Records and Reporting

The inspection and site monitoring data will be evaluated to determine whether:

- The ICs and ECs are in place, functioning properly, and are effective in attaining the remediation goals specified in the ROD;
- The monitoring plan is being implemented;
- Operation and maintenance activities are being conducted properly; and

- Based on the above items, the site remedy continues to be protective of public health and the environment and is performing as designed.

5.2 Periodic Review Report

A PRR shall be submitted annually to NYSDEC, beginning 18 months after the Certificate of Completion or equivalent document (e.g., Satisfactory Completion Letter, No Further Action Letter) is issued. In the event that the site is subdivided into separate parcels with multiple owners, a single PRR shall be prepared in accordance with NYSDEC's *Technical Guidance for Site Investigation and Remediation* (NYSDEC 2010a) and submitted within 45 days of the end of each certification period. The PRR shall include the following:

- Identification, assessment, and certification of all ICs and ECs required by the remedy for the site;
- Results of the required annual site inspections and severe condition inspections, if applicable;
- All applicable inspection forms and other records generated for the site during the reporting period, in electronic format;
- A summary of any discharge monitoring data and/or information generated during the reporting period, including comments and conclusions;
- Data summary tables that include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These shall include a presentation of past data as part of an evaluation of contaminant concentration trends;
- Graphical representations of the distributions of contaminants of concern, by media (groundwater and soil vapor);
- The results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period shall submitted electronically in a NYSDEC-approved format; and
- A site evaluation that includes the following:
    - The compliance of the remedy with the requirements of the ROD,
    - The effectiveness of all treatment units, etc., including identification of any needed repairs or modifications,
    - Any new conclusions or observations regarding site contamination based on inspections or data generated by the SMP for each media being monitored,
    - Recommendations regarding any necessary changes to the remedy and/or SMP, and
    - The overall performance and effectiveness of the remedy.

The PRR shall be submitted in hard-copy format to the NYSDEC Central Office and the Region 9 Office, and in electronic format to the NYSDEC central and regional offices and the NYSDOH, Bureau of Environmental Exposure Investigation.

5.2.1 Certifications of Institutional and Engineering Controls

Certifications of ICs and ECs are not required so long as NYSDEC or its representative is the responsible party (RP) for site management. In the event that site management is taken over by the property owner or the owner's designated site representative, a qualified environmental professional or NYS PE will prepare the following certifications in a PRR. The RP will continue to prepare periodic certifications through the PRR until NYSDEC notifies the RP in writing that this certification is no longer needed. Certifications will not be made until after the last inspection of the reporting period.

For ICs, the certification will include the following:

"For each institutional control identified for the site, I certify that all of the following statements are true:

- The ICs employed at this site are unchanged from the date the control was put in place, or are compliant with NYSDEC-approved modifications;
- Nothing has occurred that would impair the ability of the Institutional Controls to protect the public health and environment;
- Nothing has occurred that would constitute a violation or failure to comply with any site-specific requirements of the SMP;
- Access to the site will continue to be provided to NYSDEC to evaluate the remedy, including access to evaluate the continued maintenance of the ICs;
- If a financial assurance mechanism is required under the oversight document for the site, the mechanism remains valid and sufficient for the intended purpose under the document;
- Use of the site is in compliance with the environmental notice;
- The information presented in this report is accurate and complete; and
- I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as [Owner or Owner's Designated Site Representative] (and if the site consists of multiple properties): [and I have been authorized and designated by all site owners to sign this certification] for the site."

For ECs, the certification will include the following:

"For each engineering control identified for the site, I certify that all of the following statements are true:

- Inspection of the site to confirm the effectiveness of each engineering control required by the remedial program was performed under my direction;
- Each engineering control employed at this site is unchanged from the date the control was put in place, or are compliant with NYSDEC-approved modifications;
- Nothing has occurred that would impair the ability of the Engineering Controls to protect public health and the environment;
- Nothing has occurred that would constitute a violation or failure to comply with any site-specific requirements of the SMP;
- Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of the engineering controls;
- If a financial assurance mechanism is required under the oversight document for the site, the mechanism remains valid and sufficient for the intended purpose under the document;
- Use of the site is in compliance with the environmental notice;
- Each engineering control is performing as designed and is effective;
- To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program and generally accepted engineering practices;
- The information presented in this report is accurate and complete; and
- I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class “A” misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as [Owner or Owner’s Designated Site Representative] (and if the site consists of multiple properties): [I have been authorized and designated by all site owners to sign this certification] for the site.”

The signed certifications will be included in the PRR described below.

If for any reason one or more of the above statements cannot be certified, the certification cannot be completed and a corrective measures plan must be submitted to NYSDEC (see Section 5.4).

5.3 Reporting Exceedances of Standards, Criteria, and Guidance Values

If VOCs or other contaminants are detected at concentrations exceeding the SCGs defined by NYSDEC for groundwater, indoor air, or effluent from the treatment system, the exceedance must be reported to NYSDEC as soon as the information becomes available. The interim analytical results will then be evaluated by NYSDEC to determine whether further analytical testing or interim remedial actions are needed. New York State currently does not have any SCG values for concentrations of chemicals in soil vapor.

5.4 Corrective Measures Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an IC or EC, a corrective measures plan shall be submitted to NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the corrective measures plan until it has been approved by NYSDEC.

All records and information regarding maintenance shall be included as a part of the site inspection report. If maintenance is projected for the future or cannot be completed as a result of winter weather or other difficulties, it shall be noted in the site inspection report. Records of all completed maintenance efforts, including any transportation and disposal of waste, shall also be included in the site inspection report.

In order to comply with the above submittal times, it may be necessary to prepare and submit interim reports to NYSDEC to supplement the semiannual reports.

6

Health and Safety Plan

A site-specific Health and Safety Plan (SHASP) must be developed for the work assignments to be conducted. As required by NYSDEC's *Technical Guidance for Site Investigation and Remediation* (NYSDEC 2010a), the O&M subcontractor's HASP included in this SMP can be used as a guide when producing an SHASP for the activities, or separately for each activity, as required. A copy of the O&M subcontractor's HASP is provided in Appendix N-1. A copy of the HASP for groundwater and air sampling is provided as Appendix N-2

All staff should be aware of Occupational Safety and Health Administration (OSHA) hazardous communication requirements. Personnel should review all required Material Safety Data Sheets (MSDSs) and instructions pertaining to all anticipated chemicals prior to the initiation of any work.

6.1 Preparation of a Site-Specific Health and Safety Plan

In accordance with the requirements of 29 Code of Federal Regulations (CFR) 1910.120, an SHASP must be prepared prior to initiating field activities at the site. The SHASP should include the following:

- The names of key personnel responsible for site health and safety, including an appointed site Health and Safety Officer;
- A safety and health-risk analysis for each site task and operation;
- Employee training requirements;
- Specification of PPE to be used by employees for each of the site tasks and operations being conducted;
- Medical surveillance requirements;
- Frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used;
- Site control measures;
- Decontamination procedures;
- Site standard operating procedures; and
- A contingency plan for responses to emergencies.

6.2 Training

All personnel performing monitoring, inspection, or remediation activities at the Mr. C’s Site must complete OSHA’s 40-hour health and safety training course for work at hazardous waste sites. This includes 8-hour refresher training, first aid/ cardiopulmonary resuscitation (CPR) training, and annual physical examinations.

6.3 Emergency Telephone Numbers

As appropriate, the fire department and other emergency response group will be notified immediately by telephone of the emergency. Emergencies may include injury to personnel, fire or explosion, environmental release, or serious weather conditions. The emergency telephone number list is provided as Table 6-1.

Table 6-1 Emergency Contact Numbers

Medical, Fire, and Police	9-1-1
One Call Center	(800) 272-4480 (three-day notice required for utility mark-out)
Poison Control Center	(800) 222-1222
Pollution Toxic Chemical Oil Spills	(800) 424-8802
NYSDEC Spills Hotline	(800) 457-7362

In the event of any environmentally related situation or unplanned occurrence requiring assistance, the Owner or Owner’s representative(s) should contact the appropriate party from the contact list below. For emergencies, appropriate emergency response personnel should be contacted. Prompt contact should also be made to Mr. William Welling, NYSDEC Division of Environmental Remediation.

NYSDEC – Albany O&M Section	518-457-0927
NYSDEC – Project Manager, William Welling	518-402-9814

These emergency contact lists must be maintained in an easily accessible location at the site. The list will also be posted prominently at the site and made readily available to all personnel at all times.

7 References

Ecology and Environment Engineering, P.C. (EEEPC). 2015a. *Summary Report for the Mr. C's Dry Cleaners Site Enhanced Bioremediation and Bioaugmentation Pilot Study, NYSDEC Site No. 9-15-157, East Aurora, Erie County, New York*. January 2015.

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__________. 2011. *November 2010 Indoor Air Quality Report – 27 Whaley Avenue*. Letter report to NYSDEC. September 12, 2011.

__________. 2008. *January 2008 Site Management Plan, Mr. C's Dry Cleaners Site, NYSDEC Site No. 9-15-157, East Aurora, Erie County, New York*. January 2008.

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___________. 1995a. *Remedial Investigation Report – Mr. C’s Dry Cleaners Superfund Site.*

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___________. 2010b. CP-51 - *Soil Cleanup Guidance Policy. Issued on October 21, 2010. Available online at*: http://www.dec.ny.gov/docs/remediation_hudson_pdf/cpsoil.pdf.

___________. 2009. http://www.dec.ny.gov/docs/remediation_hudson_pdf/cp43mwdecomm.pdf

___________. 1997. Division of Remediation. *Record of Decision, Mr. C’s Dry Cleaners Site, East Aurora (V), Erie County, Site Number 9-15-157.* March 1997 .

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United States Environmental Protection Agency (EPA). 1989. *Handbook of Suggested Practices for the Design and Installation of Groundwater Monitoring Wells*. EPA 600/4-89/034.

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A

Parcel Map and Assessment Records of Mr. C’s and Surrounding Properties

A1 – Parcel Map of Mr. C’s and Surrounding Properties

Mr. C's Parcel Map

Legend

☐ Parcels

☐ Municipal Boundaries

🟩 2011_bdy

0 188.08 376.2 Feet

WGS_1984_Web_Mercator_Auxiliary_Sphere
THIS MAP IS NOT TO BE USED FOR NAVIGATION

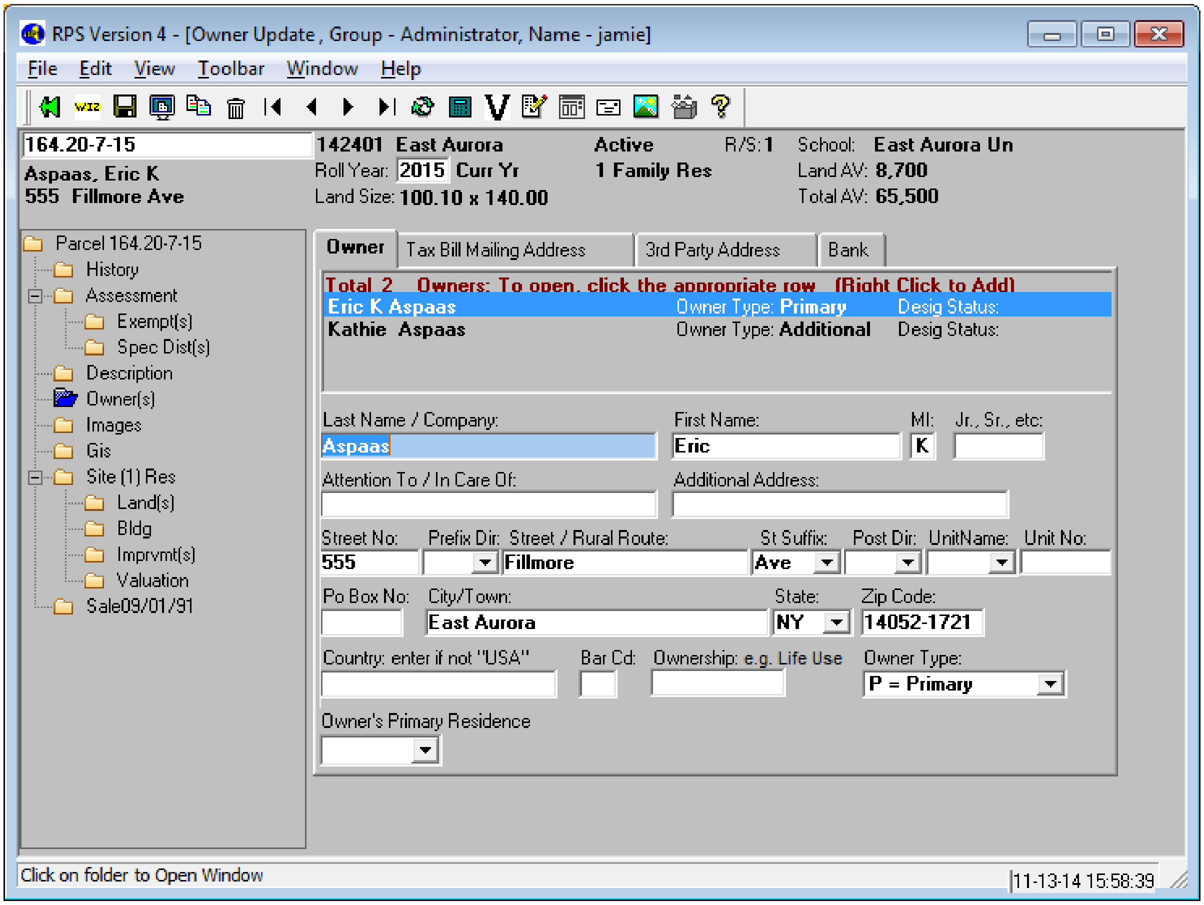
ERIE COUNTY
DEPARTMENT OF ENVIRONMENT & PLANNING
OFFICE OF GIS

1: 2,257

A2 – Summary Table of the Mr. C’s and the Surrounding Properties

Parcel ID No.	Address	Ownership
164.20-7-15	555 Fillmore Avenue	Eric & Kathie Aspaas
164.20-7-20	566 Main Street	Intrepid Automotive Partners
164.20-7-21	572 Main Street	Intrepid Automotive Partners
164.20-7-22	578 Main Street	580 Main Street, LLC
164.20-7-23	584 Main Street	Deltora, LLC
164.20-7-24	586 Main Street	Deltora, LLC
164.20-7-25	594 Main Street	594 Main Street, LLC
164.20-7-28	27 Whaley Avenue	David Dubois
164.20-7-29	19 Whaley Avenue	Michael D. Pitt
164.20-7-30	550 Main Street	Aurora Town Public Library
164.20-7-31	538 Main Street	People Inc.
164.20-7-34.2	510 Main Street	Steven Krastev
164.20-7-8	511 Fillmore Avenue	Bobby Iwankow
164.20-8-1	591 Main Street	Red Brick Plaza, LLC
164.20-8-2	589 Main Street	Matthew Dunaif
164.20-8-3.1	16 Paine Street	The Boys & Girls Club of EA
164.20-9-7	9 Paine Street	First Presbyterian Church

A3 – 555 Fillmore Avenue – Eric & Kathy Aspaas



RPS Version 4 - [Owner Update , Group - Administrator, Name - jamie]

164.20-7-15
Aspaas, Eric K
555 Fillmore Ave

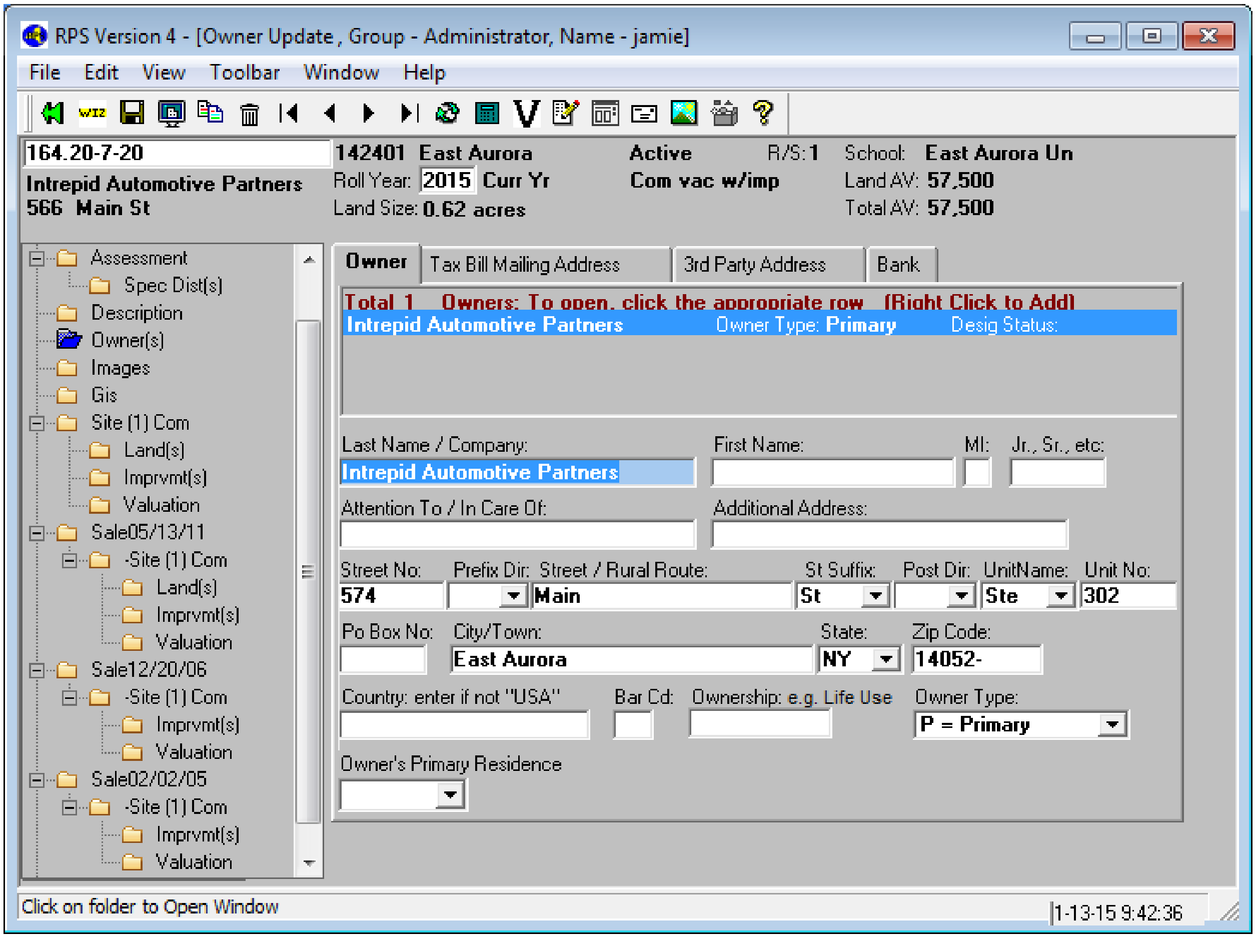
142401 East Aurora **Active** R/S: **1** School: **East Aurora Un**
Roll Year: **2015** **Curr Yr** **1 Family Res** Land AV: **8,700**
Land Size: **100.10 x 140.00** Total AV: **65,500**

Total 2 Owners: To open, click the appropriate row (Right Click to Add)
Eric K Aspaas Owner Type: **Primary** Desig Status:
Kathie Aspaas Owner Type: **Additional** Desig Status:

Last Name / Company: Aspaas
First Name: Eric
MI: K
Jr., Sr., etc:
Attention To / In Care Of:
Additional Address:
Street No: 555
Prefix Dir:
Street / Rural Route: Fillmore
St Suffix: Ave
Post Dir:
UnitName:
Unit No:
Po Box No:
City/Town: East Aurora
State: NY
Zip Code: 14052-1721
Country: enter if not "USA"
Bar Cd:
Ownership: e.g. Life Use
Owner Type: P = Primary
Owner's Primary Residence

11-13-14 15:58:39

A4 – 566 Main St – Intrepid Automotive Partners



164.20-7-20
Intrepid Automotive Partners
566 Main St

142401 East Aurora
Roll Year: 2015 Curr Yr
Land Size: 0.62 acres

Active
Com vac w/imp

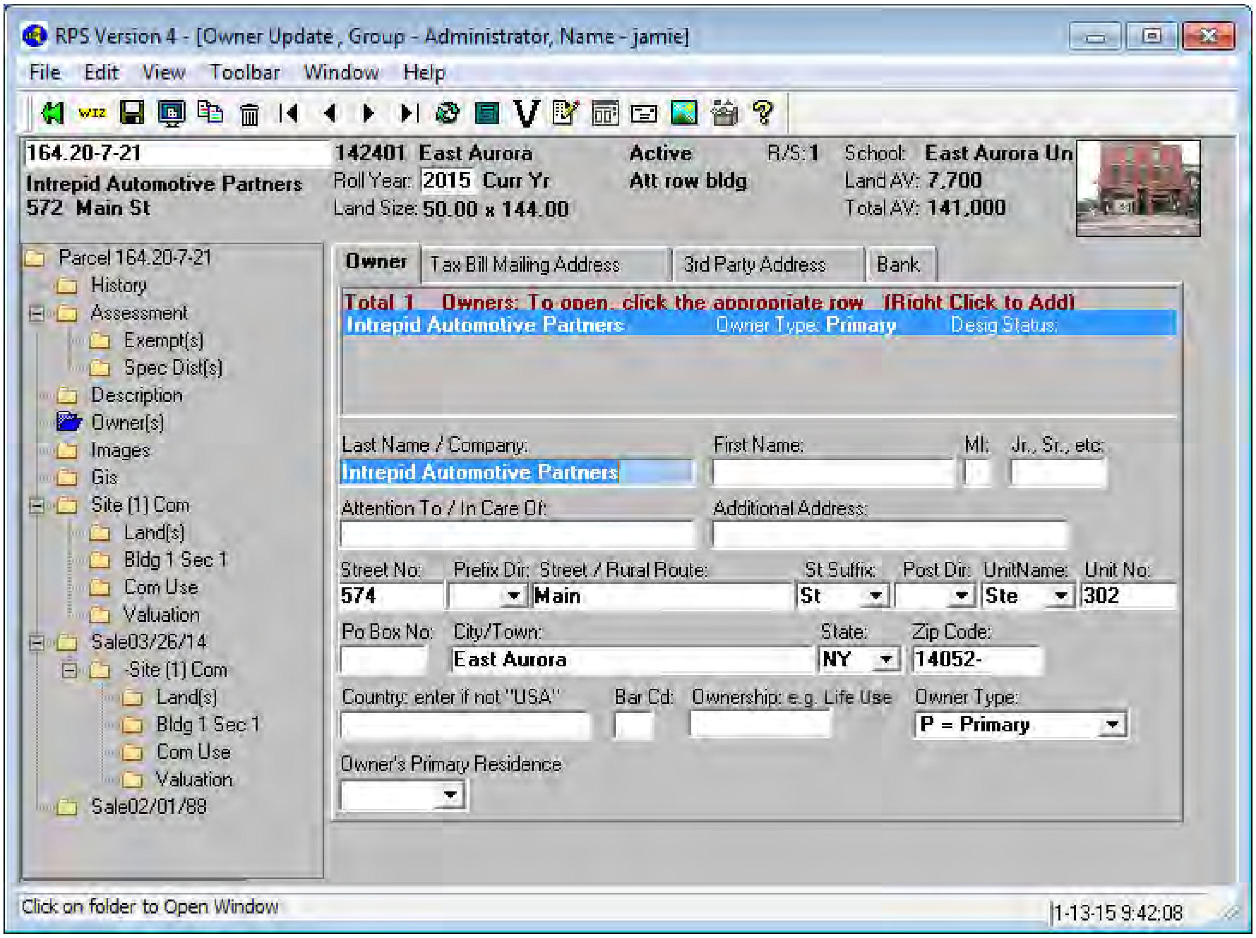
R/S: 1
School: East Aurora Un
Land AV: 57,500
Total AV: 57,500

Total 1 Owners: To open, click the appropriate row (Right Click to Add)
Intrepid Automotive Partners Owner Type: Primary Desig Status:

Last Name / Company: Intrepid Automotive Partners
First Name:
MI:
Jr., Sr., etc:
Attention To / In Care Of:
Additional Address:
Street No: 574
Prefix Dir:
Street / Rural Route: Main
St Suffix: St
Post Dir:
UnitName: Ste
Unit No: 302
Po Box No:
City/Town: East Aurora
State: NY
Zip Code: 14052-
Country: enter if not "USA"
Bar Cd:
Ownership: e.g. Life Use
Owner Type: P = Primary
Owner's Primary Residence

Click on folder to Open Window
1-13-15 9:42:36

A5 – –572 Main St. – Intrepid Automotive Partners



164.20-7-21
Intrepid Automotive Partners
572 Main St

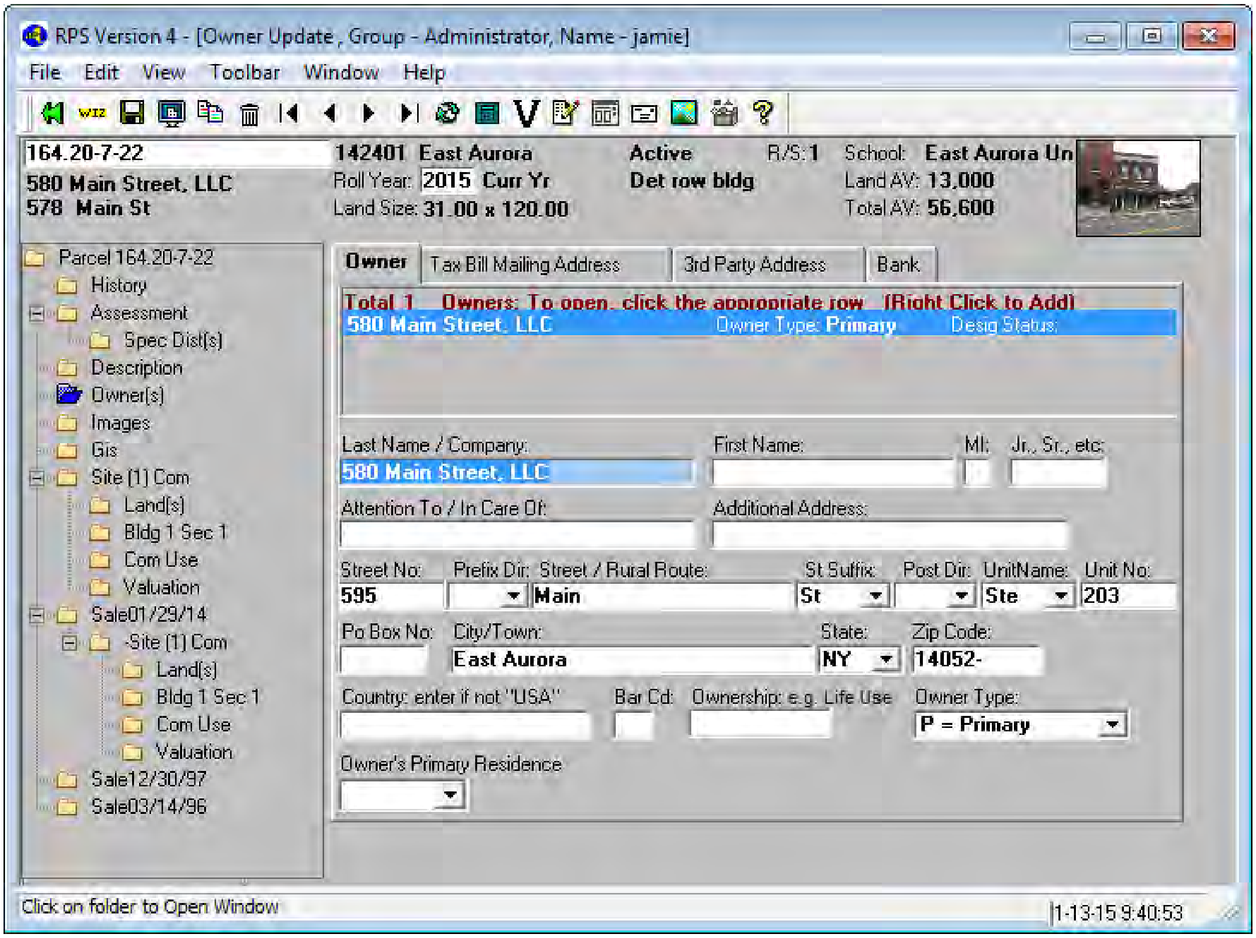
142401 East Aurora **Active** R/S: **1** School: **East Aurora Un**
Roll Year: 2015 **Curr Yr** **Att row bldg** Land AV: **7,700**
Land Size: **50.00 x 144.00** Total AV: **141,000**

Total 1 Owners: To open, click the appropriate row (Right Click to Add)
Intrepid Automotive Partners Owner Type: **Primary** Desig Status:

Last Name / Company: Intrepid Automotive Partners
First Name:
MI:
Jr., Sr., etc:
Attention To / In Care Of:
Additional Address:
Street No: 574
Prefix Dir:
Street / Rural Route: Main
St Suffix: St
Post Dir:
UnitName: Ste
Unit No: 302
Po Box No:
City/Town: East Aurora
State: NY
Zip Code: 14052-
Country: enter if not "USA"
Bar Cd:
Ownership: e.g. Life Use
Owner Type: P = Primary
Owner's Primary Residence

Click on folder to Open Window
1-13-15 9:42:08

A6 – 578 Main St - 580 Main Street, LLC



RPS Version 4 - [Owner Update , Group - Administrator, Name - jamie]

164.20-7-22
580 Main Street, LLC
578 Main St

142401 East Aurora
Roll Year: 2015 Curr Yr
Land Size: 31.00 x 120.00

Active
Det row bldg

R/S: 1

School: East Aurora Un
Land AV: 13,000
Total AV: 56,600

Total 1 Owners: To open, click the appropriate row (Right Click to Add)

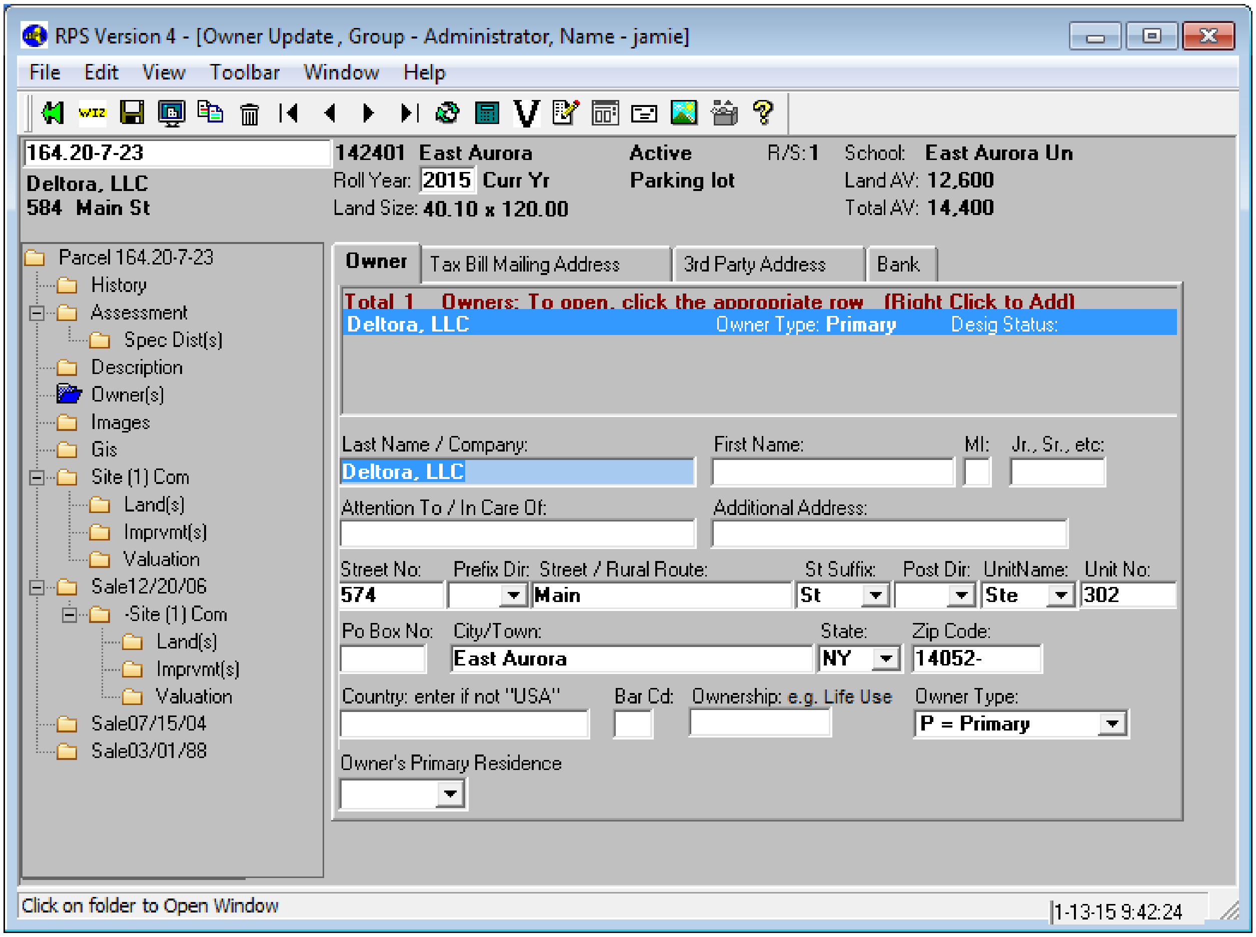
580 Main Street, LLC Owner Type: Primary Desig Status:

Last Name / Company: 580 Main Street, LLC
First Name:
MI:
Jr., Sr., etc:
Attention To / In Care Of:
Additional Address:
Street No: 595
Prefix Dir:
Street / Rural Route: Main
St Suffix: St
Post Dir:
UnitName: Ste
Unit No: 203
Po Box No:
City/Town: East Aurora
State: NY
Zip Code: 14052-
Country: enter if not "USA"
Bar Cd:
Ownership: e.g. Life Use
Owner Type: P = Primary
Owner's Primary Residence

Click on folder to Open Window

1-13-15 9:40:53

A7 – 584 Main St - Deltora, LLC



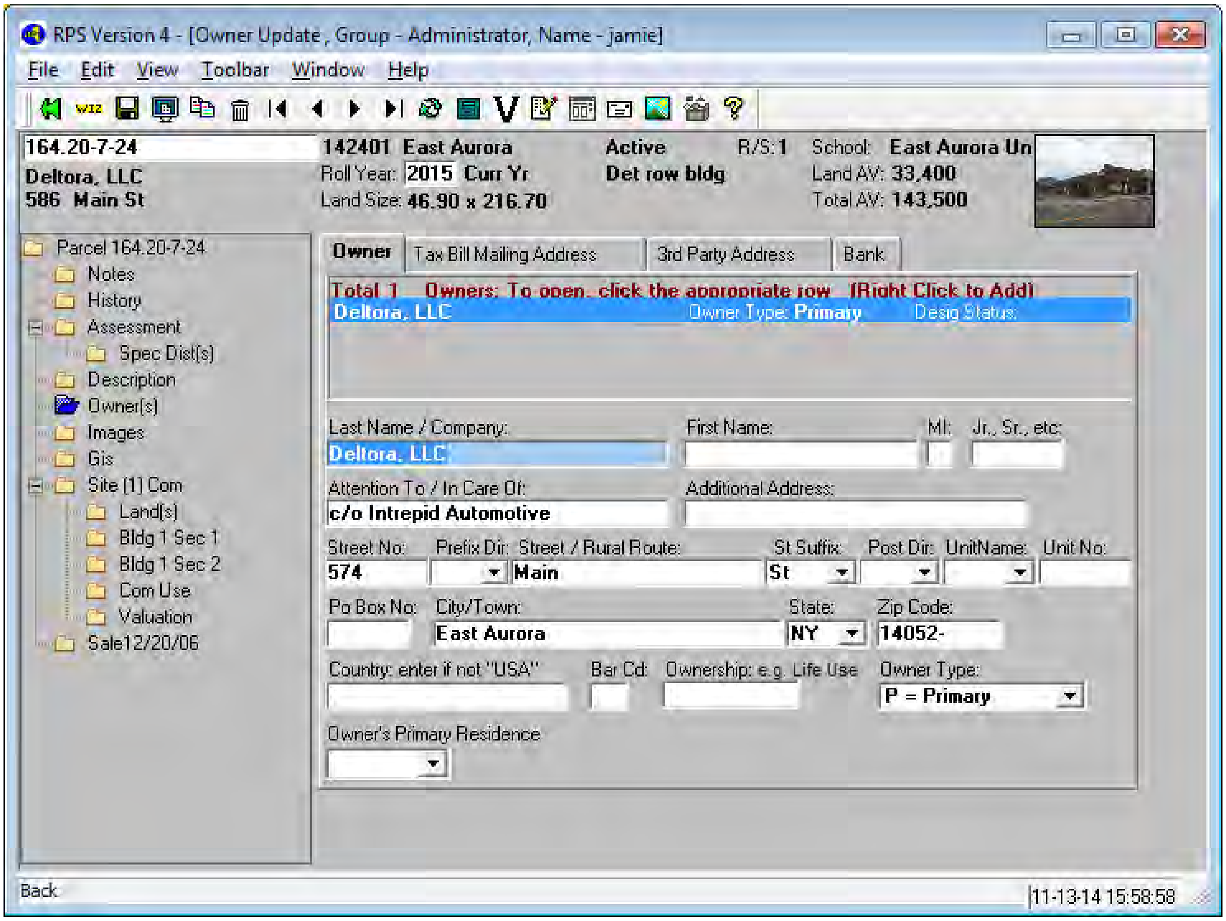
164.20-7-23
Deltora, LLC
584 Main St

142401 East Aurora **Active** R/S: **1** School: **East Aurora Un**
Roll Year: **2015 Curr Yr** **Parking lot** Land AV: **12,600**
Land Size: **40.10 x 120.00** Total AV: **14,400**

Total 1 Owners: To open, click the appropriate row (Right Click to Add)
Deltora, LLC Owner Type: **Primary** Desig Status:

Last Name / Company: **Deltora, LLC**
First Name:
MI:
Jr., Sr., etc:
Attention To / In Care Of:
Additional Address:
Street No: **574**
Prefix Dir:
Street / Rural Route: **Main**
St Suffix: **St**
Post Dir:
UnitName: **Ste**
Unit No: **302**
Po Box No:
City/Town: **East Aurora**
State: **NY**
Zip Code: **14052-**
Country: enter if not "USA"
Bar Cd:
Ownership: e.g. Life Use
Owner Type: **P = Primary**
Owner's Primary Residence

A8 – 586 Main St - Deltora, LLC



164.20-7-24
Deltora, LLC
586 Main St

142401 East Aurora
Roll Year: 2015 Curr Yr
Land Size: 46.90 x 216.70

Active
Det row bldg
R/S: 1

School: East Aurora Un
Land AV: 33,400
Total AV: 143,500

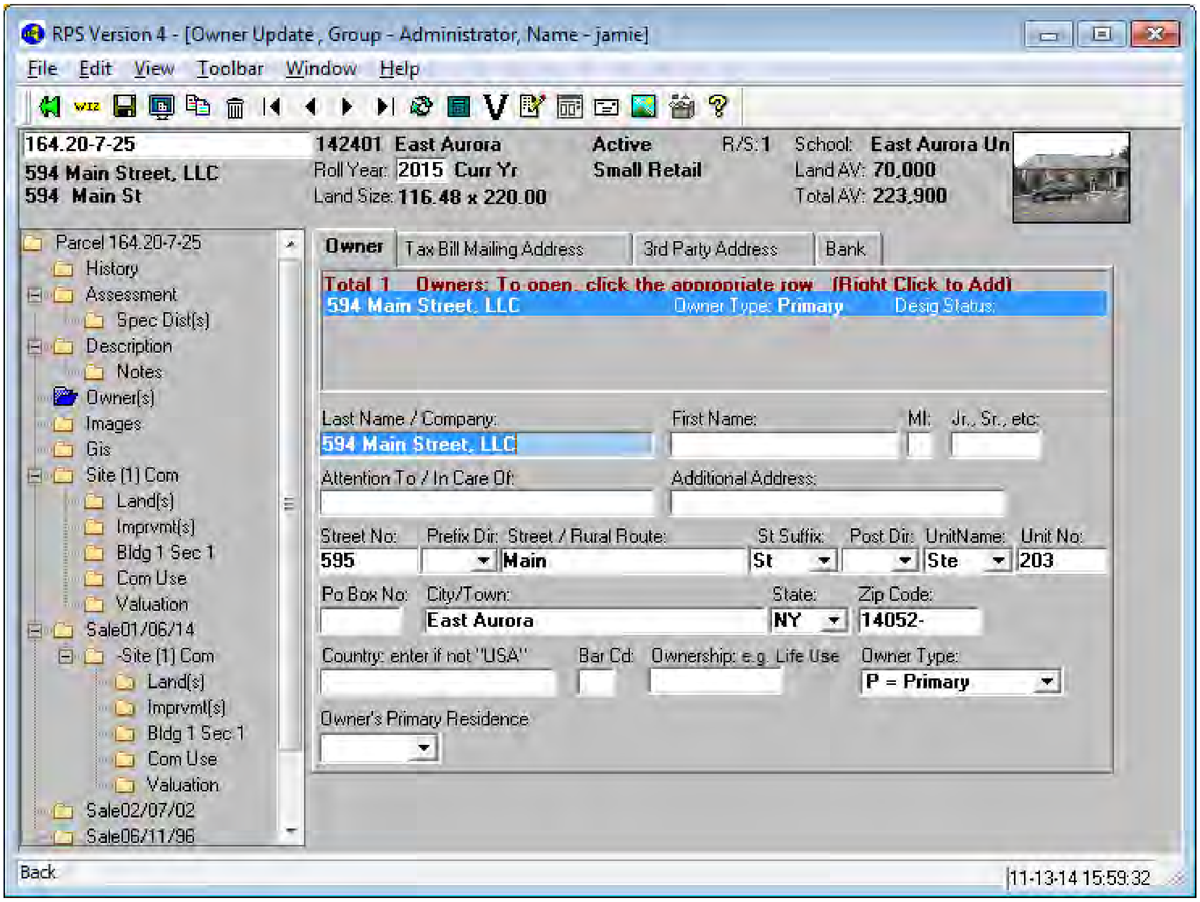
Total 1 Owners: To open, click the appropriate row (Right Click to Add)

Deltora, LLC Owner Type: Primary Desig Status:

Last Name / Company: Deltora, LLC
First Name:
MI:
Jr., Sr., etc:
Attention To / In Care Of: c/o Intrepid Automotive
Additional Address:
Street No: 574
Prefix Dir:
Street / Rural Route: Main
St Suffix: St
Post Dir:
UnitName:
Unit No:
Po Box No:
City/Town: East Aurora
State: NY
Zip Code: 14052-
Country: enter if not "USA"
Bar Cd:
Ownership: e.g. Life Use
Owner Type: P = Primary
Owner's Primary Residence

11-13-14 15:58:58

A9 – 594 Main St – 594 Main Street, LLC



164.20-7-25
594 Main Street, LLC
594 Main St

142401 East Aurora
Roll Year: 2015 Curr Yr
Land Size: 116.48 x 220.00

Active
Small Retail

R/S: 1

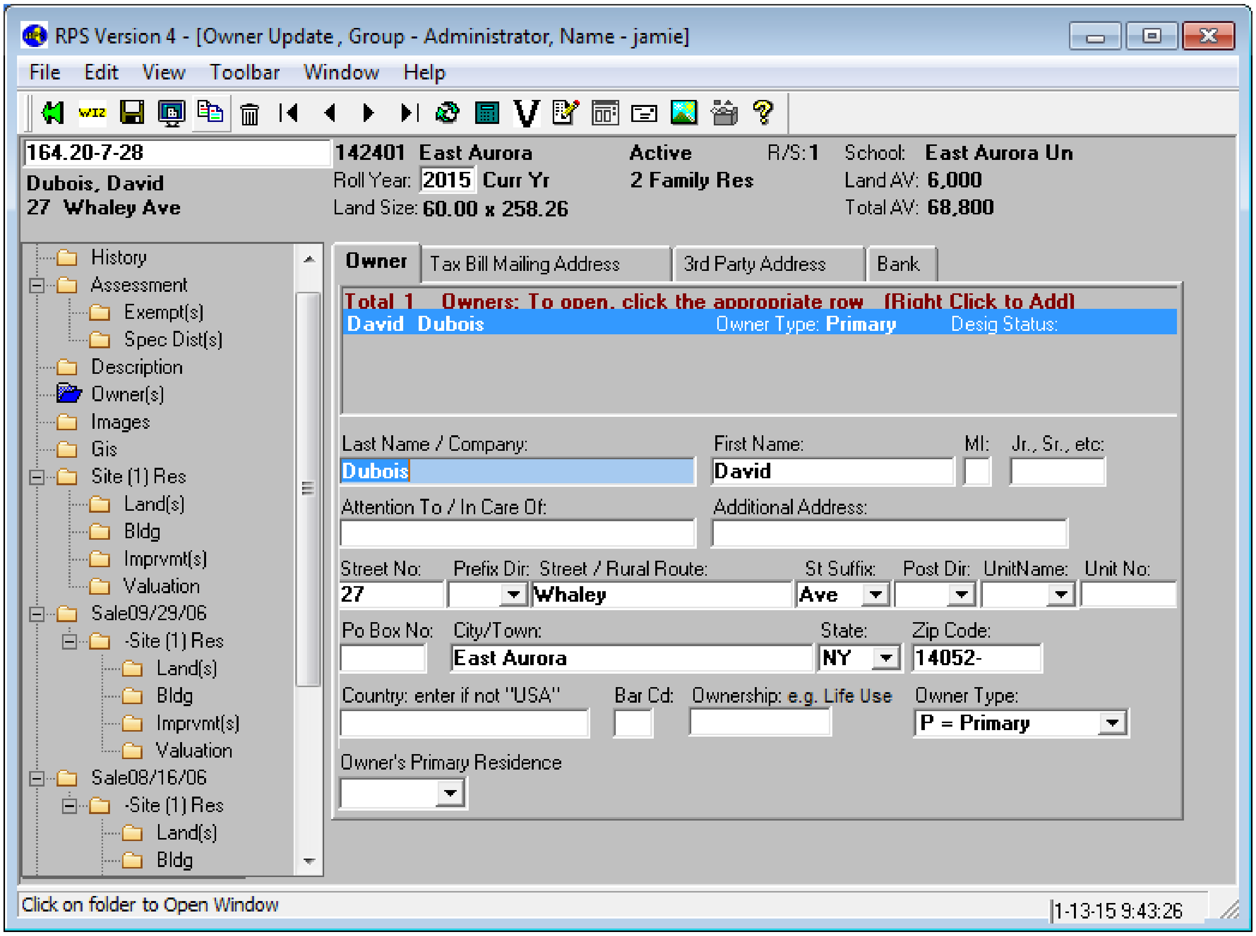
School: East Aurora Un
Land AV: 70,000
Total AV: 223,900

Total 1 Owners: To open, click the appropriate row (Right Click to Add)

594 Main Street, LLC Owner Type: Primary Desig Status:

Last Name / Company: 594 Main Street, LLC
First Name:
MI:
Jr., Sr., etc:
Attention To / In Care Of:
Additional Address:
Street No: 595
Prefix Dir:
Street / Rural Route: Main
St Suffix: St
Post Dir:
UnitName: Ste
Unit No: 203
Po Box No:
City/Town: East Aurora
State: NY
Zip Code: 14052-
Country: enter if not "USA"
Bar Cd:
Ownership: e.g. Life Use
Owner Type: P = Primary
Owner's Primary Residence

A10 – 27 Whaley Ave – David Dubois



164.20-7-28
Dubois, David
27 Whaley Ave

142401 East Aurora
Roll Year: 2015 Curr Yr
Land Size: 60.00 x 258.26

Active
2 Family Res

R/S:1

School: East Aurora Un
Land AV: 6,000
Total AV: 68,800

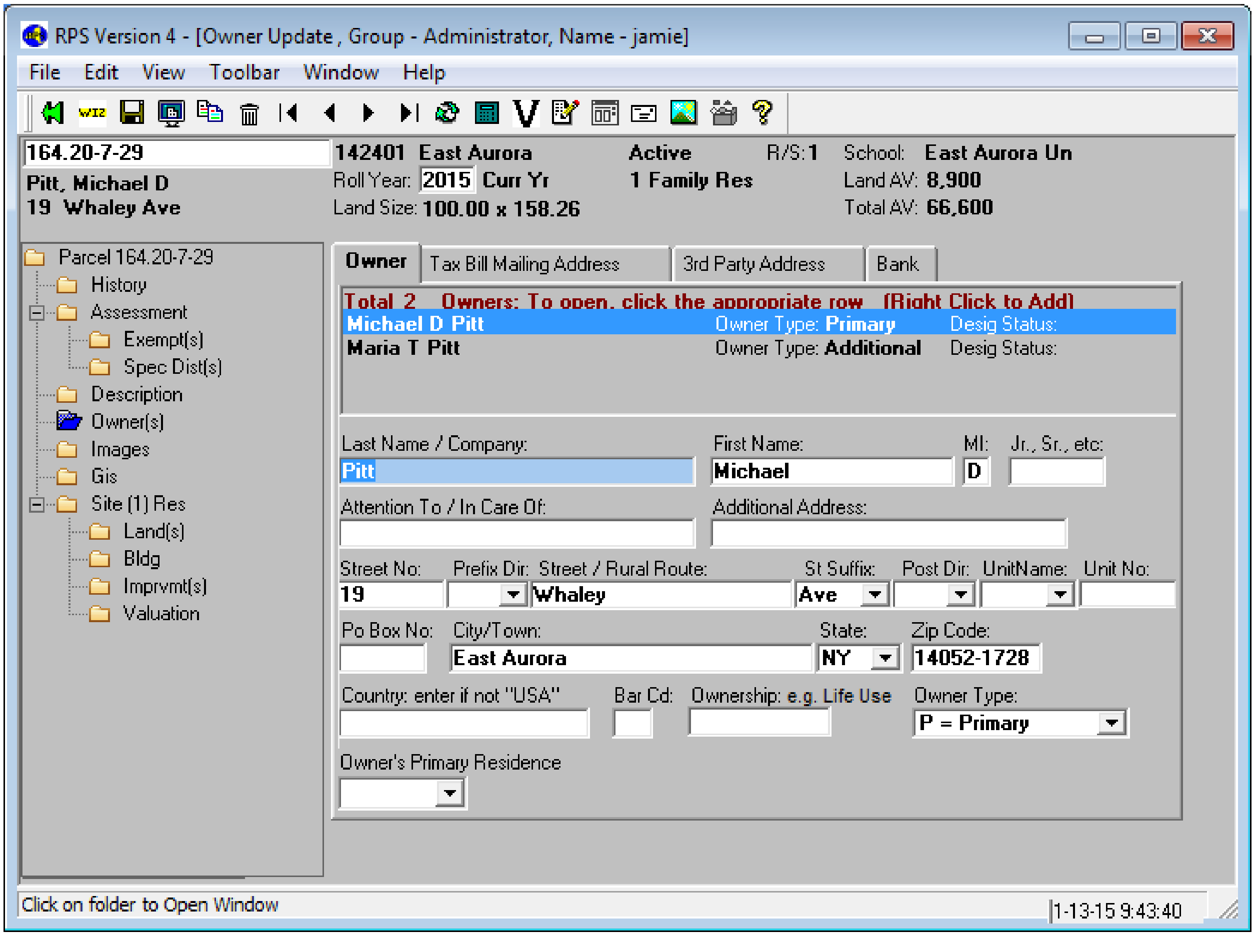
Total 1 Owners: To open, click the appropriate row (Right Click to Add)

David Dubois Owner Type: Primary Desig Status:

Last Name / Company: Dubois
First Name: David
MI:
Jr., Sr., etc:
Attention To / In Care Of:
Additional Address:
Street No: 27
Prefix Dir:
Street / Rural Route: Whaley
St Suffix: Ave
Post Dir:
UnitName:
Unit No:
Po Box No:
City/Town: East Aurora
State: NY
Zip Code: 14052-
Country: enter if not "USA"
Bar Cd:
Ownership: e.g. Life Use
Owner Type: P = Primary
Owner's Primary Residence

Click on folder to Open Window
1-13-15 9:43:26

A11 – 19 Whaley Avenue – Michael D. Pitt



RPS Version 4 - [Owner Update , Group - Administrator, Name - jamie]

164.20-7-29

Pitt, Michael D

19 Whaley Ave

142401 East Aurora **Active** R/S: **1** School: **East Aurora Un**

Roll Year: 2015 **Curr Yr** **1 Family Res** Land AV: **8,900**

Land Size: **100.00 x 158.26** Total AV: **66,600**

Total 2 Owners: To open, click the appropriate row (Right Click to Add)

Michael D Pitt Owner Type: **Primary** Desig Status:

Maria T Pitt Owner Type: **Additional** Desig Status:

Last Name / Company: Pitt

First Name: Michael

MI: D

Jr., Sr., etc:

Attention To / In Care Of:

Additional Address:

Street No: 19

Prefix Dir:

Street / Rural Route: Whaley

St Suffix: Ave

Post Dir:

UnitName:

Unit No:

Po Box No:

City/Town: East Aurora

State: NY

Zip Code: 14052-1728

Country: enter if not "USA"

Bar Cd:

Ownership: e.g. Life Use

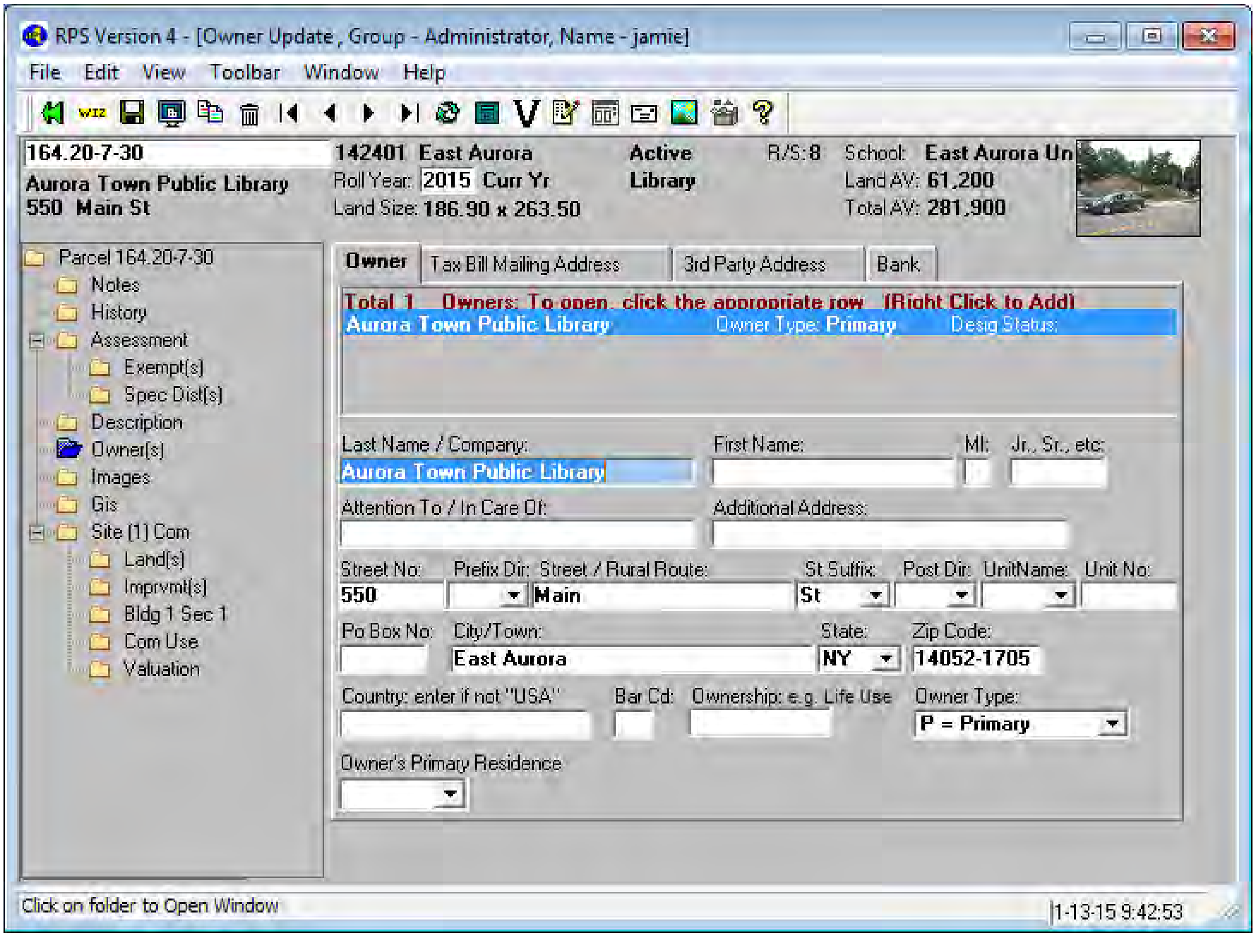
Owner Type: P = Primary

Owner's Primary Residence

Click on folder to Open Window

1-13-15 9:43:40

A12 – –550 Main St. – Aurora Town Public Library



164.20-7-30

Aurora Town Public Library
550 Main St

142401 East Aurora
Roll Year: 2015 Curr Yr
Land Size: 186.90 x 263.50

Active
Library

R/S: 8

School: East Aurora Un
Land AV: 61,200
Total AV: 281,900

Total 1 Owners: To open, click the appropriate row (Right Click to Add)

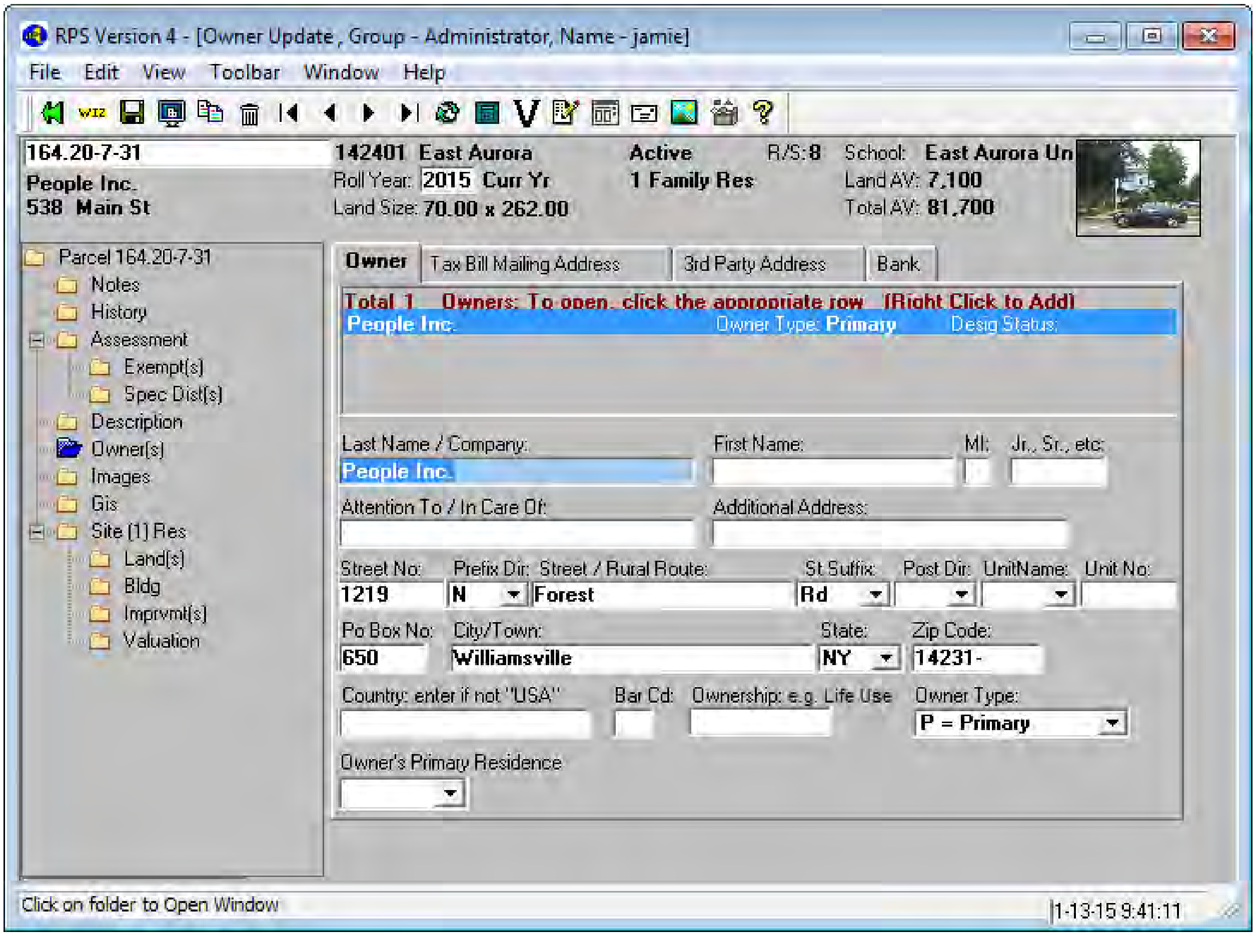
Aurora Town Public Library Owner Type: Primary Desig Status:

Last Name / Company: Aurora Town Public Library
First Name:
MI:
Jr., Sr., etc:
Attention To / In Care Of:
Additional Address:
Street No: 550
Prefix Dir:
Street / Rural Route: Main
St Suffix: St
Post Dir:
UnitName:
Unit No:
Po Box No:
City/Town: East Aurora
State: NY
Zip Code: 14052-1705
Country: enter if not "USA"
Bar Cd:
Ownership: e.g. Life Use
Owner Type: P = Primary
Owner's Primary Residence

Click on folder to Open Window

1-13-15 9:42:53

A13 – 538 Main St. – People Inc.



RPS Version 4 - [Owner Update , Group - Administrator, Name - jamie]

164.20-7-31
People Inc.
538 Main St

142401 East Aurora
Roll Year: 2015 Curr Yr
Land Size: 70.00 x 262.00

Active
1 Family Res
R/S: 8

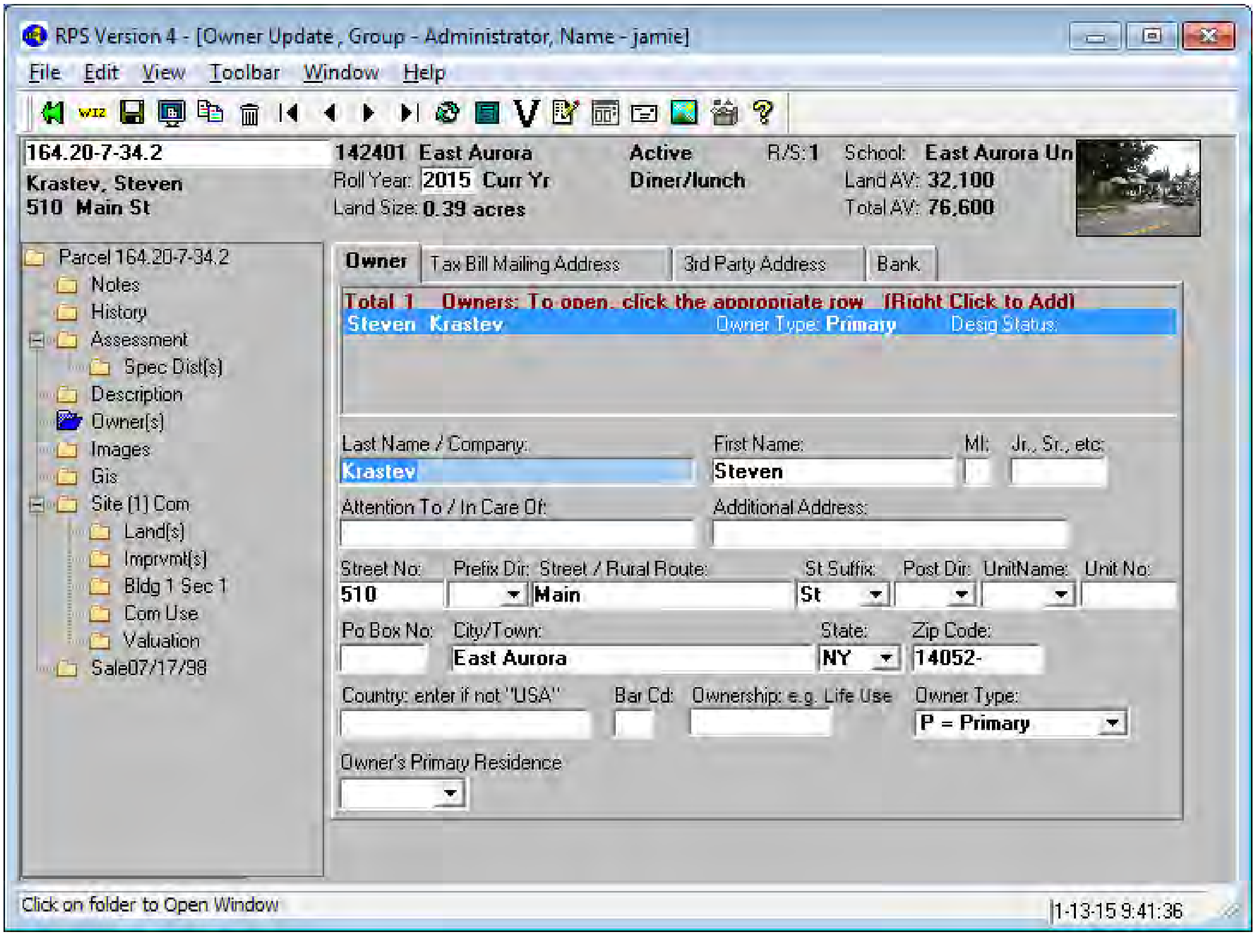
School: East Aurora Un
Land AV: 7,100
Total AV: 81,700

Total 1 Owners: To open, click the appropriate row (Right Click to Add)
People Inc. Owner Type: Primary Desig Status:

Last Name / Company: People Inc.
Street No: 1219
Prefix Dir: N
Street / Rural Route: Forest
St Suffix: Rd
Po Box No: 650
City/Town: Williamsville
State: NY
Zip Code: 14231-
Owner Type: P = Primary

Click on folder to Open Window
1-13-15 9:41:11

A14 – 510 Main St. – Steven Krastev



RPS Version 4 - [Owner Update , Group - Administrator, Name - jamie]

164.20-7-34.2
Krastev, Steven
510 Main St

142401 East Aurora **Active** R/S: **1** School: **East Aurora Un**
Roll Year: 2015 **Curr Yr** **Diner/lunch** Land AV: **32,100**
Land Size: **0.39 acres** Total AV: **76,600**

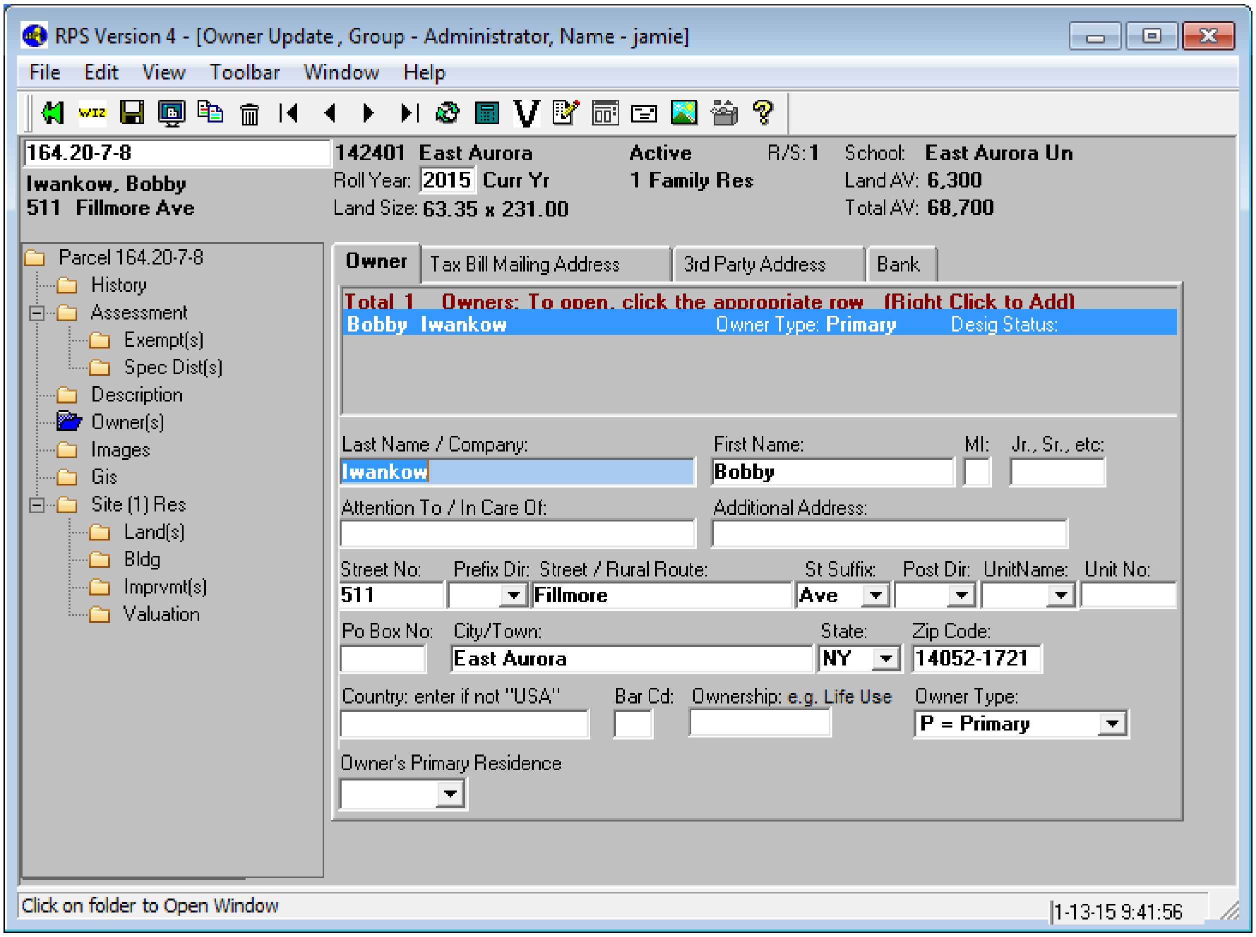
Total 1 Owners: To open, click the appropriate row (Right Click to Add)

Steven Krastev Owner Type: **Primary** Desig Status:

Last Name / Company: **Krastev**
First Name: **Steven**
MI:
Jr., Sr., etc:
Attention To / In Care Of:
Additional Address:
Street No: **510**
Prefix Dir:
Street / Rural Route: **Main**
St Suffix: **St**
Post Dir:
UnitName:
Unit No:
Po Box No:
City/Town: **East Aurora**
State: **NY**
Zip Code: **14052-**
Country: enter if not "USA"
Bar Cd:
Ownership: e.g. Life Use
Owner Type: **P = Primary**
Owner's Primary Residence

Click on folder to Open Window
1-13-15 9:41:36

A15 – 511 Fillmore Ave – Bobby Ikawankow



164.20-7-8

Iwankow, Bobby
511 Fillmore Ave

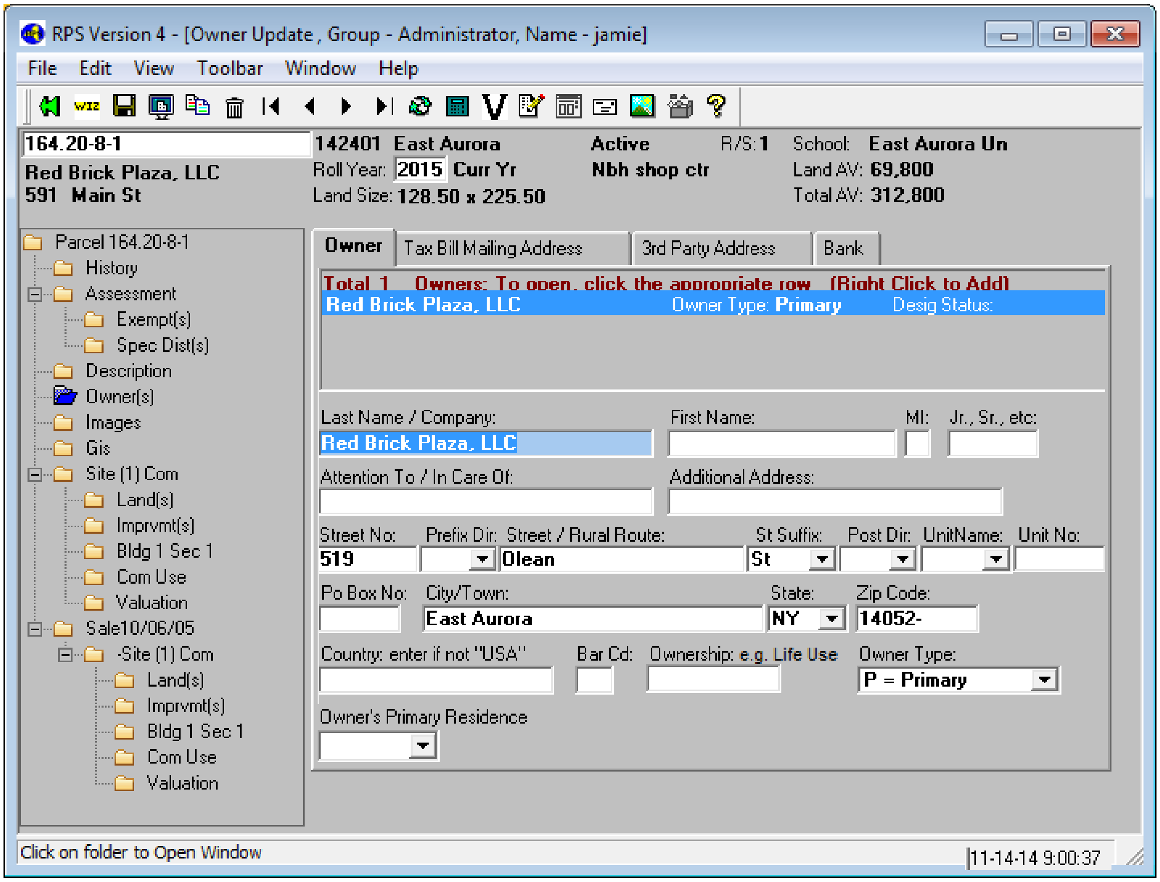
142401 East Aurora **Active** R/S: **1** School: **East Aurora Un**
Roll Year: 2015 **Curr Yr** **1 Family Res** Land AV: **6,300**
Land Size: **63.35 x 231.00** Total AV: **68,700**

Total 1 Owners: To open, click the appropriate row (Right Click to Add)
Bobby Iwankow Owner Type: **Primary** Desig Status:

Last Name / Company: **Iwankow**
First Name: **Bobby**
MI:
Jr., Sr., etc:
Attention To / In Care Of:
Additional Address:
Street No: **511**
Prefix Dir:
Street / Rural Route: **Fillmore**
St Suffix: **Ave**
Post Dir:
UnitName:
Unit No:
Po Box No:
City/Town: **East Aurora**
State: **NY**
Zip Code: **14052-1721**
Country: enter if not "USA"
Bar Cd:
Ownership: e.g. Life Use
Owner Type: **P = Primary**
Owner's Primary Residence

Click on folder to Open Window
1-13-15 9:41:56

A16 – 591 Main St. – Red Brick Plaza, LLC



164.20-8-1
Red Brick Plaza, LLC
591 Main St

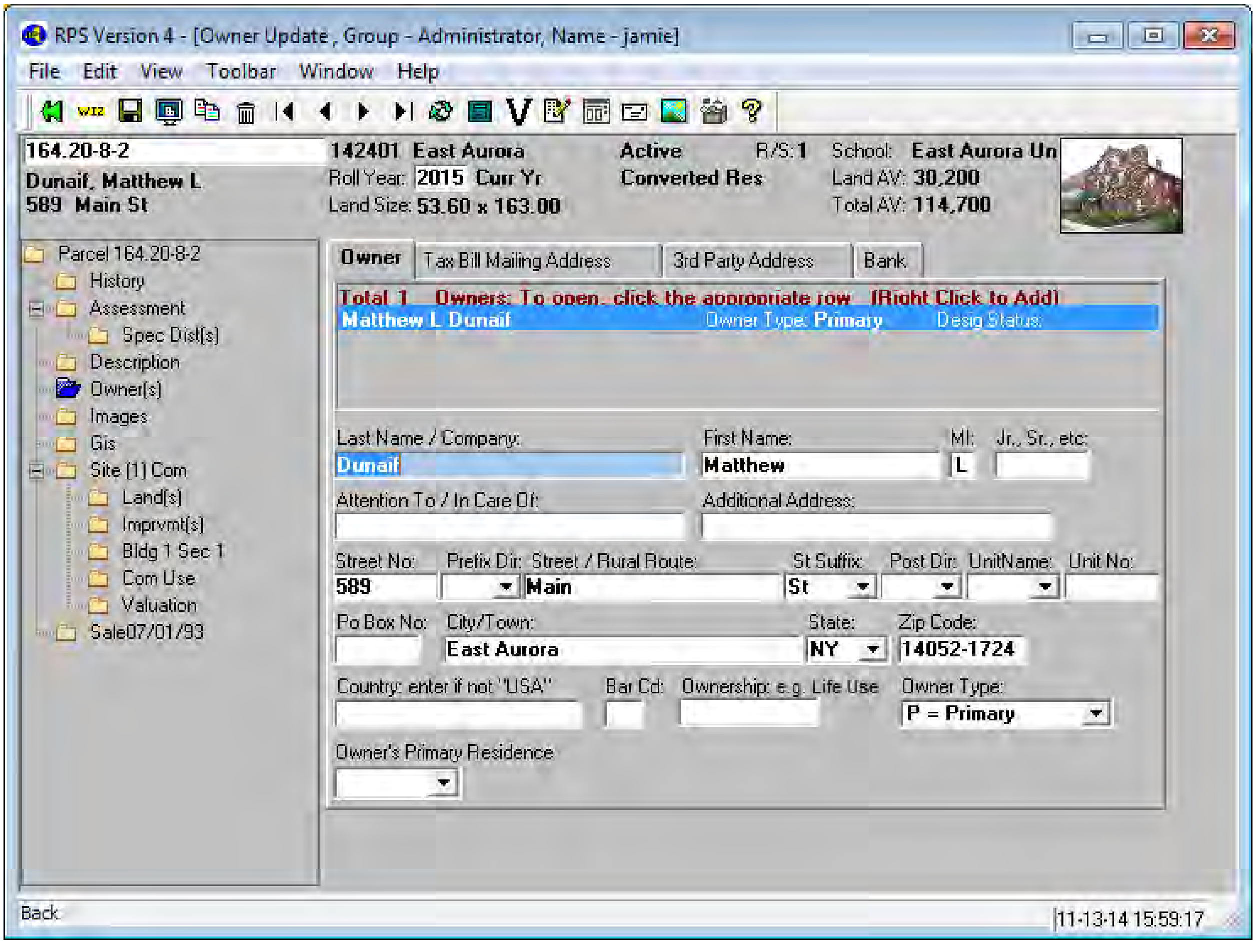
142401 East Aurora **Active** R/S: **1** School: **East Aurora Un**
Roll Year: **2015** **Curr Yr** **Nbh shop ctr** Land AV: **69,800**
Land Size: **128.50 x 225.50** Total AV: **312,800**

Total 1 Owners: To open, click the appropriate row (Right Click to Add)
Red Brick Plaza, LLC Owner Type: **Primary** Desig Status:

Last Name / Company: **Red Brick Plaza, LLC**
First Name:
MI:
Jr., Sr., etc:
Attention To / In Care Of:
Additional Address:
Street No: **519**
Prefix Dir:
Street / Rural Route: **Olean**
St Suffix: **St**
Post Dir:
UnitName:
Unit No:
Po Box No:
City/Town: **East Aurora**
State: **NY**
Zip Code: **14052-**
Country: enter if not "USA"
Bar Cd:
Ownership: e.g. Life Use
Owner Type: **P = Primary**
Owner's Primary Residence

11-14-14 9:00:37

A17 – 589 Main St. – Matthew Dunaif



RPS Version 4 - [Owner Update , Group - Administrator, Name - jamie]

164.20-8-2
Dunaif, Matthew L
589 Main St

142401 East Aurora
Roll Year: 2015 Curr Yr
Land Size: 53.60 x 163.00

Active
Converted Res
R/S: 1

School: East Aurora Un
Land AV: 30,200
Total AV: 114,700

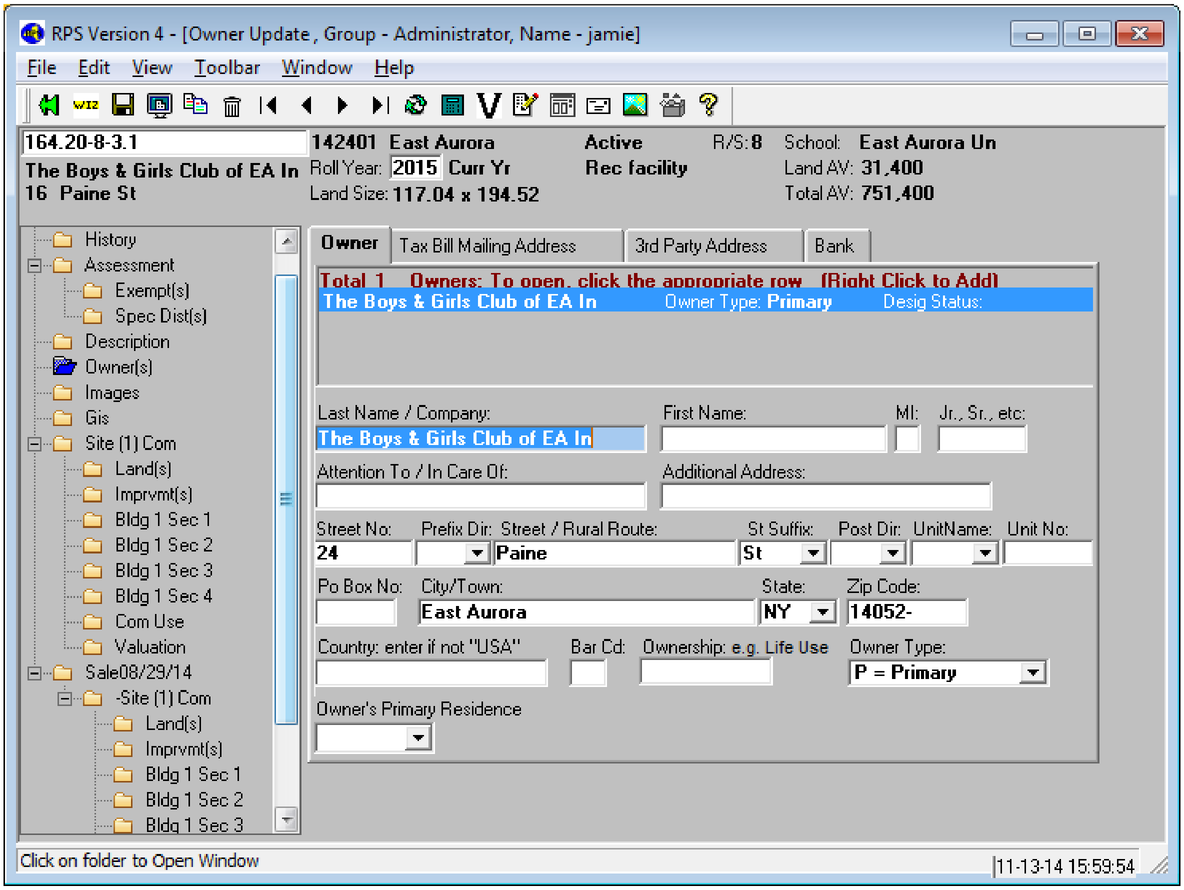
Total 1 Owners: To open, click the appropriate row (Right Click to Add)

Matthew L Dunaif Owner Type: Primary Desig Status:

Last Name / Company: Dunaif
First Name: Matthew
MI: L
Jr., Sr., etc:
Attention To / In Care Of:
Additional Address:
Street No: 589
Prefix Dir:
Street / Rural Route: Main
St Suffix: St
Post Dir:
UnitName:
Unit No:
Po Box No:
City/Town: East Aurora
State: NY
Zip Code: 14052-1724
Country: enter if not "USA"
Bar Cd:
Ownership: e.g. Life Use
Owner Type: P = Primary
Owner's Primary Residence

11-13-14 15:59:17

A18 – 16 Paine St. – The Boys & Girls Club of EA



164.20-8-3.1
The Boys & Girls Club of EA In
16 Paine St

142401 East Aurora
Roll Year: 2015 Curr Yr
Land Size: 117.04 x 194.52

Active R/S: 8
Rec facility

School: East Aurora Un
Land AV: 31,400
Total AV: 751,400

Total 1 Owners: To open, click the appropriate row (Right Click to Add)

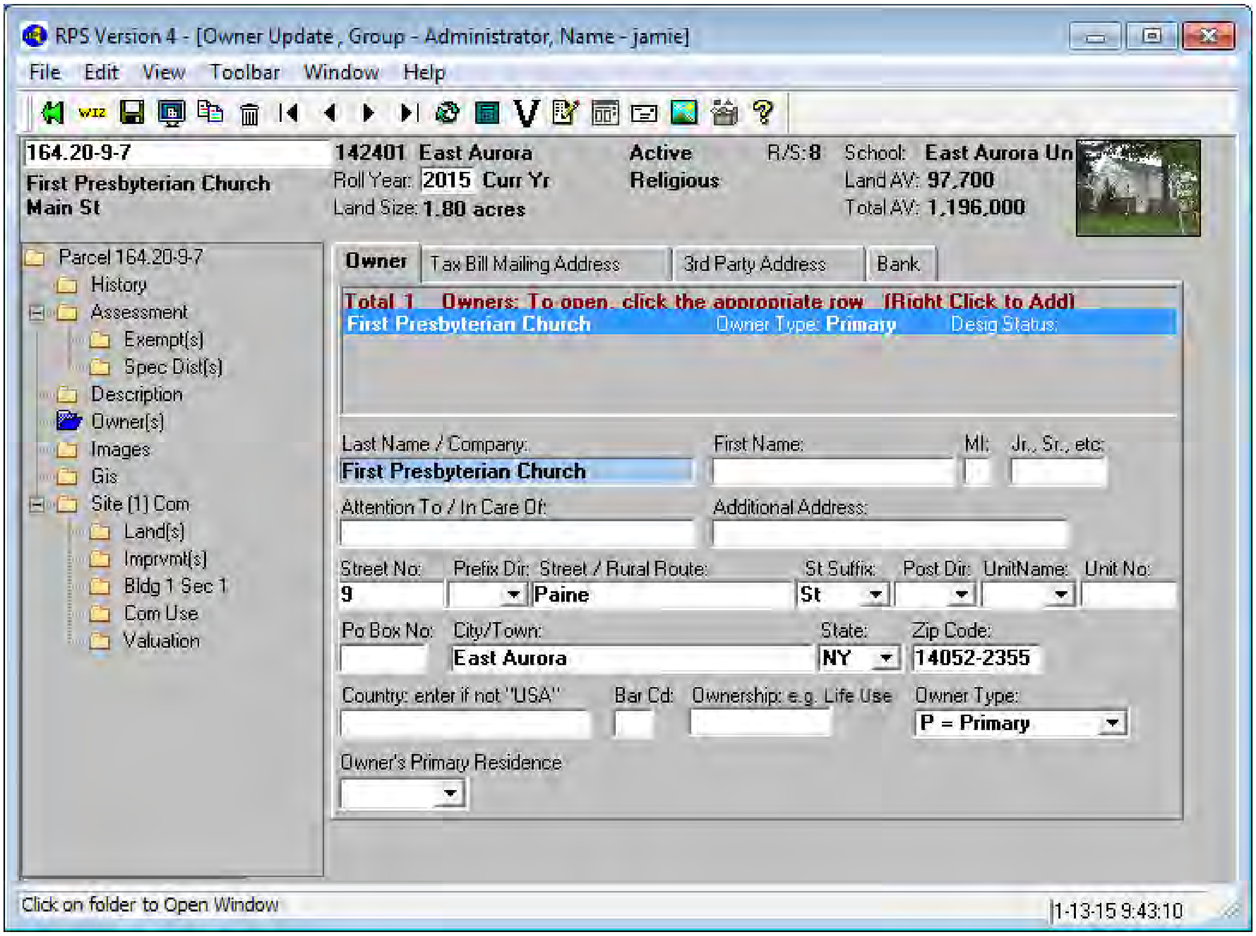
The Boys & Girls Club of EA In Owner Type: Primary Desig Status:

Last Name / Company: The Boys & Girls Club of EA In
First Name:
MI:
Jr., Sr., etc:
Attention To / In Care Of:
Additional Address:
Street No: 24
Prefix Dir:
Street / Rural Route: Paine
St Suffix: St
Post Dir:
UnitName:
Unit No:
Po Box No:
City/Town: East Aurora
State: NY
Zip Code: 14052-
Country: enter if not "USA"
Bar Cd:
Ownership: e.g. Life Use
Owner Type: P = Primary
Owner's Primary Residence

Click on folder to Open Window

11-13-14 15:59:54

A19 – 9 Paine St. – First Presbyterian Church



RPS Version 4 - [Owner Update , Group - Administrator, Name - jamie]

164.20-9-7
First Presbyterian Church
Main St

142401 East Aurora **Active** R/S: **8** School: **East Aurora Un**
Roll Year: **2015 Curr Yr** **Religious** Land AV: **97,700**
Land Size: **1.80 acres** Total AV: **1,196,000**

Total 1 Owners: To open, click the appropriate row (Right Click to Add)
First Presbyterian Church Owner Type: **Primary** Desig Status:

Last Name / Company: **First Presbyterian Church**
First Name:
MI:
Jr., Sr., etc:
Attention To / In Care Of:
Additional Address:
Street No: **9**
Prefix Dir:
Street / Rural Route: **Paine**
St Suffix: **St**
Post Dir:
UnitName:
Unit No:
Po Box No:
City/Town: **East Aurora**
State: **NY**
Zip Code: **14052-2355**
Country: enter if not "USA"
Bar Cd:
Ownership: e.g. Life Use
Owner Type: **P = Primary**
Owner's Primary Residence

Click on folder to Open Window
1-13-15 9:43:10

B

Record of Decision

B1 – 1997 Record of Decision

Department of Environmental Conservation

Division of Environmental Remediation

Record of Decision

Mr. C's Dry Cleaners Site
East Aurora (V), Erie County
Site Number 9-15-157

March 1997

New York State Department of Environmental Conservation
GEORGE E. PATAKI, *Governor* JOHN P. CAHILL, *Acting Commissioner*

DECLARATION STATEMENT - RECORD OF DECISION

Mr. C's Dry Cleaners Inactive Hazardous Waste Site
East Aurora (V), Erie County, New York
Site No. 9-15-157

Statement of Purpose and Basis

The Record of Decision (ROD) presents the selected remedial action for the Mr. C's Dry Cleaners inactive hazardous waste disposal site which was chosen in accordance with the New York State Environmental Conservation Law (ECL). The remedial program selected is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300).

This decision is based upon the Administrative Record of the New York State Department of Environmental Conservation (NYSDEC) for the Mr. C's Dry Cleaners Inactive Hazardous Waste Site and upon public input to the Proposed Remedial Action Plan (PRAP) presented by the NYSDEC. A bibliography of the documents included as a part of the Administrative Record is included in Appendix B of the ROD.

Assessment of the Site

Actual or threatened release of hazardous waste constituents from this site, if not addressed by implementing the response action selected in this ROD, presents a current or potential threat to public health and the environment.

Description of Selected Remedy

Based upon the results of the Remedial Investigation/Feasibility Study (RI/FS) for the Mr. C's Dry Cleaners Site and the criteria identified for evaluation of alternatives the NYSDEC has selected In-situ Treatment of Groundwater with System Expansion to Remediate Source Area Soil. The components of the remedy are as follows:

1. Installation of up to 8 in-situ air stripping wells along the axis of the source plume, associated piping necessary to convey the VOC vapors drawn from the wells to the carbon treatment location, and the installation of one additional in-situ well adjacent to the Mr. C's building to remove the suspected source material, The conceptual plan for this system is shown on Figure 4 of the ROD.

2. The stripping wells and air treatment system would be operated, maintained and monitored. The system would remain in operation until the identified exposure pathways have been eliminated and the contamination in the source plume have been reduced to levels consistent with groundwater outside the source plume.

3. Continued operation and maintenance of the indoor air filters, including periodic monitoring.

4. Continued monitoring of residential irrigation wells.

5. A monitoring program would be instituted to allow the effectiveness of the selected remedy to be monitored and would be a component of the operation and maintenance for the site.

New York State Department of Health Acceptance

The New York State Department of Health concurs with the remedy selected for this site as being protective of human health.

Declaration

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

3/27/97
Date

Michael J. O'Toole
Michael J. O'Toole, Jr., Director
Division of Hazardous Waste Remediation

TABLE OF CONTENTS

SECTION PAGE

RECORD OF DECISION

Mr. C's Dry Cleaners Site
Village of East Aurora, Erie County, New York
Site No. 9-15-157
March 1997

SECTION 1: SITE LOCATION AND DESCRIPTION

The Mr. C's Dry Cleaners Site, is located at 586 Main Street in the Village of East Aurora, New York (see Figures 1 and 2). The half acre property includes a one floor building on a concrete slab foundation and an adjacent paved parking lot. Mr. C's Dry Cleaners, Inc., has operated the dry cleaning business at the site since 1974. The surrounding area is a mix of light commercial, municipal, and residential development. All properties are served with public water from the Erie County Water Authority. The site is situated over highly conductive saturated sand and gravel glacial outwash deposits approximately 16 to 21 feet thick.

The site is also adjacent to Agway Energy Product, the location of a petroleum spill discovered in 1987. The groundwater contamination caused by this spill has commingled with the contamination from the Mr. C's Dry Cleaners site in the area immediately to the west and northwest of the site.

Other petroleum spill sites are also present in the area, one at the Delia Automobile dealership, which was identified during this investigation and is currently undergoing a separate investigation under the NYSDEC Oil Spills program. A 1987 petroleum spill at the Cumberland Farms gas station located 900 feet west of Mr. C's was also identified, however, there are no impacts to the Mr. C's study area from this site.

SECTION 2: SITE HISTORY

2.1: Operational/Disposal History

The existing building used by Mr. C's Dry Cleaners is believed to have been built around 1927, has been used as a dry cleaner since prior to 1970. It has been operated as Mr. C's since 1974. Environmental investigations began in October 1991 when chemical odors were detected in the basement of the First Presbyterian Church, which is located diagonally across Main Street from Mr. C's.

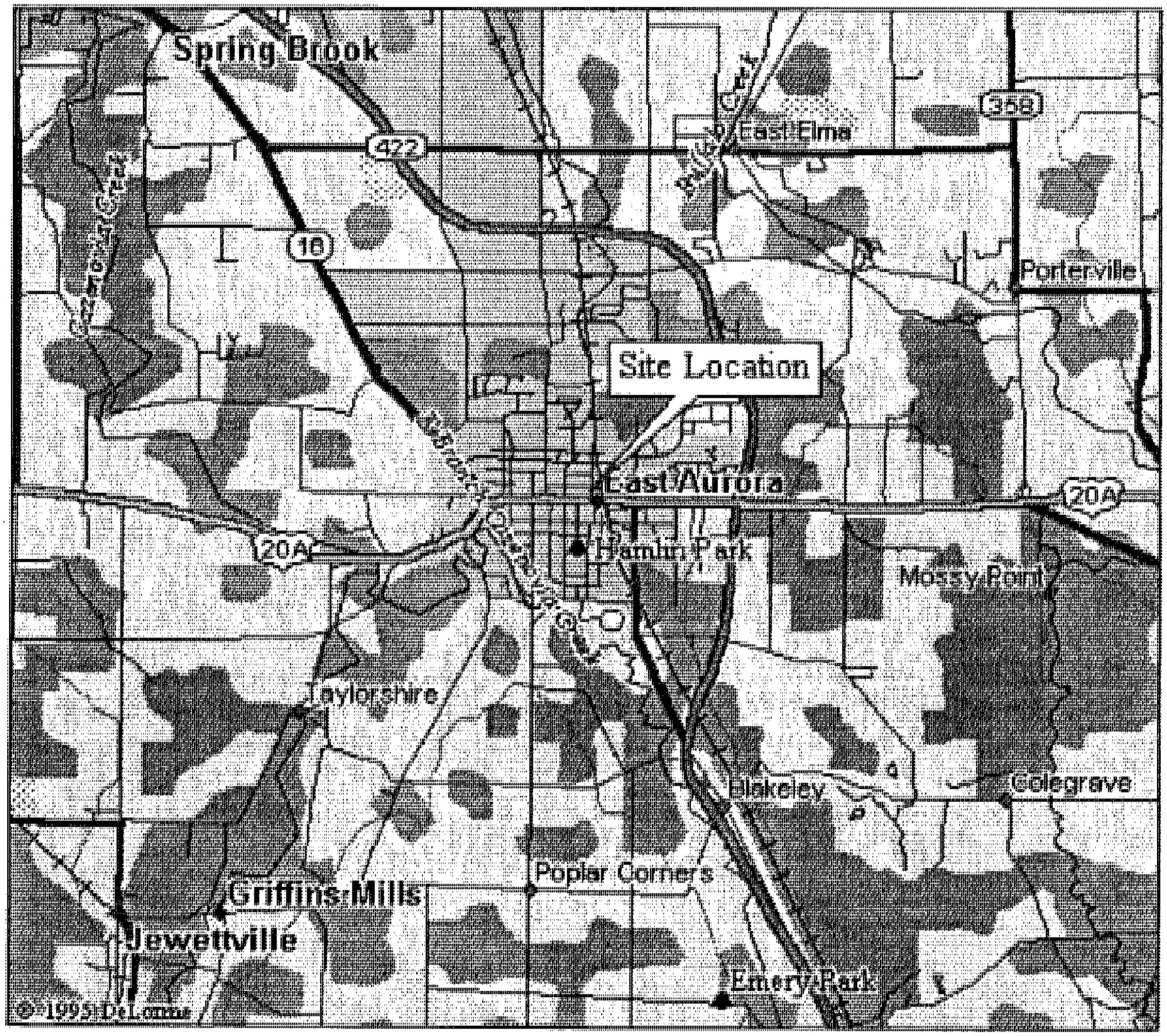
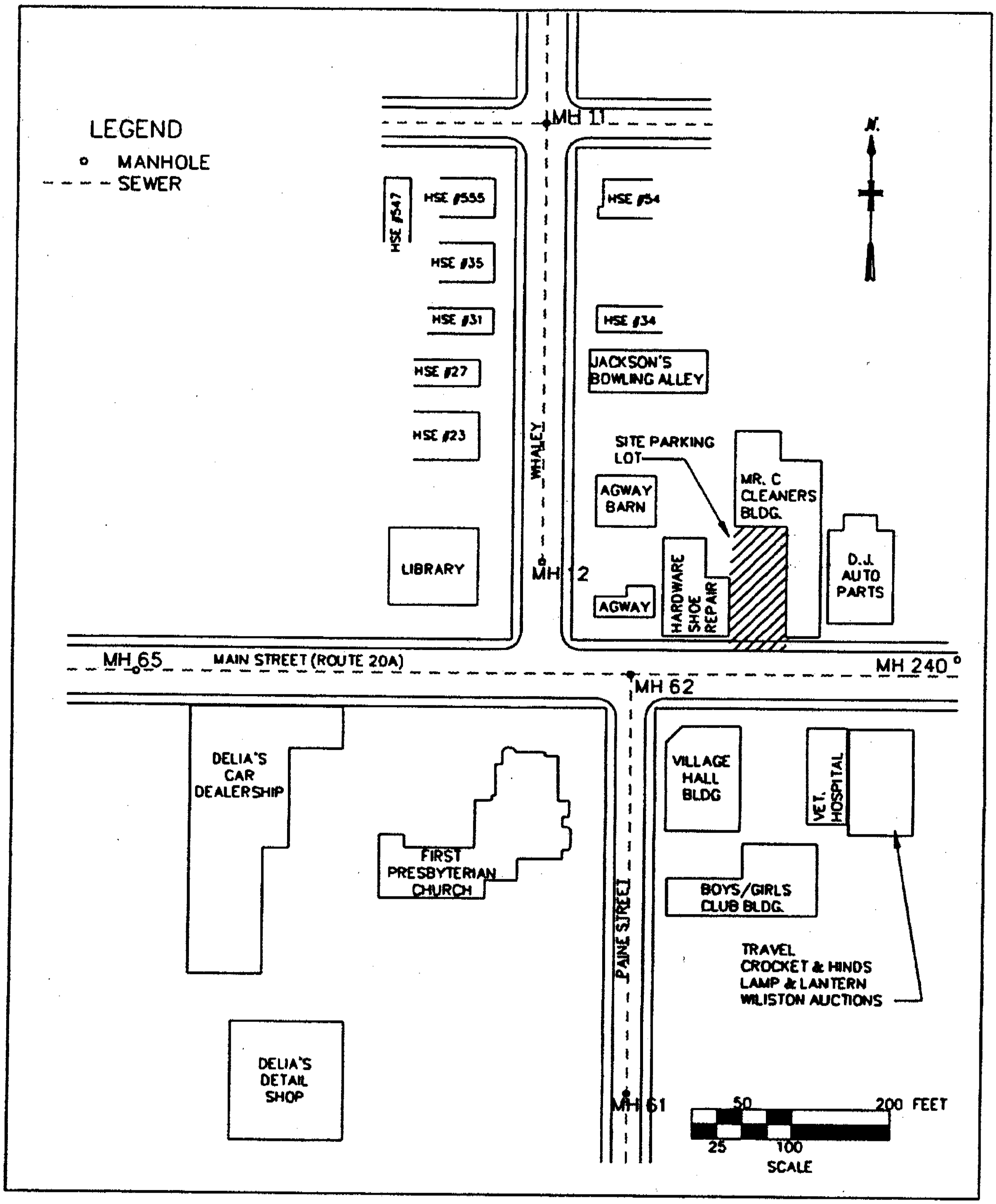

Spring Brook
422
358
East Elma
18
Porterville
Site Location
East Aurora
20A
20A
Hamlin Park
Mossy Point
Taylorshire
Blakeley
Colegrave
Poplar Corners
Griffins Mills
Jewettville
Emery Park
© 1995 DeLorme

Figure 1



MR C CLEANERS
FEASIBILITY STUDY

SITE VICINITY MAP

NYSDEC OCTOBER 1995
DIVISION OF HAZARDOUS WASTE REMEDIATION

Figure 2

Dry cleaning operations at Mr. C's use a cleaning solvent comprised of predominantly tetrachloroethene also known as perchloroethene (PCE). All dry cleaning wastes have been disposed of through a commercial waste disposal firm since 1985. Prior to 1985, it is reported that sludge and filters were placed into a dumpster located behind the hardware store building and collected by the Village of East Aurora.

Wastes generated during dry cleaning that contain residual solvent include cartridge filters used to remove solids from used cleaning solvent, sludge residue from the distillation of used cleaning solvent, and wastewater generated during the distillation of used solvent.

Potential mechanisms of release of PCE include possible past practices of disposing of wastes in sewers or on the grounds, leaks from the dumpster where sludge and filters were disposed, and various incidental discharge from the dry cleaning process including the possibility of spillage of solvents during the changeover of equipment. Solvents disposed of into the sewers may have leaked into the soils due the age and reported poor condition of the sewers in this section of East Aurora.

2.2: Remedial History

Oct. 1991: Odors were detected in the basement of the First Presbyterian Church. After preliminary investigations by members of the Church, the NYSDEC was notified and the incident was assigned Spill No. 9109437. Indoor air sampling conducted by the State confirmed PCE contamination within the basement area of the church. Based on this sampling, a ventilation system was installed which reduced the air contaminant levels to well below the NYSDOH guidance value for PCE in residential indoor air.

Jan. - Mar. 1992: Sanitary sewer sampling was conducted by the DEC during three separate sampling events. The highest levels of PCE contamination were detected immediately down stream of the service lateral for the Mr. C's building, indicating Mr. C's as the likely source of the contamination.

Apr. - July 1992: Environmental site assessment performed including a soil gas survey and the installation of six monitoring wells for groundwater samples. Groundwater contamination was confirmed to be migrating from the Mr. C's property into the residential area to the west.

Nov. 1993 - June 1995: Phased Remedial Investigation to determine the full nature and extent of contamination and to identify completed exposure pathways for both the environment and human health.

June 1996: As part of the on-going periodic indoor air sampling conducted by the NYSDOH, basement air samples were collected from four homes along Whaley Avenue.

Sept. 1996: Results from the June sampling were received and indicated two of the homes contained levels approaching or slightly above the NYSDOH guidance value for PCE in residential indoor air of 100 mg/m^3. NYSDOH recommends action to address indoor air in the homes on Whaley Avenue. A decision was made to install indoor air cleaners at two impacted homes as an Interim Remedial Measure (IRM).

Nov. 1996: Feasibility Study completed.

Jan 1997: Portable indoor air cleaners equipped with carbon filters are to be installed in the basements of two homes along Whaley Avenue to address indoor air contamination.

SECTION 3: CURRENT STATUS

In response to a determination that the presence of hazardous waste at the Site presents a significant threat to human health and the environment, the NYSDEC has recently completed a Remedial Investigation/Feasibility Study (RI/FS).

3.1: Summary of the Remedial Investigation

The purpose of the RI was to define the nature and extent of any contamination resulting from past activities at Mr. C's Dry Cleaners.

The RI was conducted in two phases. Phase I was performed during November 1993 to June 1994. Phase II was performed during December 1994 to June 1995. A final report entitled Remedial Investigation Report - Mr. C's Dry Cleaners Superfund Site dated June 1995 has been prepared. This report describes in detail the field activities and the findings of the RI.

Additional information on the hydrogeologic properties at the site were necessary, therefore aquifer pumping tests were recommended. The pump tests were conducted during August and September, 1995. The field activities and results of the pumping tests are provided in detail in the report entitled Remedial Investigation Report Addendum A: Aquifer Testing Report - Mr. C's Dry Cleaners Superfund Site.

The Phase I RI included the following activities:

- Review of past studies and other available information.
- Quantitative soil gas survey to estimate extent of groundwater contamination.
- Selection of monitoring well locations based on results of the soil gas survey.
- Drilling and soil sampling at four deep exploratory soil borings.
- Shallow soil sampling at two locations near the suspected source area.
- Waste water and sediment sampling from sanitary sewers.

- Indoor air sampling at select locations
- Drilling, installation, and development of 12 monitoring wells.
- In situ hydraulic conductivity testing of 25 monitoring wells
- Monitoring of groundwater levels and survey of well locations and elevations.
- Groundwater sampling from 25 monitoring wells.

The Phase II RI included the following activities:

- Collection of 31 groundwater samples from specific depths using a Hydropunch® sampler and immediate on site analysis.
- Drilling, installation, and development of 6 monitoring wells based on the results of the Hydropunch® sampling.
- In situ hydraulic conductivity testing of the 6 monitoring wells.
- Monitoring of groundwater levels and survey of new monitoring wells.
- Groundwater sampling.
- Indoor air sampling at select locations.

To determine which media (soil, groundwater, etc.) contain contamination at levels of concern, the RI analytical data was compared to environmental Standards, Criteria, and Guidance (SCGs). Groundwater, drinking water and surface water SCGs identified for the Mr. C's Dry Cleaners site were based on NYSDEC Ambient Water Quality Standards and Guidance Values and Part V of NYS Sanitary Code. NYSDEC TAGM 4046 soil cleanup guidelines for the protection of groundwater, background conditions, and risk-based remediation criteria were used as SCGs for soil. NYSDOH guidance value for PCE in residential indoor air was used to assess the risks posed by indoor air impacts resulting from contaminated groundwater.

Based upon the results of the remedial investigation in comparison to the SCGs and potential public health and environmental exposure routes, certain areas and media of the site require remediation. These are summarized below. More complete information can be found in the RI Report.

Chemical concentrations are reported in parts per billion (ppb) and parts per million (ppm). For comparison purposes, SCGs are given for each media where applicable.

3.1.1 Nature of Contamination:

As described in the RI Report, soil gas, soil, groundwater and waste water samples were collected at the Site to characterize the nature and extent of contamination. The primary contaminants of concern, and those which first brought the site to the attention of the NYSDEC are volatile organic compounds (VOC). Specifically, the compound perchloroethene (PCE), also known as tetrachloroethene, has consistently been detected in all media sampled at the site. PCE naturally degrades to trichloroethylene (TCE), 1,2 Dichloroethene (1,2 DCE), 1,1 Dichloroethene (1,1 DCE), and vinyl chloride, all of which have also been detected in samples collected at the site.

VOC contamination associated with petroleum products has also been found at specific locations near the site, namely in the vicinity of the Agway property to the northwest and near the Delia car dealership. Compounds detected include benzene, toluene, ethylbenzene, and xylene. In both cases, the contamination can be attributed to known petroleum spills at the named properties. There are areas where both the compounds from the dry cleaning operation and those from the petroleum spills have mixed to create a complex groundwater contamination plume.

3.1.2 Extent of Contamination

Table 1 summarizes the extent of contamination for the contaminants of concern in the groundwater, soil and waste water from the sewers and compares the data with the proposed remedial action levels (SCGs) for the Site. The following are the media which were investigated and a summary of the findings of the investigation.

Soil

A soil gas investigation was performed immediately adjacent to the Mr. C's Dry Cleaners in the parking area, designed to identify source areas of highly contaminated soil. Results indicated that PCE concentrations were below levels that would suggest such a source, except in the area of the sewer lateral and at one location on the west side of the parking area adjacent to the shoe repair building. Therefore, soil samples were collected only at those two locations. These samples were collected to determine if a source of PCE remained above the water table. Such a source typically migrates directly downward until it reaches the water table, then is partially dissolved and moves with the regional groundwater flow. Therefore any PCE or break down product contamination found in areas other than the source would be the result of contaminant migration within the groundwater, so wide spread soil sampling was not warranted for this project.

Two soil samples were collected at the first location adjacent to the sewer lateral from soil boring SB-1 at depths of 6-8' and 8-10' below ground surface. The highest concentration of PCE was detected at 6-8' at 48,000 ppb indicating that past leakage from the sewer lateral is the likely source of the contamination. The 8-10' sample contained 6400 ppb of PCE.

The sample analyzed from SB-2 (west side of parking area) was from 8-10' below ground surface and contained 12,000 ppb of PCE. Because the groundwater table is near 10 feet and rises and falls throughout the seasons, the concentrations of PCE in unsaturated soil are likely contaminating the soil from PCE dissolved in the groundwater as explained above.

The levels of PCE identified in the soil are well above the TAGM 4046 level for the protection of groundwater, which is 1400 ppb.

Groundwater

Groundwater exists within the glacial outwash sand and gravel deposits and within the lacustrine fine sands and silt. These two units are hydrogeologically connected yet exhibit distinctly different hydraulic properties. This groundwater is also known as the water table aquifer. It is free to rise and fall seasonally as it directly receives the portion of precipitation that infiltrates into the soil. Flow directions are relatively simple to determine through measurement of the water table in monitoring wells. Flow direction is from areas of higher water table to areas of lower water table. The outwash sand and gravel is highly variable within the study area and generally highly productive for groundwater with an average hydraulic conductivity of 8.6×10^{-3} cm/sec. This unit is encountered at approximately 10' below ground surface with a saturated thickness of 16-21'. Although residents are served with municipal water for domestic use, there are several wells in the area used for outdoor use, such as gardens and lawns, that draw water from this aquifer. Groundwater flow velocity within the outwash aquifer has been calculated to be .29-.39 ft/day.

The next deeper unit, the lacustrine fine sand and silt unit, is more uniform than the outwash unit above and is less productive for groundwater with an average hydraulic conductivity of 2.8×10^{-4} cm/sec. This unit is directly beneath the outwash unit at a depth of approximately 30 feet below ground surface and with a saturated thickness of 11-14'. Due to the lower hydraulic conductivity and lower hydraulic gradient, groundwater velocity within this unit is only .007 ft/day.

During the RI, 63 groundwater samples were collected from 40 locations across the study area and analyzed for VOCs. Three of the samples were analyzed for the complete Target Compound List (TCL) to determine if contamination other than VOCs existed in the groundwater. No other compounds of concern were identified except those associated with petroleum in the oil spill areas described above. Significant concentrations of PCE or PCE break down products were identified throughout the saturated portion of the outwash unit. PCE concentrations are generally in the 100 to 500 ppb range in the upper outwash, and at much higher concentrations at the base of the outwash, up to 8,200 ppb. Although the outwash and lacustrine units are hydraulically connected, contamination is primarily within the outwash unit, with the high concentrations extending all the way to the base of the outwash aquifer. PCE was only detected in 3 of 8 groundwater samples collected from the lacustrine unit at much lower concentrations, ranging from 11 ppb to 460 ppb.

The groundwater contamination plume has been defined as extending from the Mr. C's Dry Cleaners building to the west in two distinct branches in the upper portion of the outwash aquifer. The primary direction is to the northwest extending across the Agway property between the vacant Energy Products building and the current Agway store. The plume crosses under Whaley Avenue, behind the Town of Aurora Public Library, continuing approximately another 300 to 400 feet to the northwest. This branch of the plume is considered the source plume, and it will be referred to as such throughout the remainder of this document. It is generally defined as the area containing greater that 1000 ppb of PCE in the groundwater. As the plume moves further from the source area, the highest concentrations of PCE are found deeper in the outwash unit, which is explained by the fact that PCE is heavier than water and tends to slowly sink in an aquifer.

The second branch of the plume extends from the source area to the southwest to slightly beyond the First Presbyterian Church. Concentrations of PCE and breakdown products in the groundwater were generally in the 100 to 300 ppb range, significantly lower than found in the source plume described above. The extent of these plumes is shown on Figure 3. Unlike the source plume described above, the contaminants within this plume are found only in the upper portion of the outwash aquifer.

Waste Water/Sanitary Sewer

Since the suspected path for PCE to have been distributed into the environment was through the sanitary sewer system, samples of the waste water were collected to determine if any residual PCE remained in the sewers, or if any current sources existed. Trace levels of PCE, less than 5 ppb, were detected in the waste water. These extremely low levels indicate that PCE likely did not remain in the sewer, and there is no current source. Other VOCs, including acetone, benzene, xylene, toluene, and chloroform were detected throughout the section of sewer system sampled. However, the low levels detected of these VOC could reasonably be expected given the commercial setting of the area, and therefore are not considered associated with the site.

There were no sediments that could be sampled for analysis in the sewers.

3.2 Interim Remedial Measures:

Interim Remedial Measures (IRMs) are conducted at sites when a source of contamination or exposure pathway can be effectively addressed before completion of the RI/FS.

Based on the fact that the source plume extends under Whaley Avenue and elevated levels of PCE were found in soil gas samples collected in the Whaley Avenue area, four homes were sampled to identify any impacts to indoor air.

Table 1
Nature and Extent of Contamination

MEDIA	CLASS	CONTAMINANT OF CONCERN	CONCENTRATION RANGE	FREQUENCY OF EXCEEDING SCGs	SCG (ppb)
Groundwater	Volatile Organic Compounds (VOCs)	Tetrachlorothene	1 to 8200	30/47	5
		Trichloroethene	1 to 280	16/47	5
		1,2 Dichloroethene (T)	1 to 82	18/47	5
		1,1 Dichloroethene	2 to 19	2/47	5
		Vinyl Chloride	6 to 240	3/47	2
		1,1,1 Trichloroethane	4 to 14	2/47	5
		Methylene Chloride	11 to 120	4/47	5
		Benzene	1 to 3200	14/47	5
		Toluene	2 to 740	6/47	5
		Ethylbenzene	3 to 430	5/47	5
		Xylene	6 to 1900	5/47	5
Soil		Tetrachloroethene	6400 to 48,000	3/3	1400

The need for an IRM was identified in September 1996 by the NYSDOH based upon elevated concentration of PCE in indoor air from two of the four houses sampled on Whaley Avenue. After consideration of the available options, it was decided to provide indoor air filtration units at the two impacted homes. These homes have been impacted by PCE vapors volatilizing from the water table into the basements at concentration levels above the NYSDOH guidance of 100 mg/m^3, creating a human exposure pathway due to contaminated indoor air. Portable room air cleaners equipped with carbon filtration systems have been installed in the basements to remove the PCE, as well as any other VOCs such as the potential PCE break down products, from the air in the basement. Since the basement is the point of entry for the contaminated air, these units will be effective at eliminating the exposure pathway throughout the homes.

Periodic monitoring of the indoor air will continue. The air cleaners will remain in place until the proposed remedy has reduced the groundwater contaminant levels to the point that impacts to indoor air no longer occur. Several rounds of confirmatory indoor air sampling will be conducted prior to any decision to remove the air cleaners.

3.3 Summary of Human Exposure Pathways:

This section describes the types of human exposures that may present added health risks to persons at or around the site. A more detailed discussion of the health exposures can be found in Section 6 of the RI Report and summarized in Section 1.3.6 of the Feasibility Study (FS).

An exposure pathway is how an individual may come into contact with a contaminant. The five elements of an exposure pathway are 1) the source of contamination; 2) the environmental media and transport mechanisms; 3) the point of exposure; 4) the route of exposure; and 5) the receptor population. These elements of an exposure pathway may be based on past, present, or future events Completed pathways which are known to or may exist at the site include the incidental ingestion or dermal contact of groundwater or the inhalation of vapor phase chemicals from the groundwater. There is also the potential for utility/construction workers be exposed either though incidental ingestion or dermal contact with contaminated soils, as well as the potential for anyone to be exposed to vapor phase chemicals volatilizing from contaminated soil. Table 2 provides a summary of the pathways considered complete for the site.

The groundwater in the area is classified by the NYSDEC as GA (best usage, drinking water), although not currently used as such. While all residents in the area are served with municipal water from the Erie County Water Authority as a source of potable water, several residents in the area currently use water from this aquifer for outdoor activities such as gardening or washing automobiles. Low level contamination has been found in some of these wells and the property owners have been advised by the NYSDOH regarding appropriate precautions.

TABLE 2

MR. C CLEANERS SUPERFUND SITE
EXPOSURE PATHWAY ANALYSIS

IDENTIFICATION OF PATHWAYS CONSIDERED COMPLETE

Exposure Medium/ Exposure Route	Site Occupants and Visitors	Utility Workers/ Construction Workers	Off-Site Population[1]
Groundwater:			
Incidental Ingestion	-	A	C, L
Dermal Contact	-	A	C, L
Inhalation of Vapor Phase Chemicals	A	A	C, L
Subsurface Soil:			
Incidental Ingestion	-	A	-
Dermal Contact	-	A	-
Inhalation of Vapor Phase Chemicals	A	A	C, L

Notes:

A = *Exposure to adults only*

C = *Exposure in children may be significantly greater than in adults*

L = *Lifetime Exposure*

(1) *Indicates adjacent commercial occupants, adjacent visitors and off-site residents.*

\- = *Exposure in this population via this route is not likely to occur.*

Another potential route of exposure exists for site or utility workers who may be exposed during excavation or subsurface maintenance activities in the area of the Mr. C's building, via inhalation of vapors or airborne particulates while working in the area.

3.4 Summary of Environmental Exposure Pathways:

This section summarizes the types of environmental exposures which may be presented by the site. The RI and previous investigations did not identify any environmental exposure pathways for the environmental resources in close proximity to the site. The nearest surface water body is Tannery Brook located approximately 1/4 mile north of the site. Tannery Brook receives the surface water drainage from the study area, eventually discharging into Cazenovia Creek to the southwest, which in turn discharges to Lake Erie approximately 12.5 miles west of the site. Cazenovia Creek is located approximately 1 mile south of the site. Based on the results of the RI, groundwater is the only potential ecological exposure pathway associated with the site. The defined groundwater contaminant plume indicates that contamination is not reaching either surface water body and therefore there are no impacts to Tannery Brook or Cazenovia Creek from the site have been identified at this time.

SECTION 4: ENFORCEMENT STATUS

The Potential Responsible Party (PRP) for the site, documented to date, include: Mr C's Cleaners, currently owned by Mr. John Crawford.

The PRP was unable to implement the RI/FS at the site when requested by the NYSDEC. After the remedy is selected, the PRPs will again be contacted to assume responsibility for the remedial program. The PRP is subject to legal actions by the State for recovery of all response costs the State has incurred. If an agreement cannot be reached with the PRPs, the NYSDEC will evaluate the site for further action under the State Superfund

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SECTION 5: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10. The overall remedial goal is to meet all Standards, Criteria, and Guidance (SCGs) and be protective of human health and the environment.

At a minimum, the remedy selected should eliminate or mitigate all significant threats to the public health and to the environment presented by the hazardous waste disposed at the site through the proper application of scientific and engineering principles.

The goals selected for this site are:

- Mitigate human health risk by reducing the potential for inhalation of vapors in on-site and off-site basements.
- Mitigate the source area of the contaminant plume to prevent further migration of the chlorinated volatile organic compounds and reduce volatilization into adjacent basements.
- Achieve NYSDEC groundwater quality standards to the extent practical.

SECTION 6: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy should be protective of human health and the environment, be cost effective, comply with other statutory laws and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. Potential remedial alternatives for the Mr. C's Dry Cleaners Site were identified, screened and evaluated in a Feasibility Study. This evaluation is presented in the report entitled "Feasibility Study Report - Mr. C's Dry Cleaners Site", November 1996.

The Risk Assessment determined that potential and current exposures routes to contaminants associated with the site are directly attributable to the distribution of contaminated groundwater or the suspected source located under the building and sewer lateral. Therefore, during the development of the RAOs, it was determined that the RAOs would be achieved through remediation of the groundwater and the suspected source.

Two scenarios for the mitigation of groundwater contamination were identified that would meet the RAOs. Scenario 1 would actively remediate that portion of the groundwater contamination plume that exhibits the highest concentration of PCE (i.e., the source plume), generally concentrations greater than 1,000 ppb, while PCE concentrations less than 1,000 ppb would disperse and degrade naturally by actively eliminating further contributions of contaminants from the source area.

Scenario 2 would actively remediate PCE contaminated groundwater in the source plume area as well as the portion of the plume with concentrations less than 1,000 ppb. Groundwater remedial actions would be located to address all areas that have currently been identified as having completed exposure pathways, or where exposure had been identified in the past. This Scenario includes the source plume, the Presbyterian Church, Jackson's Bowling Alley, Whaley Avenue residences, and Fillmore Avenue irrigation wells.

It was assumed that a groundwater extraction and treatment system would be implemented for either scenario to serve as a comparison. Both scenarios were evaluated using the seven criteria described below in section 7.3 Evaluation of Remedial Alternatives. When the two scenarios were compared, it was determined that Scenario 2 would result in only a 9% increase in VOC mass removal rates while at the same time increasing the potential for exposure during construction, significant increase in costs for construction and operation, and reduction in storm sewer capacity. Scenario 1, remediation of the source plume, will fulfill the requirements of the RAOs with significantly less disturbance to the neighborhood and at a much lower cost. It is also a concern that the additional wells outside of the source plume under Scenario 2 could draw contaminated groundwater from the source plume to areas, resulting in further distribution of contamination rather than the desired removal. Therefore only Scenario 1 was carried through the remainder of the FS.

A summary of the detailed analysis follows. As used in the following text, the time to implement reflects only the time required to implement the remedy, and does not include the time required to design the remedy, procure contracts for design and construction or to negotiate with responsible parties for implementation of the remedy.

6.1: Description of Alternatives

It should be noted that a presumptive remedy approach to developing the remedial alternatives below has been part of the ongoing process since the end of the first phase of the RI. At that point in the project, it was recognized that a groundwater treatment remedy would be necessary to address the contamination at the site, with the possibility of needing to address the source if it could be identified. Sufficient evidence was collected that suggests a source of PCE does exist above the groundwater table beneath the Mr. C's Dry Cleaners building that requires remediation. Due to the moderately dense residential/light commercial setting of the site and surrounding area, and due to the nature and extent of contamination within a highly conductive hydrogeologic setting, most of the remedial alternatives typically evaluated for such a site could logically be eliminated from the screening process without a formal evaluation. The elimination of such alternatives are generally based on a high degree of difficulty to implement, from a construction or public safety standpoint, significant negative impacts to the community or environment, or simply due to excessive costs when other options are available that will accomplish the same goal.

Excavation of contaminated soil from beneath the Mr. C's Dry Cleaners building had been considered an effective alternative to remove the suspected source. However, this would involve partial demolition and temporary shut down of the Mr. C's Dry Cleaners business and high levels of chemical vapors from the volatilization of PCE could occur during excavation, requiring engineering controls to protect the community. Since other viable alternatives, as described below, were available to address this problem without significant impacts to the business and community, excavation was not considered in the FS.

The remedial alternatives described below are intended to address the presence of contaminated soils acting as a source of groundwater contamination beneath the building and the contaminated groundwater at the site.

All remedial alternatives below, except the no action, will also effectively remediate the petroleum compounds in areas where the two contaminant plumes have mixed.

Alternative 1: No Further Action

Present Worth:	$ 241,500
Capital Cost:	$ 0
Annual O&M:	$ 19,700

This alternative recognizes remediation of the site conducted under a previously completed IRMs. Only continued monitoring is necessary to evaluate the effectiveness of the remediation completed under the IRM. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment.

Alternative 2: In-situ Treatment of Groundwater with Replacement of Sewer Lateral

Present Worth:	$ 1,244,000[1]
Capital Cost:	$ 489,600
Annual O&M:	$ 106,500
Time to Implement:	6-12 months

This alternative would involve the installation of up to 8 in-situ air stripping wells along the axis of the source plume. The wells would be installed to the base of the outwash unit with spacing designed to create an overlap of the zones of influence, based on pump test data. The contaminants would be removed by passing large volumes of air through the water within the well, causing an aggressive aeration This would create an air stripping system within the well, forcing VOCs from the water into a vapor phase, much in the same manner as a typical air stripper. The large volume of air would create circulation of the groundwater from the aquifer into the well. A separate screen in the vadose zone (above the water table) would be incorporated in the design of the well to allow the rising water to discharge back into the soil just above the water table and ultimately back into the aquifer. An inward hydraulic gradient to the well would be created during this process, thereby capturing and treating the water out to a pre-defined distance from the well. . The VOCs would be removed in vapor phase under a vacuum applied to the top of the well, then sent to a vapor phase activated carbon filter where they are adsorbed and trapped on the carbon. The spent carbon would be sent off site for regeneration where the VOCs are ultimately destroyed.

[1] This present worth reflects only 10 years operation based on past performance of in-situ treatment systems.

Activated carbon was selected for its effectiveness, reliability, low maintenance, and availability as treatment for VOCs. However it is not as effective for vinyl chloride as it is for all the other VOCs found at the site. VC is a break down product of PCE in certain areas of the source plume, and is expected to be at relatively low concentrations and decrease with time. It was determined in the FS that the size of the carbon system (amount of carbon) required to address all VOCs at the site would be of sufficient size to effectively remove VC as well. This will be further evaluated during the remedial design and closely monitored during the actual operation of the remedial system. If at any time, it is determined that the activated carbon would not or is not effectively addressing the VC, the alternative treatment of Advanced Oxidation Process (AOP) can easily be retrofitted into the remedy.

The second component of this alternative would involve the replacement of the existing sewer lateral that connects the Mr. C's Dry Cleaners building to the sanitary sewer line under Main Street. As described earlier in this document, it is believed the majority of contamination entered the environment through fractures in this sewer lateral. The suspected source would remain contained in place under the building slab for this alternative.

Alternative 3: In-situ Treatment of Groundwater with System Expansion to Remediate Source Area Soil

Present Worth:	$1,251,675[1]
Capital Cost:	$ 485,425
Annual O&M:	$ 108,265
Time to Implement:	6-12 months

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[1] This present worth reflects only 10 years operation based on past performance of in-situ treatment systems.

This alternative would be the same as Alternative 2 for addressing the groundwater source plume. It would also, however, include an expansion of the in-situ treatment system with the addition of another air stripping well adjacent to the source area under the building. Depending on the specific technology selected to accomplish the in-situ air stripping, the suspected source under the building would be removed by one of two processes. One process would involve routing the discharge water from the well to under the Mr. C's Dry Cleaners building to flush the PCE contaminated soil, mobilizing the PCE down to water table and where it would be immediately collected back into the air stripping well, where the same process described above would remove the contamination. The other process would utilize soil vapor extraction, accomplished by the vacuum in the vadose (unsaturated) zone created by the extraction well. Because PCE is a volatile compound, it is readily removed from sandy soils using an applied vacuum. Under this alternative, the suspected source beneath the building would be treated.

Alternative 4: Groundwater Extraction with Air Stripping/AOP and Replacement of Sewer Lateral

Present Worth:	$ 1,612,000
Capital Cost:	$ 843,400
Annual O&M:	$ 139,200
Time to Implement:	12-18 months

This alternative would include the installation of up to nine (9) conventional groundwater extraction wells located along the axis of the source plume. Groundwater would be pumped at a combined rate of approximately 100 gallons per minute to a single air stripper to be located on the Mr. C's Dry Cleaners property. The air stripper would be of sufficient size to treat contaminated groundwater to acceptable discharge limits for surface water since the treated water will be discharged to the Whaley Avenue storm sewer, which empties into Tannery Brook. Air stripping would force the VOCs from the water into vapor phase. The vapors would be collected and treated using a system known as Advanced Oxidation Process (AOP). This system uses ultraviolet (UV) light and hydrogen peroxide to oxidize organic contaminants down to non-toxic compounds.

The sewer lateral replacement component of this alternative would be the same as described for Alternative 2.

Alternative 5: Groundwater Extraction with Air Stripping/AOP with One In-situ Treatment Well for Source Area Soils

Present Worth:	$ 1,619,675
Capital Cost:	$ 839,225
Annual O&M:	$ 140,965
Time to Implement:	12 months

This alternative would be a combination of the groundwater extraction system described in Alternative 4 and the single in-situ air stripping well adjacent to the source area to remediate contaminated soil as described in Alternative 3, except that the air discharge could be directed to the AOP unit for treatment.

6.2 Evaluation of Remedial Alternatives

The criteria used to compare the potential remedial alternatives are defined in the regulation that directs the remediation of inactive hazardous waste sites in New York State (6NYCRR Part 375). For each of the criteria, a brief description is provided followed by an evaluation of the alternatives against that criterion. A detailed discussion of the evaluation criteria and comparative analysis is contained in the Feasibility Study.

The first two evaluation criteria are termed threshold criteria and must be satisfied in order for an alternative to be considered for selection.

1. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether or not a remedy will meet applicable environmental laws, regulations, standards, and guidance.

The SCGs of concern in this instance are the contravention of the groundwater standard (6NYCCR700-705) and the NYSDEC TAGM 4046, Soil Cleanup Guidance for the protection of groundwater, and the NYSDOH guidance value for PCE in residential indoor air.

All alternatives except alternative 1, No Action, would significantly reduce contaminant levels in groundwater, and would be expected to achieve groundwater standards over time as the source is removed and the remaining contaminants attenuate. However, a waiver of the groundwater standards in the impacted would be necessary until such attenuation has occurred. Alternatives 3 and 5 would comply with the groundwater standard and the soil cleanup guidance both on and off site by removing the source of contamination from the environment as well as removing the contaminated groundwater that is impacting public health. Alternatives 2 and 4 would only comply with the groundwater standard by removing the contaminated groundwater on and off site, however the suspected source would remain under the Mr. C's Dry Cleaners building indefinitely.

2. Protection of Human Health and the Environment. This criterion is an overall evaluation of the health and environmental impacts to assess whether each alternative is protective.

All alternatives except no action would be protective of public health. However, if at some time in the future the Mr. C's Dry Cleaners building were to be demolished and new construction occur on the site, exposure to the PCE left under the building with alternatives 2 and 4 would pose a threat. Alternatives 3 and 5 would be most protective since they would provide treatment of the groundwater and provide for removal of the PCE from under the building.

3. Short-term Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

All alternatives except no action would result in some increased risks due to the installation of wells in highly contaminated groundwater, which could result in vapor emissions during drilling. These alternatives also include buried piping for the conveyance of water or air to the corresponding treatment area. The in-situ treatment wells for alternative 2 and 3 also require shallow excavation at each location to create an infiltration gallery, therefore there is more potential vapor emissions. All these potential risks to the community and workers are routinely easily addressed with proper precautions.

Alternatives 2 and 3 are predicted to remediate groundwater in approximately 10 years. Alternatives 3 and 5 are predicted to remediate groundwater in approximately 30 years.

4. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the controls intended to limit the risk, and 3) the reliability of these controls.

Alternative 1 would not be effective in the long term. Alternative 3 and 5 would result in the greatest degree of long term effectiveness and permanence since the source and the groundwater contamination would be removed from the site. It is estimated that alternative 3 would accomplish this in approximately one third of the time that alternative 5 would take. Alternative 2 and 4 would also provide a high degree of long term effectiveness by removing the contaminated groundwater, but would not eliminate the suspected source material under the building. The suspected source material under the building would continue to impact groundwater as seasonal fluctuations in the water table rise to contact the PCE. Alternatives 2 and 3 would remediate the groundwater plume in the shortest time based on past performance of the in-situ treatment.

5. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume (TMV) of the wastes at the site.

Alternative 1 would not reduce the TMV of the waste present at the site. Alternative 3 and 5 would be the most effective at attaining all three since contamination in the suspected source material and groundwater would be collected and removed from the site media. Alternatives 2 and 4 would be effective at attaining all three for contaminated groundwater, however they would not address the toxicity, mobility or volume of the suspected source area under the building.

6. Implementability. The technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction and the ability to monitor the effectiveness of the remedy. For administrative feasibility, the availability of the necessary personnel and material is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, etc..

Alternative 1, would not require any action, therefore, this is not a concern. Alternative 4 would result in the greatest degree of disruption to the site and the existing business and require a significant degree of coordination and administrative oversight to implement. Alternative 5 would result in a slightly less degree of difficulty, both largely due to water handling requirements for collection, treatment and discharge to surface water of up to 100 gallons per minute. A monitoring plan would be necessary to ensure the effluent criteria continued to be met. Alternative 4 has the added complication of installing the new sewer lateral, including the actual construction and obtaining easements to cross private property to connect to the Whaley Avenue sewer main. Alternatives 2 and 4 are considerably less complicated since the only waste stream to handle is contaminated air from the in-situ air stripping wells. Those wells would be connected with piping to one treatment location, and there would be no water to treat and discharge. Alternative 2 would be slightly more difficult, again due to the installation of the new sewer lateral. Therefore, of the proposed remedial alternatives, Alternative 3 is the most implementable remedy.

7. Cost. Capital and operation and maintenance costs are estimated for each alternative and compared on a present worth basis. Although cost is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the remaining criteria, cost effectiveness can be used as the basis for the final decision. The costs for each alternative are presented in Table 3.

This final criterion is considered a modifying criterion and is taken into account after evaluating those above. It is focused upon after public comments on the Proposed Remedial Action Plan have been received.

8. Community Acceptance - Concerns of the community regarding the RI/FS reports and the Proposed Remedial Action Plan are evaluated. A " Responsiveness Summary" will be prepared that describes public comments received and how the Department will address the concerns raised. If the final remedy selected differs significantly from the proposed remedy, notices to the public will be issued describing the differences and reasons for the changes.

SECTION 7: SUMMARY OF THE SELECTED REMEDY

Based upon the results of the RI/FS, and the evaluation presented in Section 7, and public comment, the NYSDEC has selected **Alternative 3: In-situ Treatment of Groundwater with System Expansion to Remediate Source Area Soil** as the remedy for this site.

This selection is based upon the evaluation of the five alternatives developed for the site. Alternative 3 would be protective of human health and attain the RAOs through the removal of PCE from the suspected source area and the restoration of the aquifer on and off site. Operation of the room air cleaners as an IRM would no longer be necessary once the aquifer is restored to levels that will no longer impact indoor air. This alternative would also be protective of the environment by eliminating any future migration of the groundwater contamination plume toward Tannery Brook or Cazenovia Creek. Alternative 3 would be effective in the short term presenting potential risk only during the installation of the wells, which can easily be addressed with the proper precautions. This alternative would provide a high degree of long term effectiveness and permanence with regard to human exposure and would also be most effective in addressing the environmental contamination by removing the source and treating the groundwater plume. No implementation problems would be expected for this alternative. Implementation of this alternative would result in reclassification of this site, on the New York State Registry of Inactive Hazardous Waste Disposal Sites, to a Class 4, indicating that the site had been properly closed and only continued monitoring would be required. Upon completion of the groundwater treatment with no further impacts to indoor air contamination, the site would be evaluated for delisting from the Registry.

The estimated present worth cost to implement the remedy would be $1,251,675.00. The cost to construct the remedy is estimated to be $485,425 and the estimated average annual operation and maintenance cost, including monitoring, is estimated to be $108,265/year over the next ten years.

The elements of the selected remedy would be:

1. A remedial design program to verify the components of the conceptual design and provide the details necessary for the construction, operation and maintenance, and monitoring of the remedial program. Any uncertainties identified during the RI/FS would be resolved.

2. Installation of up to 8 in-situ air stripping wells along the axis of the source plume, associated piping necessary to convey the VOC vapors drawn from the wells to the carbon treatment location, and the installation of one additional in-situ well adjacent to the Mr. C's building to remove the suspected source material. The conceptual plan for this system is shown on Figure 4.

3. The stripping wells and air treatment system would be operated, maintained and monitored. The system would remain in operation until the identified exposure pathways have been eliminated and the contamination in the source plume have been reduced to levels consistent with groundwater outside the source plume.

4. Continued operation and maintenance of the indoor air filters, including periodic monitoring.

5. Continued monitoring of residential irrigation wells.

6. A monitoring program would be instituted to allow the effectiveness of the selected remedy to be monitored and would be a component of the operation and maintenance for the site.

SECTION 8: HIGHLIGHTS OF COMMUNITY PARTICIPATION

As part of the remedial investigation process, a number of Citizen Participation (CP) activities were undertaken in an effort to inform and educate the public about conditions at the site and the potential remedial alternatives. The following public participation activities were conducted for the site:

- A repository for documents pertaining to the site was established.

- A site mailing list was established which included nearby property owners, local political officials local media and other interested parties.

- Fact Sheet was sent to the mailing list in November 1993 announcing the scheduling of a public meeting to discuss the planned Remedial Investigation for the site.

- Public meeting held on November 18, 1993 to present the RI Work Plan and to answer citizen's questions regarding the project.

- Fact Sheet was sent to the mailing list in October 1994 announcing the scheduling of a public availability session to discuss the findings of the first phase of the RI.

- Public availability session held on October 20, 1994 to present and discuss the findings of the first phase RI.

- Fact Sheet was sent to the mailing list in July 1995 informing the public of recent findings in the second phase RI and to announce the need for additional field activities for the completion of the second phase RI.

- Fact Sheet was sent to the mailing list in September 1995 announcing the findings of the second phase RI and the scheduling of a public availability session to be held in October 1995

- Public availability session held on October 5, 1995 to discuss the findings of the second phase RI and to inform public of the upcoming FS to be conducted at the site.

- In addition to the CP correspondence and events listed above , the NYSDOH has sent letters to residents informing them of monitoring data generated from samples collected on their property as it became available. If their property had been impacted by contaminants from the site, they were advised accordingly with regard to appropriate precautions.

- A Fact Sheet was sent to the mailing list in January 1997 announcing the availability of the PRAP and to schedule a public meeting to discuss the PRAP.

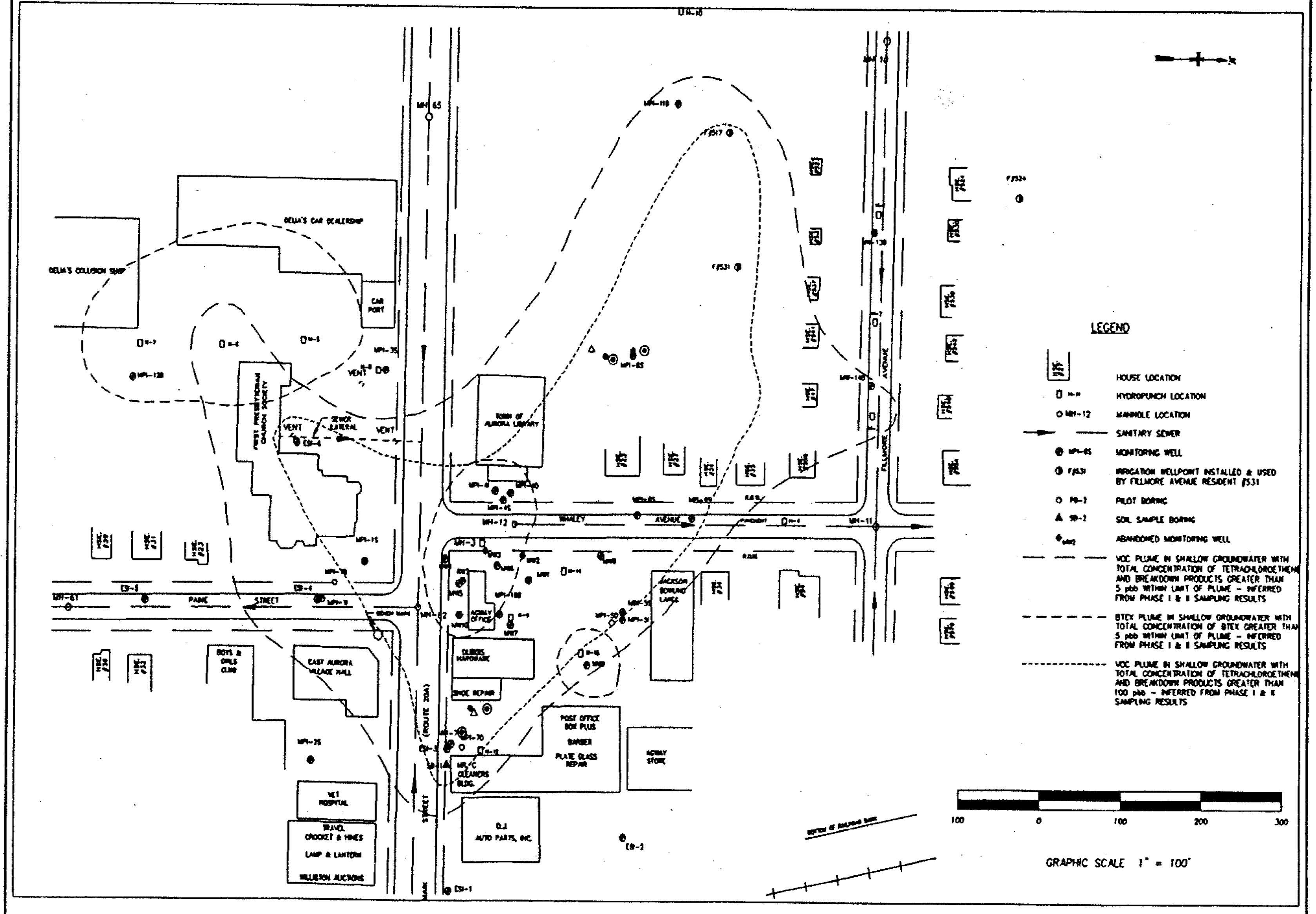
- A public meeting was held on February 11, 1997 to present the PRAP and discuss and answer questions regarding the proposed remedy and the RI/FS.

- A Responsiveness Summary was prepared and made available to the public to address the comments receive during the public comment period for the PRAP

Table 3
Remedial Alternative Costs

Remedial Alternative	Capital Cost	Annual O&M	Total Present Worth
Alternative 1: No Further Action	$0	$19,700	$241,500
Alternative 2: In-situ Treatment of Groundwater with Replacement of Sewer Lateral	$489,600	$106,500 (10 years)	$1,244,000
Alternative 3: In-situ Treatment of Groundwater with System Expansion to Remediate Source Area Soil	$485,425	$108,265 (10 years)	$1,251,675
Alternative 4: Groundwater Extraction with Air Stripping/AOP and Replacement of Sewer Lateral	$843,400	$139,200	$1,612,000
Alternative 5: Groundwater Extraction with Air Stripping/AOP with One In-situ Treatment Well for Source Area Soils	$839,225	$140,965	$1,619,675

Annual O&M reflects a 30 year period unless otherwise indicated.

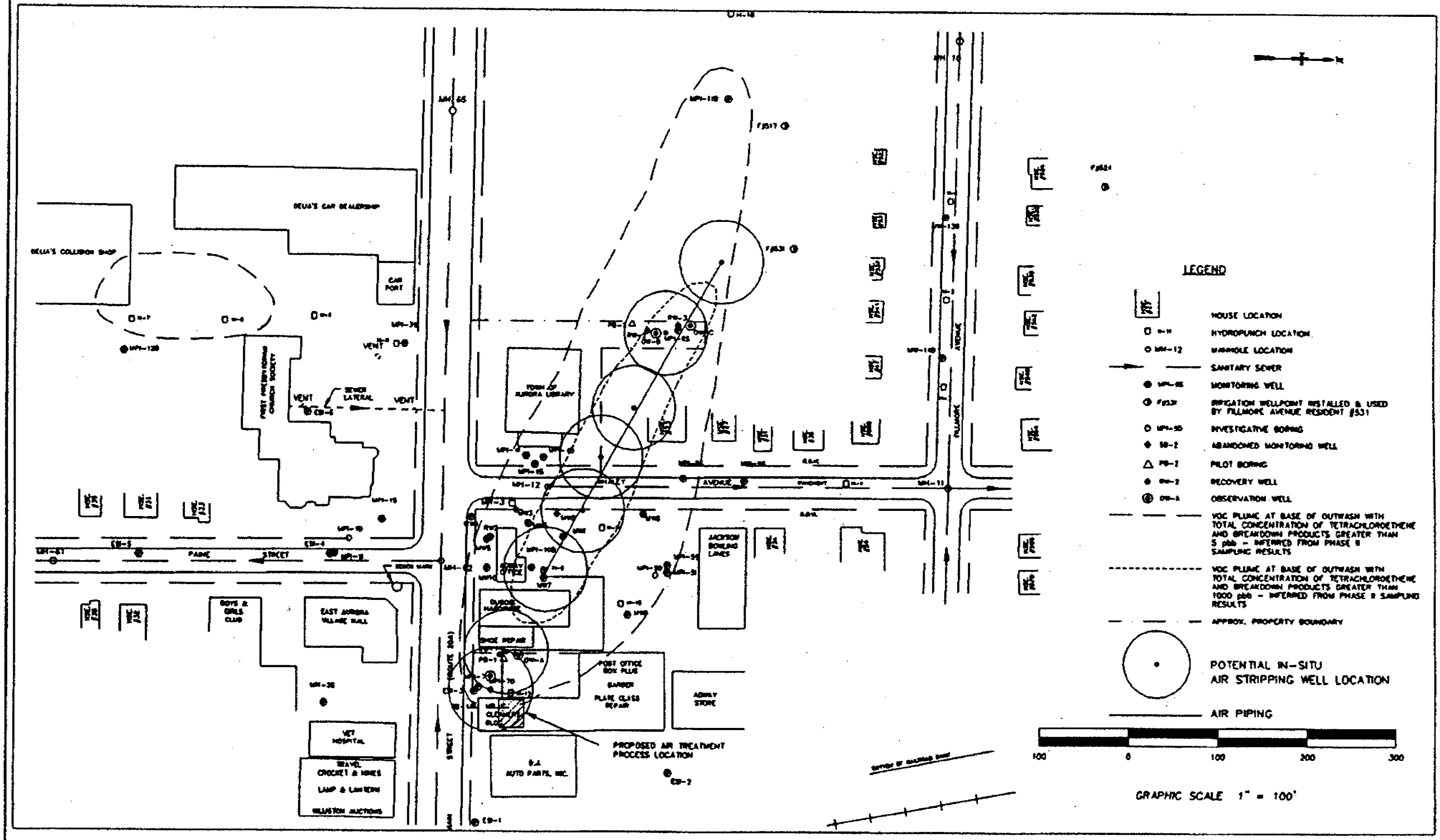


MR. C CLEANERS
FEASIBILITY STUDY

SHALLOW TETRACHLOROETHENE
AND BTEX PLUMES

NYSDEC NOVEMBER 1996
DIVISION OF HAZARDOUS WASTE REMEDIATION

Figure 3



MR. C CLEANERS
FEASIBILITY STUDY
SOURCE PLUME CONTROL
USING IN-SITU AIR STRIPPING TECHNOLOGY
NYSDEC NOVEMBER 1996
DIVISION OF HAZARDOUS WASTE REMEDIATION

Appendix A

RESPONSIVENESS SUMMARY

Mr. C's Dry Cleaners Site
Proposed Remedial Action Plan
East Aurora (V), Erie County
Site No. 9-15-157

The Proposed Remedial Action Plan (PRAP) for the Mr. C's Dry Cleaners Site, was prepared by the New York State Department of Environmental Conservation (NYSDEC) and issued to the local document repository on January 31, 1996. This Plan outlined the preferred remedial measure proposed for the remediation of the contaminated soil and sediment at the Mr. C's Dry Cleaners Site. The preferred remedy is groundwater treatment using in-situ air stripping technology combined with source removal through flushing or soil vapor extraction.

The release of the PRAP was announced via a notice to the mailing list, informing the public of the PRAP's availability.

A public meeting was held on Tuesday, February 11, 1997 which included a presentation of the Remedial Investigation (RI) and the Feasibility Study (FS) as well as a discussion of the proposed remedy. The meeting provided an opportunity for citizens to discuss their concerns, ask questions and comment on the proposed remedy. These comments have become part of the Administrative Record for this site. No written comments were received during the public comment period for the PRAP which closed on March 6, 1997.

The following are the comments received at the public meeting, with the NYSDEC's responses:

COMMENT 1: What is the volume, how much is in the ground?

RESPONSE 1: It is unlikely that we will ever know exactly how much perchloroethene (PCE) has been released into the ground. A general estimate might be five to ten gallons. It is important to note that the selected remedy will remove the PCE from the source area and there is no further discharge of PCE to the ground due to the installation of new dry cleaning equipment.

COMMENT 2: What happens when you stir everything up, will you be drawing it back toward the church?

RESPONSE 2: The remedy will address the area referred to as the source plume, which extends from the Mr. C's building northwest to behind the Town of Aurora Public Library. Extraction wells which will be positioned along this plume will have areas of influence of approximately 100 feet in diameter. This will not influence the area around the church and therefore is not expected to draw any contaminated groundwater toward the church.

COMMENT 3: We would like to use the church rooms, how often will you be monitoring the rooms and for how long?

RESPONSE 3: The indoor air quality in the church as been tested numerous times since the problem was discovered. As early as 1991 the tetrachloroethene concentration was below the NYSDOH air quality guideline of 100 ug/m3. Recent sampling data in 1994, 1995 and 1996 indicate that the concentrations of tetrachloroethene were at or near what could be expected (background) for indoor air. Church officials were informed in writing of our findings and were advised that the rooms in the church basement could be used. DOH/DEC plan to sample the church twice a year after the remediation program begins. How long the indoor air quality monitoring program continues will depend on the analysis of the progress of the remediation effort.

COMMENT 4: How much air and at what pressure will the air be in the wells?

RESPONSE 4: The volume and pressure of the air used in the wells will depend on the specific process selected. Generally, a relatively high volume of air is injected at low pressures to create aggressive bubbling of the water within the well. One of the technologies being considered for in-situ air stripping actually uses a vacuum rather than pressurized air.

COMMENT 5: How noisy will the treatment unit be?

RESPONSE 5: The exact treatment unit has not yet been selected, however noise suppression will be a consideration. The unit will be housed either in the Mr. C's building or shed to be constructed on the property. In either case, enough insulation will be placed along the walls so that the system should not be heard unless standing immediately adjacent to the building.

COMMENT 6: The groundwater under the plume is it a stream or a pool of water?

RESPONSE 6: The contamination is dissolved within the groundwater known as the plume. Groundwater exists beneath the site within the pore spaces between the grains of sand and gravel. In this setting, there are no actual pools or streams, just saturated soil. The groundwater moves very slowly around the grains of soil as a whole, carrying with it any contaminants that have been dissolved at the same slow pace..

COMMENT 7: How much has the contamination decreased in the plume since it has been identified?

RESPONSE 7: Based on numerous sampling events, the contamination levels appear to be stable. This will most likely be the case until the remedy is in place actively removing the contaminant.

COMMENT 8: The PRAP says discharge occurred 4 or 5 years ago, I thought it had happened in the 1970's?

RESPONSE 8: Two separate mechanisms of release are believed to have occurred. One is that filters from the dry cleaning machines had been disposed of in a dumpster in the parking area over extended periods of time, which may have resulted in PCE leaking from them onto the ground. This may have occurred at anytime since the property has been used as a dry cleaning facility, back to the late 1960's or early 1970's. The other mechanism believed to have occurred involves discharge of a concentrated volume of PCE to the sewer which leaked under the building in the early 1990's during an equipment change over.

Both of these mechanisms are theories that are supported by the data collected during the RI.

COMMENT 9: Can you tell us what the side affects are from each of these contaminants?

RESPONSE 9: The primary contaminant at this site is tetrachloroethene. Tetrachloroethene (also called tetrachloroethylene or perchloroethylene) is a colorless man-made liquid used as a solvent for dry cleaning fabrics, for removing grease from metal, and as an intermediate (building block) in the manufacture of the chemicals . It is found in some consumer products such as paint and spot removers, water repellents, silicone lubricants, adhesives and wood cleaners.

Tetrachloroethene causes cancer in laboratory animals exposed to high levels over their lifetimes. Chemicals that cause cancer in laboratory animals also may increase the risk of cancer in people who are exposed to lower levels over long periods of time. Whether or not tetrachloroethene causes cancer in humans is unknown. People exposed to large amounts of this chemical in the workplace or from hobbies have had nervous system damage. Exposure to high concentrations of tetrachloroethene has also caused liver and kidney damage in laboratory animals. For further information on this chemical or any other chemical you can call Mr. Cameron O'Connor of the New York State Department of Health at 847-4502.

COMMENT 10: Is there a way for me to find out what the risk of exposure is to me?

RESPONSE 10: See response 9.

COMMENT 11: Some of the homes still show contamination, is there a way to tell what levels the people living there were exposed to in the past?

RESPONSE 11: Recent (1996) indoor air sampling data indicate that the basement air quality in one home contained a concentration of tetrachloroethene that equaled the New York State Department of Health air quality guideline of 100 mg/m3. The sampling data for samples taken in the upstairs living area was below this guideline. In another home the air quality in a basement was below the indoor air guideline; however, it was high enough to indicate an adverse impact. There is no way that we can determine what levels may have occurred in the past.

COMMENT 12: Who is the Doctor those people should contact?

RESPONSE 12: You or your physician can call or write to Mr. Cameron O'Connor, New York State Department of Health, 584 Delaware Ave., Buffalo, New York 14202, (847-4502). Mr. O'Connor will forward any information to the appropriate person within New York State Department of Health that can assist you.

COMMENT 13: What kind of measurements will you use to see if the remediation is working?

RESPONSE 13: Several measurements will be made as part of the operation and maintenance of the remedial system. First, additional monitoring wells will be installed near the extraction wells for the direct measurement of the area of influence. These measurements will either be groundwater elevations or dissolved oxygen within the groundwater, depending on the system. Secondly, groundwater samples will be collected periodically to determine contaminant level trends, which should be decreasing over time if the remedy is working. In the event that such a decreasing trend is not occurring, additional remedial measures will be incorporated. Thirdly, indoor air monitoring will continue to determine contaminant level trends, which should also be decreasing as the groundwater contamination decreases.

COMMENT 14: Has this remedy been used any place else in New York State? Are you familiar with other sites where this kind of remediation is in operation in other States?

RESPONSE 14: A similar remedy has not yet been implemented elsewhere in the state for groundwater contaminated with hazardous waste, however it has been selected at another site and is scheduled for implementation. This technology has also been used in the Oil Spills program. Data generated by the USEPA and the vendors that have developed the technology indicate that the remedy will be effective in this specific geologic and contaminant condition. Variations have been used at numerous sites across the country and Europe.

COMMENT 15: Is the evaluation of the success of the remediation based solely on the monitoring wells?

RESPONSE 15: The success of the remediation is based on its effectiveness in achieving the Remedial Action Objectives (RAOs). As described above (Response 13), this will be monitored through groundwater and indoor air sampling on a periodic basis.

COMMENT 16: Is there a better than 50/50 probability that the remediation will work?

RESPONSE 16: The Feasibility Study is conducted to evaluate several remedial alternatives to address the contamination at the site. An alternative is selected based on the seven criteria listed in the PRAP, which collectively favor the alternative that will be most effective for achieving the RAOs. While there is no way to actually place odds on whether or not the remedy will work, it is fully expected that the selected remedy will be effective. The selected alternative contains an extensive monitoring program to continually track the effectiveness of the remedy. If for some unforeseen circumstance it is not performing as expected, then additional alternatives or enhancements will be implemented to make certain the RAOs are achieved. While this is a new technology, having limited operating installations, based on the research performed it appears to be a very good match for this site and therefore we feel there is a high probability for success. If the NYSDEC were not confident in the remedial alternative's ability to succeed, it would not have been selected.

COMMENT 17: When do you anticipate starting work?

RESPONSE 17: Assuming the Record of Decision (ROD) is signed by the end of March as currently planned, a realistic estimate of when construction could be expected to begin would be late Spring or Summer of 1998.

COMMENT 18: Who put in the air cleaners in the homes?

RESPONSE 18: The air cleaner units were provided by the NYSDEC DER as an IRM in response to the identified presence of contaminants above action levels.

COMMENT 19: We put in an air treatment system ourselves, can I recover my cost?

RESPONSE 19: If a cost or other damage has resulted from the contamination attributable to the site, the impacted party can pursue the responsible party(ies) for restitution. The State has no mechanism for reimbursement of costs incurred by a party impacted by the site.

COMMENT 20:. When you mention Site owner funded, who are you talking about as the site owner?

RESPONSE 20: The current owner of Mr. C's Dry Cleaners

COMMENT 21: Could the contamination have happened years ago?

RESPONSE 21: Yes, it may never be known for certain the exact mechanism or timing of the release. (Also see response 8 above).

COMMENT 22:. If there was a release before the changeover, could there have been a container removed, or some in ground storage in a tank that leaked?

RESPONSE 22: Soil gas sampling was conducted in the parking area to investigate the possibility of such an underground storage or discharge tank. The data indicated that no such tank is or apparently ever was present.

COMMENT 23: Is there going to any long term health monitoring?

RESPONSE 23: At this time no long term health monitoring or health studies are planned.

COMMENT 24:. The classification states "threat to the public health", don't they consider this a health risk?

RESPONSE 24: The Class 2 classification for this is based on the potential threat to public health if the problem was not remediated and subsurface conditions were allowed to remain as they exist. There could be the potential for further impact to the indoor air quality in residential areas if no remedial action were undertaken.

COMMENT 25: You keep talking about drinking water but I haven't heard anything about air contamination?

RESPONSE 25: The indoor air contamination originates from the contaminated groundwater. The references to groundwater in this discussion were made to simplify the explanation regarding the origin and extent of indoor air contamination.

COMMENT 26: The one home on Whaley only had the upstairs tested, not the basement?

RESPONSE 26: Homes on Whaley Avenue were first sampled in the basements in all cases. Based on the results of that sampling, it was determined by the DOH that indoor air be sampled again at one of the homes, both from the basement and the upstairs living area.

COMMENT 27: Who makes the final decision on what will be done?

RESPONSE 27: The final decision on this remedy will be made in the Record of Decision or ROD, which is a document signed by the Director of the Division of Environmental Remediation. The PRAP which was presented at the public meeting and has been available to the public for review is essentially a draft of the ROD.

COMMENT 28: What is the probability of the local residents having to shoulder some of the cost?

RESPONSE 28: The local residents will not be required to assume the cost of this remedy. If there is not a viable PRP to fund the implementation of the selected remedy, the State will design and construct it utilizing funding provided by the 1986 Environmental Quality Bond Act, or as it is commonly known, the State Superfund.

COMMENT 29:. If there should be a second blower, would the noise be a factor in the decision?

RESPONSE 29: Yes, the same as described in response 5.

COMMENT 30:. How big are the manholes?

RESPONSE 30: Depending on the vendor selected, the manholes could be between one to two feet in diameter.

COMMENT 31: Will trees have to be cut down to install the wells?

RESPONSE 31: It is possible some small trees or brush will need to be cleared to get the necessary equipment in place to drill the wells. However there is enough flexibility for the exact placement of the wells so that the actual taking of mature trees will be unlikely. The State will work with property owners to avoid any inconvenience, including cutting of trees, to the extent possible

COMMENT 32:. The Fact Sheet states milligrams, shouldn't it be micrograms for the level of highest level of contamination identified in the source plume.

RESPONSE 32: Yes, that was a typographical error. The correct units of concentration should be micrograms per liter (ug/l) in this case and as presented in the PRAP and the RI/FS reports for the site, which are available in the document repositories.

COMMENT 33:. Do you have any additional information about the remedial technology you could give me so that I could make intelligent comments about the remediation?

RESPONSE 33: The Feasibility Study presents a significant level of detail with regard to the selection process and description of the remedy. The PRAP is essentially a summary of the Feasibility Study. This is the best place to seek additional information.

However, please realize the primary input that the DEC/DOH hopes to receive from the public in this process relates to their concerns regarding impacts to the neighborhood or their lifestyles when the remedy is implemented.

COMMENT 34: Why does it take so long to remediate a site?

RESPONSE 34: From a technical standpoint, this type of remedy relies in part on the natural circulation of groundwater, which as described above, is a very slow process. Once the system is in place, it is expected to take approximately 10 years to remediate the site. From an administrative standpoint, there is a significant amount of work to be done before the actual implementation of the remedy. This includes a range of tasks from resolution of legal issues to performing the engineering design of the remedial system, all of which could take one to two years.

COMMENT 35:. If the contamination has moved this far in five years, how much further will it migrate in the additional two years before the remedy is in operation?

RESPONSE 35: Groundwater monitoring indicates the plume has generally reached equilibrium. Measurements indicate that groundwater flow slows significantly in the area to the northwest of the Library, the same area defined as the end of the source plume. It is anticipated the plume will not migrate significantly beyond its current position, however additional monitoring will be conducted during the design to determine this is the case. Modifications will be incorporated in the design as necessary if the plume has migrated .

COMMENT 36:. With regard to other ways to address this problem, can we assume that there are no chemical additives that will fix the problem; or, can you pump water into the plume to dilute it?

RESPONSE 36: This contaminant plume is relatively simple to remove and permanently remediate the impacted area. That is always the preferred method of remediation whenever possible. There are number of alternatives commercially available that involve introducing various additives to reduce or eliminate contaminants from the soil and groundwater, however the high degree of control necessary to achieve effectiveness would not be possible in this Village setting. Attempting to dilute the contamination is not typically an option for a groundwater plume problem.

COMMENT 37: Will other homes have their indoor air treated?

RESPONSE 37: Based on the indoor air sampling conducted to date, no other homes require treatment. If in the future other homes are identified as impacted, then an air filter can easily be installed.

COMMENT 38:. Will all the remedial equipment, piping and wells be underground?

RESPONSE 38: The wells, piping, and electric wires will be buried under ground similar to any other utility. The treatment unit and blower/vacuum system will be contained either within the Mr. C's building or a shed constructed on the Mr. C's property.

COMMENT 39:. What about the electricity?

RESPONSE 39: See response 38.

COMMENT 40: Could you call these wells a giant aquarium bubbler?

RESPONSE 40: Similar on a much larger and more complex scale.

COMMENT 41:. With this extraction system, will the contamination continue to spread?

RESPONSE 41: The primary objective for treating the source plume is to prevent any further migration of contaminants through alteration of the groundwater flow direction and by actual removal of the contaminants. The significantly lower concentrations of contamination outside the source plume will then disperse naturally with no further loadings from the source plume.

COMMENT 42: Is any of this contamination from Agway?

RESPONSE 42: Yes. There are a number of petroleum related compounds that have combined with the PCE plume in the area of the Agway property. It does not appear that these petroleum based compounds have migrated significantly beyond Whaley Avenue. The contamination attributable to Agway will also be effectively addressed with the selected remedy.

COMMENT 43:. Did the contaminants from Agway reach Whaley Ave.?

RESPONSE 43: See response 42 above.

COMMENT 44: Will there be any restrictions on building or construction for the neighborhood?

RESPONSE 44: There are no environmental or health based restrictions anticipated. However, there may be some restrictions based on the location of the extraction wells and associated buried utilities.

Appendix B

Administrative Record

The following documents constitute the Administrative Record for the Mr. C's Dry Cleaners Site Record of Decision.

June 1995	Remedial Investigation Report, Malcolm Pirnie, Inc.
May 1996	Remedial Investigation Report Addendum A: Aquifer Testing Report, Malcolm Pirnie, Inc.
November 1996	Feasibility Study Report, Malcolm Pirnie, Inc.
January 1997	Proposed Remedial Action Plan
March 1997	Responsiveness Summary for Remedial Investigation/Feasibility Study and Proposed Remedial Action Plan (Appendix A of ROD)

B2 – 2000 Explanation of Significant Differences

EXPLANATION OF SIGNIFICANT DIFFERENCES
MR. C'S DRY CLEANERS SITE

East Aurora / Erie County / Registry No. 9-15-157 / April 2000

Prepared by the New York State Department of Environmental Conservation
Division of Environmental Remediation

1.0 INTRODUCTION

The purpose of this notice is to describe the progress of the cleanup at the Mr. C's Dry Cleaners Site and to inform you about a change in the Site remedy. The Mr. C's Dry Cleaners Site is located at 586 Main Street in the Village of East Aurora, Erie County. In March of 1997, the New York State Department of Environmental Conservation signed a Record of Decision (ROD) which selected a remedy to cleanup the Site. While attempting to implement this ROD, the inability to obtain independent bids at a reasonable cost led to the need to revise the remedy.

This Explanation of Significant Differences (ESD) will become part of the Administrative Record for this Site. The information here is a summary of what can be found in greater detail in documents that have been placed in the following repositories:

Aurora Town Public Library 550 Main Street East Aurora, NY 14052 (716)652-4440 Call for hours	NYSDEC Div. of Haz. Waste Remediation 50 Wolf Road, Room 352 Albany, NY 12233-7010 William Ottaway, Project Manager (518) 457-4343 (M-F, 8:00am -4:15pm)	NYSDEC Region 9 Office 270 Michigan Avenue Buffalo, NY 14203 Attn: Michael Podd (716) 851-7220 (M-F 8:30am-4:45pm,by appt.)

Although this is not a request for comments, interested persons are invited to contact the Department's Project Manager for this site to obtain more information or have questions answered.

2.0 SITE DESCRIPTION AND ORIGINAL REMEDY

2.1 Site History, Contamination, and Selected Remedy

The existing building used by Mr. C's Dry Cleaners has operated as Mr. C's since 1974, and as a dry cleaner since 1970. Dry cleaning operations at Mr. C's use a cleaning solvent comprised predominantly of tetrachloroethene (a.k.a. perchloroethene or PCE). Since 1985, all wastes have been disposed of through a commercial disposal firm. Prior to 1985, waste was disposed of via the sanitary sewer and the dumpster located behind the hardware store. Tetrachloroethene may have been released to the environment as a result of leakage from the sewer and dumpster, as well as accidental spillage.

Environmental investigations began in October 1991 when chemical odors were detected in the basement of the First Presbyterian Church, located across the street. As a result of the investigations, a plume of contaminated groundwater was delineated. To address the immediate impact to the public, portable indoor air cleaners were installed at the church, as well as two residences on Whaley Avenue to address indoor air quality.

The Record of Decision (ROD) for this Site called for the installation of up to 8 in-situ air stripping wells, along with piping to convey the vapor phase contaminants to a central carbon treatment facility.

3.0 CURRENT STATUS

The plume of contamination in the groundwater has remained largely unchanged. Recent sampling shows that the contamination has not spread any further. At the suspected principal source of the contamination, the sewer pipe, the contamination levels have fallen off dramatically. This will allow us to eliminate the previously proposed well directly at the source, and rely on the next down-gradient well to address the remaining contamination.

4.0 DESCRIPTION OF SIGNIFICANT DIFFERENCES

4.1 New Information

After the ROD for this project was signed, it was discovered that a sufficient number if independent bids for in-situ air stripping could not be obtained. This predictably resulted in a significant increase in estimated cost. In short, the proprietary nature of the remedy made it not economically feasible. In-situ air stripping was therefore abandoned, and new alternatives were considered.

The first of these alternatives was ex-situ air stripping combined with advanced oxidation. Although this remedy at first appeared to be effective and economical, concerns were raised regarding the safe handling of the oxidizing agent during the design process. Required safety measures, which partially address these concerns, eliminated the cost advantage for this remedy. The recognition that this alternative would be less safe and more expensive than anticipated eliminated it from consideration.

The remedy currently being designed utilizes ex-situ air stripping with activated carbon.

4.2 Comparison of Changes with Original Remedy

Functionally, the treatment processes will be exactly the same as in the ROD. Air stripping is still used to remove the contaminants from the water, carbon is still used to remove the contaminants from the vapor phase waste stream, and underground piping is still used to convey the contamination to the central treatment facility. The air stripping function is simply moved from the wells to a central location to eliminate the expensive, proprietary technology in favor of a more conventional process.

In the original November 1996 Feasibility Study (FS), this remedy was assessed and was found to be protective of human health and the environment, effective and implementable. At that time, the options discussed above in Section 4.1 were considered preferable only because they were expected to be less expensive. Based on the new information listed above, this remedy is the most efficient, safest means to remediate this site.

One additional requirement is that the treated groundwater must be properly disposed of. The water will be the piped and discharged to the Tannery Brook. Prior to discharge, naturally occurring iron in the groundwater must be treated to meet SPDES standards.

5.0 SCHEDULE AND MORE INFORMATION

The remedial design for this project is currently being completed, and the project should go to bid this summer. Construction is expected to begin in late 2000 or early 2001. If you have questions or need additional information you may contact any of the following:

Reports & General Concerns:	Site Related Health Concerns:
William Ottaway, P.E. Project Engineer - NYSDEC **(518) 457-4343**	Cameron O'Connor NYSDOH **(716) 847-4500**

4/28/00
Date

William Ottaway, Project ~~Manager~~
Bureau of Western Remedial Action

4/28/00
Date

Edward R. Belmore, Director
Bureau of Western Remedial Action

5/2/00
Date

Michael J. O'Toole, Jr., Director
Division of Environmental Remediation

C

Project Permanent Easement Institutional Controls

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Construction Services, 12th Floor
625 Broadway, Albany, New York 12233-7013
Phone: (518) 402-9814 • **FAX:** (518) 402-9819
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

DEC 19 2001

RECEIVED
BY MGS DATE 1/2/02

Nixon Peabody LLP
Attention: Michael J. Tone, Esq.
990 Stewart Avenue
Garden City, New York 11530

Dear Mr. Tone:

RE: Executed Access Agreement Amendment #2
Mr. C's Dry Cleaners, Site No. 9-15-157
Village of East Aurora, Erie County

Enclosed for your files is one fully executed amendment #2 to the existing access agreement that you recently negotiated with James Charles, Esq. of the NYSDEC.

Legal questions relating to this subject matter should be directed to Jim Charles at (716) 851-7050. Technical questions should be brought to my attention at (518) 402-9812. Thank you for your continued cooperation.

Sincerely,

David J. Chiusano
Project Manager
Western Field Services Section
Bureau of Construction Services
Division of Environmental Remediation

Enclosures

cc: R. Williams - Agway
T. Szuba Esq. - Agway
M. Steffan - E&E
G. Jones - E&E

New York State Department of Environmental Conservation

SECOND AMENDMENT TO THE AGREEMENT
for
ACCESS TO PRIVATE PROPERTY FOR PURPOSES PURSUANT TO ENVIRONMENTAL CONSERVATION LAW
ARTICLE 27

The agreement made the 27th day of February, 2001 between AGWAY, INC. hereinafter referred to as "Agway," and the COMMISSIONER OF THE DEPARTMENT OF ENVIRONMENTAL CONSERVATION FOR THE PEOPLE OF THE STATE OF NEW YORK, hereinafter referred to as "the Department" pursuant to the above cited law shall be amended this twelfth day of November 2001 by adding the following to Article I Paragraphs 3, 5 and 7 noted below as follows:

ARTICLE I

3. The Work. The Work contemplated under this Agreement shall also include the following:

k.) temporary vehicular parking for the Town of Aurora Library patrons for a period of four (4) weeks beginning on November 12, 2001 and ending December 10, 2001.

l.) vehicular parking for the Department's and Tyree Organization, Ltd.'s (the Contractor) employees for the duration of this Agreement.

5. Access. Access to the property shall be subject to the October 2001 Final Traffic Control Plan prepared by The Tyree Organization, Ltd.

7. The Location. The Work shall be performed at the Property in the areas identified in the diagram attached hereto as Exhibit A ("Work Area"). Exhibit A is amended to also include the northwest corner of the Property, an area approximately 53' wide x 75' long, hereinafter referred to as "the Parking Area." The Parking Area shall be used only for the Work noted in Subparagraphs 3.k and 3.l above.

IN WITNESS WHEREOF, this amendment has been executed on the day and date first above written.

AGWAY, INC.
By: ______________________

NEW YORK STATE DEPARTMENT OF
ENVIRONMENTAL CONSERVATION
By: ______________________
Richard Randles, Director
Division of Management and Budget

New York State Department of Environmental Conservation

(Agway, Inc. Representative)

STATE OF NEW YORK)
) ss.:
COUNTY OF Onondaga)

On this 7th day of November, 2001, before me personally came Jeffery C. McIntyre personally known, and known to me to be the individual described in, and who executed the foregoing instrument, and he duly acknowledged to me that he executed the same.

Seal

Janet Williams
Notary Public

JANET WILLIAMS
Notary Public in the State of New York
Qualified in Onondaga County No. 4957864
My Commission Expires October 23, ~~19~~ 2005

DAS

D A SIBLEY REALTY INC.
225 W. JEFFERSON ST.
SYRACUSE, N. Y. 13202

FAX

To: DAVE CHISWONO

518-457-7743

From: DON SIBLEY

Date: 3/30/01
Number of Pages: 2
Phone: 315-423-9067
Fax: 315-476-1011

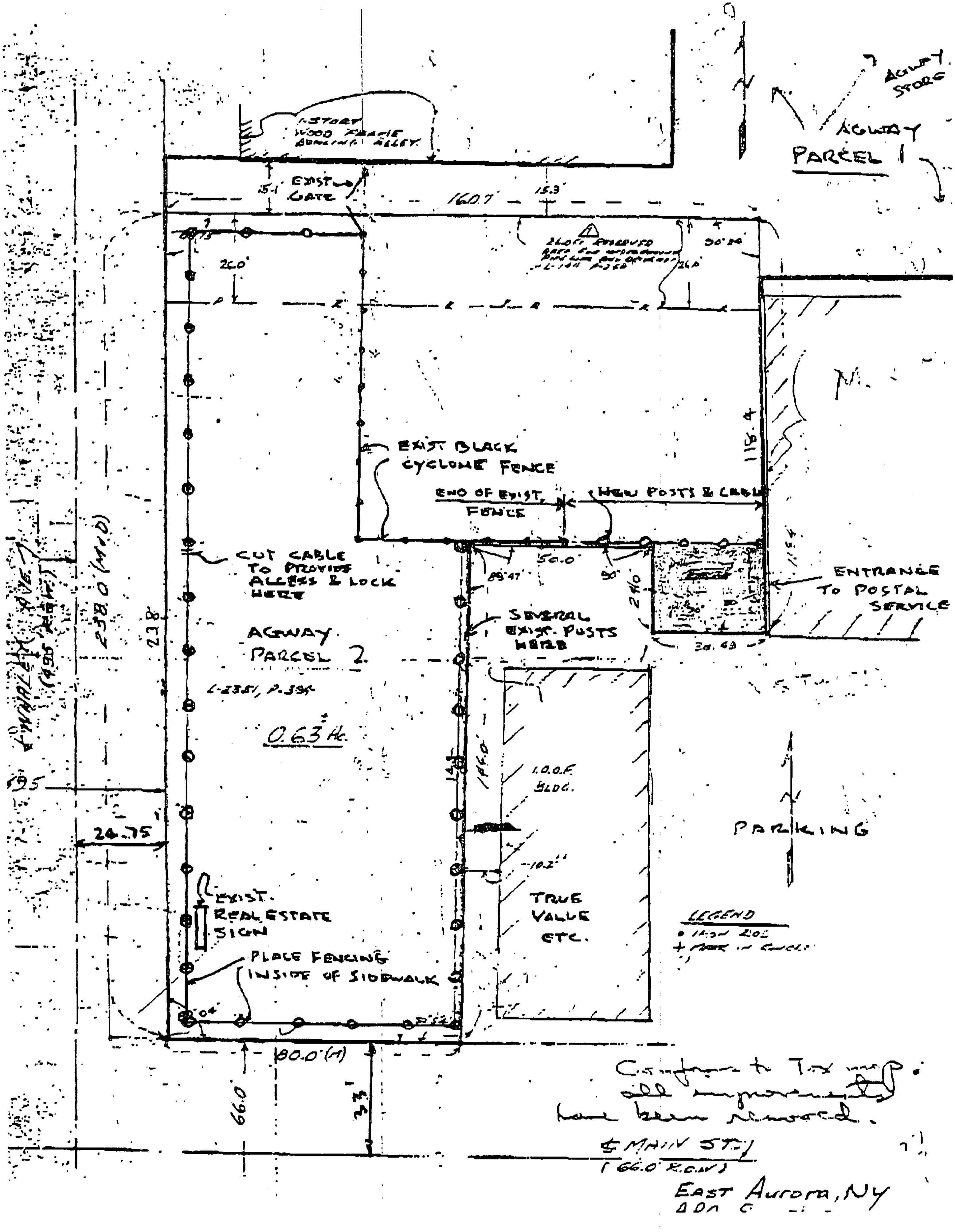
Remarks: EAST AURORA, N.Y. — AGWAY FENCING

Attached is my plot plan and my proposed fencing. Will work with you on this for arrangement.

Please call ASAP.

Don Sibley

Post-it® Fax Note 7671		Date 3/30/01	# of pages ▶ 2
To	M-STEFFAN	From	D. CHIUSANO
Co./Dept.	E&F	Co.	DEC
Phone #		Phone #	
Fax #	(716) 684-0644	Fax #	



Conforms to Tax map. All improvements have been removed.

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**************** -COMM. JOURNAL- ******************** DATE MAY-17-2001 ***** TIME 00:43 *** P.01

    MODE = MEMORY TRANSMISSION                    START=MAY-17 00:42      END=MAY-17 00:43

      FILE NO.= 152

STN NO.     COM     ABBR NO.      STATION NAME/TEL.NO.      PAGES     DURATION

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                                                              -E AND E BUFFALO           -

*************************************** -                 - ***** -        716 684  0844- *********
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ecology and environment engineering, p.c.
International Specialists in the Environment
Buffalo Corporate Center
368 Pleasant View Dr.
Lancaster, New York 14086
Phone 716.684.8060 Fax 716.684.0844
Buffalo, New York

Telecopier Transmission Form

Date: *May 16, 2001*	***Time:***
Job Code: *06840602*	***Total Pages:*** *3*
To: Mr. Gregory Sutton	
Company: NYSDEC, Division of Environmental Remediation, Region 9	
Telecopier Phone: (716) 851-7226	
From: *M.G. Steffan* M.G.S	
cc: Mr. Dave Chiusano	**518-457-7743**

Special Instructions:

Greg,

FYI. Copy of the Agway easements for surveying by J. Lu are attached. My mistake, the construction easement to used for contractor mobilization does not go all the way to Whaley Avenue.

I will look at overlaying the Matrix well information onto the work to be performed under the contract. I'll send the information tomorrow.

M. Steffan

Mike Steffan *May 16, 2001 (3:58PM)*

Please call if pages are poor quality or all pages were not transmitted.

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**************** -COMM. JOURNAL- ******************** DATE MAY-17-2001 ***** TIME 00:48 *** P.01

   MODE = MEMORY TRANSMISSION                       START=MAY-17 00:46      END=MAY-17 00:48

     FILE NO.= 155

STN NO.     COM     ABBR NO.     STATION NAME/TEL.NO.     PAGES    DURATION

  001        OK      ☎           184577743-06840602        003/003 00:01'07"

                                                             -E AND E BUFFALO          -

***************************************** -                - ***** -        716 684  0844- *********
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ecology and environment engineering, p.c.
International Specialists in the Environment
Buffalo Corporate Center
368 Pleasant View Dr.
Lancaster, New York 14086
Phone 716.684.8060   Fax 716.684.0844
Buffalo, New York

Telecopier Transmission Form

Date: May 16, 2001	***Time:***
Job Code: 06840602	***Total Pages: 3***
To: Mr. Gregory Sutton	
Company: NYSDEC, Division of Environmental Remediation, Region 9	
Telecopier Phone: (716) 851-7226	
From: ***M.G. Steffan*** M.G.S.	
cc: Mr. Dave Chiusano	**518-457-7743**

Special Instructions:

Greg,

FYI. Copy of the Agway easements for surveying by J. Lu are attached. My mistake, the construction easement to used for contractor mobilization does not go all the way to Whaley Avenue.

I will look at overlaying the Matrix well information onto the work to be performed under the contract. I'll send the information tomorrow.

M. Steffan

Mike Steffan *May 16, 2001 (3:58PM)*

Please call if pages are poor quality or all pages were not transmitted.

ecology and environment engineering, p.c.
International Specialists in the Environment
Buffalo Corporate Center
368 Pleasant View Dr.
Lancaster, New York 14086
Phone 716.684.8060 Fax 716.684.0844
Buffalo, New York

Telecopier Transmission Form

Date: *May 16, 2001*	***Time:***
Job Code: *06840602*	***Total Pages:*** *3*

To: **Mr. Gregory Sutton**

Compar NYSDEC, Division of Environmental Remediation, Region 9

Telecop

FAX

From:

cc: Mr. **518-457-7743**

Special

Greg,

Please send cc to this person

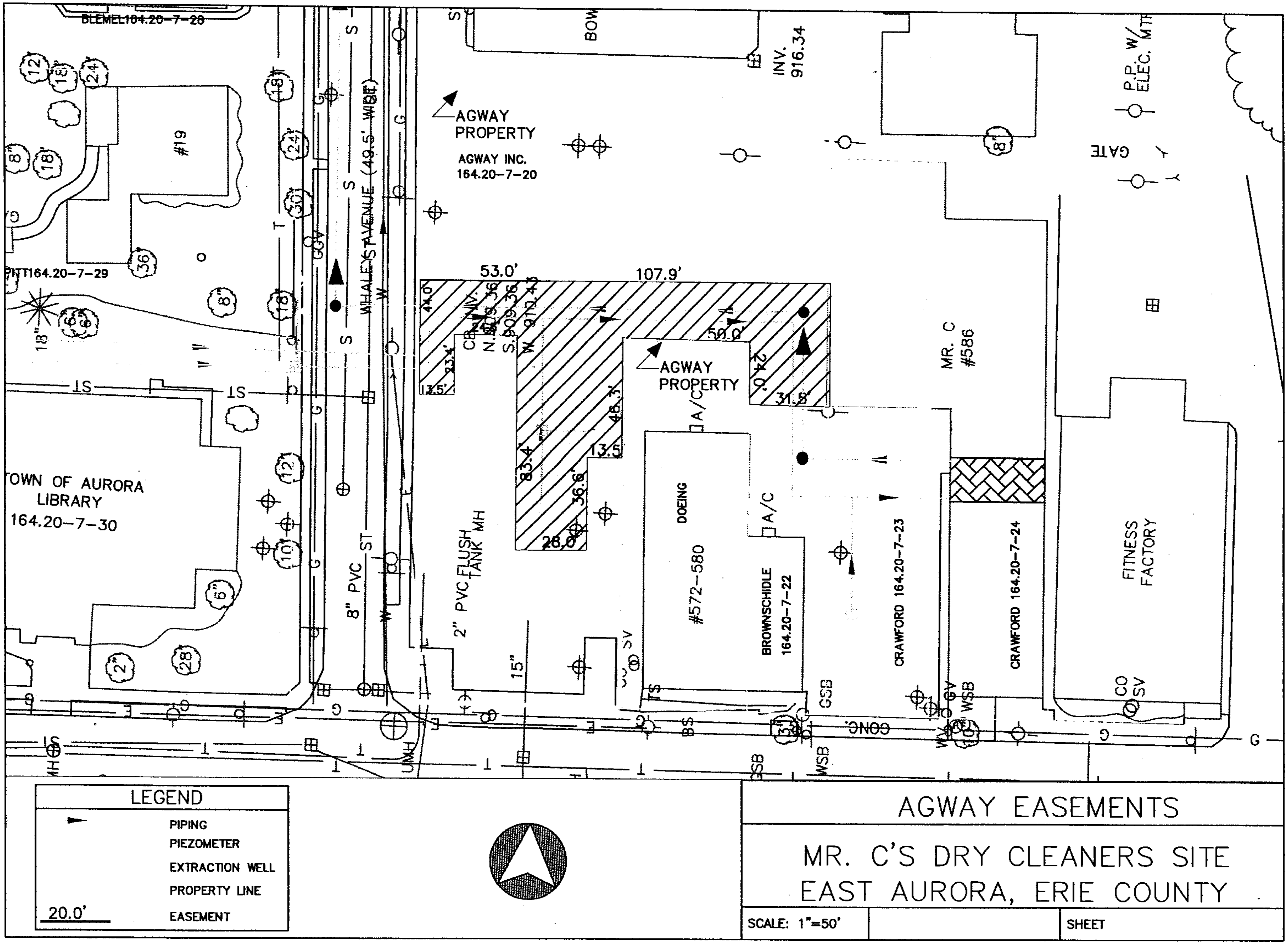
FYI. by J. Lu are attached. My mistake, the construction easem not go all the way to Whaley Avenue.

I will on onto the work to be performed under the contract. I'll send the information

M. Steffan

Mike Steffan *May 16, 2001 (3:58PM)*

Please call if pages are poor quality or all pages were not transmitted.



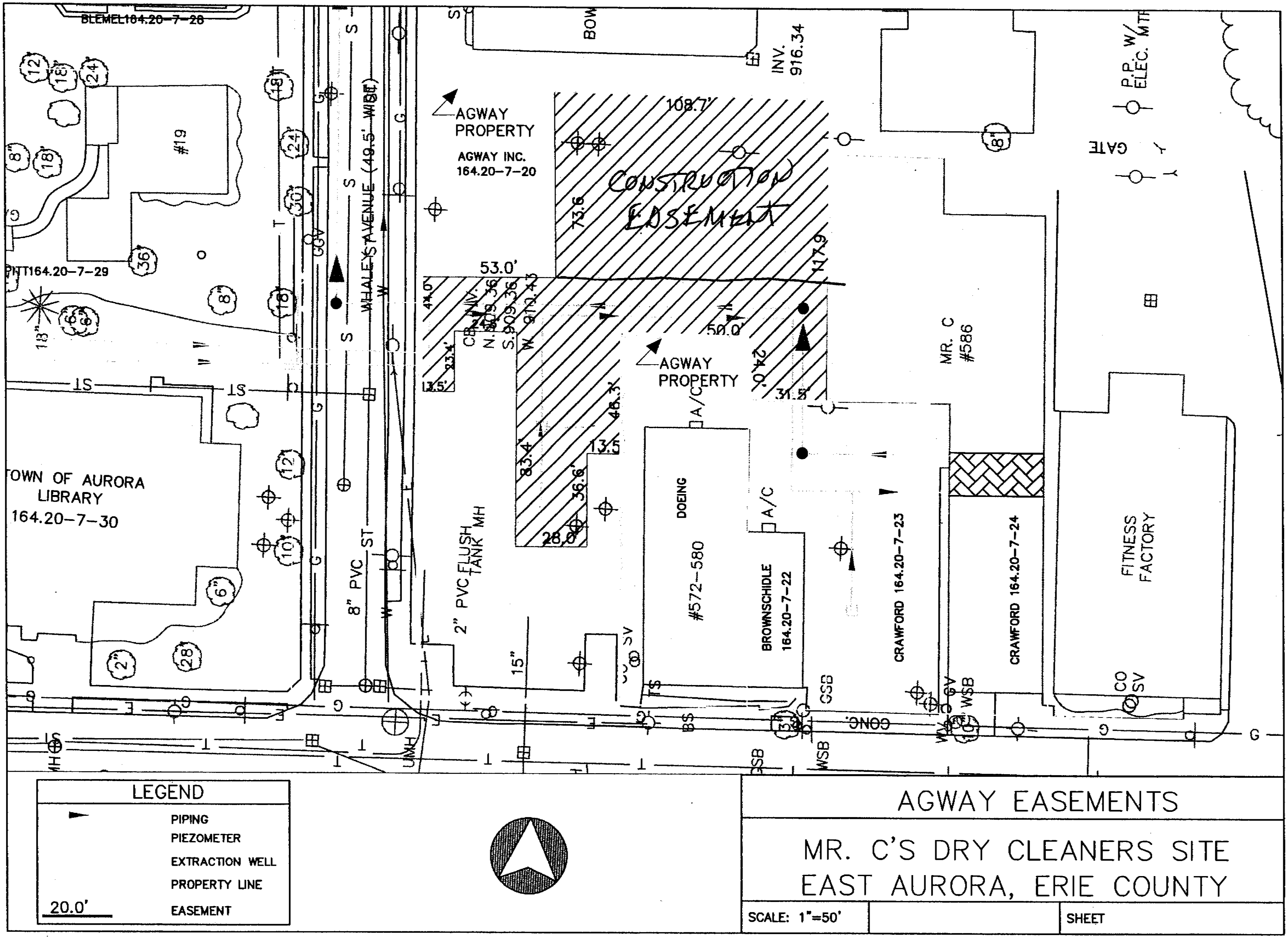
AGWAY EASEMENTS

MR. C'S DRY CLEANERS SITE
EAST AURORA, ERIE COUNTY

SCALE: 1"=50'

SHEET

ATTACHMENT C



AGWAY EASEMENTS

MR. C'S DRY CLEANERS SITE
EAST AURORA, ERIE COUNTY

SCALE: 1"=50'

SHEET

ATTACHMENT D.

M. Steffan

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Construction Services, Room 267
50 Wolf Road, Albany, New York 12233-7010
Phone: (518) 457-9280 • **FAX:** (518) 457-7743
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

APR 5

Mr. Michael J. Tone
Nixon Peabody LLP
Attorneys at Law
990 Stewart Avenue
Garden City, New York 11530-4838

Dear Mr. Tone:

RE: Mr. C's Dry Cleaners Site, (V) East Aurora (C) Erie
Temporary Use & Occupancy Agreements/Standard Vouchers

Enclosed is a Temporary Use & Occupancy Agreement (TU&O) which has been signed and executed on behalf of the Department in relation to the planned cleanup at the Mr. C's Dry Cleaning site. Please keep this copy for your records.

Secondly, per recent discussions between Agway and Jim Charles, a draft amendment dated April 4, 2001 to the TUO has also been enclosed.

Finally, a Standard Voucher form has been included in triplicate original. The voucher is to be signed by Agway and returned to the Department to my attention at the address identified below. Please note that the voucher will not be processed by the Department until formal notice to proceed (NTP) has been issued to the selected remedial contractor. The Standard Voucher will be processed by the Department and Agway will be issued a check for the specified dollar amount associated with the TUO once the NTP date is established ($5,800). Remedial work will not occur on your property until after the NTP date which is expected to be some time in August 2001. Agway will be notified in the future of the NTP date under separate letter.

Please sign, date, and return the three (3)original copies of the Standard Voucher to:

David J. Chiusano, Project Manager
Bureau of Construction Services
Division of Environmental Remediation
50 Wolf Road, Room 267
Albany, NY 12233-7010

Please feel free to contact me at (518) 457-7878 or at djchiusa@gw.dec.state.ny.us should you have any questions. Legal questions relating to the TUO and/or draft amendment should be directed to Jim Charles, Attorney, NYSDEC - Division of Environmental Enforcement, at (716) 851-7050. Your continued cooperation is appreciated.

Sincerely,

David J. Chiusano
Project Manager
Western Field Services Section
Bureau of Construction Services
Division of Environmental Remediation

Enclosures

cc: J. Charles, DEE
M. Steffan, E&E ✓

M. Steffan

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Construction Services, Room 267
50 Wolf Road, Albany, New York 12233-7010
Phone: (518) 457-9280 • **FAX:** (518) 457-7743
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

Rec'd
4/12/01
M.H.S.

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

APR 5 2001

People, Inc.
Attn: Rhonda Frederick
1219 N. Forest Rd.
Williamsville, NY 14221

Dear Ms. Frederick:

RE: Mr. C's Dry Cleaners Site, (V) East Aurora (C) Erie
Temporary Use & Occupancy Agreements / Standard Vouchers

Enclosed is a Temporary Use & Occupancy Agreement (TU&O) which has been signed and executed on behalf of the Department in relation to the planned cleanup at the Mr. C's Dry Cleaning site. Please keep this copy for your records.

Secondly, please recall that on March 19, 2001 you signed and dated the associated Standard Voucher forms. Please note that the voucher will not be processed by the Department until formal Notice to Proceed (NTP) has been given to the selected remedial contractor. Once that date is established, the Standard Voucher will be processed by the Department and Peoples, Inc., will be issued a check for the specified dollar amount associated with the TUO ($600). Remedial work will not occur on your property until after the NTP date which is expected to be some time in August 2001. You will be notified of the NTP date in a separate letter.

Please feel free to contact me at (518) 457-7878 or at djchiusa@gw.dec.state.ny.us should you have any questions. Legal questions should be directed to Jim Charles, Attorney, NYSDEC - Division of Environmental Enforcement, at (716) 851-7050. Your continued cooperation is appreciated.

Sincerely,

David J. Chiusano
Project Manager
Western Field Services Section
Bureau of Construction Services
Division of Environmental Remediation

Enclosure

cc: J. Charles, DEE
M. Steffan, E&E

M. Steffan

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Construction Services, Room 267
50 Wolf Road, Albany, New York 12233-7010
Phone: (518) 457-9280 • **FAX:** (518) 457-7743
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

APR 5 2001

Mr. Jack Crawford
584 and 586 Main Street
East Aurora, NY 14052

Dear Mr. Crawford:

RE: Mr. C's Dry Cleaners Site, (V) East Aurora (C) Erie
Temporary Use & Occupancy Agreements/Standard Vouchers

Enclosed is a Temporary Use & Occupancy Agreement (TU&O) which has been signed and executed on behalf of the Department in relation to the planned cleanup at the Mr. C's Dry Cleaning site. Please keep this copy for your records. Currently a pre-bid meeting has been scheduled at the site for May 16, 2001 at 11:00 a.m., and the bid opening has been scheduled for May 30, 2001 at 1:00 p.m.

Please feel free to contact me at (518) 457-7878 or at djchiusa@gw.dec.state.ny.us should you have any questions. Legal questions should be directed to Jim Charles, Attorney, NYSDEC - Division of Environmental Enforcement, at (716) 851-7050. Your continued cooperation is appreciated.

Sincerely,

David J. Chiusano
Project Manager
Western Field Services Section
Bureau of Construction Services
Division of Environmental Remediation

Enclosure

cc: J. Charles, DEE
M. Steffan, E&E

M. Steffan

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Construction Services, Room 267
50 Wolf Road, Albany, New York 12233-7010
Phone: (518) 457-9280 • **FAX:** (518) 457-7743
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

APR 5 2001

Town of Aurora
c/o Thomas Cotton, Supervisor
Town Hall, 5 South Grove Road
East Aurora, NY 14052

Dear Supervisor Cotton:

RE: Mr. C's Dry Cleaners Site, (V) East Aurora (C) Erie
Temporary Use & Occupancy Agreements/Standard Vouchers

Enclosed is a Temporary Use & Occupancy Agreement (TU&O) which has been signed and executed on behalf of the Department in relation to the planned cleanup at the Mr. C's Dry Cleaning site. Please keep this copy for your records. Currently a pre-bid meeting has been scheduled at the site for May 16, 2001 at 11 a.m., and the bid opening has been scheduled for May 30, 2001 at 1:00 p.m.

Please feel free to contact me at (518) 457-7878 or at djchiusa@gw.dec.state.ny.us should you have any questions. Legal questions should be directed to Jim Charles, Attorney, NYSDEC - Division of Environmental Enforcement, at (716) 851-7050. Your continued cooperation is appreciated.

Sincerely,

David J. Chiusano
Project Manager
Western Field Services Section
Bureau of Construction Services
Division of Environmental Remediation

Enclosure

cc: J. Charles, DEE
M. Steffan, E&E

M. Steffan

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Construction Services, Room 267
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Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

APR 5 2001

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Village of East Aurora
c/o The Honorable John Pagliaccio
Mayor
Village Hall, 571 Main Street
East Aurora, NY 14052

Dear Mayor Pagliaccio:

RE: Mr. C's Dry Cleaners Site, (V) East Aurora (C) Erie
Temporary Use & Occupancy Agreements/Standard Vouchers

Enclosed is a Temporary Use & Occupancy Agreement (TU&O) which has been signed and executed on behalf of the Department in relation to the planned cleanup at the Mr. C's Dry Cleaning site. Please keep this copy for your records. Currently a pre-bid meeting has been scheduled at the site for May 16, 2001 at 11 a.m., and the bid opening has been scheduled for May 30, 2001 at 1 p.m.

Please feel free to contact me at (518) 457-7878 or at djchiusa@gw.dec.state.ny.us should you have any questions. Legal questions should be directed to Jim Charles, Attorney, NYSDEC - Division of Environmental Enforcement, at (716) 851-7050. Your continued cooperation is appreciated.

Sincerely,

David J. Chiusano
Project Manager
Western Field Services Section
Bureau of Construction Services
Division of Environmental Remediation

Enclosure

cc: J. Charles, DEE
M. Steffan, E&E

M. Steffan

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Construction Services, Room 267
50 Wolf Road, Albany, New York 12233-7010
Phone: (518) 457-9280 • **FAX:** (518) 457-7743
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

APR 5 2001

Mr. Lee Brownschidle
2065 West River Road
Grand Island, NY 14072

Dear Mr. Brownschidle:

Re: Mr. C's Dry Cleaners Site, (V) East Aurora (C) Erie
Temporary Use & Occupancy Agreements/Standard Vouchers

Enclosed is a Temporary Use & Occupancy Agreement (TU&O) which has been signed and executed on behalf of the Department in relation to the planned cleanup at the Mr. C's Dry Cleaning site located in East Aurora. Please keep this copy for your records.

Secondly, I have enclosed three (3) original copies of Standard Voucher forms which you need to date and sign. Please note that the vouchers will not be processed by the Department until formal notice to proceed (NTP) has been given to the selected remedial contractor. Once that date is established, the Standard Voucher will be processed by the Department and you will be issued a check for the specified dollar amount associated with the TUO ($400). Remedial work will not occur on your property until after the NTP date, which is expected to be some time in August 2001. You will be notified of the NTP date in separate letter.

Please sign and return the three (3)original copies of the Standard Voucher to:

David J. Chiusano, Project Manager
Bureau of Construction Services
Division of Environmental Remediation
50 Wolf Road, Room 267
Albany, NY 12233-7010

Please feel free to contact me at (518) 457-7878 or at djchiusa@gw.dec.state.ny.us should you have any questions. Legal questions should be directed to Jim Charles, Attorney, NYSDEC - Division of Environmental Enforcement, at (716) 851-7050. Your continued cooperation is appreciated.

Sincerely,

David J. Chiusano
Project Manager
Western Field Services Section
Bureau of Construction Services
Division of Environmental Remediation

Enclosure

cc: J. Charles, DEE
M. Steffan, E&E

M. Steffan

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Construction Services, Room 267
50 Wolf Road, Albany, New York 12233-7010
Phone: (518) 457-9280 • **FAX:** (518) 457-7743
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

APR 5 2001

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Michael D. and Mrs. Maria T. Pitt
19 Whaley Avenue
East Aurora, NY 14052

Dear Mr. and Mrs. Pitt:

RE: Mr. C's Dry Cleaners Site, (V) East Aurora (C) Erie
Temporary Use & Occupancy Agreements/Standard Vouchers

Enclosed is a Temporary Use & Occupancy Agreement (TU&O) which has been signed and executed on behalf of the Department in relation to the planned cleanup at the Mr. C's Dry Cleaning site. Please keep this copy for your records.

Secondly, I have enclosed three (3) original copies of Standard Voucher forms which you will need to date and sign. Please note that the vouchers will not be processed by the Department until formal notice to proceed (NTP) has been given to the selected remedial contractor. Once that date is established, the Standard Voucher will be processed by the Department and you will be issued a check for the specified dollar amount associated with the TUO ($250). Remedial work will not occur on your property until after the NTP date, which is expected to be some time in August 2001. You will be notified of the NTP date in separate letter.

Please sign and return the three (3)original copies of the Standard Voucher to:

David J. Chiusano, Project Manager
Bureau of Construction Services
Division of Environmental Remediation
50 Wolf Road, Room 267
Albany, NY 12233-7010

Please feel free to contact me at (518) 457-7878 or at djchiusa@gw.dec.state.ny.us should you have any questions. Legal questions should be directed to Jim Charles, Attorney, NYSDEC - Division of Environmental Enforcement, at (716) 851-7050. Your continued cooperation is appreciated.

Sincerely,

David J. Chiusano
Project Manager
Western Field Services Section
Bureau of Construction Services
Division of Environmental Remediation

Enclosure

cc: J. Charles, DEE
M. Steffan, E&E

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Western Remedial Action, Room 348
50 Wolf Road, Albany, New York 12233-7010
Phone: (518) 457-0414 • **FAX:** (518) 457-3972
Website: www.dec.state.ny.us

John P. Cahill
Commissioner

RECEIVED
MAR 12
BUREAU OF
CONSTRUCTION SERVICES

MEMORANDUM

TO: James Jensen, Division of Lands and Forest, Bureau of Real Property
FROM: Michael Ryan, Acting Chief, Section A, Bureau of Western Remedial Action, DER
SUBJECT: Temporary Use Agreements, Mr. C's Inactive Hazardous Waste Site 9-015-157

DATE: March 9, 2001

Attached please find three original, signed and notarized copies of the Temporary Use and Occupancy Agreement (TUO) for Agway Inc. We have also included copies of a completed Standard Voucher for your use. We request that you process these documents to finalize access to this property.

We have also attached a copy of a letter sent to People Inc, offering them compensation of $600.00 and enclosing a revised TUO and Standard Vouchers for their signature. We have asked People Inc to send the completed document to your office, and ask you to process this TUO and payment as well.

It is our understanding that the TUO's we forwarded to you on January 18, 2001 are being held in your office awaiting processing of Standard Vouchers to facilitate payment of compensation. We have attached copies of completed Standard Vouchers for Michael and Maria Pitt, and Lee Brownschidle, and request that you to process these vouchers. (Note that the remaining 3 TUO's, for the Village of East Aurora, the Town of Aurora, and Jack Crawford (the PRP) are not being compensated for the TUO's, so no vouchers have been prepared). Once the vouchers have been signed by the property owners, we request that you process the payments and finalize the agreements.

For clarification, the following table summarizes the TUO status for affected properties:

PROPERTY	COMPENSATION REQUIRED	TUO STATUS
Agway Inc.	Yes: $5,800.00	Attached.
Brownschidle	Yes: $400.00	Forwarded to DLF 6/18/01
Crawford	No	Forwarded to DLF 6/18/01
People Inc	Yes: $600.00	Sent out by DER 3/8/01
Pitt	Yes: $250.00	Forwarded to DLF 6/18/01
Town of Aurora	No	Forwarded to DLF 6/18/01
Village of East Aurora	No	Forwarded to DLF 6/18/01

The Bureau of Construction Services is prepared to begin work on this remedy as soon as the agreements are in place, so anything you could do to speed this process would be appreciated.

I would also like to make sure that the long term easements discussed in our memo of June 8, 2000 will be processed in a timely fashion to allow these agreements to be in place ahead of the completion of the remedial construction. Please provide a summary of the status of these agreements, and the work that must be done to complete them.

Your assistance with this matter is greatly appreciated. If you have any questions, please contact Bill Ottaway at 457-3375.

Attachments

cc: Dave Chiusano, DER, BCS ✓
Bill Ottaway, DER, BWRA

Mr. Steffa

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Construction Services, Room 267
50 Wolf Road, Albany, New York 12233-7010
Phone: (518) 457-9280 • FAX: (518) 457-7743
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

JUL - 3 2001

RECEIVED
BY MGS DATE 7/16/01

Nixon Peabody LLP
Attention: Michael J. Tone, Esq.
990 Stewart Avenue
Garden City, New York 11530

Dear Mr. Tone:

RE: Final Access Agreement Amendment
Mr. C's Dry Cleaners, Site No. 9-15-157
Village of East Aurora, Erie County

Pursuant to your recent discussions with James Charles, enclosed are triplicate originals of the subject document. Please have your client sign and notarize all the originals and return them by no later than **July 20, 2001** to:

David J. Chiusano, Environmental Engineer
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, New York 12233-7013

One fully executed access agreement will be returned to your attention once the Department signs them.

Secondly, a Standard Voucher was previously transmitted to you in triplicate original via letter dated April 5, 2001. To date, the Department has not received the signed vouchers. As such, please sign the vouchers and return to my attention at the above address. Once received, the Standard Vouchers will be processed by the Department and Agway will be issued a check for $5,800. Please note that the voucher will not be processed until formal notice to proceed (NTP) has been issued to the selected remedial contractor. NTP is currently anticipated for late July, early August 2001.

Finally, as you are already aware, the Department opened competitive bids for remedial construction at the subject site on June 6, 2001. The Tyree Organization has been identified as the apparent low bidder as a result of that bid opening. It is my current understanding that Agway has recently completed installation of air sparge/SVE points on the their adjacent parcel for which the Department has access to install their groundwater extraction well(s) and piezometers. Recently, I have been in contact with Richard Williams of Agway in order to obtain a surveyed record drawing depicting the accurate locations and depths of your clients treatment locations. The exact locations are necessary to avoid any potential damage to Agway's treatment system during remedial construction, any costs/changes to our contract specifications and delays to our construction schedule. To date, I have not received this requested information. In order to avoid any further delay, I am requesting that the Department be provided with your client's record drawing by **Friday, July 20, 2001.** After that time, the Department will proceed to conduct our own survey of that area in an effort to obtain the necessary information.

Legal questions relating to this subject matter should be directed to Jim Charles at (716) 851-7050. Technical questions should be brought to my attention at (518) 457-7878. As of July 16, 2001 my new phone number will be (518) 402-9812. My new address is identified above. Thank you for your time and prompt attention to this matter.

Sincerely,

David J. Chiusano
Project Manager
Western Field Services Section
Bureau of Construction Services
Division of Environmental Remediation

Enclosures

cc: R. Williams, Agway
M. Steffan, E&E

Buffalo, New York

ecology and environment engineering, p.c.
International Specialists in the Environment
Buffalo Corporate Center
368 Pleasant View Dr.
Lancaster, New York 14086
Phone 716.684.8060 Fax 716.684.0844

Telecopier Transmission Form

Date: July 3, 2001	*Time:*
Job Code: 06840602	*Total Pages: 3*

To: Mr. Dave Chiusano

Company: NYSDEC, Division of Environmental Remediation

Telecopier Phone: 518-457-7743

From: *M.G. Steffan* M.G.S.

cc:

Special Instructions:

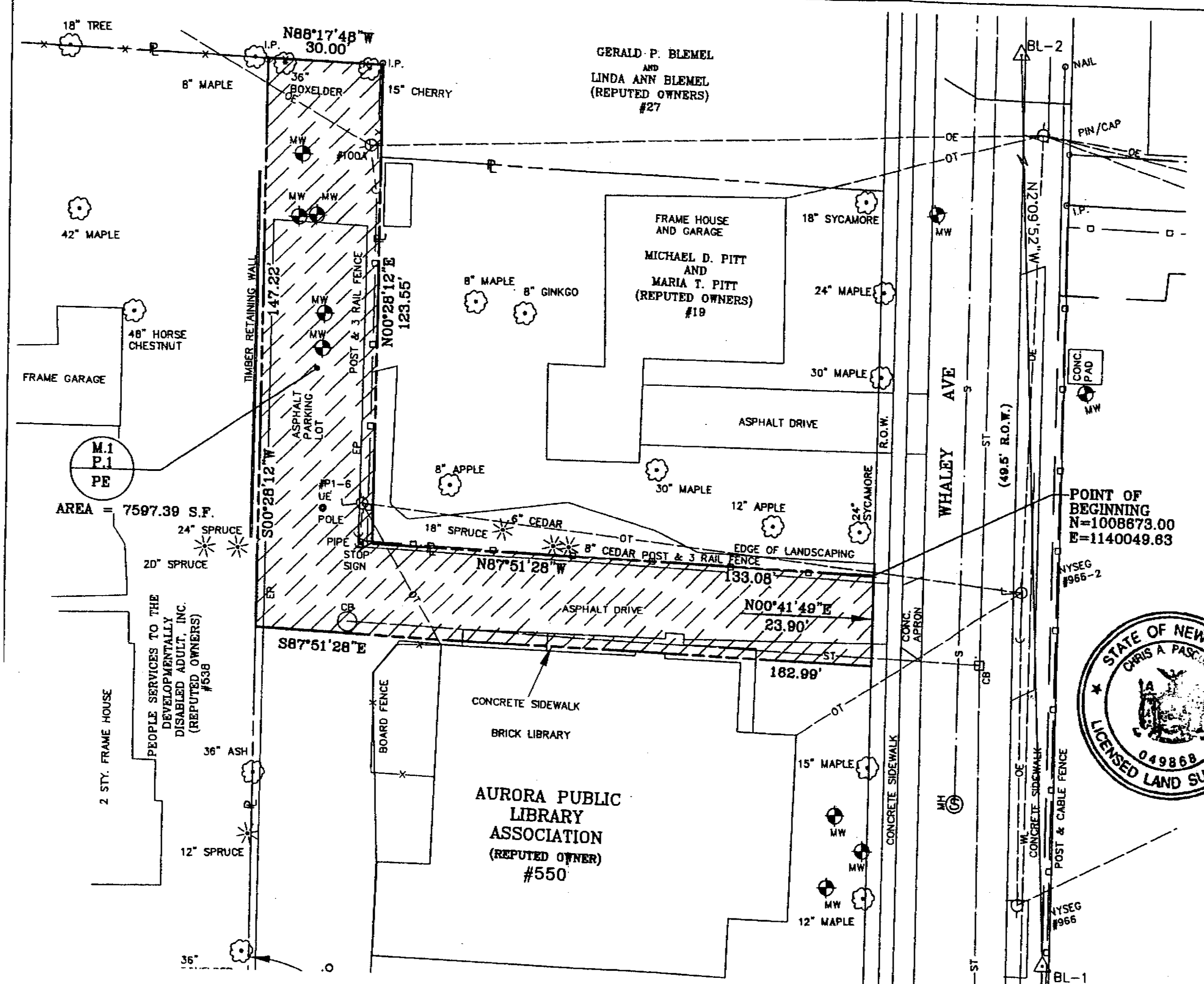
Dave,

Copy of the draft map and metes and bounds description for the construction easement for the library property for the Mr. C's project. I just received the copy and have not reviewed the information yet. I will make my comments to you on Thursday (7/5/01).

M. Steffan

Mike Steffan *July 3, 2001 (3:54PM)*

Please call if pages are poor quality or all pages were not transmitted.

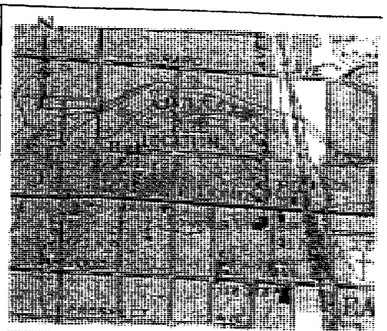


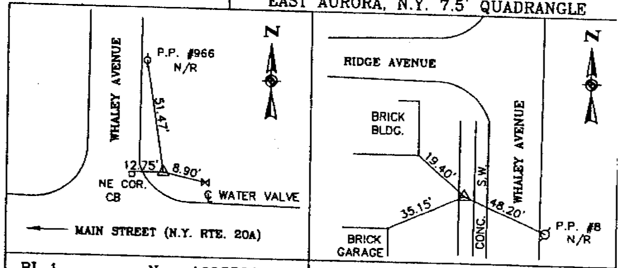
CHRIS A. PASCUZZO 049868

N

NOTE:

ALL BEARINGS SHOWN ARE ORIENTED TO GRID NORTH AS PER THE NEW YORK STATE PLANE COORDINATE SYSTEM, WEST ZONE. HAVING A CENTRAL MERIDIAN OF 78°35'00" WEST LONGITUDE. DETERMINED BY GPS MEANS NAD 83/96 HARN ON JUNE 20, 2001.


LOCATION MAP
EAST AURORA, N.Y. 7.5' QUADRANGLE



BL 1 RR SPIKE	N = 1008536.31 E = 1140097.55	BL 2 MAG NAIL	N = 1009421.42 E = 1140064.10

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION

LU ENGINEERS–CONSULTANT

PERMANENT EASEMENT FOR DRAINAGE PIPE LINE PURPOSES OF MAP OF LANDS TO BE ACQUIRED PURSUANT TO SECTION 3-0305 OF THE ENVIRONMENTAL CONSERVATION LAW

PROJECT: MR. C's DRY CLEANERS
AURORA PUBLIC LIBRARY ASSOCIATION–REPUTED OWNER

Situated in:

PART OF LOT 24; TOWNSHIP 9; RANGE 6
OF HOLLAND LAND COMPANY'S SURVEY
VILLAGE OF EAST AURORA; COUNTY OF ERIE
STATE OF NEW YORK

Designated As: NYSDEC SITE NO. #9-15-157

SCALE: 1" = 30'

0 30 60 90

I HERE BY CERTIFY THAT THIS IS AN ACCURATE SURVEY MAP PREPARED BY LU ENGINEERS UNDER MY DIRECTION, FROM AN ACTUAL SURVEY, PERFORMED IN ACCORDANCE WITH THE STANDARDS AND PROCEDURES ADOPTED BY THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

7-02-2001
DATE:

Chris A. Pascuzzo
CHRIS A. PASCUZZO License No. 049868

MAP DRAFTED BY: CLIFFORD J. RIGERMAN DATE

Survey no.
Field Book E-E #5 Pages #1-5

MAP No. 1

I HEREBY CERTIFY THAT THIS MAP WAS PREPARED FOR THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSEVATION AND WAS OFFICIALLY FILED IN THE DEPARTMENTAL OFFICES AT ALBANY, NEW YORK.

DATE: ______________

JAMES M. WEST, SUPERINTENDENT, REAL PROPERTY

APPROVED

DATE: ______________, 2001

____
NAME

EXECUTIVE DEPUTY COMMISSIONER
N.Y.S. DEPARTMENT OF ENVIRONMENTAL CONSERVATION

REFERENCES:

FOUR CORNERS ABSTRACT
SEARCH NO. B34092/40674
DATED JUNE 1, 2001

NOTE:

"ALTERATION OF THIS DOCUMENT, EXCEPT BY A LICENSED LAND SUVEYOR, IS ILLEGAL"

Continued on Sheet No. 2

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
PERMANENT EASEMENT FOR DRAINAGE PIPE LINE

AURORA PUBLIC LIBRARY ASSOCIATION
(REPUTED OWNER)

VILLAGE OF EAST AURORA
ERIE COUNTY, NEW YORK
E.C.C.O. LIBER: 6849 OF DEEDS, PAGE 523

MAP NO. 1
TYPE P.E.
SHEET 2 OF 2

A permanent easement to be exercised in, on and over the property above designated for the purpose of construction, reconstruction and maintaining thereon for drainage pipe line, drainage structures, together with appurtenances, in and to all that piece or parcel of property herein after designated as Parcel No.1, situate in Lot No. 24, Township No. 9, Range No. 6 of the Holland Land Company Survey, Village of East Aurora, County of Erie, State of New York, as shown on the accompanying Map and described as follows:

Parcel No. 1

Beginning at a point on the westerly boundary of the existing Whaley Avenue, at its intersection with the division line between the property of the AURORA PUBLIC LIBRARY ASSOCIATION (Reputed Owner) on the south and the property of MICHAEL D. PITT and MARIA D. PITT (Reputed Owner) on the north, said point having coordinates N 1008673.00 and E 1140049.63; thence North 87°–51'–28" East along the said division line a distance of 133.08 feet to a point; thence North 00°–28'–12" West a distance of 123.55 feet to a point, said point being the division line between property of the AURORA PUBLIC LIBRARY ASSOCIATION (Reputed Owner) on the South and the property of GERALD P. BLEMEL and LINDA ANN BLEMEL (Reputed Owners) on the North; thence North 88°–17'–48" West along the said division line a distance of 30.00 feet to a point, said point being the division line between the property of the Aurora Public Library Association (Reputed Owner) on the East and the property of the PEOPLE SERVICES TO THE DEVELOPMENTALLY DISABLED ADULT, INC. (Reputed Owner) on the west; thence South 00°–28'–12" West along the said division line a distance of 147.22 feet to a point; thence through the property of the AURORA PUBLIC LIBRARY ASSOCIATION (Repute Owner) South 87°–51'–28" East a distance of 162.99 feet to the westerly boundary of the existing Whaley Avenue; thence North 00°–41'–49" East along the last mentioned boundary a distance of 23.90 feet to the Point of Beginning, being 7597.39 Square Feet more or less.

Reserving, however, to the owner of any right, title or interest in and to the property described above, and such owners successors or assigns, the right of using said property and such use shall not be further limited or restricted under this easement beyond that which is necessary to effectuate its purposes for, and as established by, the construction and as so constructed, the maintenance of the herein identified project.

The Horizontal datum used in the preparation of the survey baseline and mapping shown herein is referenced to the New York State Plane Coordinate System, Western Zone, based on the North American Datum of 83/96 HARN.

All Bearings referred to True North at the 78°–35'–00" Meridian of West Longitude.

M. Steffan

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Construction Services, 12th Floor
625 Broadway, Albany, New York 12233-7013
Phone: (518) 402-9814 • **FAX:** (518) 402-9020
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

JUL 30 2001

RECEIVED
BY MGS DATE 8/3/01

CERTIFIED MAIL
RETURN RECEIPT REQUESTED
SECOND NOTICE

Mr. Lee Brownschidle
2065 West River Road
Grand Island, New York 14072

Dear Mr. Brownschidle:

Re: Mr. C's Dry Cleaners Site, (V) East Aurora (C) Erie
Temporary Use & Occupancy Agreements/Standard Vouchers

To date, the Department has not received the three signed copies of the Standard Voucher forms originally sent to you in certified letter dated April 5, 2001. As such, I have enclosed another three (3) original copies of Standard Voucher forms which you need to date and sign as soon as possible.

Please note that the vouchers will not be processed by the Department until formal notice to proceed (NTP) has been given to the selected remedial contractor. Once that date is established, the Standard Voucher will be processed by the Department and you will be issued a check for the specified dollar amount associated with the TUO ($400). Remedial work will not occur on your property until after the NTP date, which is expected to be some time in late August/early September 2001. You will be notified of the exact NTP date in separate letter.

Please sign and return the three (3)original copies of the Standard Voucher to:

David J. Chiusano, Project Manager
New York State Department of Environmental Conservation
Western Field Services Section
Bureau of Construction Services
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, New York 12233-7013

Please feel free to contact me at (518) 402-9812 or at djchiusa@gw.dec.state.ny.us should you have any questions. Legal questions should be directed to Jim Charles, Attorney, NYSDEC - Division of Environmental Enforcement, at (716) 851-7050. Your continued cooperation is appreciated.

Sincerely,

David J. Chiusano
Project Manager
Western Field Services Section
Bureau of Construction Services
Division of Environmental Remediation

Enclosure

cc: J. Charles - NYSDEC, DEE
M. Steffan - Ecology and Environment, Inc. ✓

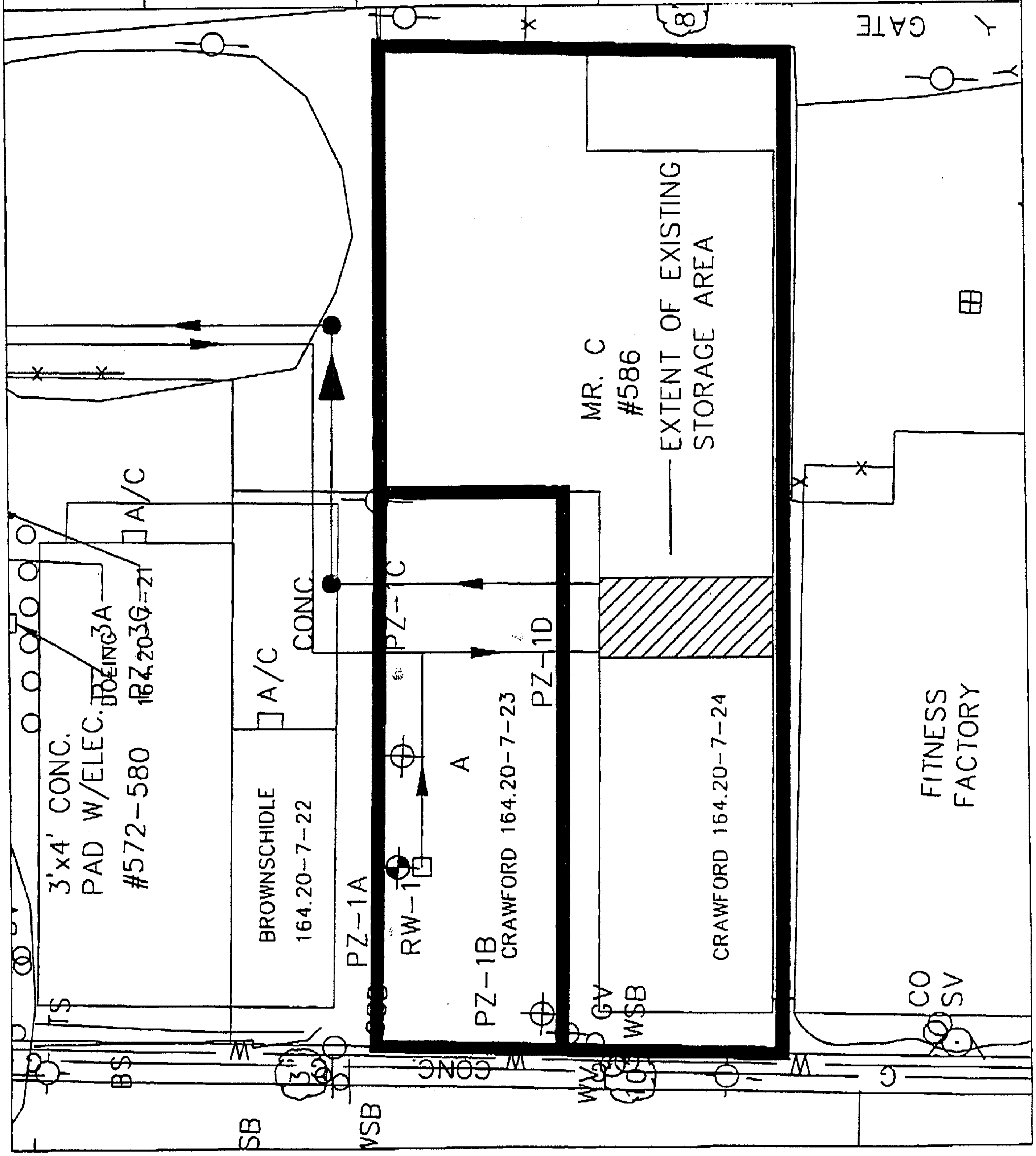
CRAWFORD PROPERTY

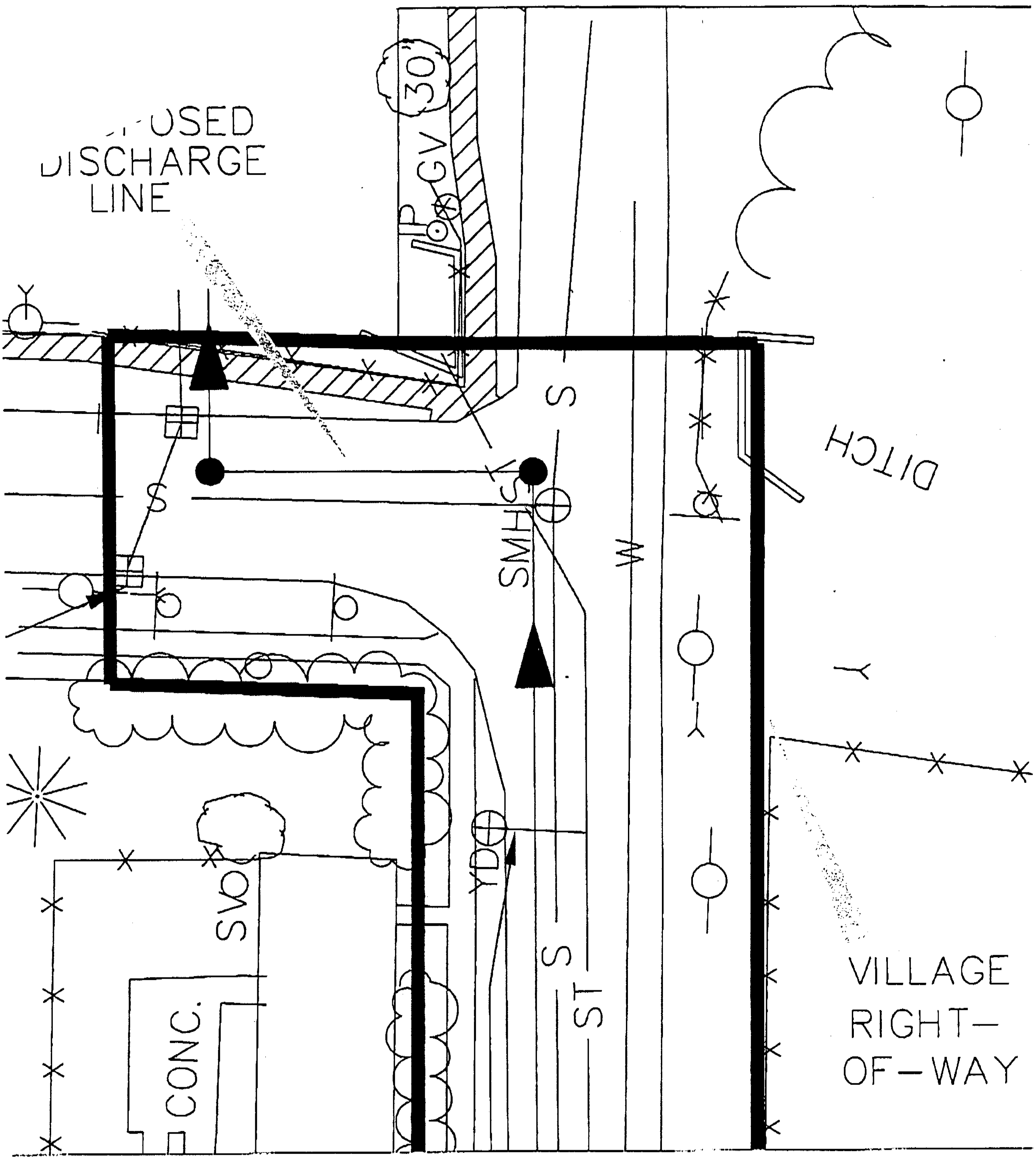
MR. C'S DRY CLEANERS SITE
EAST AURORA, ERIE COUNTY

SIZE	FSCM NO.	DWG NO.	REV

SCALE: 1"=30'		SHEET

LEGEND
- PIPING
- PIEZOMETER
- EXTRACTION WELL
- PROPERTY LINE

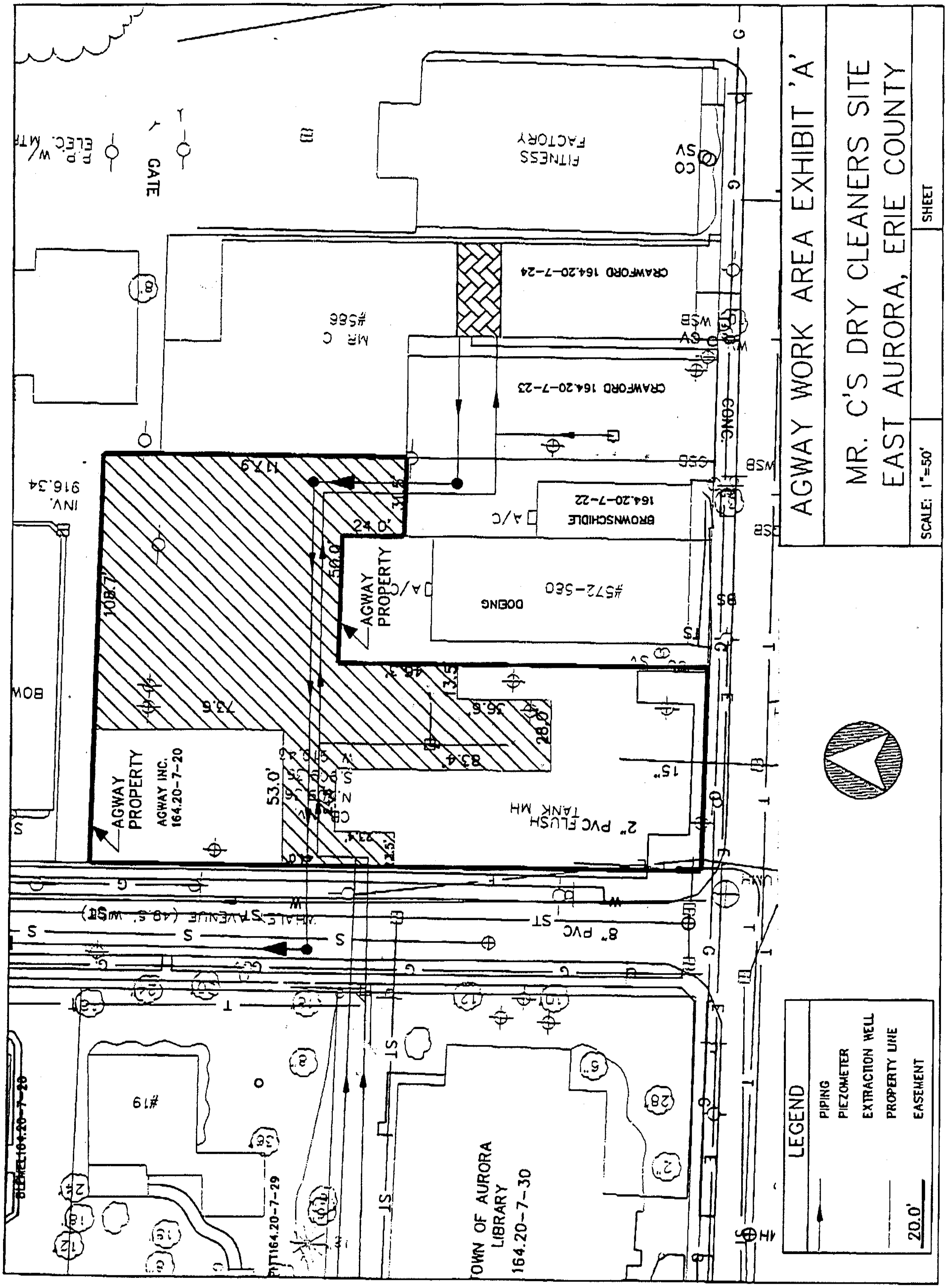




Ridge Road / Outlet

MR. C'S DRY CLEANERS
SITE NO. 9-15-157
VILLAGE OF EAST AURORA, ERIE COUNTY

SCALE: 1"=20'	SCHEDULE A



AGWAY WORK AREA EXHIBIT 'A'

MR. C'S DRY CLEANERS SITE
EAST AURORA, ERIE COUNTY

SCALE: 1"=50'

SHEET

PEOPLE INC. PROPERTY

MR. C'S DRY CLEANERS SITE
EAST AURORA, ERIE COUNTY

SIZE	FSCM NO.	DWG NO.	REV

SCALE: 1"=40'

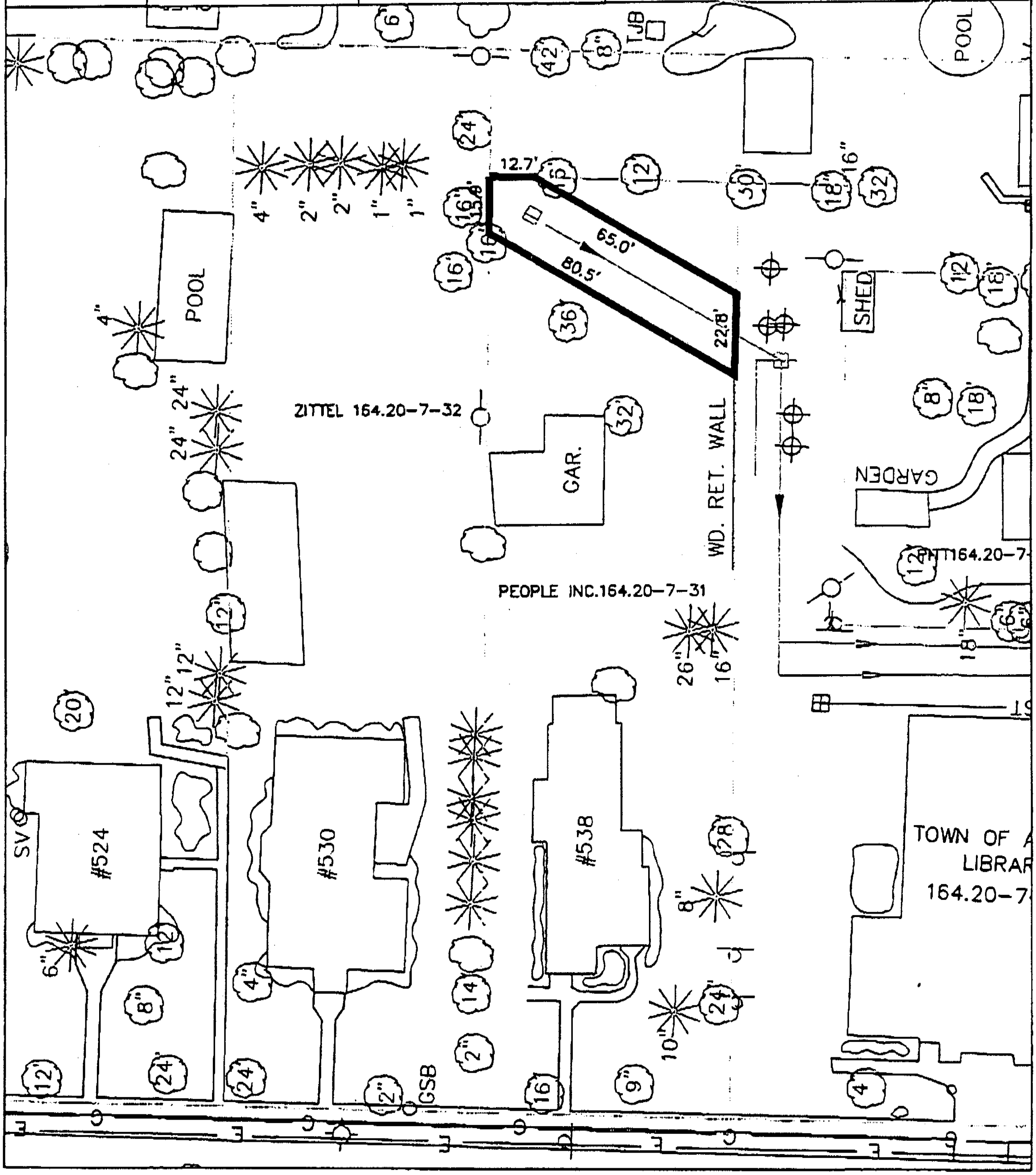
SHEET SCHEDULE A

LEGEND

PIPING

PIEZOMETER

EXTRACTION WELL



CRAWFORD PROPERTY

MR. C'S DRY CLEANERS SITE
EAST AURORA, ERIE COUNTY

SIZE	FSCM NO.	DWG NO.	REV

SCALE: 1"=30'

SHEET

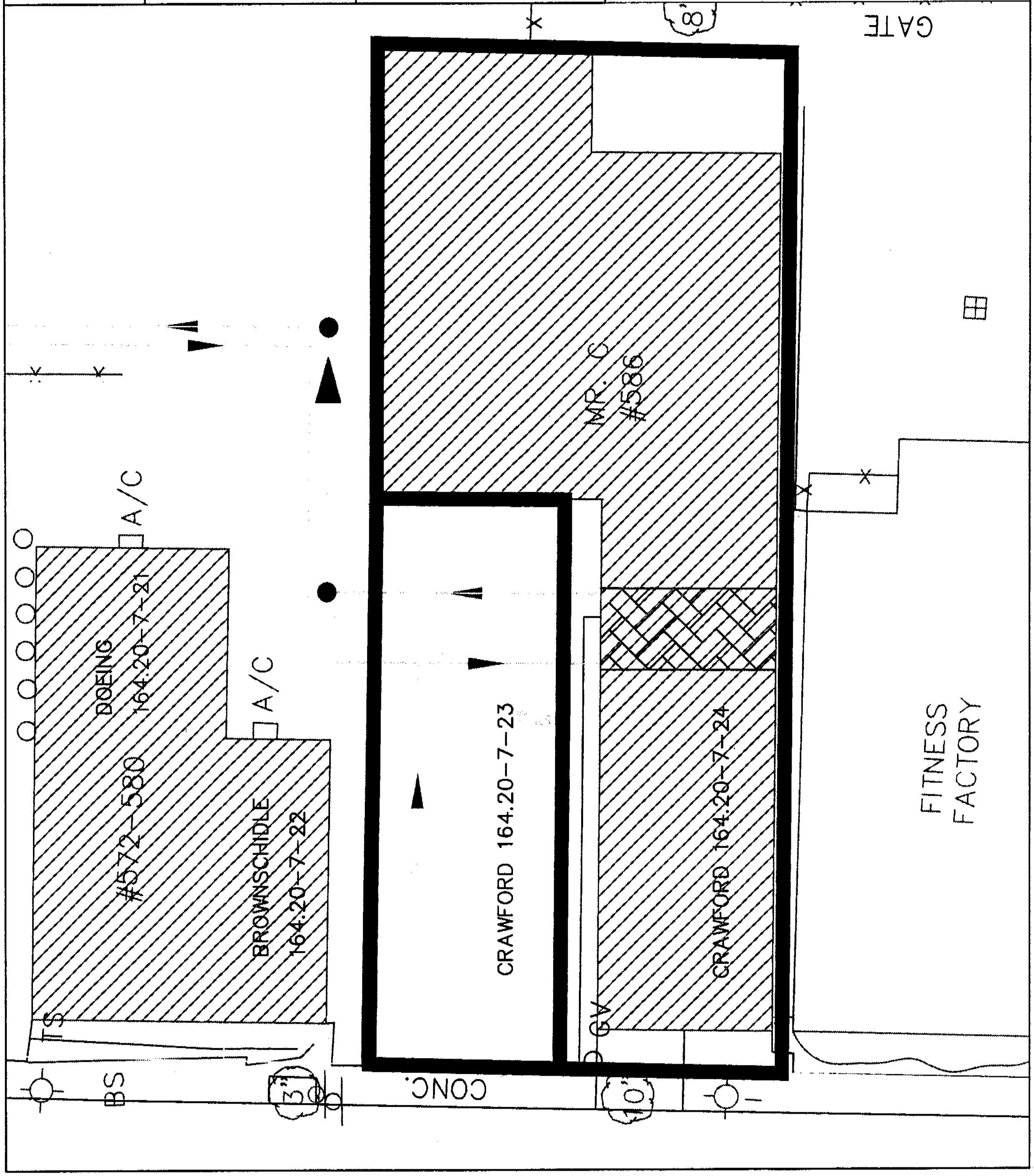
LEGEND

► PIPING

PIEZOMETER

EXTRACTION WELL

▬ PROPERTY LINE



PITTS PROPERTY

MR. C'S DRY CLEANERS SITE
EAST AURORA, ERIE COUNTY

SIZE	FSCM NO.	DWG NO.	REV

SCALE: 1"=40'

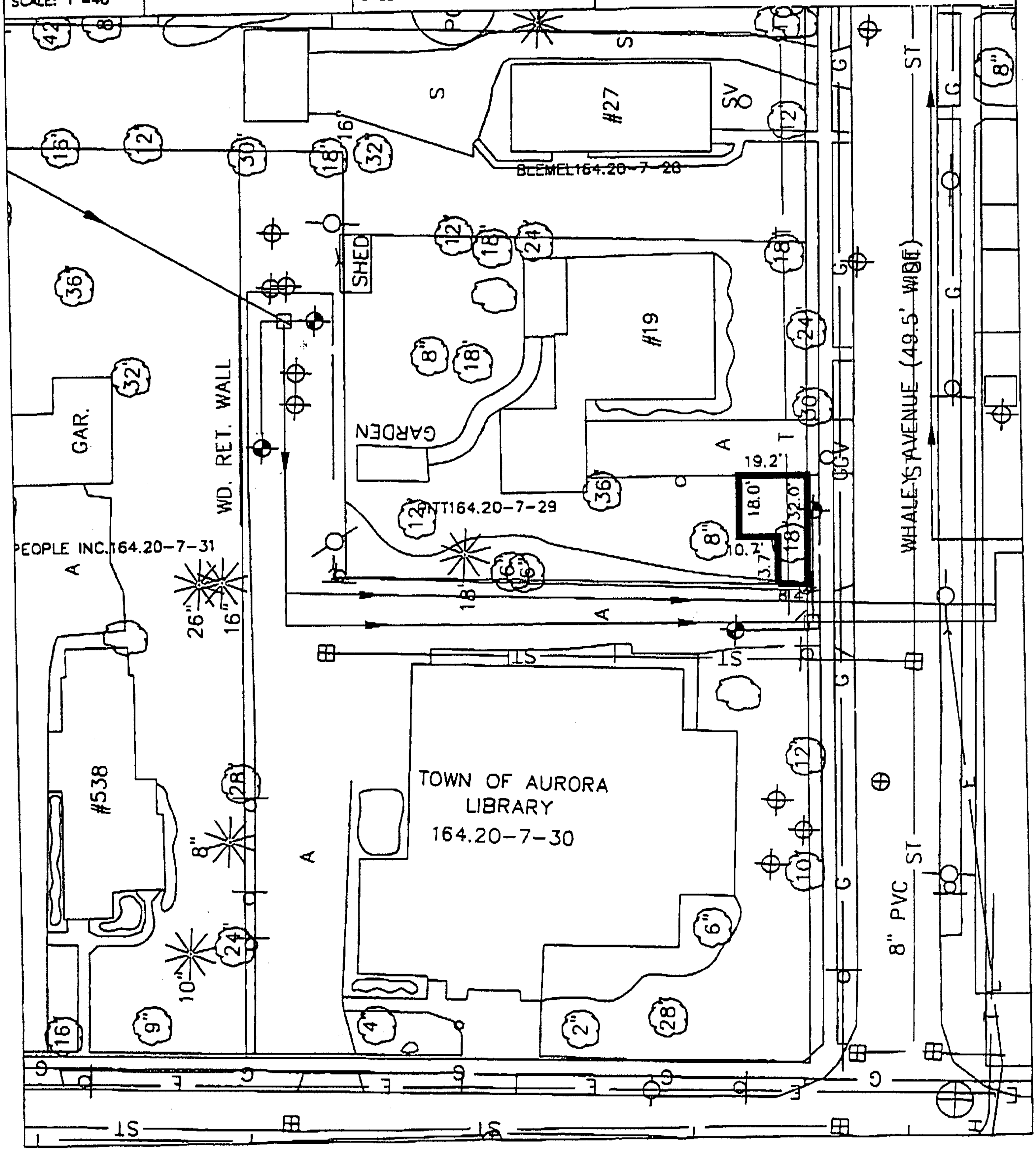
SHEET SCHEDULE A

LEGEND

PIPING

PIEZOMETER

EXTRACTION WELL



LIBRARY PROPERTY

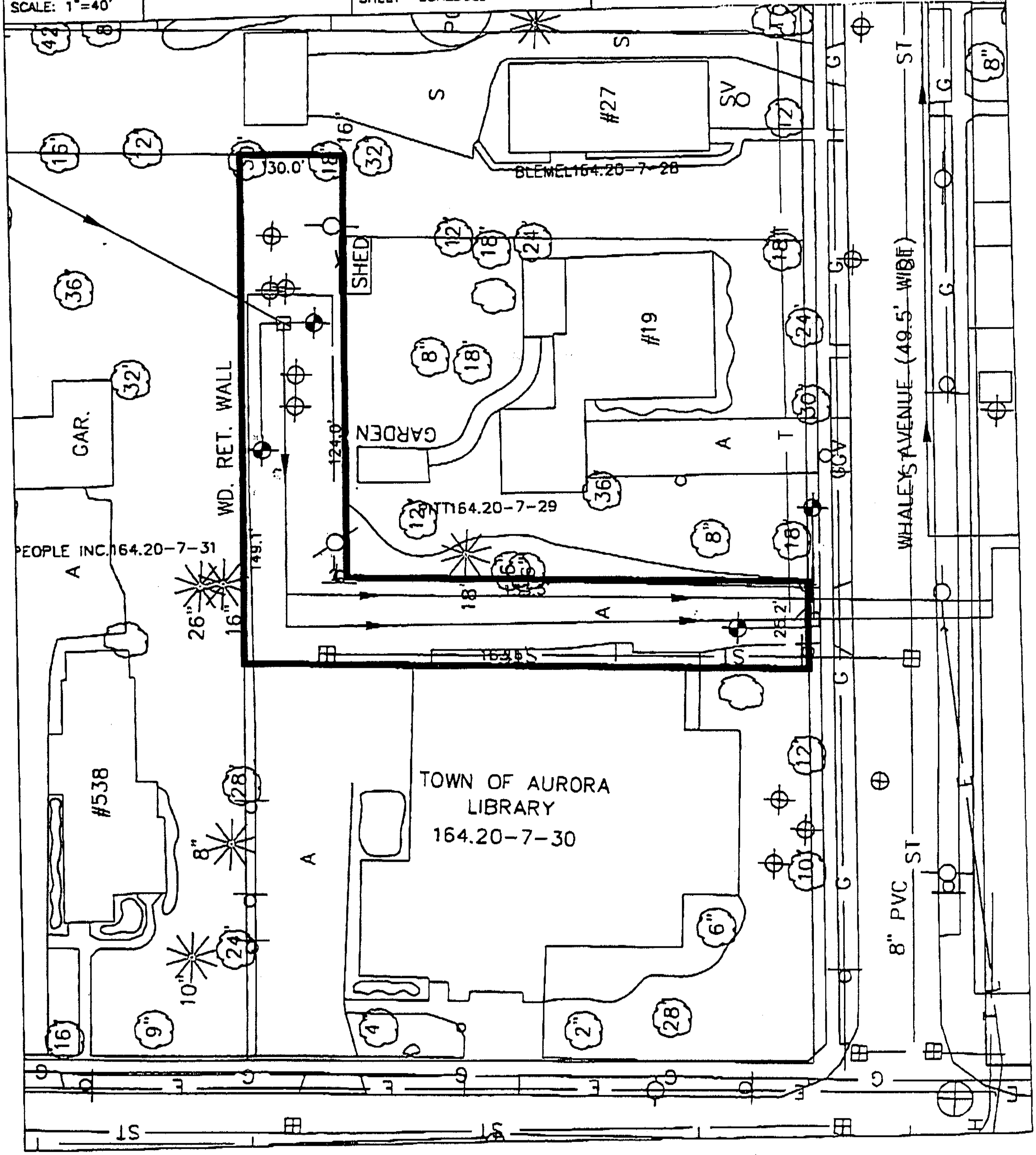
MR. C'S DRY CLEANERS SITE
EAST AURORA, ERIE COUNTY

SIZE	FSCM NO.	DWG NO.	REV
SCALE: 1"=40'		SHEET SCHEDULE A	

LEGEND

- PIPING
- PIEZOMETER
- ⊕ EXTRACTION WELL

N



BROWNSCHIDLE PROPERTY

MR. C'S DRY CLEANERS SITE
EAST AURORA, ERIE COUNTY

SIZE	FSCM NO.	DWG NO.	REV

SCALE: 1"=30'

SHEET SCHEDULE A

LEGEND

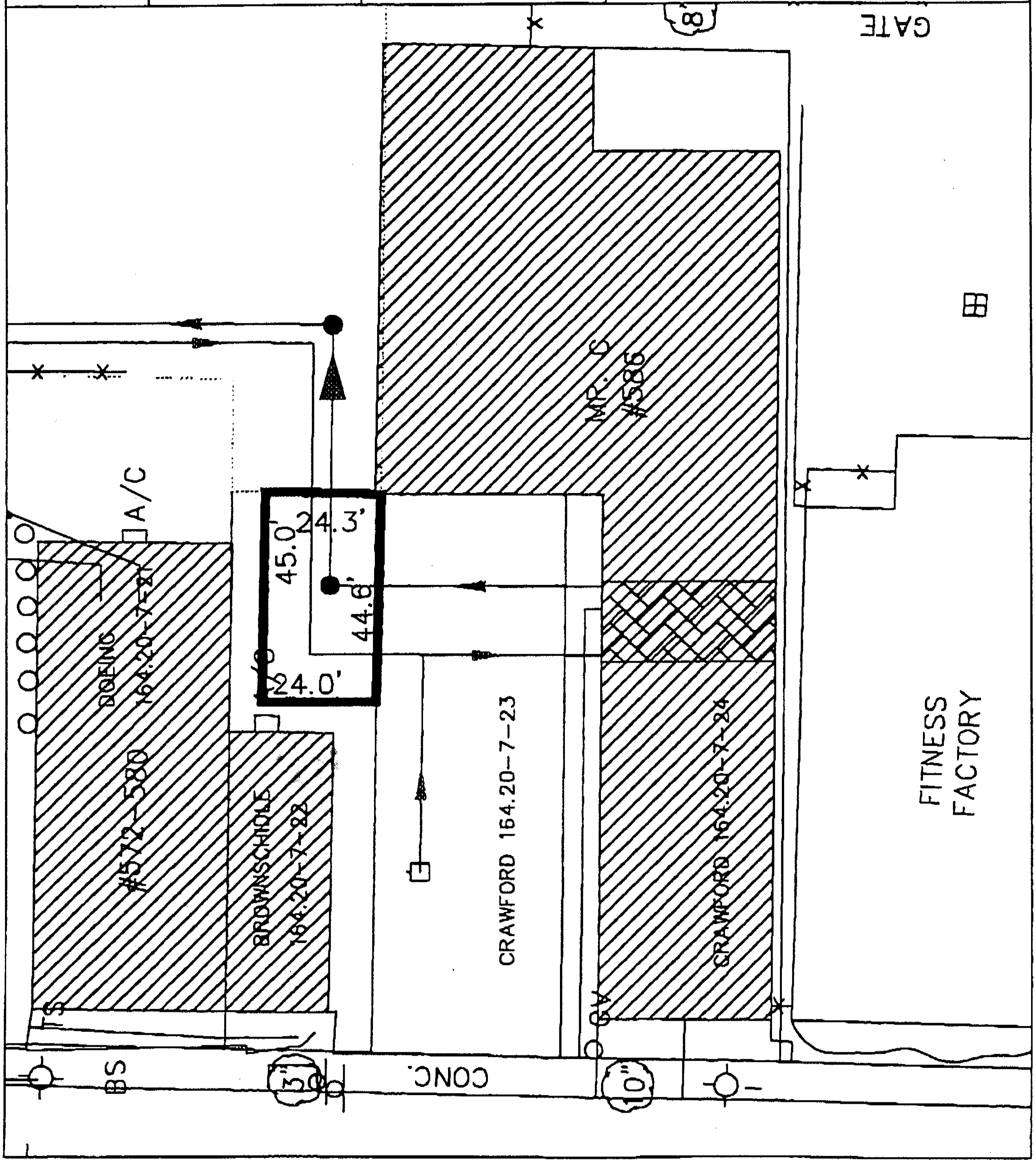
PIPING

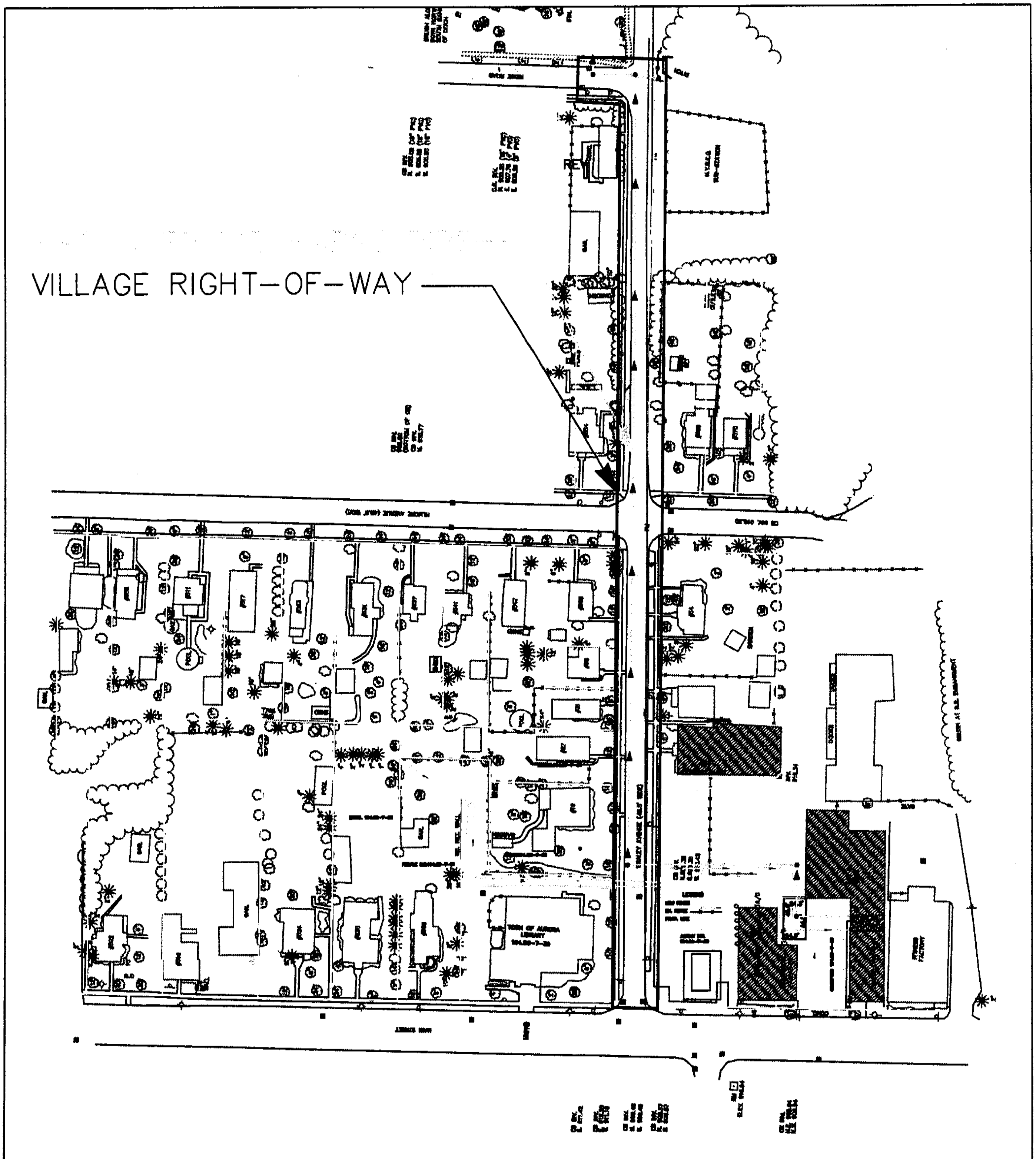
PIEZOMETER

EXTRACTION WELL

PROPERTY LINE

EASEMENT BOUNDARY





Village Right-of-Way

MR. C'S DRY CLEANERS
SITE NO. 9-15-157
VILLAGE OF EAST AURORA, ERIE COUNTY

SCALE: 1"=120'

FIGURE 1

D

Private Property Access Agreements

Access Agreement For Maintenance Of Soil Vapor Mitigation Systems

RE: Property: 27 Whaley Avenue, East Aurora, New York 14052

☒ I agree to allow NYSDEC and its duly authorized agents to enter the facility at **27 Whaley Avenue, East Aurora, New York 14052**, to perform inspection and maintenance activities on the soil vapor mitigation system installed on my property. I understand that all routine inspections will be scheduled by telephone at least two weeks in advance and that I or my designee will be present at the time of inspection and maintenance.

☐ Access denied.

Name DAVID D. BOOK

Signature ______________________ Date 9.12.7

**This agreement may be rescinded by the property owner by writing to NYSDEC at the address on the front of this letter.*

IOM&M / NYSDEC Copy

Access Agreement For Maintenance Of Soil Vapor Mitigation Systems

RE: Property: First Presbyterian Church, 9 Paine Avenue, East Aurora,
New York 14052

☒ I agree to allow NYSDEC and its duly authorized agents to enter the facility at **9 Paine Avenue, East Aurora, New York 14052**, to perform inspection and maintenance activities on the soil vapor mitigation system installed on my property. I understand that all routine inspections will be scheduled by telephone at least two weeks in advance and that I or my designee will be present at the time of inspection and maintenance.

☐ Access denied.

Name William R. Larson

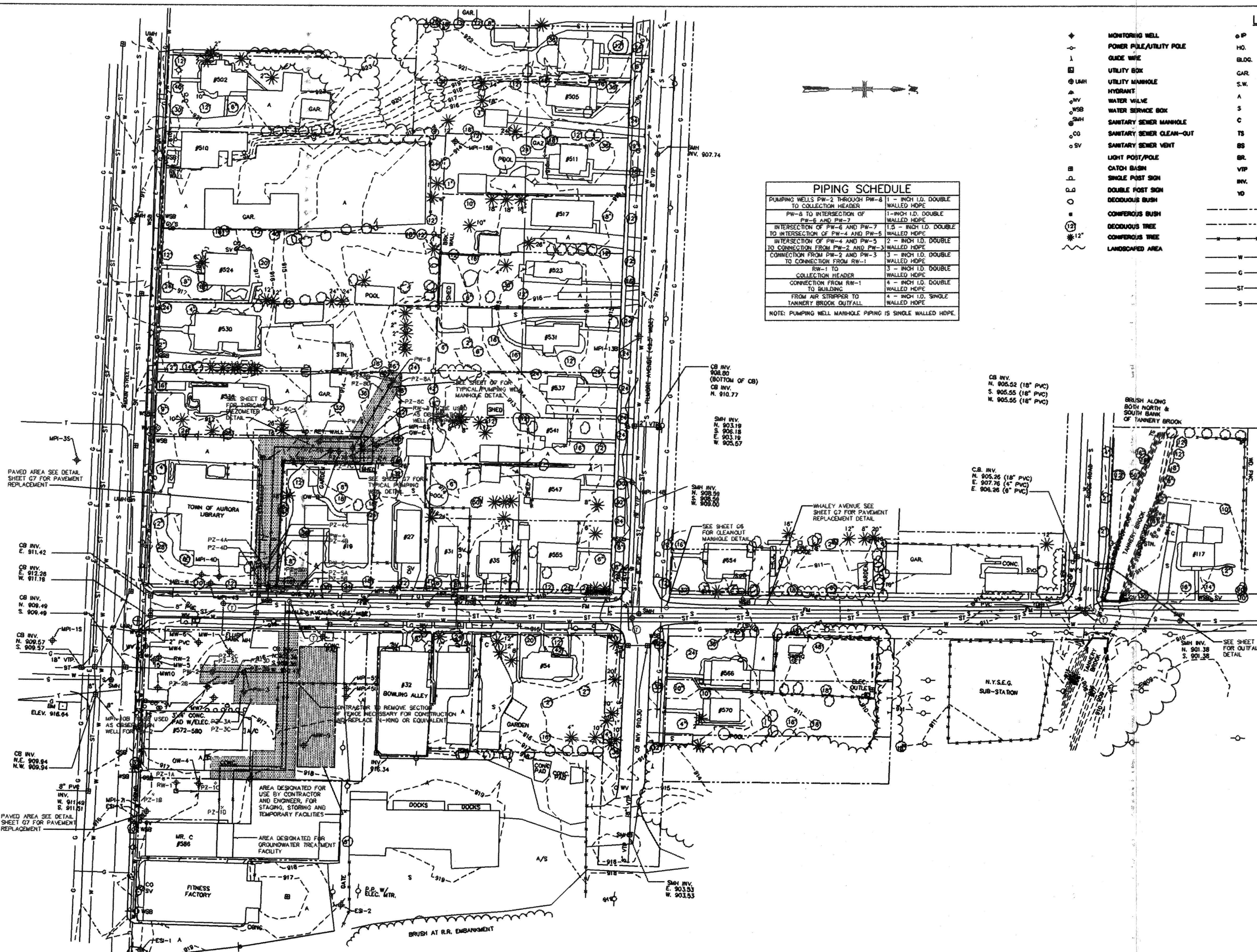
Signature Will R Larson Date 9-17-07

**This agreement may be rescinded by the property owner by writing to NYSDEC at the address on the front of this letter.*

IOM&M / NYSDEC Copy

E

Record Drawings for the On-Site Treatment System



LEGEND

◆	MONITORING WELL	● IP	PROPERTY IRON	▨	LONG TERM TEMPORARY EASEMENTS
-○-	POWER POLE/UTILITY POLE	HO.	HOUSE	◆ PW-1	PUMPING WELL
⅄	GUIDE WIRE	BLDG.	BUILDING	◦ PZ-A	PIEZOMETER
⊞	UTILITY BOX	GAR.	GARAGE	□	PUMPING WELL MANHOLE
⊕ UMH	UTILITY MANHOLE	S.W.	SIDEWALK	○	CLEANOUT CHAMBER
▲	HYDRANT	A	ASPHALT DRIVEWAY	——◂	OUTFALL
○ WV	WATER VALVE	S	STONE DRIVEWAY	Ⓣ	TEST PIT
○ WSB	WATER SERVICE BOX	C	CONCRETE DRIVEWAY	——FM——	DISCHARGE FORCEMAIN
⊕ SMH	SANITARY SEWER MANHOLE	TS	TOP OF SLOPE		
○ CO	SANITARY SEWER CLEAN-OUT	BS	BOTTOM OF SLOPE		
○ SV	SANITARY SEWER VENT	BR.	BRICK		
	LIGHT POST/POLE	VTP	VITREOUS TILE PIPE		
⊞	CATCH BASIN	INV.	INVERT		
⍝	SINGLE POST SIGN	YD	YARD DRAIN		
⍝⍝	DOUBLE POST SIGN	— - - —	APPROXIMATE HIGHWAY BOUNDARY		
○	DECIDUOUS BUSH	— - - —	APPROXIMATE PROPERTY LINE		
●	CONIFEROUS BUSH	—×—×—	FENCE		
⑫	DECIDUOUS TREE	——W——	EXISTING WATERLINE		
✳12"	CONIFEROUS TREE	——G——	EXISTING GASLINE		
∿	LANDSCAPED AREA	——ST——	EXISTING STORM SEWER		
		——S——	EXISTING SANITARY SEWER		

PIPING SCHEDULE	
PUMPING WELLS PW-2 THROUGH PW-8 TO COLLECTION HEADER	1 - INCH I.D. DOUBLE WALLED HDPE
PW-8 TO INTERSECTION OF PW-6 AND PW-7	1-INCH I.D. DOUBLE WALLED HDPE
INTERSECTION OF PW-6 AND PW-7 TO INTERSECTION OF PW-4 AND PW-5	1.5 - INCH I.D. DOUBLE WALLED HDPE
INTERSECTION OF PW-4 AND PW-5 TO CONNECTION FROM PW-2 AND PW-3	2 - INCH I.D. DOUBLE WALLED HDPE
CONNECTION FROM PW-2 AND PW-3 TO CONNECTION FROM RW-1	3 - INCH I.D. DOUBLE WALLED HDPE
RW-1 TO COLLECTION HEADER	3 - INCH I.D. DOUBLE WALLED HDPE
CONNECTION FROM RW-1 TO BUILDING	4 - INCH I.D. DOUBLE WALLED HDPE
FROM AIR STRIPPER TO TANNERY BROOK OUTFALL	4 - INCH I.D. SINGLE WALLED HDPE
NOTE: PUMPING WELL MANHOLE PIPING IS SINGLE WALLED HDPE.	

UTILITIES INFORMATION

EVIDENCE OF UTILITIES AND STRUCTURES ARE SHOWN BUT MAY NOT BE SHOWN IN THEIR ENTIRETY. VERIFICATION IS REQUIRED PRIOR TO CONSTRUCTION.
(NEW YORK STATE LAW CODE RULE 753)

GENERAL NOTES

- PROPERTY LINES ARE PLOTTED FROM TAX MAP INFORMATION AND ARE NOT TO USED FOR BOUNDARY LINE DETERMINATION
- SNOW COVER WAS PRESENT AT THE TIME OF SURVEY SOME PLANIMETRIC FEATURES MAY HAVE BEEN OBSCURED FROM VIEW AND MAY HAVE BEEN OMITTED

NOTES:

1. CONFINE CONSTRUCTION OPERATIONS TO WITHIN LIMITS INDICATED BY THE LONG TERM TEMPORARY EASEMENTS. IN ALL OTHER AREAS COORDINATE WITH ENTITY HAVING JURISDICTION OVER AREA.
2. MONITORING WELL MW-11B COULD NOT BE LOCATED DURING DECEMBER 1999 GROUNDWATER SAMPLING.
3. LOCATION OF MPI-15B IS APPROXIMATE.
4. MONITORING WELLS MW-2 AND MW-3 ARE ABANDONED.
5. MONITORING WELLS ESI-4, ESI-5, ESI-6, MPI-11, MPI-2S, AND MPI-12B ARE LOCATED SOUTH OF MAIN ST. AND ARE NOT SHOWN ON THESE DRAWINGS.
6. MONITORING WELLS AG-1 THROUGH AG-10 ARE NOT SHOWN ON THESE DRAWINGS.

WARNING - IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

MALCOLM PIRNIE

REVISIONS			
NO.	BY	DATE	REMARKS

DES ______
DWN ______
CKD ______

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
MR. C'S DRY CLEANERS SITE, EAST AURORA, NEW YORK
CONTRACT NUMBER D004180
REMEDIAL DESIGN

PIPING AND WELL LAYOUT PLAN
SCALE: 1" = 50'

DATE OCTOBER 2000
G SHEET 1 OF 7
CAD REF. NO. 0266G003

Figure 1.3a

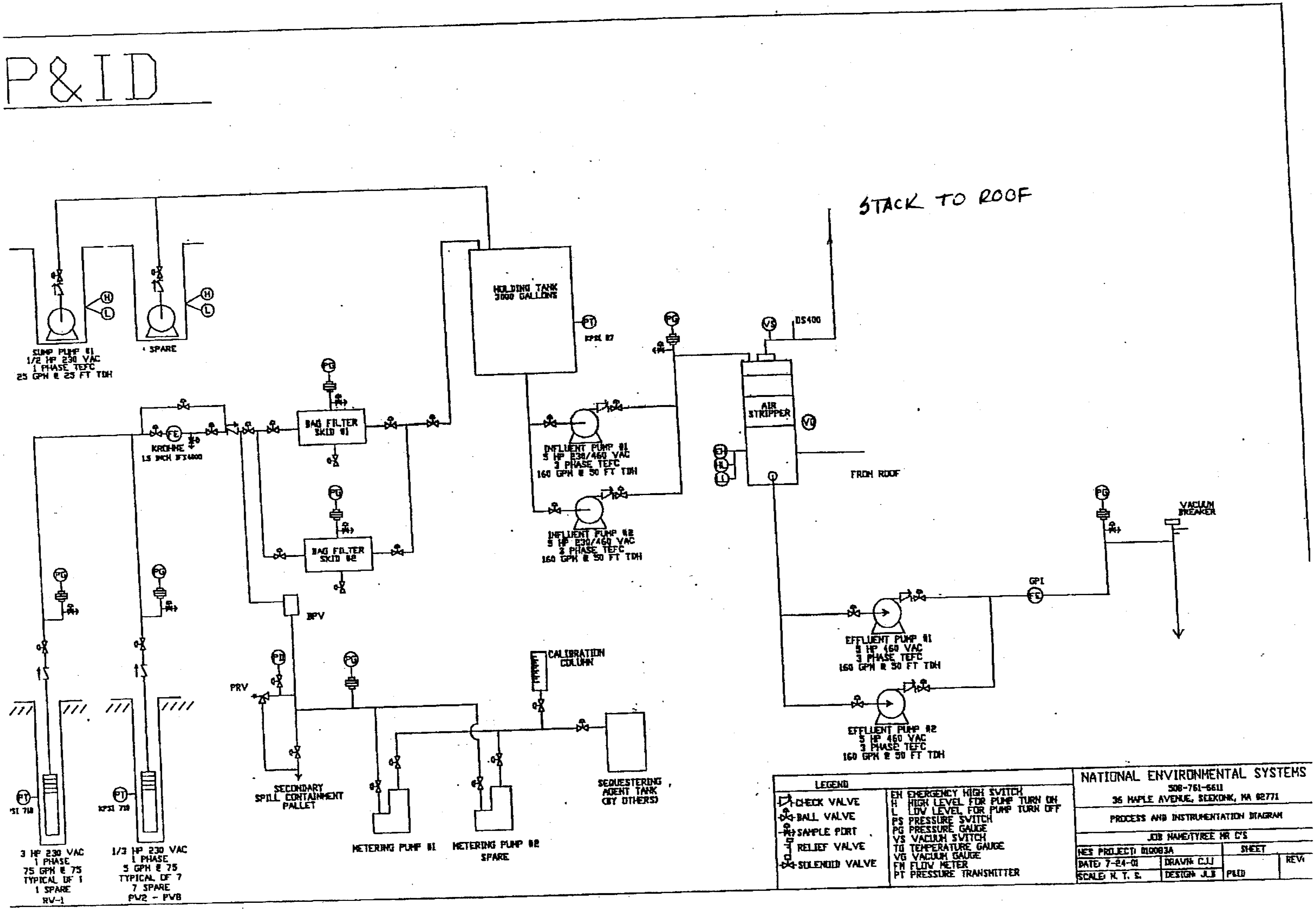

P&ID
STACK TO ROOF
SUMP PUMP #1
1/2 HP 230 VAC
1 PHASE TEFC
25 GPM @ 25 FT TDH
SPARE
H
L
HOLDING TANK
3000 GALLONS
PT
KPSI 87
PG
VS
DS400
AIR STRIPPER
VG
EH
H
L
FROM ROOF
BAG FILTER SKID #1
BAG FILTER SKID #2
FE
KROHNE
1.5 INCH IFS4000
INFLUENT PUMP #1
5 HP 230/460 VAC
3 PHASE TEFC
160 GPM @ 50 FT TDH
INFLUENT PUMP #2
5 HP 230/460 VAC
3 PHASE TEFC
160 GPM @ 50 FT TDH
VACUUM BREAKER
GPI
FE
EFFLUENT PUMP #1
5 HP 460 VAC
3 PHASE TEFC
160 GPM @ 50 FT TDH
EFFLUENT PUMP #2
5 HP 460 VAC
3 PHASE TEFC
160 GPM @ 50 FT TDH
BPV
PRV
PG
SECONDARY SPILL CONTAINMENT PALLET
CALIBRATION COLUMN
SEQUESTERING AGENT TANK (BY OTHERS)
METERING PUMP #1
METERING PUMP #2 SPARE
PT
PSI 710
PT
KPSI 710
3 HP 230 VAC
1 PHASE
75 GPM @ 75
TYPICAL OF 1
1 SPARE
RV-1
1/3 HP 230 VAC
1 PHASE
5 GPM @ 75
TYPICAL OF 7
7 SPARE
PV2 - PV8
LEGEND
CHECK VALVE
BALL VALVE
SAMPLE PORT
RELIEF VALVE
SOLENOID VALVE
EH EMERGENCY HIGH SWITCH
H HIGH LEVEL FOR PUMP TURN ON
L LOW LEVEL FOR PUMP TURN OFF
PS PRESSURE SWITCH
PG PRESSURE GAUGE
VS VACUUM SWITCH
TG TEMPERATURE GAUGE
VG VACUUM GAUGE
FM FLOW METER
PT PRESSURE TRANSMITTER
NATIONAL ENVIRONMENTAL SYSTEMS
508-761-6611
36 MAPLE AVENUE, SEEKONK, MA 02771
PROCESS AND INSTRUMENTATION DIAGRAM
JOB NAME/TYREE MR C'S
NES PROJECT: 010083A
SHEET
DATE: 7-24-01
DRAWN: CJJ
REV:
SCALE: N. T. S.
DESIGN: JLB
P&ID

Figure 1-3b

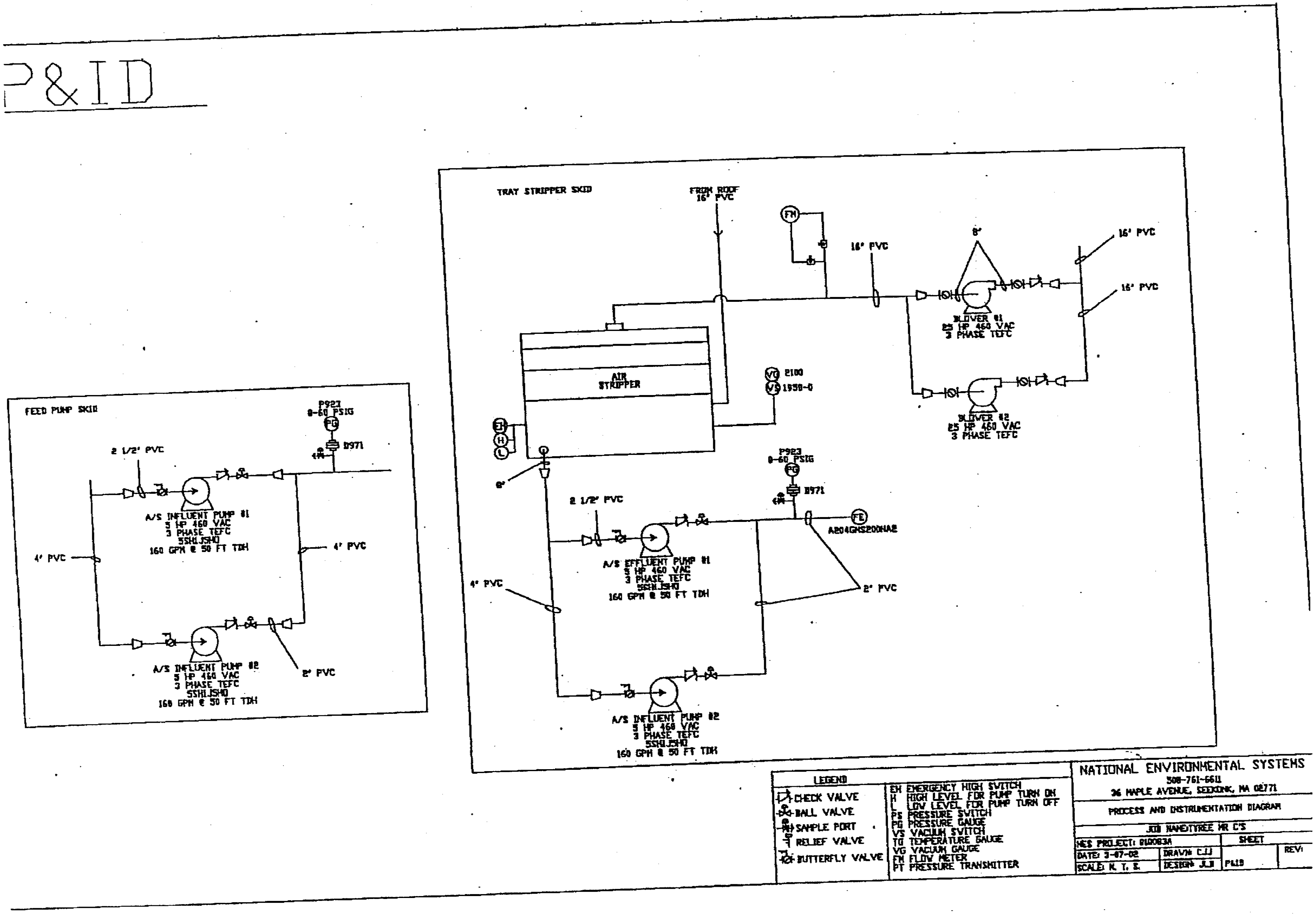
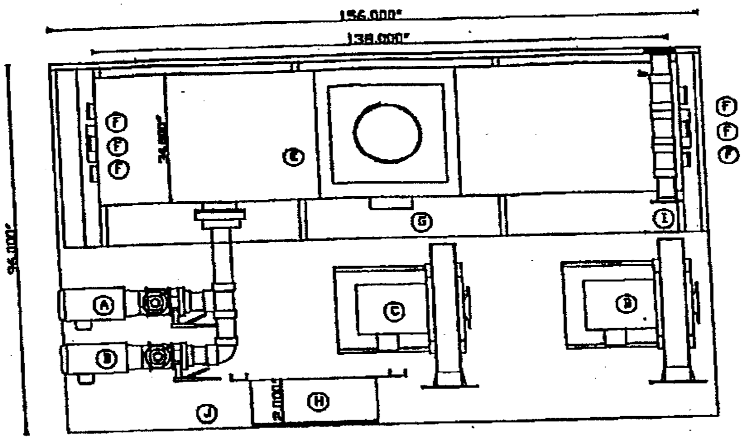
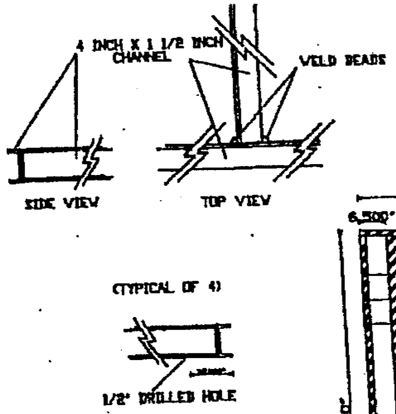

P&ID
FEED PUMP SKID
P923
0-60 PSIG
PG
D971
2 1/2' PVC
A/S INFLUENT PUMP #1
5 HP 460 VAC
3 PHASE TEFC
5SH1JSHO
160 GPM @ 50 FT TDH
4' PVC
4' PVC
A/S INFLUENT PUMP #2
5 HP 460 VAC
3 PHASE TEFC
5SH1JSHO
160 GPM @ 50 FT TDH
2' PVC
TRAY STRIPPER SKID
FROM ROOF
16' PVC
FM
16' PVC
8'
16' PVC
16' PVC
BLOWER #1
25 HP 460 VAC
3 PHASE TEFC
BLOWER #2
25 HP 460 VAC
3 PHASE TEFC
AIR
STRIPPER
VG 2100
VS 1950-0
EH
H
L
8'
P923
0-60 PSIG
PG
D971
FE
A204GHS200HA2
2 1/2' PVC
A/S EFFLUENT PUMP #1
5 HP 460 VAC
3 PHASE TEFC
5SH1JSHO
160 GPM @ 50 FT TDH
4' PVC
2' PVC
A/S INFLUENT PUMP #2
5 HP 460 VAC
3 PHASE TEFC
5SH1JSHO
160 GPM @ 50 FT TDH
LEGEND
CHECK VALVE
BALL VALVE
SAMPLE PORT
RELIEF VALVE
BUTTERFLY VALVE
EH EMERGENCY HIGH SWITCH
H HIGH LEVEL FOR PUMP TURN ON
L LOW LEVEL FOR PUMP TURN OFF
PS PRESSURE SWITCH
PG PRESSURE GAUGE
VS VACUUM SWITCH
TG TEMPERATURE GAUGE
VG VACUUM GAUGE
FM FLOW METER
PT PRESSURE TRANSMITTER
NATIONAL ENVIRONMENTAL SYSTEMS
508-761-6611
36 MAPLE AVENUE, SEEKONK, MA 02771
PROCESS AND INSTRUMENTATION DIAGRAM
JOB NAME: TYREE MR C'S
NES PROJECT: 0100B3A
DATE: 3-07-02
SCALE: N. T. S.
DRAWN: CJJ
DESIGN: JLB
SHEET
P&ID
REV:

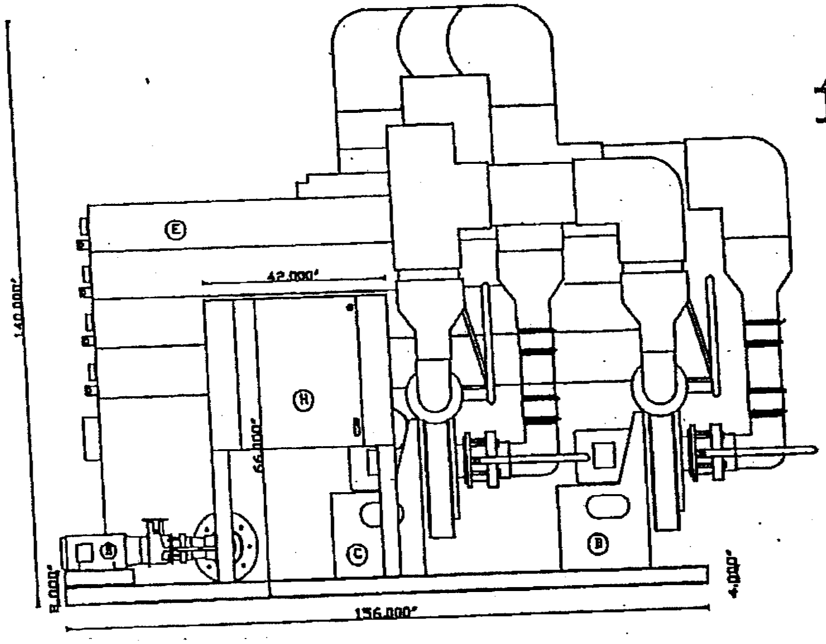
Figure 1-3c

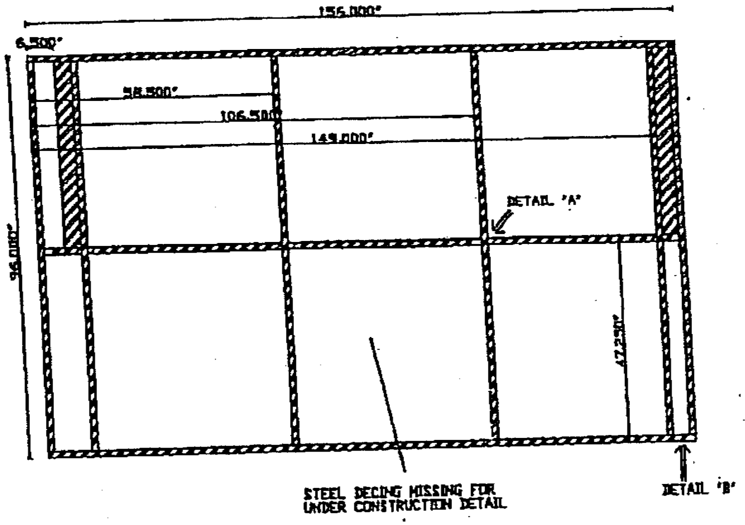
NOTES:
1. TOP VIEW PLUMBING OMMITED FOR CLARITY OF LAYOUT
PURPOSES.
CONTROL PANEL HEIGHT IS 6 FEET FROM FINISHED
FLOOR.
3. INLET AND OUTLET DUCTING IS 16 INCH PVC.
4. TRANSFER PUMP PLUMBING CONSIST OF 4 INCH, 2 1/2 INCH
AND 2 INCH PVC PIPING.
5. FLOW METER IS SHIPPED LOOSE FOR INSTALLATION BY OTHERS.
6. FEED PUMPS ARE MOUNTED ON A SEPERATE SKID AND
SHIPPED LOOSE FOR INSTALLATION BY OTHERS.
7. DIMENSIONS GIVEN ARE ESTIMATED AND MAY CHANGE
DURING CONSTRUCTION.
8. CONDUIT WILL BE ELECTRICAL PVC WITH LIQUID TIGHT WHIPS
NO MORE THAN 6 FEET FROM MOTOR JUNCTION BOX.



Ⓐ PUMP #3
Ⓑ PUMP #4
Ⓒ BLOWER #1
Ⓓ BLOWER #2
Ⓔ STRIPPER
Ⓕ CLEAN OUT PORT
Ⓖ 10 INCH AIR INLET PORT
Ⓗ CONTROL PANEL
Ⓘ 4 INCH FLANGED WATER INFLUENT
Ⓙ CARBON STEEL SKID





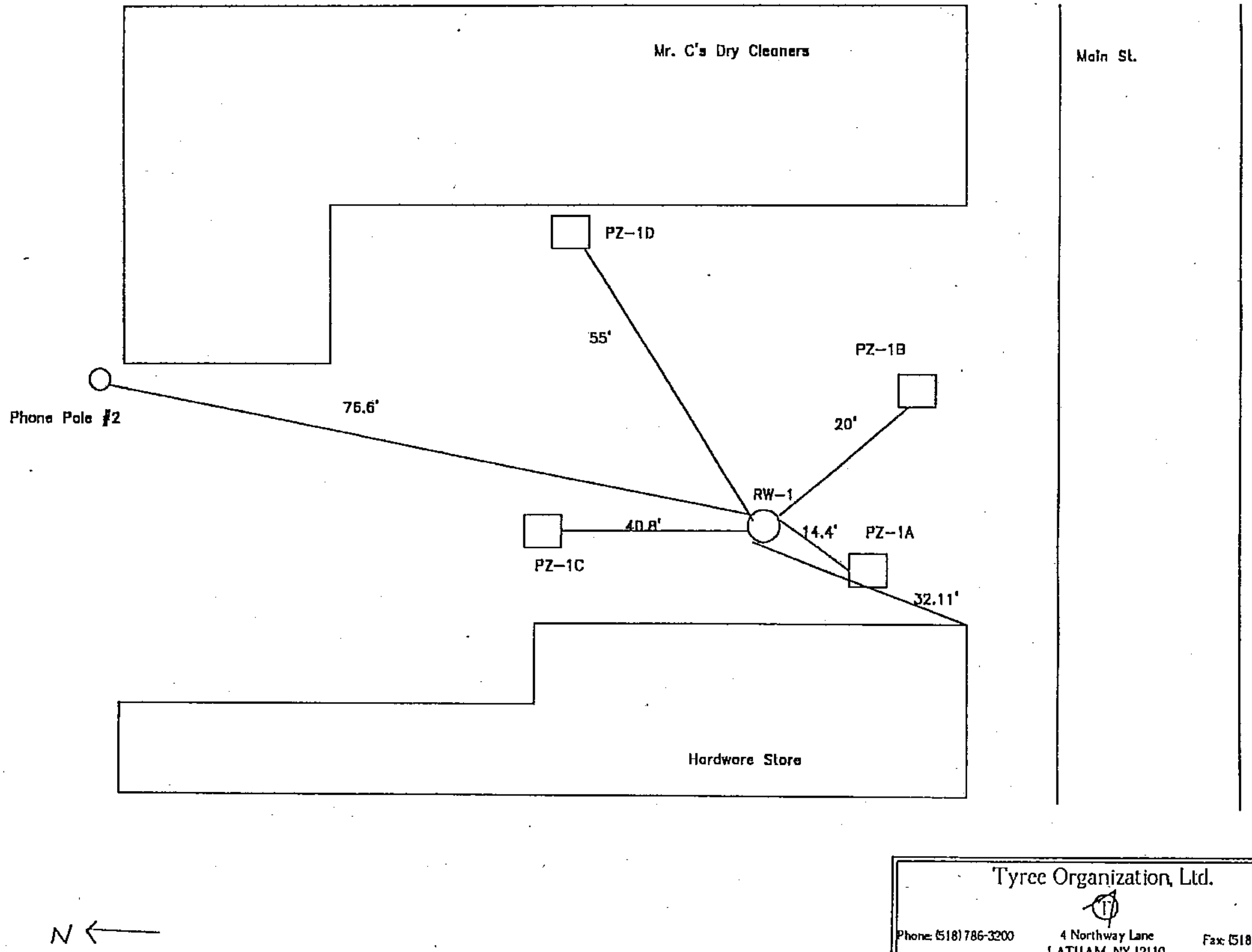


F

Monitoring and Pumping Well Logs

F1 – Well Construction Information

RW-1 Well Clusters



Tyree Organization, Ltd.

Phone: (518) 786-3200
4 Northway Lane
LATHAM, NY 12110
Fax: (518) 786-7351

Project Number 017301
As Builts
Mr. C's Dry Cleaners
586 Main Street
East Aurora, New York 14052

DRAWN BY: DLP
11-26-01
SCALE: NTS
CLIENT: DEC
PLATE: RW-1

WELL/BOREHOLE RW-1 CONSTRUCTION DETAILS

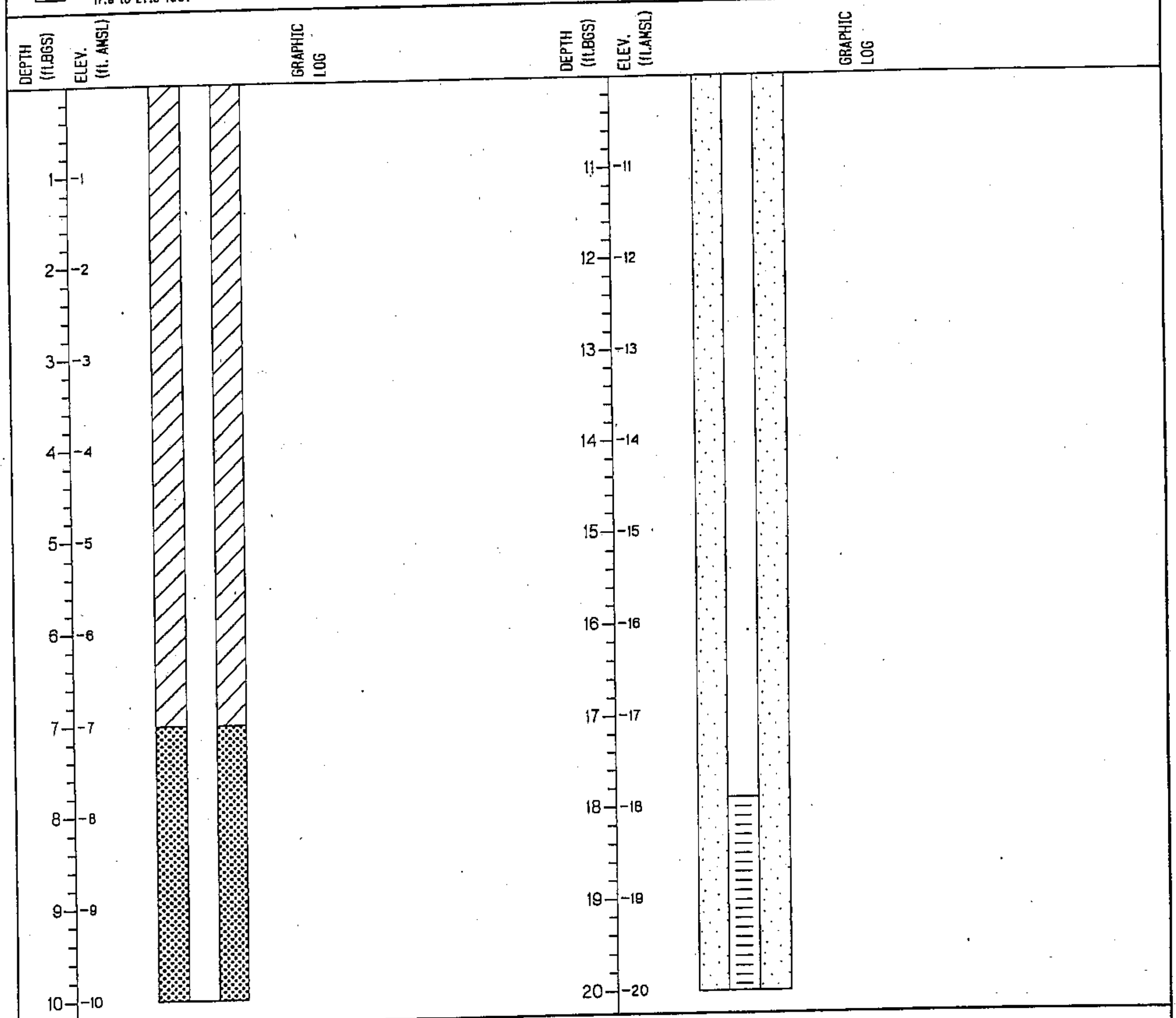
PROJECT: MR C CLEANERS
PROJECT NO.: 0266-31-4
LOCATION: EAST AURORA, NEW YORK
SURVEY COORDINATES:
SURVEY DATUM: NEW YORK STATE SURVEY GRID

CLIENT: NYSDEC
DRILLING DATES: 08/14/95 - 08/15/95
DRILLING METHOD: 10 1/4" HSA
LOGGED/CHECKED BY: JPH
SURFACE ELEVATION:

SYMBOLS AND DEFINITIONS

- ▨ BENTONITE-CEMENT SEAL 0 to 7.0 feet
- ▩ BENTONITE SLURRY SEAL 7.0 to 10.0 feet
- ⬚ MORIE #3 SAND PACK 10.0 to 30.0 feet
- ☰ 6-INCH DIAM. CONTINUOUS SLOT (0.060") SCREEN 17.9 to 27.9 feet
- ‖ 4-INCH DIAMETER CASING 0 feet
- ▯ 6-INCH DIAMETER RISER 0.0 to 17.9 Feet
- | | 8-INCH DIAMETER BOREHOLE 0 feet

GRAPHIC LOG



NOTES:

MALCOLM PIRNIE. INC.

WELL/BOREHOLE RW-1 CONSTRUCTION DETAILS

PROJECT: MR C CLEANERS
PROJECT NO.: 0266-31-4
LOCATION: EAST AURORA, NEW YORK
SURVEY COORDINATES:
SURVEY DATUM: NEW YORK STATE SURVEY GRID

CLIENT: NYSDEC
DRILLING DATES: 08/14/95 - 08/15/95
DRILLING METHOD: 10 1/4" HSA
LOGGED/CHECKED BY: JPH
SURFACE ELEVATION:

SYMBOLS AND DEFINITIONS

▨ BENTONITE-CEMENT SEAL
0 to 7.0 feet

▩ BENTONITE SLURRY SEAL
7.0 to 10.0 feet

⬚ MORIE #3 SAND PACK
10.0 to 30.0 feet

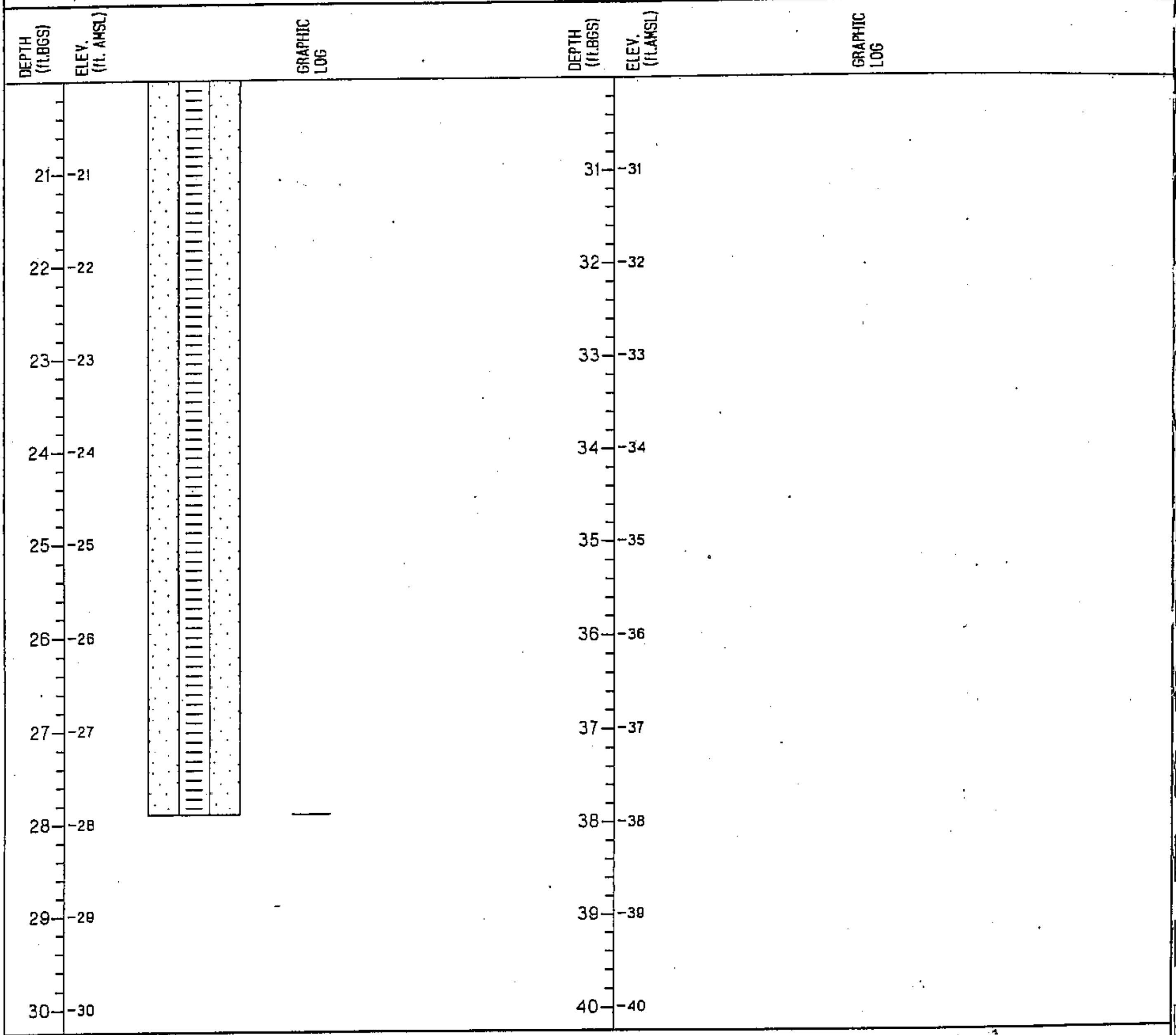
☰ 8-INCH DIAM. CONTINUOUS SLOT (0.080") SCREEN
17.8 to 27.8 feet

4-INCH DIAMETER CASING
0 feet

6-INCH DIAMETER RISER
0.0 to 17.8 Feet

8-INCH DIAMETER BOREHOLE
0 feet

GRAPHIC LOG



NOTES:

MALCOLM PIRNIE, INC.

SHEET 2 OF 2

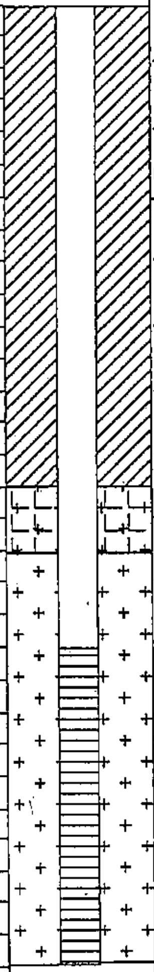
Tyree Organization, Limited
Latham, NY

BOREHOLE LOG

BORING NAME
PZ-1A

CLIENT: NYS DEC
PROJECT: Mr. C's
LOCATION: 586 Main St., East Aurora, NY

DATE STARTED/COMPLETED: 11/5/01-11/5/01
LOGGED BY: D. Perriccio
DRILLER: Nothnagle Drillers
RIG: CME 75

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
0	11,5,3,1	0.0	70%		Asphalt/ m Gravel, f Sand and Silt
2	7,6,5,1	0.0	20%		vf-f sand and silt, trace of clay, dry
4	2,3,3,2	0.0	50%		vf sand brown and silt brown trace of clay gray, trace of gravel, dry
6	3,3,3,4	0.0	60%		vf sand brown and silt brown, trace f gravel gray, moist
8	2,8,9,9	0.0	30%		f-m sand brown, some silt brown trace f gravel gray moist
10	3,7,4,4	0.0	100%		f-m sand brown, trace silt brown trace fine gravel moist
12	5,3,3,4	0.0	100%		f-m sand brown, trace silt brown, wet
14	3,3,8,8	0.0	100%		f-m sand brown, trace silt brown, wet
16	3,3,4,5	0.0	70%		f-m sand brown, wet
18	1,2,5,9	0.0	80%		f-m sand brown, trace silt brown, wet
20	3,5,2,6	0.0	60%		f-m sand brown, wet
22	6,7,12,15	0.0	50%		f-m sand brown some medium gravel trace silt brown wet
24	6,12,12,13	0.0	70%		f-m sand brown and f-m gravel trace silt gray wet
26	5,12,15,13	0.0	70%		f-m sand brown, some f-m gravel, wet
28	6,7,11,15	0.0	40%		f-m sand brown, trace f-m gravel, wet
30					
32					
34					

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 Bags
Interval: 30'-17'

GROUT / SEAL

Type: Bentonite/Grout
Volume Used: Bucket/ 4 Bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

▨ Grout
▦ Bentonite
⁘ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Tyree
Organization,
Limited
Latham, NY

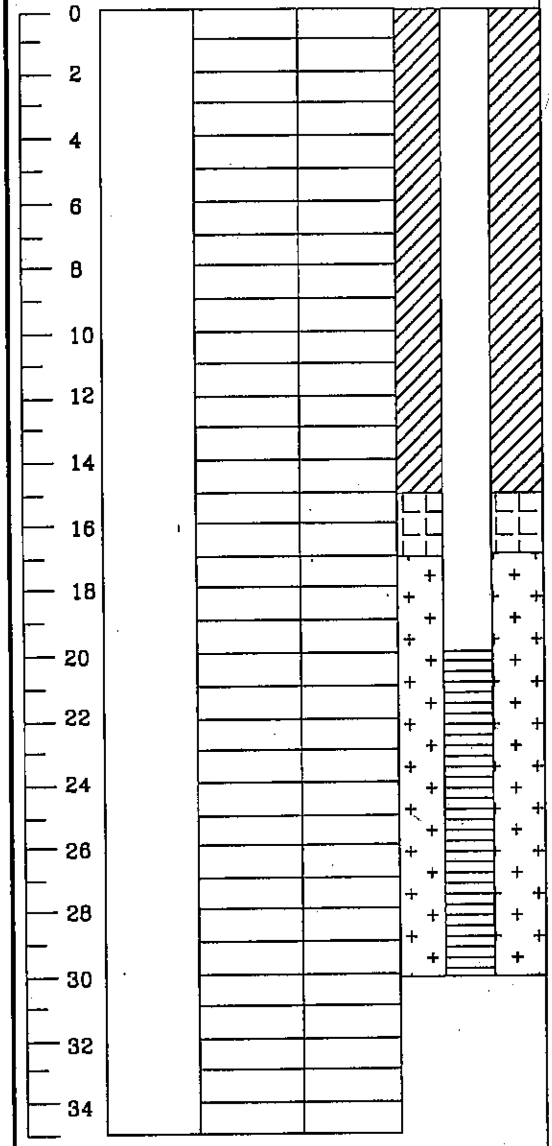
WELL CONSTRUCTION DETAIL

BORING NAME
PZ-1B

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-1B
Date Completed: 11/5/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:
▨ Grout
Bentonite
Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Tyree Organization, Limited
Latham, NY

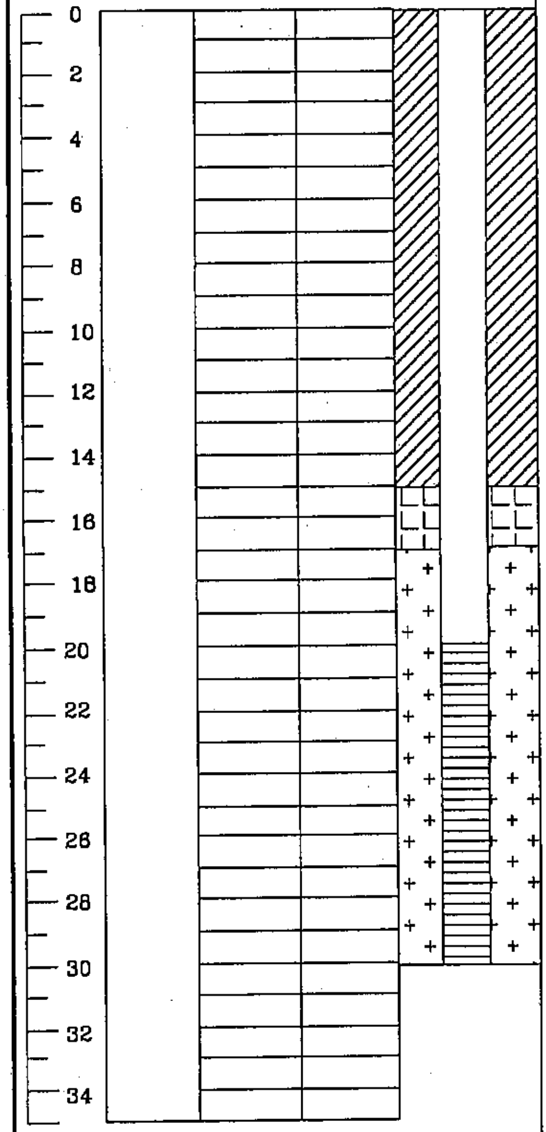
WELL CONSTRUCTION DETAIL

BORING NAME
PZ-1C

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-1C
Date Completed: 11/5/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:

▨	Grout
┗┻┛	Bentonite
+ +	Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Tyree Organization, Limited
Latham, NY

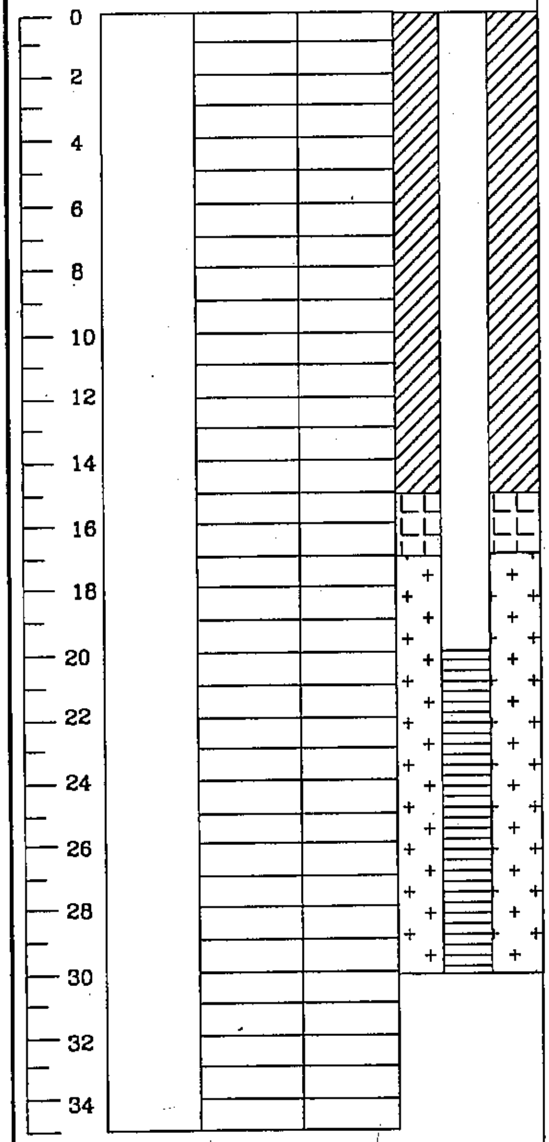
WELL CONSTRUCTION DETAIL

BORING NAME PZ-1D

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-1D
Date Completed: 11/6/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil



N/A

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

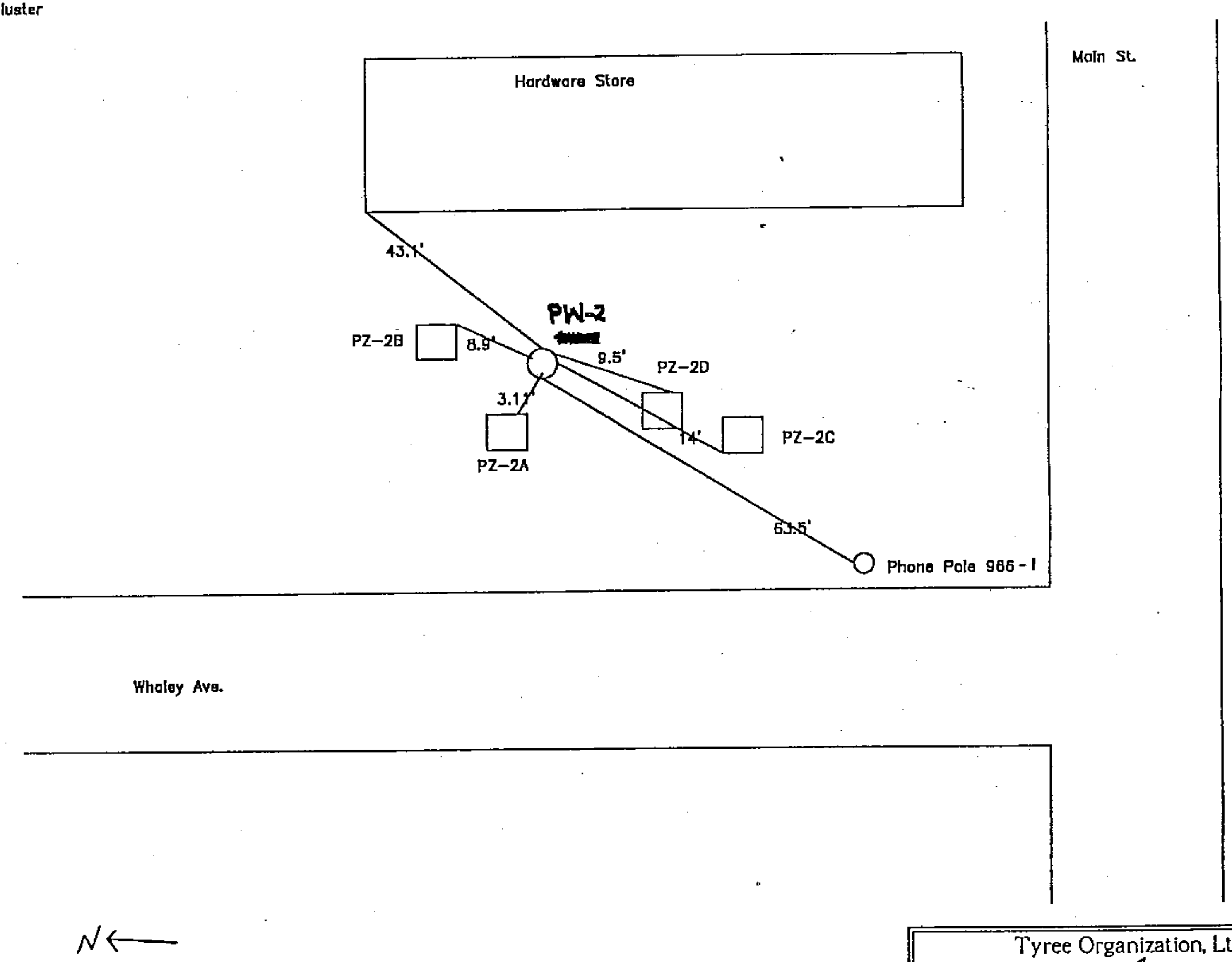
Key:
▨ Grout
▦ Bentonite
+ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

PW-2 Well Cluster



Tyree Organization, Ltd.

Phone: (518) 786-3200
4 Northway Lane
LATHAM, NY 12110
Fax: (518) 786-7351

Project Number 017301
As Builts
Mr. C's Dry Cleaners
588 Main Street
East Aurora, New York 14052

DRAWN BY: DLP
11-28-01
SCALE: NTS
CLIENT: DEC
PLATE: PW-2

Tyree
Organization,
Limited
Latham, NY

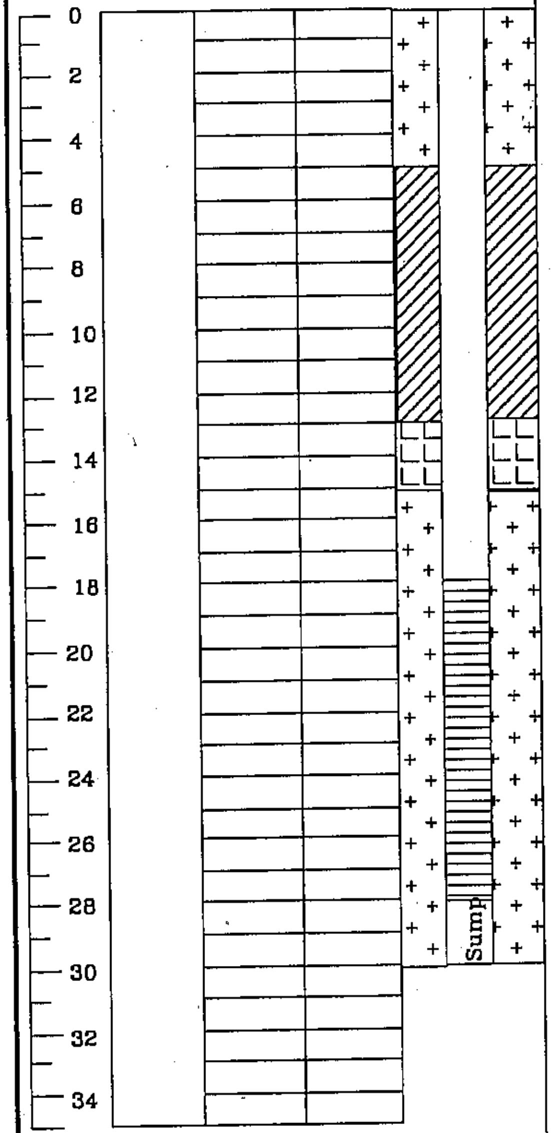
WELL CONSTRUCTION DETAIL

BORING NAME
PW-2

PROJECT NAME: NYS DEC
SITE: MR. C's
ADDRESS: 566 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PW-2
DATE COMPLETED: 11/6/01
SUPERVISED BY: D. PERRUCCIO

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 6.25"
Depth: 30'

WELL DATA

Riser Type: Stainless Steel
Riser Dia.: 4"
Riser Length: 18'
Interval: 18'-0'

Screen Type: Stainless Steel
Screen Dia.: 4"
Screen Length: 10'
Slot: 0.010
Interval: 28'-18'

FILTER PACK

Source: Sand
Composition:
Volume Used: 7 bags
Interval: 30'-15'

GROUT / SEAL

Type: Bent/ Grout/Sand
Volume Used: 1.5 bucket/3 bags/2bag
Interval: 15'-13'/13'-5'/5'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan
Key:

LEGEND

▨ Grout
▦ Bentonite
⁙ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

▽ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

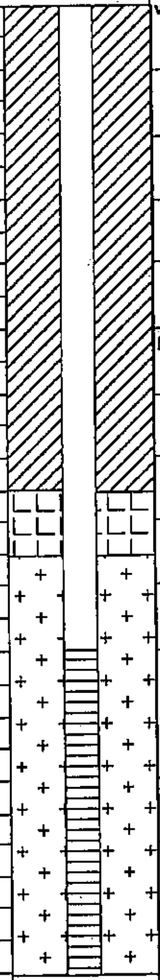
Tyree Organization, Limited
Latham, NY

BOREHOLE LOG

BORING NAME PZ-2A

CLIENT: NYS DEC
PROJECT: MR. C's
LOCATION: 586 Main St., East Aurora, NY

DATE STARTED/COMPLETED: 11/2/01-11/2/01
LOGGED BY: D. Perruccio
DRILLER: Nothnagle Drilling
RIG: CME 75



Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Field Description of Soil
0	10,10,4,5	0.2	60%	vf-f sand brown/ some silt brown, trace clay, trace f-m gravel brown/ dry
2	4,4,7,8	0.0	50%	vf-f sand brown/ some silt brown/ some clay brown/ moist
4	4,5,8,9	0.0	50%	f-m sand brown/ some clay brown/ some f-m gravel brown/ moist
6	4,3,5,5	0.0	50%	f sand brown/ and silt brown/ trace clay brown/ moist
8	4,2,3,4	0.0	60%	vf-f sand brown and silt brown/ some clay brown/ moist
10	4,8,11,13	0.0	50%	f-m sand brown/ some silt brown/ trace clay brown/ trace gravel gray/ moist
12	2,3,4,4	0.0	70%	f-m sand brown, wet
14	1,3,4,6	0.0	90%	f-m sand brown, wet
16	3,5,7,7	0.0	80%	f-m sand brown, wet
18	1,1,3,6	0.0	80%	f-m sand brown, wet
20	1,2,4,5	0.0	80%	f-m sand brown, wet
22	5,5,7,8	0.0	70%	f-m sand brown/ trace silt brown, wet
24	1,2,5,7	0.0	85%	f-m sand brown, wet
26	1,2,3,8	0.0	60%	f-m sand brown/ trace silt brown, wet
28	2,3,4,5	0.0	100%	f-m sand brown, wet
30				
32				
34				

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/ Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:

▨ Grout

▦ Bentonite

⁙ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Tyree
Organization,
Limited
Latham, NY

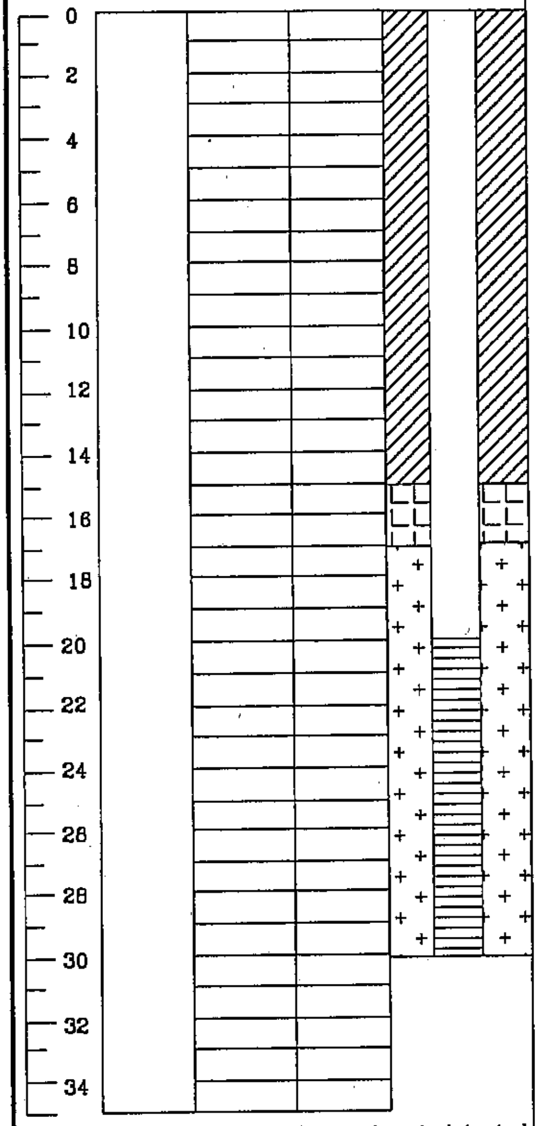
WELL CONSTRUCTION DETAIL

BORING NAME
PZ-2B

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-2B
Date Completed: 11/1/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:

▨ Grout	trace=1-10%	very fine sand=0.6-0.13mm	∇ = ground water table	
⊔ Bentonite	little=10-20%	fine sand=0.13-0.25mm	f-gravel=2-4mm	
	some=20-30%	medium sand=0.25-0.50mm	m-gravel=4-64mm	
+ Sand	and=30-50%	course sand=0.5-1mm	c-gravel=64-256mm	
		very course sand=1-2mm		

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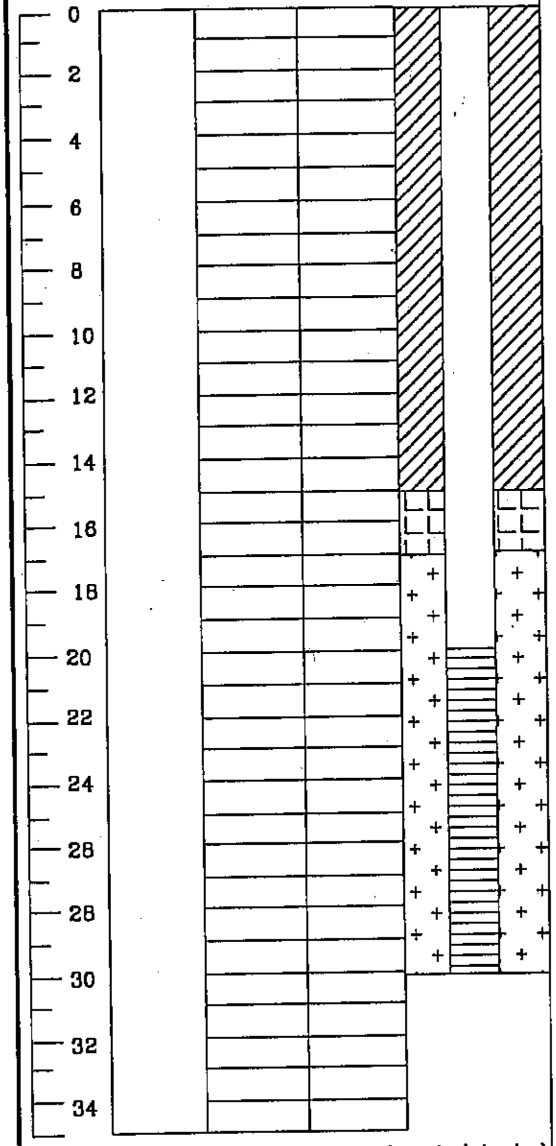
WELL CONSTRUCTION DETAIL

BORING NAME
PZ-2C

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-1C
Date Completed: 11/2/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

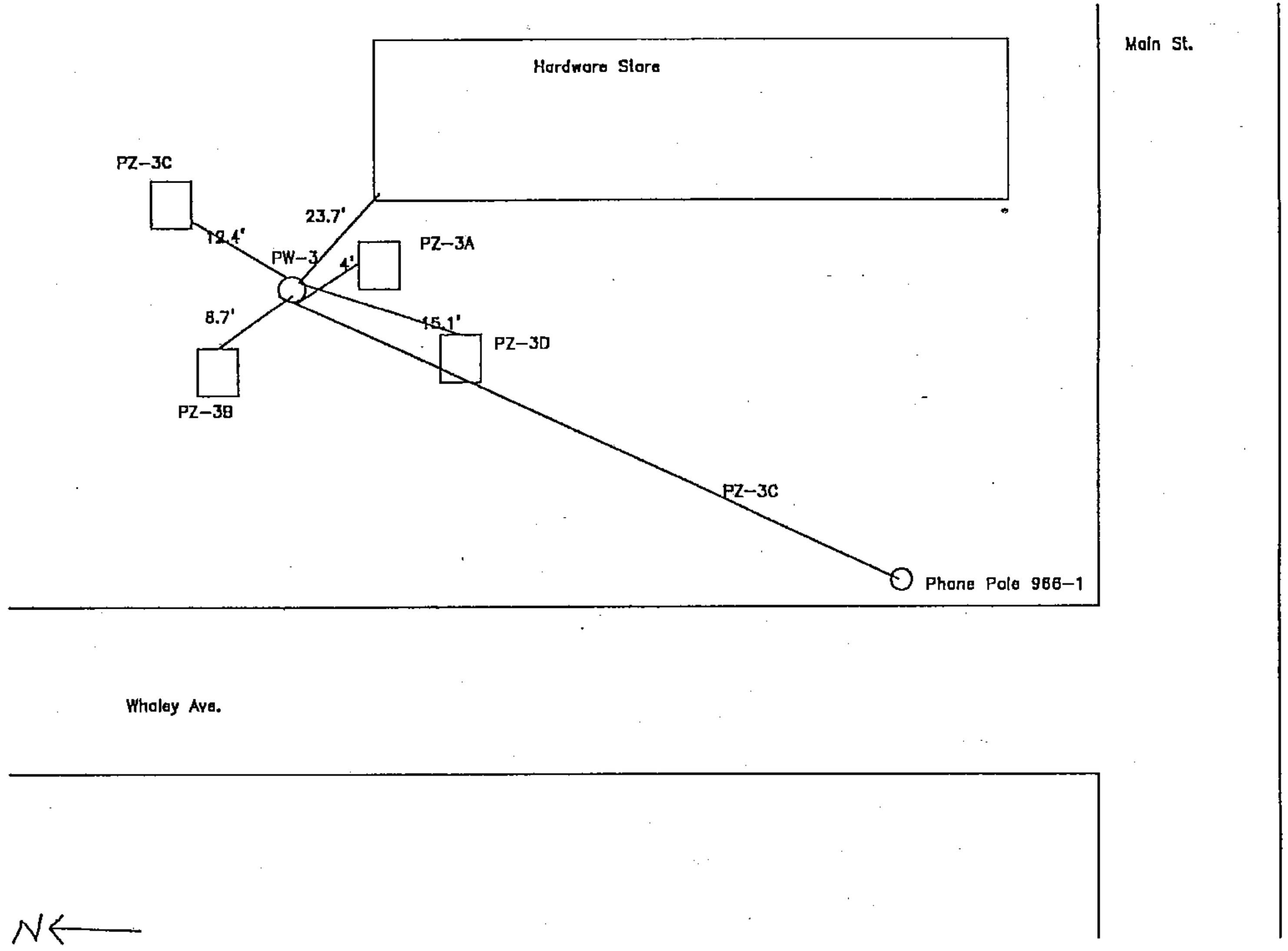
Key:
▨ Grout
▦ Bentonite
+ + + Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

PW-3 Well Cluster



Tyree Organization, Ltd.

Phone: (518) 786-3200
4 Northway Lane
LATHAM, NY 12110
Fax: (518) 786-7351

Project Number 017301
As Builts
Mr. C's Dry Cleaners
588 Main Street
East Aurora, New York 14052

DRAWN BY: DLP
11-28-01
SCALE: NTS
CLIENT: DEC
PLATE: PW-3

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Latham, NY

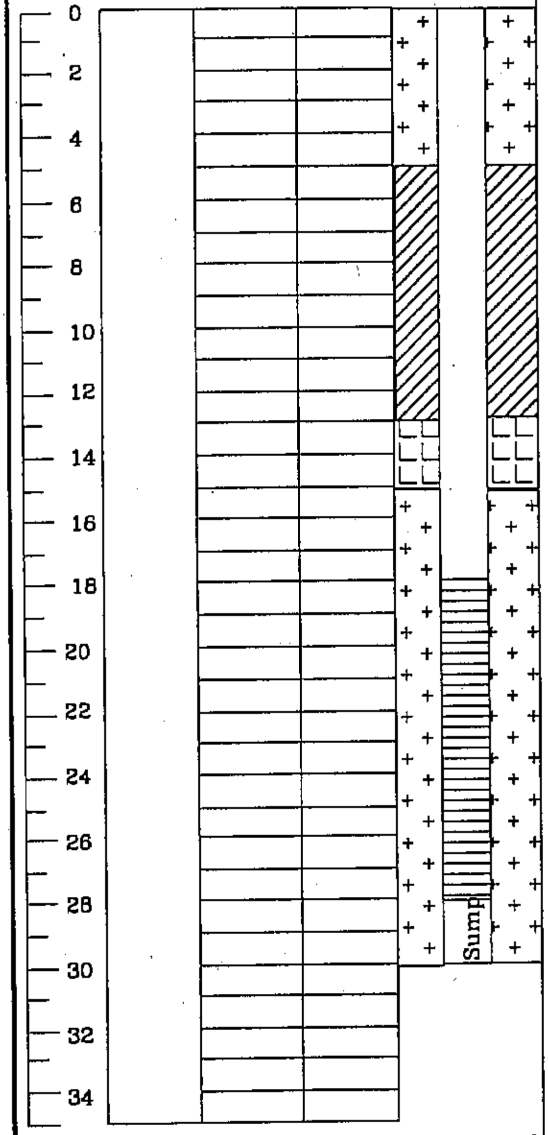
WELL CONSTRUCTION DETAIL

BORING NAME PW-3

PROJECT NAME: NYS DEC
SITE: MR. C's
ADDRESS: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PW-3
DATE COMPLETED: 11/7/01
SUPERVISED BY: D. PERRUCCIO

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 6.25"
Depth: 30'

WELL DATA

Riser Type: Stainless Steel
Riser Dia.: 4"
Riser Length: 18'
Interval: 18'-0'

Screen Type: Stainless Steel
Screen Dia.: 4"
Screen Length: 10'
Slot: 0.010
Interval: 28'-18'

FILTER PACK

Source: Sand
Composition:
Volume Used: 7 bags
Interval: 30'-15'

GROUT / SEAL

Type: Bent/ Grout/Sand
Volume Used: 1.5 bucket/3 bags/2bag
Interval: 16'-13'/13'-5'/5'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan
Key:

▨ Grout
▦ Bentonite
⁙ Sand

LEGEND

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

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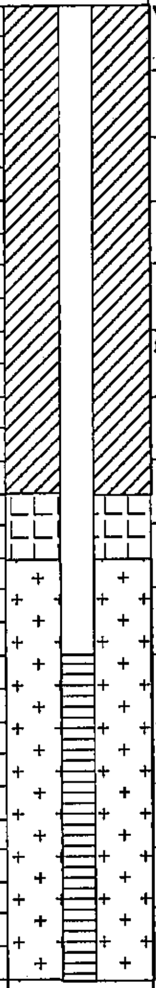
Latham, NY

BOREHOLE LOG

BORING NAME
PZ-3A

CLIENT: NYS DEC
PROJECT: MR. C's
LOCATION: 586 Main St., East Aurora, NY

DATE STARTED/COMPLETED: 11/1/01-11/1/01
LOGGED BY: D. Perruccio
DRILLER: Nothnagle Drilling
RIG: CME 75

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
0	5,2,2,2	0.0	60%		vf-f sand brown/ some silt brown, trace clay brown/ dry
2	2,6,7,7	0.0	70%		vf sand and silt brown/ some clay brown/ moist
4	3,6,6,3	0.0	40%		f-m sand brown/ some silt brown/ trace clay brown/ moist
6	2,2,1,1	0.0	20%		f-m sand brown/ some silt brown/ moist
8	2,3,3,3	0.0	10%		f-m sand brown/ little silt brown/ trace m gravel/ moist
10	4,6,8,5	0.0	50%		f-c sand brown/ trace silt brown/ moist
12	4,5,4,5	0.0	70%		m-c sand brown, trace silt brown wet
14	3,3,5,5	0.0	70%		m-c sand brown, wet
16	1,5,8,3	0.0	60%		m-c sand brown, wet
18	1,2,5,10	0.0	60%		m-c sand brown, wet
20	2,2,2,6	0.0	70%		m-c sand brown, wet
22	2,6,6,9	0.0	70%		f-m sand brown/ trace silt brown, wet
24	4,7,7,11	0.0	60%		m-c sand brown, and m gravel wet
26	2,4,5,3	0.0	50%		m-c sand brown, wet
28	2,3,3,3	0.0	50%		m-c sand brown, wet
30					
32					
34					

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/ Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan
Key:

▨ Grout
▦ Bentonite
⁘ Sand

LEGEND

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Tyree Organization, Limited
Latham, NY

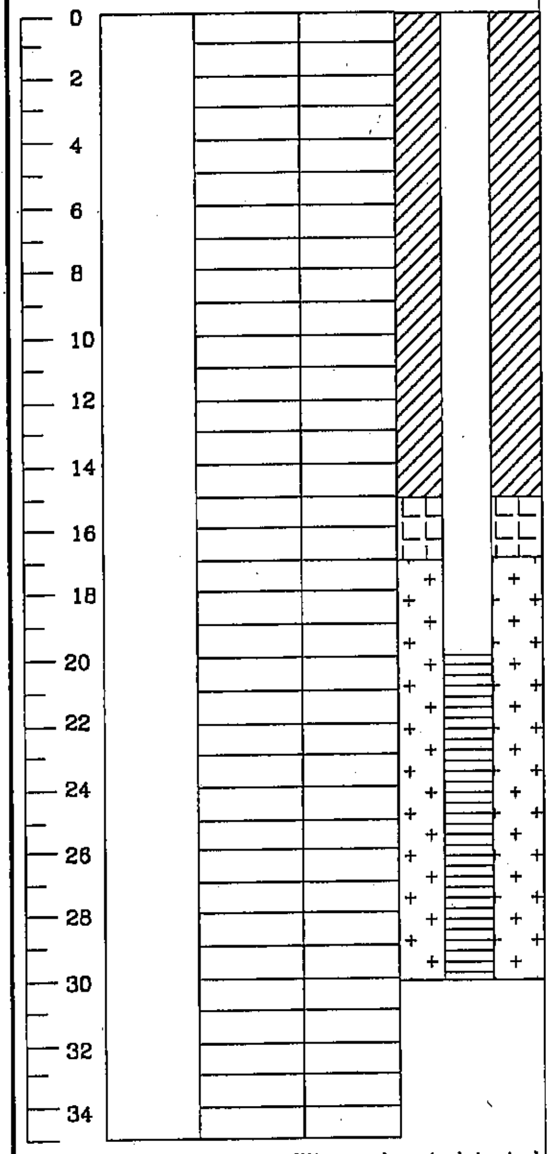
WELL CONSTRUCTION DETAIL

BORING NAME PZ-3B

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-3B
Date Completed: 10/30/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:

▨ Grout
⊞ Bentonite
+ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

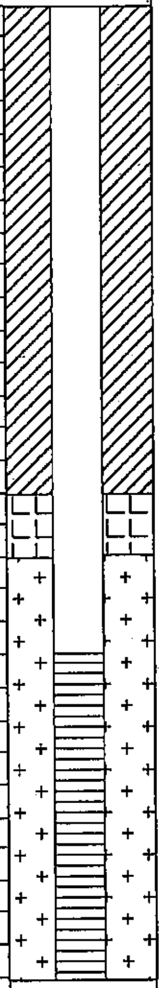
Tyree Organization, Limited
Latham, NY

WELL CONSTRUCTION DETAIL

BORING NAME PZ-3C

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-3C
Date Completed: 11/1/01
SUPERVISED BY: D. Perruccio



Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
0					
2					
4					N/A
6					
8					
10					
12					
14					
16					
18					
20					
22					
24					
26					
28					
30					
32					
34					

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:
▨ Grout
▦ Bentonite
+ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

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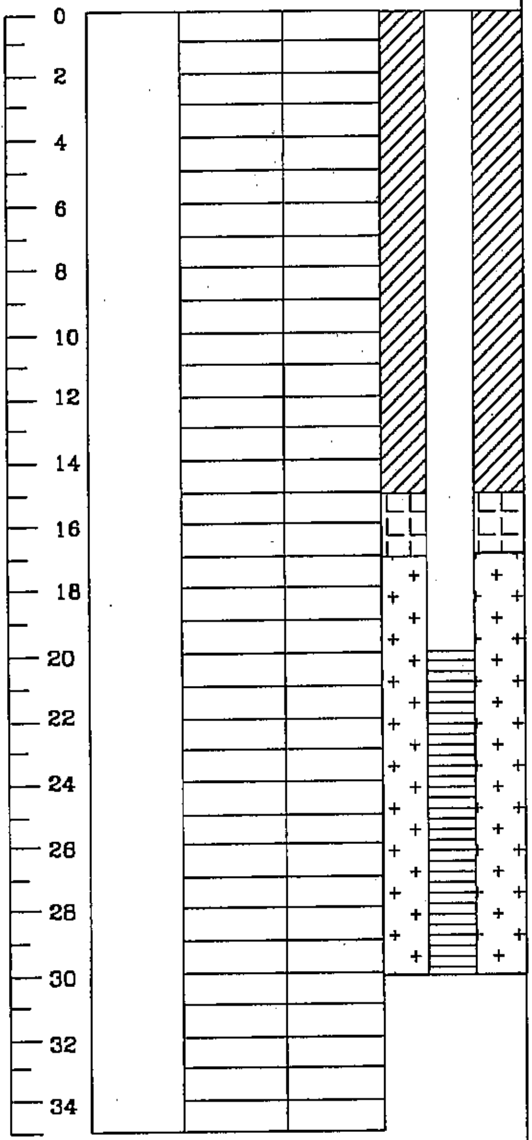
WELL CONSTRUCTION DETAIL

BORING NAME
PZ-3D

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-3D
Date Completed: 10-30-01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:

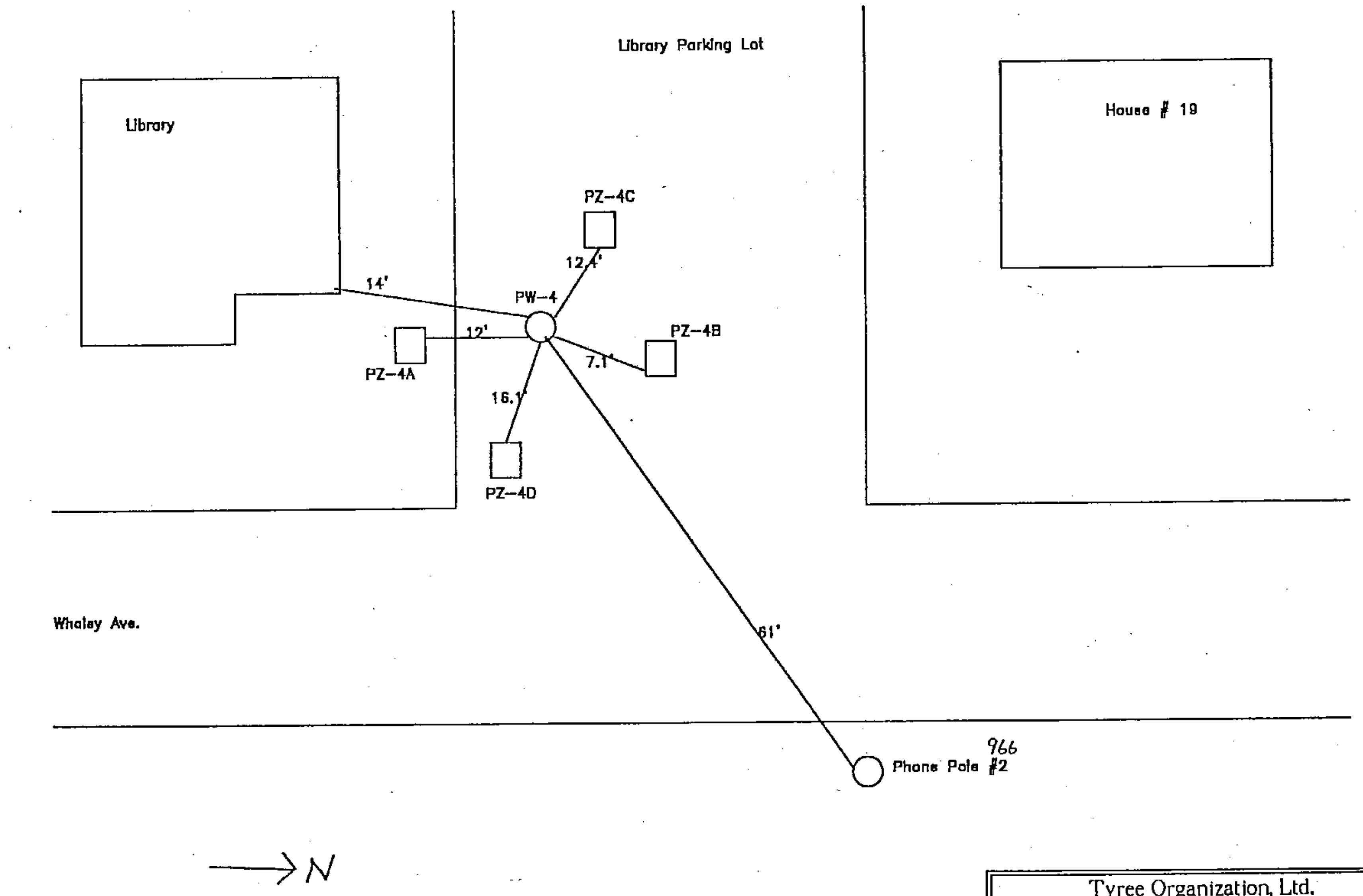
▨	Grout
⊞	Bentonite
+ +	Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

PW-4 Well Cluster



Tyree Organization, Ltd.

Phone: (518) 786-3200
4 Northway Lane
LATHAM, NY 12110
Fax: (518) 786-7351

Project Number 017301	DRAWN BY: DLP
As Built	
Mr. C's Dry Cleaners 588 Main Street East Aurora, New York 14052	11-28-01 SCALE: NTS CLIENT: DEC PLATE: PW-4

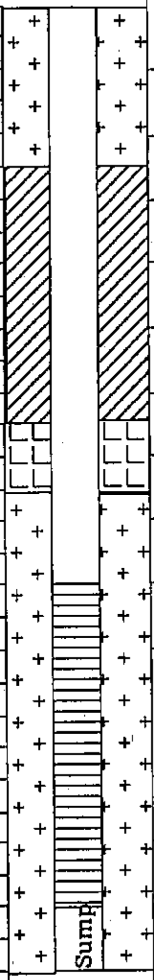
Tyree Organization, Limited
Latham, NY

BOREHOLE LOG

BORING NAME PW-4

CLIENT: NYS DEC
PROJECT: MR. C's
LOCATION: 586 Main St., East Aurora, NY

DATE STARTED/COMPLETED: 11/9/01-11/9/01
LOGGED BY: D. Perruccio
DRILLER: Nothnagle Drilling
RIG: CME 75

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
0-2	22,8,3,3	0.1	60%		Asphalt medium gravel grey, some f-m sand brown dry
2-4	1,3,6,8	0.0	70%		vf-f sand brown and silt brown clay brown moist
4-6	3,3,2,2	0.0	90%		vf-f sand brown and silt brown little clay brown, moist
6-8	2,2,2,3	0.0	70%		vf-f sand brown some silt brown trace clay brown, moist
8-10	3,3,2,3	0.0	70%		vf-m sand brown some silt brown trace gravel , moist
10-12	1,3,4,5	0.0	90%		f-m sand brown some silt brown trace clay brown moist
12-14	1,3,4,5	0.0	90%		f-m sand brown trace silt brown wet
14-16	1,2,4,5	0.0	80%		f-m sand brown trace silt brown wet
16-18	2,4,6,7	0.0	95%		f-m sand brown trace silt brown wet
18-20	1,1,3,9	0.0	60%		f-m sand brown wet
20-22	8,5,9,9	0.0	80%		f-m sand grey trace silt brown wet
22-24	12,5,7,8	0.0	70%		f-m sand grey trace silt brown wet
24-26	1,4,6,8	0.0	70%		f-m sand grey trace silt brown wet
26-28	1,3,7,11	0.0	70%		f-m sand grey trace silt brown wet
28-30	2,7,7,8	0.0	50%		f-m sand grey trace silt brown wet
30-34					

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 6.25"
Depth: 30'

WELL DATA

Riser Type: Stainless Steel
Riser Dia.: 4"
Riser Length: 18'
Interval: 18'-0'

Screen Type: Stainless Steel
Screen Dia.: 4"
Screen Length: 10'
Slot: 0.010
Interval: 28'-18'

FILTER PACK

Source: Sand
Composition:
Volume Used: 7 bags
Interval: 30'-15'

GROUT / SEAL

Type: Bent/ Grout/Sand
Volume Used: 1.5 bucket/3 bags/2bag
Interval: 15'-13'/13'-5'/5'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:
▨ Grout
▦ Bentonite
⁘ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Tyree Organization, Limited
Latham, NY

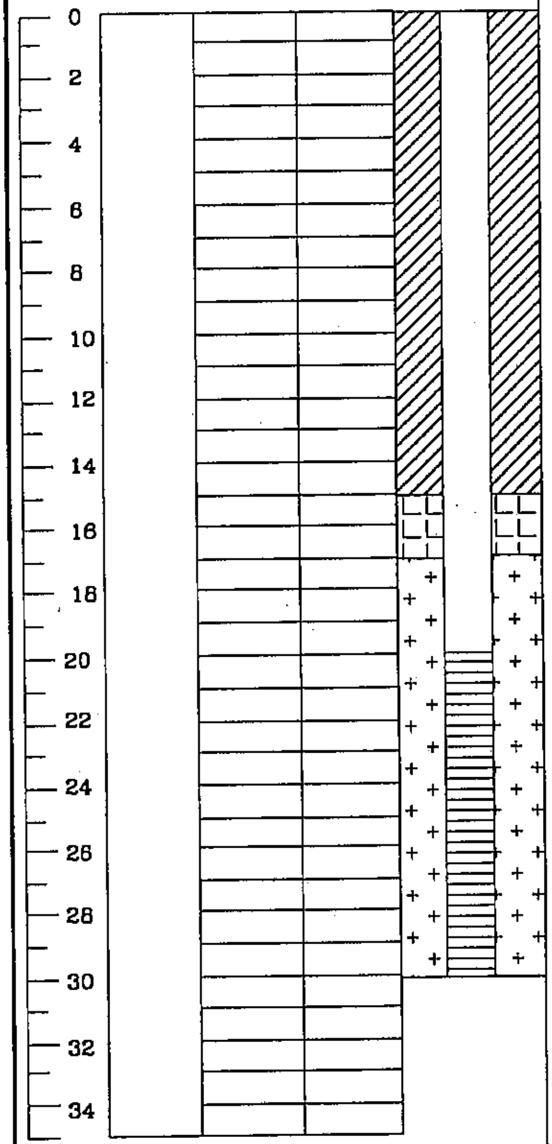
WELL CONSTRUCTION DETAIL

BORING NAME PZ-4A

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-4A
Date Completed: 10/31/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:
▨ Grout
▦ Bentonite
+ Sand

trace=1-10%	very fine sand=0.6-0.13mm	∇ = ground water table
little=10-20%	fine sand=0.13-0.25mm	f-gravel=2-4mm
some=20-30%	medium sand=0.25-0.50mm	m-gravel=4-64mm
and=30-50%	course sand=0.5-1mm	c-gravel=64-256mm
	very course sand=1-2mm	

Tyree Organization, Limited
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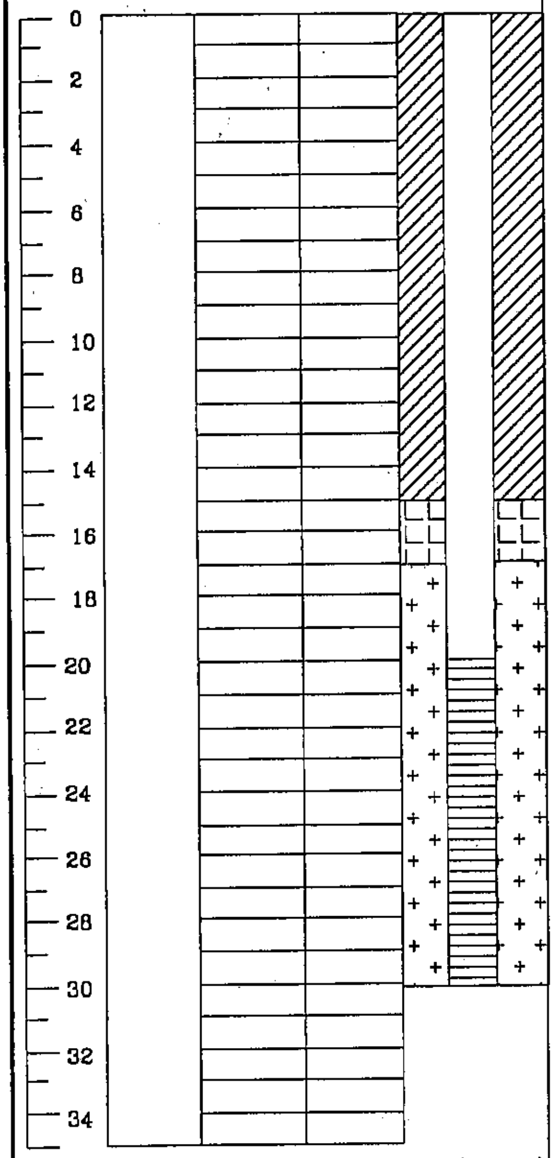
WELL CONSTRUCTION DETAIL

BORING NAME
PZ-4B

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 566 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-4B
Date Completed: 10/31/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:
▨ Grout
Bentonite
+ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

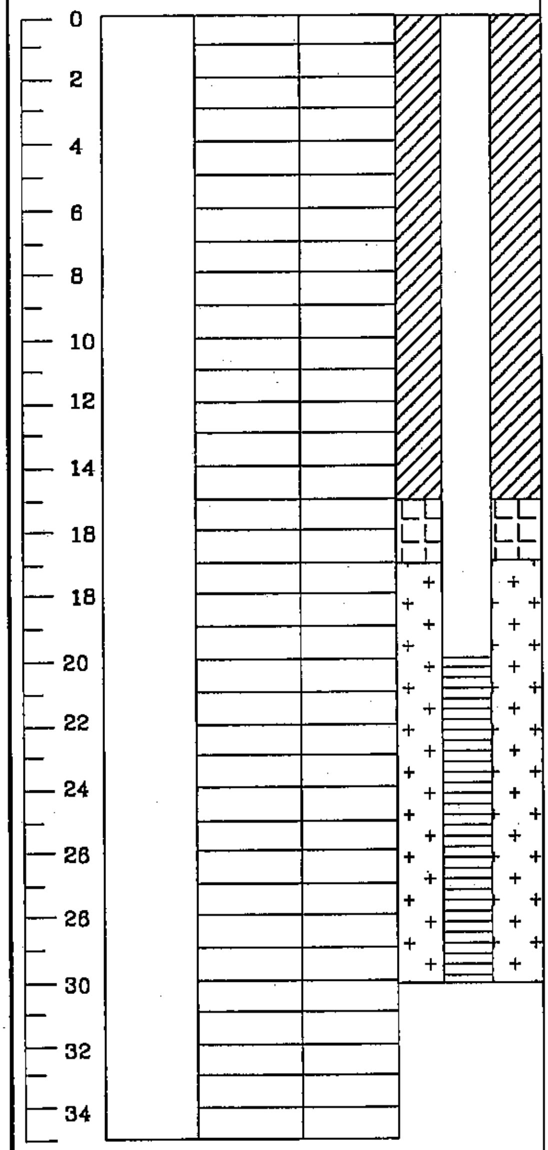
Tyree Organization, Limited
Latham, NY

WELL CONSTRUCTION DETAIL

BORING NAME PZ-4C

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY
PROJECT #: 017301
WELL #: PZ-4C
Date Completed: 10/31/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:

▨ Grout
▦ Bentonite
+ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Tyree Organization, Limited
Latham, NY

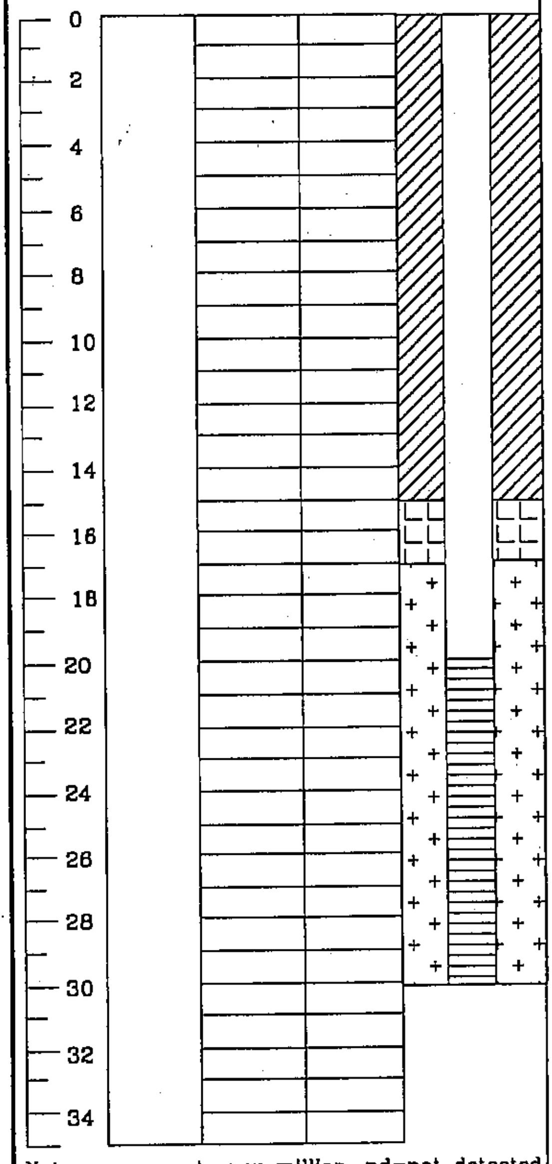
WELL CONSTRUCTION DETAIL

BORING NAME PZ-4D

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-4D
Date Completed: 10/31/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil



N/A

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

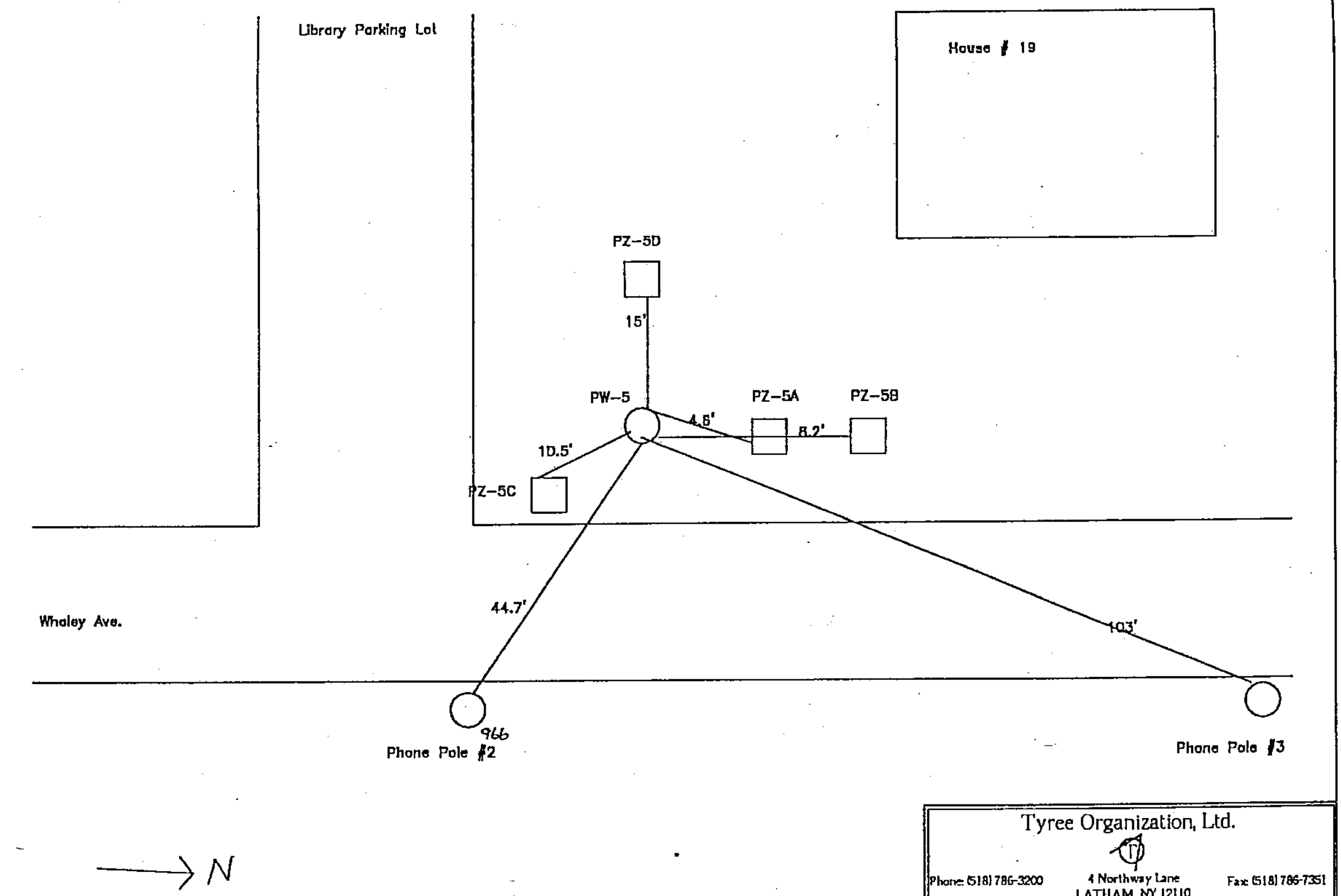
Key:
▨ Grout
⊔ Bentonite
+ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

PW-5 Well Cluster



Tyree Organization, Ltd.

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4 Northway Lane
LATHAM, NY 12110
Fax (518) 786-7351

Project Number 017301
As Builts
Mr. C's Dry Cleaners
586 Main Street
East Aurora, New York 14052

DRAWN BY: DLP
11-28-01
SCALE: NTS
CLIENT: DEC
PLATE: PW-5

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Limited
Latham, NY

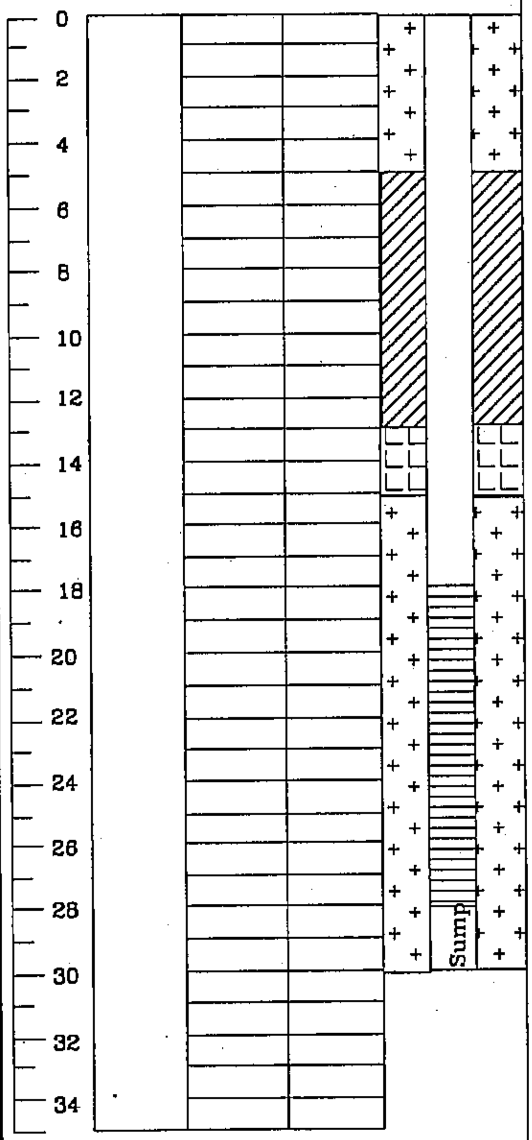
WELL CONSTRUCTION DETAIL

BORING NAME
PW-5

PROJECT NAME: NYS DEC
SITE: MR. C's
ADDRESS: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PW-5
DATE COMPLETED: 11/8/01
SUPERVISED BY: D. PERRUCCIO

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 6.25"
Depth: 30'

WELL DATA

Riser Type: Stainless Steel
Riser Dia.: 4"
Riser Length: 18'
Interval: 18'-0'

Screen Type: Stainless Steel
Screen Dia.: 4"
Screen Length: 10'
Slot: 0.010
Interval: 28'-18'

FILTER PACK

Source: Sand
Composition:
Volume Used: 7 bags
Interval: 30'-15'

GROUT / SEAL

Type: Bent/ Grout/Sand
Volume Used: 1.5 bucket/3 bags/2bag
Interval: 15'-13'/13'-5'/5'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan
Key:

▨ Grout
▦ Bentonite
⁘ Sand

LEGEND

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

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Latham, NY

BOREHOLE LOG

BORING NAME
PZ-5A

CLIENT: NYS DEC
PROJECT: MR. C's
LOCATION: 586 Main St., East Aurora, NY

DATE STARTED/COMPLETED: 10/23/01-10/23/01
LOGGED BY: C. Dinan
DRILLER: Nothnagle Drilling
RIG: CME 75

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
0	1,2,3,4	120.2	70%	▨	Dark Brown Clay f-vf sand moist but loose little gravel trace organics
2	7,13,23,24	132.4	10%	▨	dark brown fine sand dry loose some gravel (hit a rock)
4	8,13,16,15	150.0	20%	▨	brown fine sand and gravel fragments of rock dry and loose
6	6,6,9,9	17.4	40%	▨	brown- lt. brown fine sand and gravel/ rock fragements dry loose some copper staining
8	5,7,8,8	31.2	60%	▨	brown- lt. brown fine-med sand and rock fragements some gravel dry and loose
10	5,6,9,13	24.6	18%	▨	brown fine sand with some gravel dry and loose
12	3,3,3,5	12.9	80%	▨	Hit H20, dark brown fine-med sand w/ little gravel wet soft
14	3,5,6,8	5.6	70%	▨ ▦	dark brown fine-med sand wet soft
16	WR,1,2,5	4.5	60%	▦ ⁙	dark brown fine-med sand wet soft
18	WR,WR,2,3	8.0	60%	⁙	dark brown fine-vf silty sand wet soft soupy
20	WR,WR,2,4	7.6	40%	⁙	dark brown fine-vf silty sand wet soft soupy
22	1,1,1,2	0.9	90%	⁙	dark brown fine-vf silty sand wet soft soupy
24	WR,WR,WR,3	0.0	80%	⁙	dark brown fine-med silty sand wet soft soupy Field Description of Soil
26	5,4,7,11	0.0	100%	⁙	top 1/2 dark brown f-m silty sand wet soft soupy bottom 1/2 brown vf-f clay silty sand soft wet
28	WR,WR,WR,1	0.9	20%	⁙	brown vf clayey silty sand wet soft soupy
30					
32					
34					

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/ Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☑ YES ☐ NO
Size:
Concrete Pad: ☑ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:
▨ Grout
▦ Bentonite
⁙ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

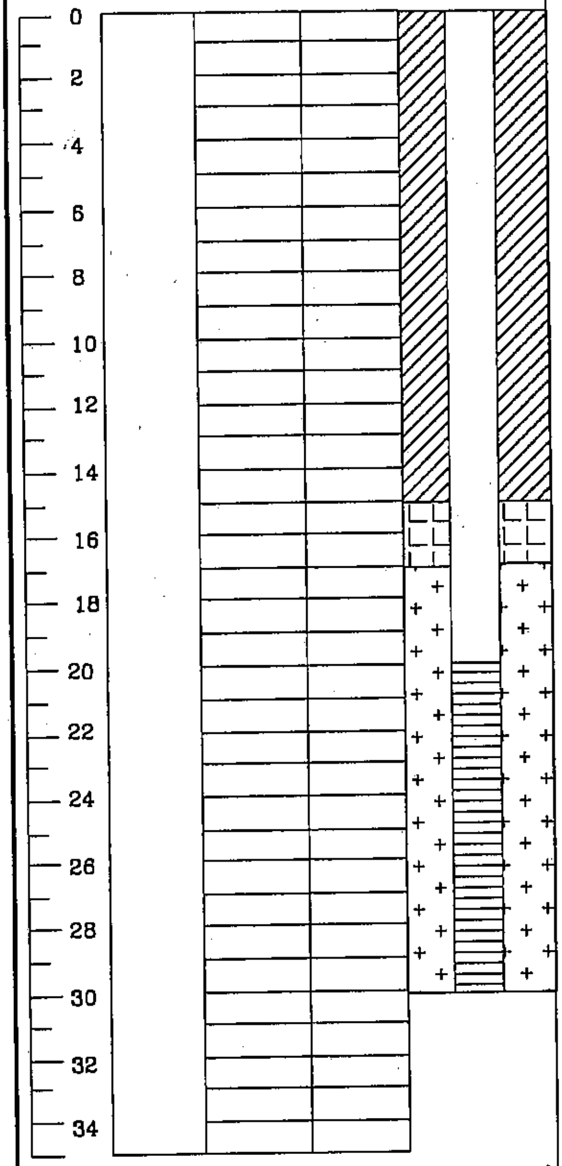
∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Tyree Organization, Limited Latham, NY	WELL CONSTRUCTION DETAIL	BORING NAME PZ-5B

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-5B
Date Completed: 10/24/01
SUPERVISED BY: C. Dinan

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:

▨	Grout
⊞	Bentonite
+ + +	Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

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Latham, NY

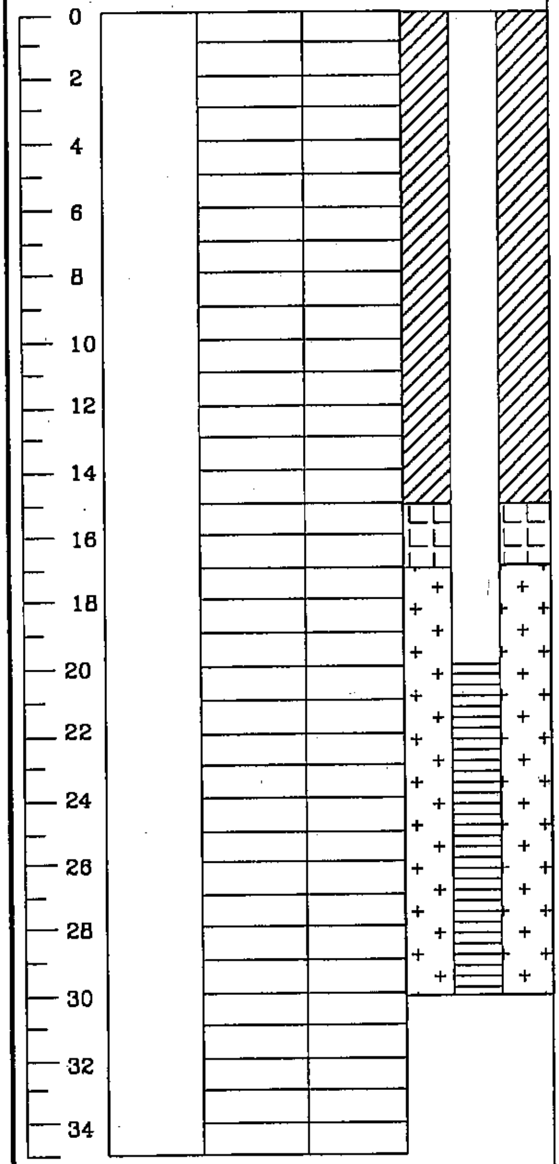
WELL CONSTRUCTION DETAIL

BORING NAME
PZ-5C

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-5C
Date Completed: 10/24/01
SUPERVISED BY: C. Dinan

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil



N/A

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA
Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA
Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK
Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL
Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION
Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT
Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:
▨ Grout
┴┴ Bentonite
+ + Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Tyree Organization, Limited
Latham, NY

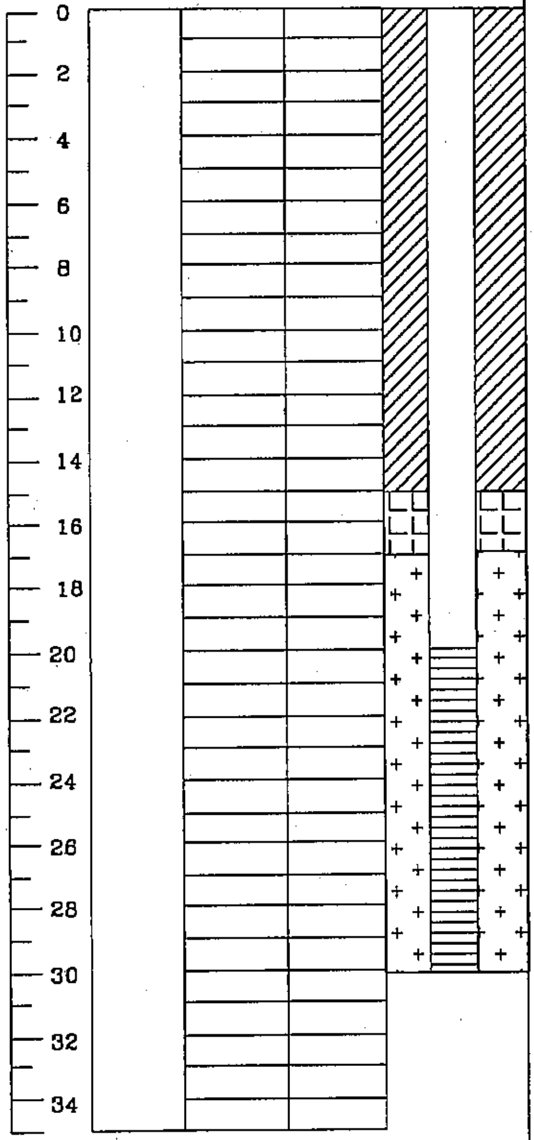
WELL CONSTRUCTION DETAIL

BORING NAME PZ-5D

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-5D
Date Completed: 10/24/01
SUPERVISED BY: C. Dinan

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

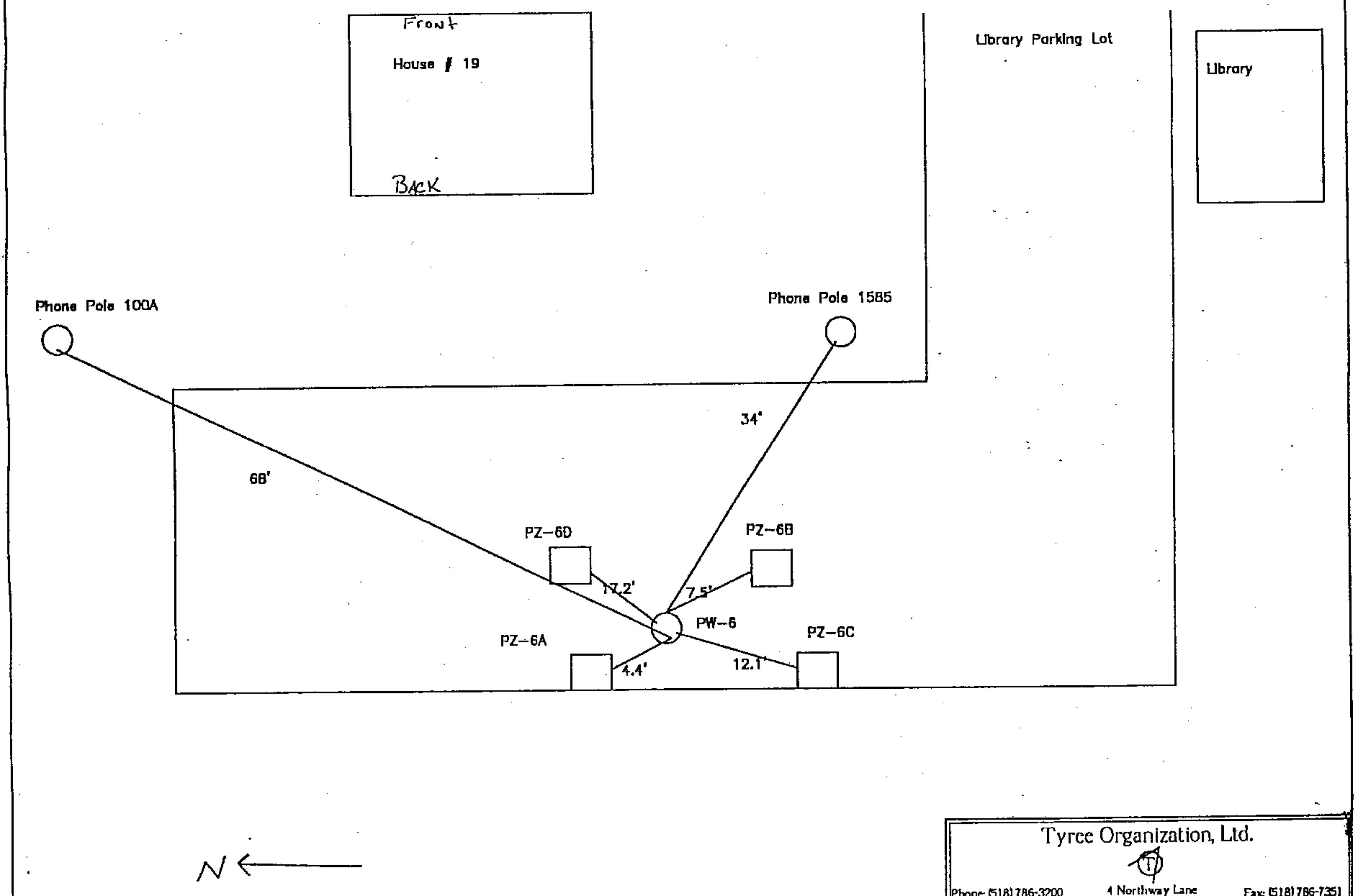
Key:
▨ Grout
Bentonite
\+ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-258mm

PW-6 Well Clusters



Tyree Organization, Ltd.

Phone: (518) 786-3200
4 Northway Lane
LATHAM, NY 12110
Fax: (518) 786-7351

Project Number 017301
As Builts
Mr. C's Dry Cleaners
586 Main Street
East Aurora, New York 14052

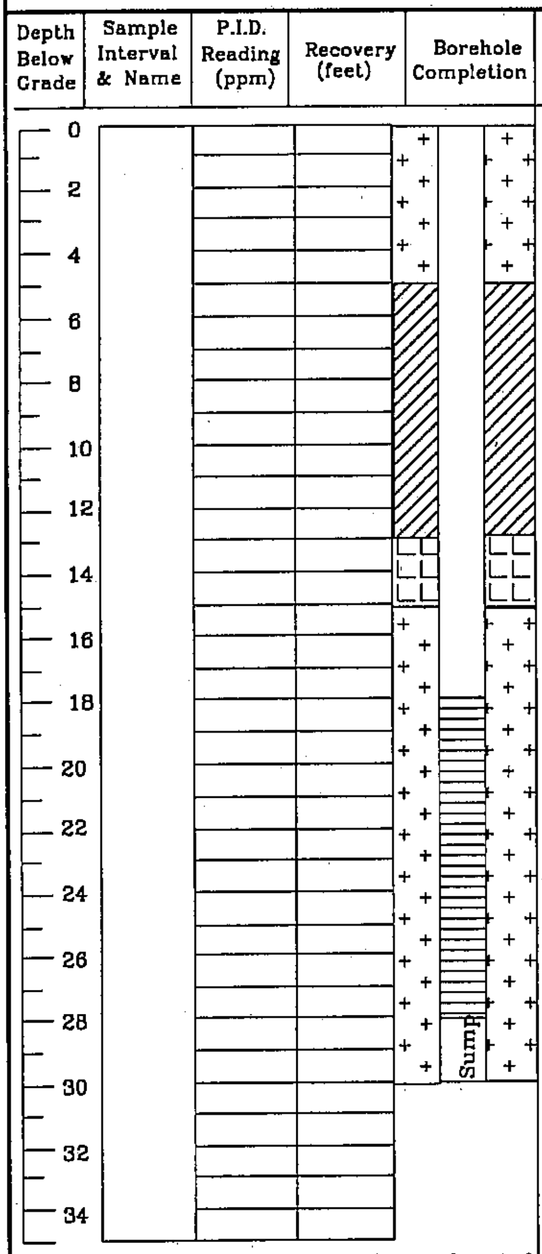
DRAWN BY: DLP
11-27-01
SCALE: NTS
CLIENT: DEC
PLATE: PW-6

Tyree Organization, Limited
Latham, NY

WELL CONSTRUCTION DETAIL

BORING NAME PW-6

PROJECT NAME: NYS DEC
SITE: MR. C's
ADDRESS: 566 Main St., East Aurora, NY
PROJECT #: 017301
WELL #: PW-6
DATE COMPLETED: 11/6/01
SUPERVISED BY: D. PERRUCCIO



Field Description of Soil

N/A

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 6.25"
Depth: 30'

WELL DATA

Riser Type: Stainless Steel
Riser Dia.: 4"
Riser Length: 18'
Interval: 18'-0'

Screen Type: Stainless Steel
Screen Dia.: 4"
Screen Length: 10'
Slot: 0.010
Interval: 28'-18'

FILTER PACK

Source: Sand
Composition:
Volume Used: 7 bags
Interval: 30'-15'

GROUT / SEAL

Type: Bent/ Grout/Sand
Volume Used: 1.5 bucket/3 bags/2bag
Interval: 15'-13'/13'-5'/5'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:
▨ Grout
⊞ Bentonite
⁘ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

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BOREHOLE LOG

BORING NAME
PZ-6A

CLIENT: NYS DEC
PROJECT: MR. C's
LOCATION: 586 Main St., East Aurora, NY

DATE STARTED/COMPLETED: 10/29/01-10/29/01
LOGGED BY: D. Perruccio
DRILLER: Nothnagle Drilling
RIG: CME 75

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
0	10,5,3,3	2.2	70%	▨	asphalt gravel dark gray medium- course sand
2	2,2,6,7	3.5	80%	▨	med. gray f-m sand some silt moist
4	2,3,4,5	0.0	50%	▨	medium gray fine to medium sand and silt moist
6	2,3,6,5	0.0	50%	▨	dark brown medium to course sand fine gravel moist
8	4,5,6,9	0.0	70%	▨	dark brown fine to medium sand some silt w/ grey silty clay moist
10	2,4,6,6	0.0	50%	▨	medium brown medium to course sand f-m gravel wet
12	2,2,5,7	0.0	100%	▨	medium grey m-c sand, f-m gravel trace silty sand wet
14	7,13,11,12	0.0	60%	▦	medium grey m-c sand, f-m gravel trace silty sand wet
16	11,18,11,14	0.0	70%	▦ ⁙	med. grey, m-c sand, f-m gravel wet
18	5,12,12,10	0.0	60%	⁙	med. grey, m-c sand, f-m gravel trace of silty sand wet
20	5,4,5,8	0.0	70%	⁙	Medium grey fine to medium sand trace silt wet
22	2,5,6,9	0.0	70%	⁙	Medium grey fine to medium sand trace silt wet
24	1,2,6,6	0.0	100%	⁙	Medium grey fine to medium sand trace silt wet
26	3,9,5,8	0.0	80%	⁙	Medium grey fine to medium sand trace silt wet
28	1,3,5,7	0.0	80%	⁙	Medium grey fine to medium sand trace silt wet
30					
32					
34					

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/ Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan
Key:

▨ Grout
▦ Bentonite
⁙ Sand

LEGEND

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Tyree Organization, Limited
Latham, NY

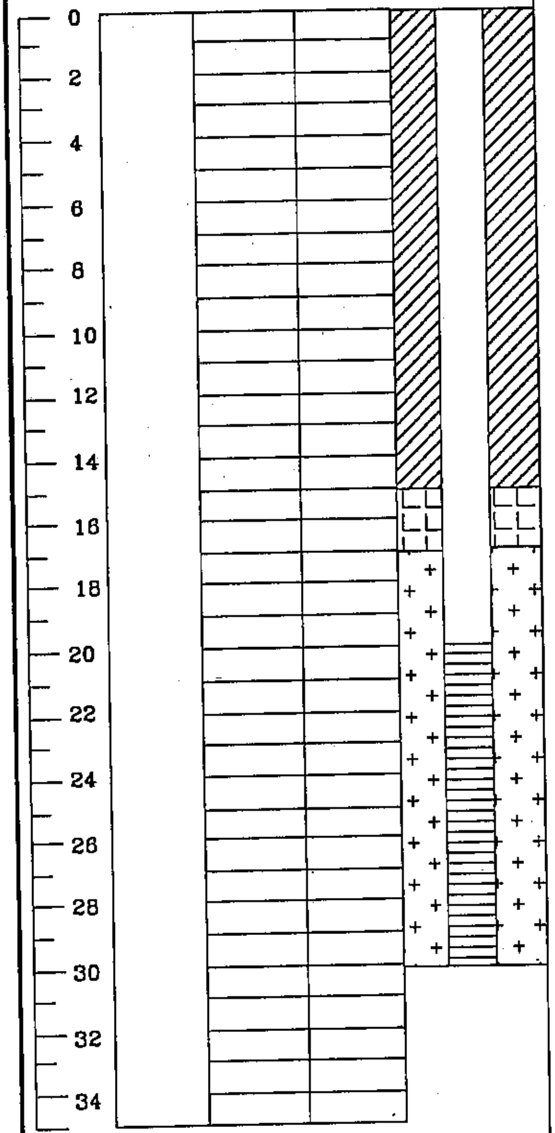
WELL CONSTRUCTION DETAIL

BORING NAME PZ-6B

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-6B
Date Completed: 10/29/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:
▨ Grout
⊞ Bentonite
+ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Tyree Organization, Limited
Latham, NY

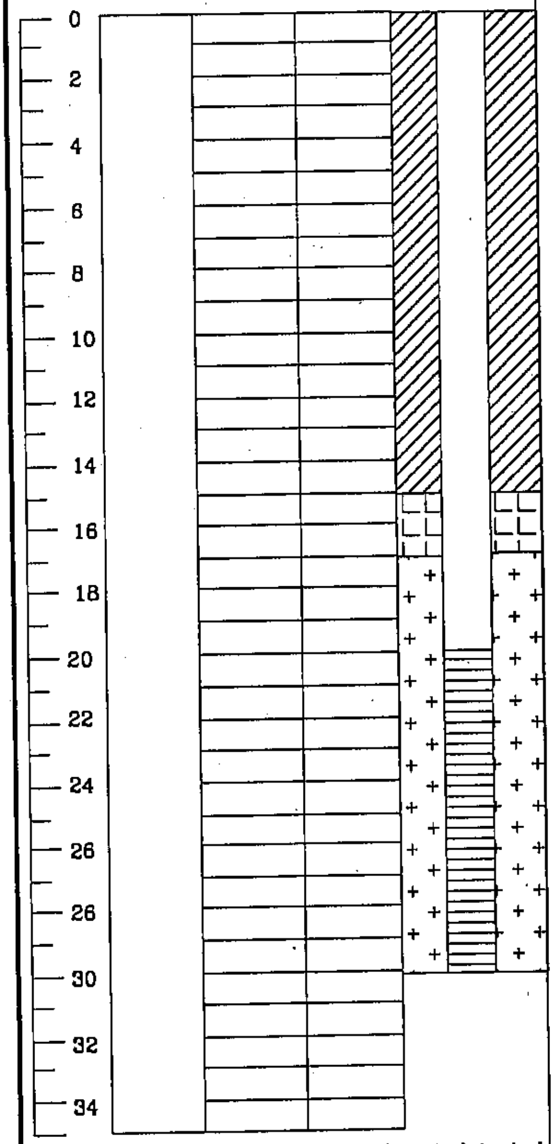
WELL CONSTRUCTION DETAIL

BORING NAME
PZ-6C

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-6C
Date Completed: 10/25/01
SUPERVISED BY: C. Dinan

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:

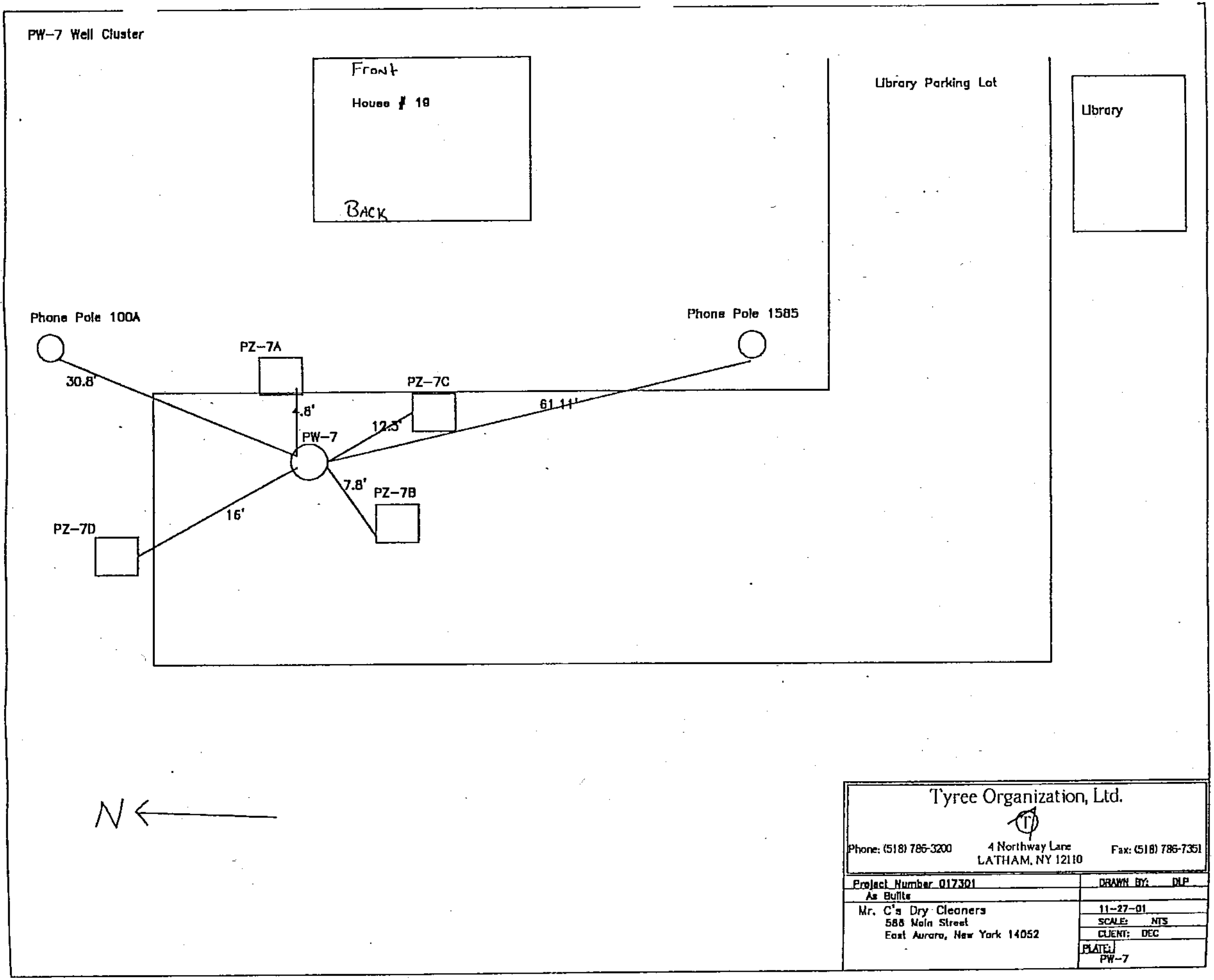
▨	Grout
▦	Bentonite
+ +	Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

PW-7 Well Cluster



Tyree Organization, Ltd.

Phone: (518) 785-3200
4 Northway Lane
LATHAM, NY 12110
Fax: (518) 785-7351

Project Number 017301
As Builts
Mr. C's Dry Cleaners
588 Main Street
East Aurora, New York 14052

DRAWN BY: DLP
11-27-01
SCALE: NTS
CLIENT: DEC
PLATE: PW-7

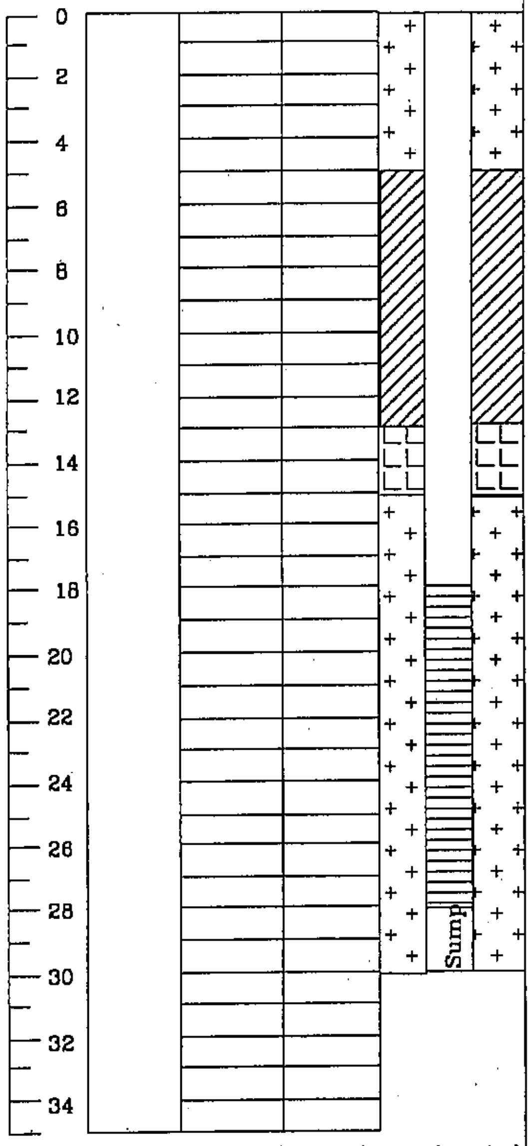
Tyree
Organization,
Limited
Latham, NY

WELL CONSTRUCTION DETAIL

BORING NAME
PW-7

PROJECT NAME: NYS DEC
SITE: MR. C's
ADDRESS: 586 Main St., East Aurora, NY
PROJECT #: 017301
WELL #: PW-7
DATE COMPLETED: 11/5/01
SUPERVISED BY: D. PERRUCCIO

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil



N/A

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 6.25"
Depth: 30'

WELL DATA

Riser Type: Stainless Steel
Riser Dia.: 4"
Riser Length: 18'
Interval: 18'-0'

Screen Type: Stainless Steel
Screen Dia.: 4"
Screen Length: 10'
Slot: 0.010
Interval: 28'-18'

FILTER PACK

Source: Sand
Composition:
Volume Used: 7 bags
Interval: 30'-15'

GROUT / SEAL

Type: Bent/ Grout/Sand
Volume Used: 1.5 bucket/3 bags/2bag
Interval: 15'-13'/13'-5'/5'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan
Key:
▨ Grout
▦ Bentonite
⁘ Sand

LEGEND

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Tyree Organization, Limited
Latham, NY

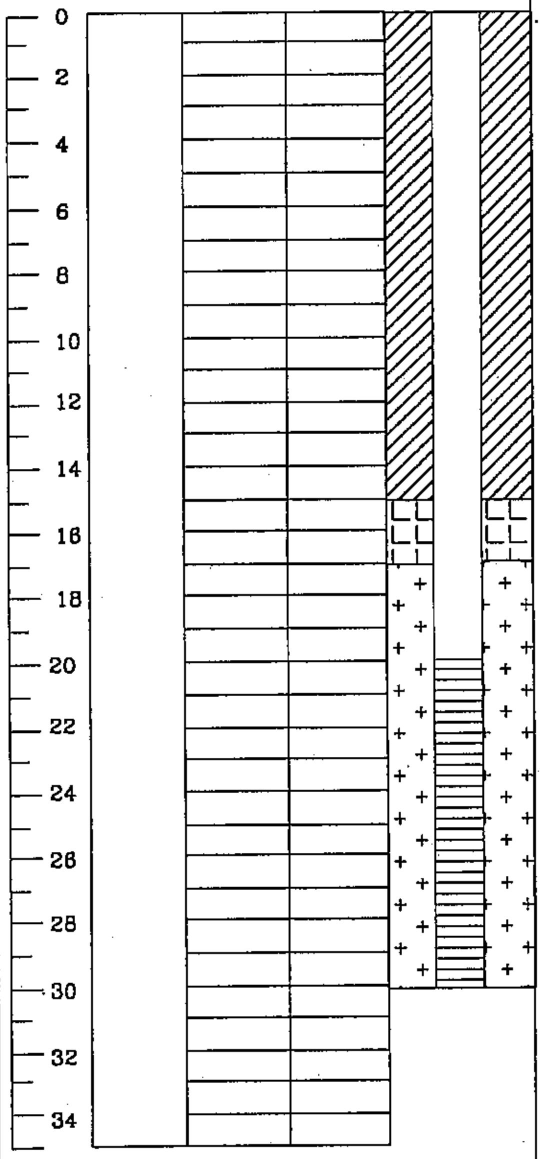
WELL CONSTRUCTION DETAIL

BORING NAME PZ-7A

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-7A
Date Completed: 11/6/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:

▨	Grout
⊞	Bentonite
+ +	Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Tyree Organization, Limited
Latham, NY

BOREHOLE LOG

BORING NAME PZ-7B

CLIENT: NYS DEC
PROJECT: MR. C's
LOCATION: 586 Main St., East Aurora, NY

DATE STARTED/COMPLETED: 10/30/01-10/30/01
LOGGED BY: D. Perruccio
DRILLER: Nothnagle Drilling
RIG: CME 75

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
0	18,10,9,8	0.0	90%	▨	medium to course sand, some fine to course gravel grey and dry
2	13,4,4,6	0.0	95%	▨	fine to medium sand brown, trace silt brown, moist
4	4,5,3,3	0.0	60%	▨	fine to medium sand brown, some silt brown, moist
6	3,4,3,4	0.0	50%	▨	m-c sand brown, some f-c gravel brown, trace silt brown, moist
8	2,4,5,6	0.0	50%	▨	m-c sand brown, some f-c gravel brown, and silt brown, moist
10	1,2,4,5	0.0	60%	▨	fine to medium sand grey trace silt grey wet
12	6,5,11,10	--	0%	▨	
14	6,18,12,18	0.0	10%	▨ ⊞	fine to medium sand brown, some silt brown, trace fine gravel brown wet
16	2,5,8,9	0.0	50%	⊞ ⁘	fine to medium sand grey trace silt grey, wet
18	3,4,6,10	0.0	70%	⁘	fine to medium sand grey trace silt grey, wet
20	2,3,8,8	0.0	60%	⁘	fine to medium sand grey trace silt grey, wet
22	2,4,8,10	0.0	70%	⁘	fine to medium sand grey trace silt grey, wet
24	2,5,7,7	0.0	70%	⁘	fine to medium sand grey trace silt grey, wet
26	1,1,2,3	0.0	80%	⁘	Medium to course sand grey wet
28	13,6,12,9	0.0	50%	⁘	Medium to course sand grey wet
30					
32					
34					

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/ Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan
Key:
▨ Grout
⊞ Bentonite
⁘ Sand

LEGEND

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

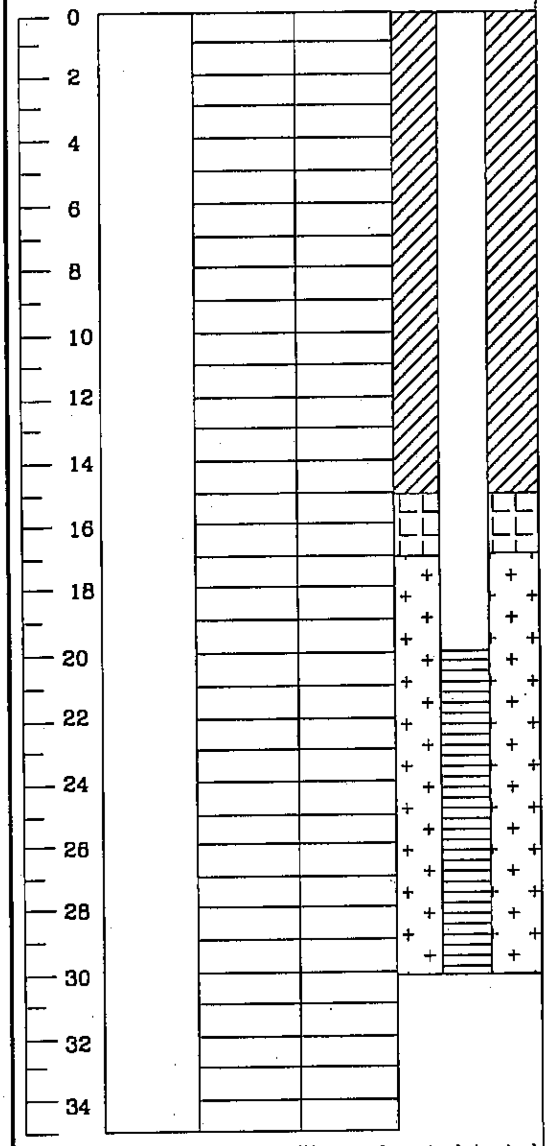
Tyree Organization, Limited
Latham, NY

WELL CONSTRUCTION DETAIL

BORING NAME
PZ-7C

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY
PROJECT #: 017301
WELL #: PZ-7C
Date Completed: 11/6/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

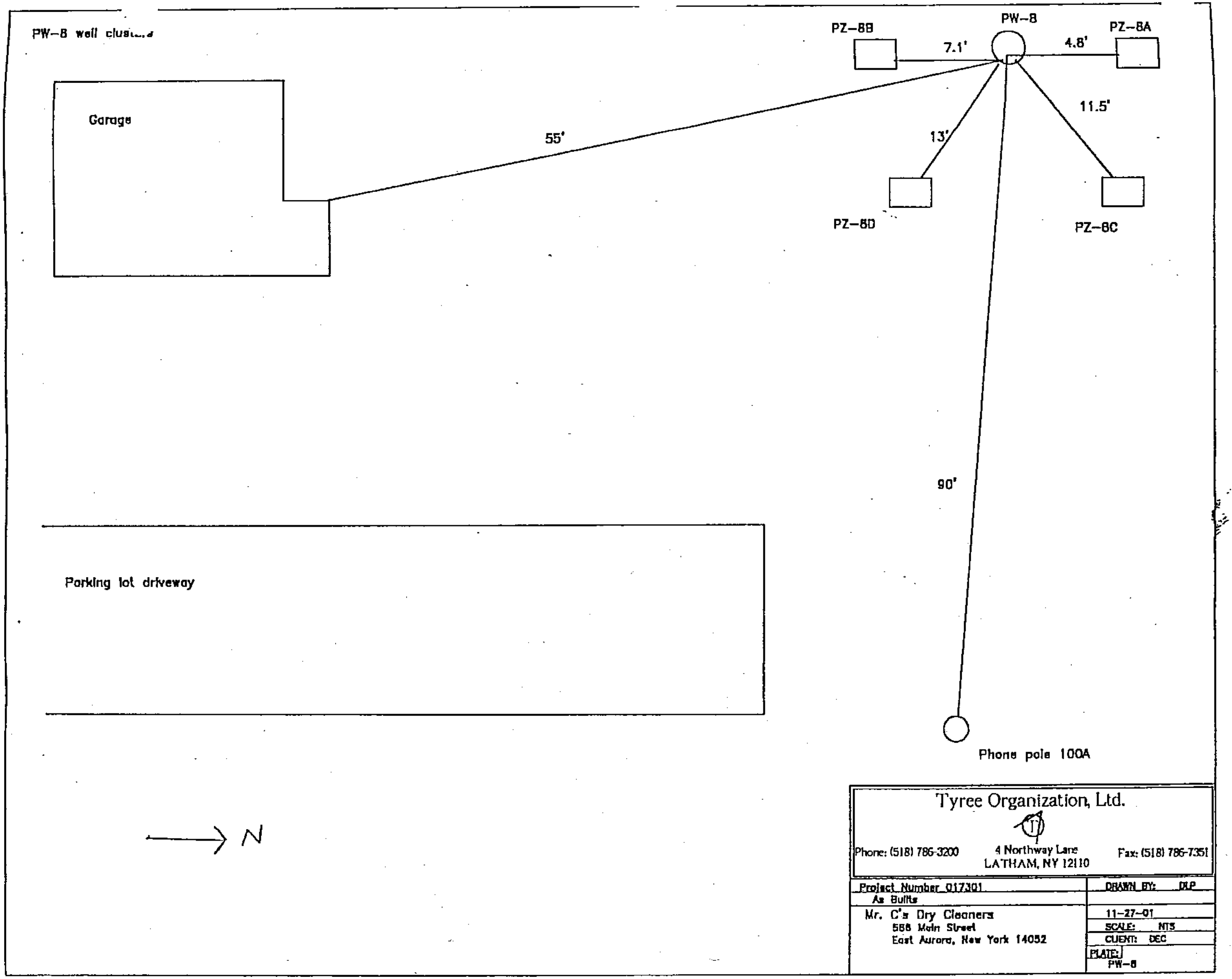
Key:

▨	Grout
⊞	Bentonite
+ + +	Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm



Tyree Organization, Ltd.

Phone: (518) 786-3200
4 Northway Lane
LATHAM, NY 12110
Fax: (518) 786-7351

Project Number 017301
As Builts

Mr. C's Dry Cleaners
588 Main Street
East Aurora, New York 14052

DRAWN BY: DLP
11-27-01
SCALE: NTS
CLIENT: DEC
PLATE: PW-8

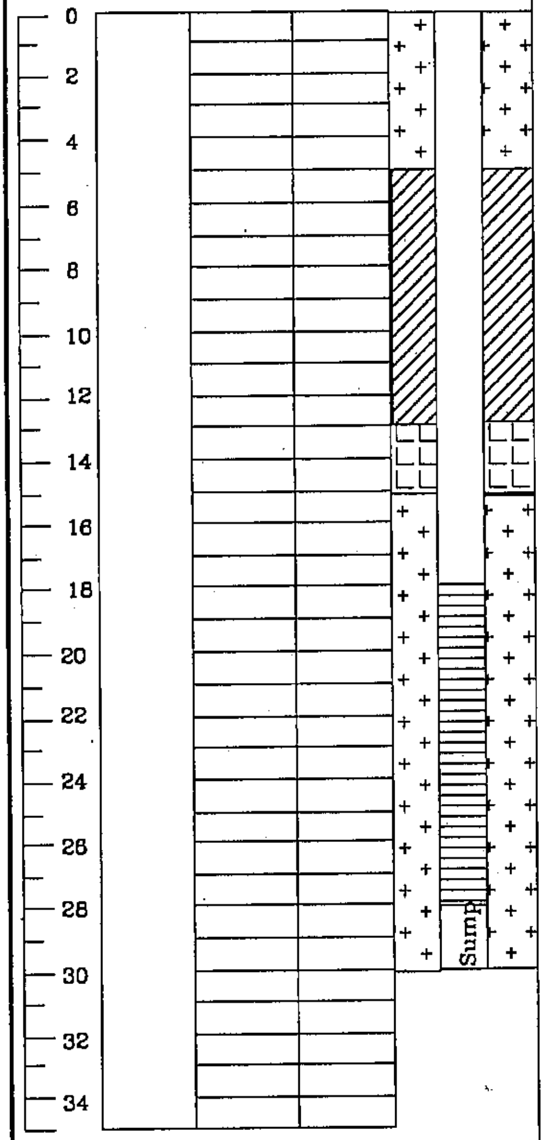
Tyree Organization, Limited
Latham, NY

WELL CONSTRUCTION DETAIL

BORING NAME
PW-8

PROJECT NAME: NYS DEC
SITE: MR. C's
ADDRESS: 586 Main St., East Aurora, NY
PROJECT #: 017301
WELL #: PW-8
DATE COMPLETED: 11/7/01
SUPERVISED BY: D. PERRUCCIO

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 6.25"
Depth: 30'

WELL DATA

Riser Type: Stainless Steel
Riser Dia.: 4"
Riser Length: 18'
Interval: 18'-0'

Screen Type: Stainless Steel
Screen Dia.: 4"
Screen Length: 10'
Slot: 0.010
Interval: 28'-18'

FILTER PACK

Source: Sand
Composition:
Volume Used: 7 bags
Interval: 30'-15'

GROUT / SEAL

Type: Bent/ Grout/Sand
Volume Used: 1.5 bucket/3 bags/2bag
Interval: 15'-13'/13'-5'/5'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:
▨ Grout
▦ Bentonite
⛆ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

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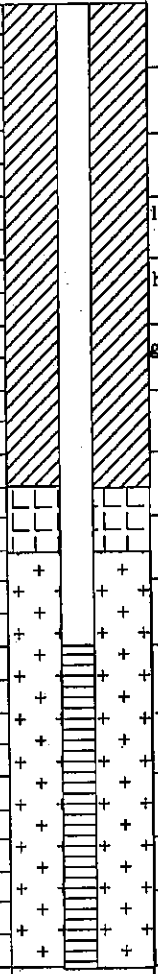
Latham, NY

BOREHOLE LOG

BORING NAME
PZ-8A

CLIENT: NYS DEC
PROJECT: MR. C's
LOCATION: 586 Main St., East Aurora, NY

DATE STARTED/COMPLETED: 10/25/01-10/25/01
LOGGED BY: C. Dinan
DRILLER: Nothnagle Drilling
RIG: CME 75

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
0	2,4,5,7	0.0	90%		Top 3rd dark brown soil w/ organics Bottom v-f to f sand dry loose
2	5,7,11,12	0.0	60%		light brown sand w/ some gravel rock fragements dry loose
4	2,2,5,4	0.0	20%		light brown sand w/ some gravel rock fragements dry loose
6	3,3,3,7	0.0	30%		light brown sand and gravel shale rock fragements loose dry
8	5,7,8,11	0.0	70%		hit H20, top 5" same as above bottom gray wet silty clay stiff
10	3,6,7,11	0.0	70%		grey silty clay wet semi stiff
12	4,8,11,12	0.0	40%		brown vf sand and f-m gravel wet semi loose
14	6,4,3,6	1.6	30%		brown vf sand and f-m gravel wet semi loose
16	4,5,7,6	3.5	50%		f-m gravel with some brown fine sand wet loose
18	9,7,8,10	1.4	40%		f-m gravel with some brown fine sand wet loose
20	3,6,7,8	2.0	50%		top 4"- same as above mid 4" brown sandy silt wet sticky stiff bottom 4"-gray vf-f sand wet
22	4,4,4,4	1.0	50%		grey silty vf sand wet sticky
24	5,5,5,6	0.4	20%		dark grey f-m sand w/ trace gravel wet loose
26	WR,3,5,6	0.0	80%		grey vf-f sand, silty wet and sticky
28	2,3,4,4	0.0	70%		Grey vf-f silty sand wet sticky
30					
32					
34					

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/ Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan
Key:
▨ Grout
⊞ Bentonite
⁘ Sand

LEGEND

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Tyree
Organization,
Limited
Latham, NY

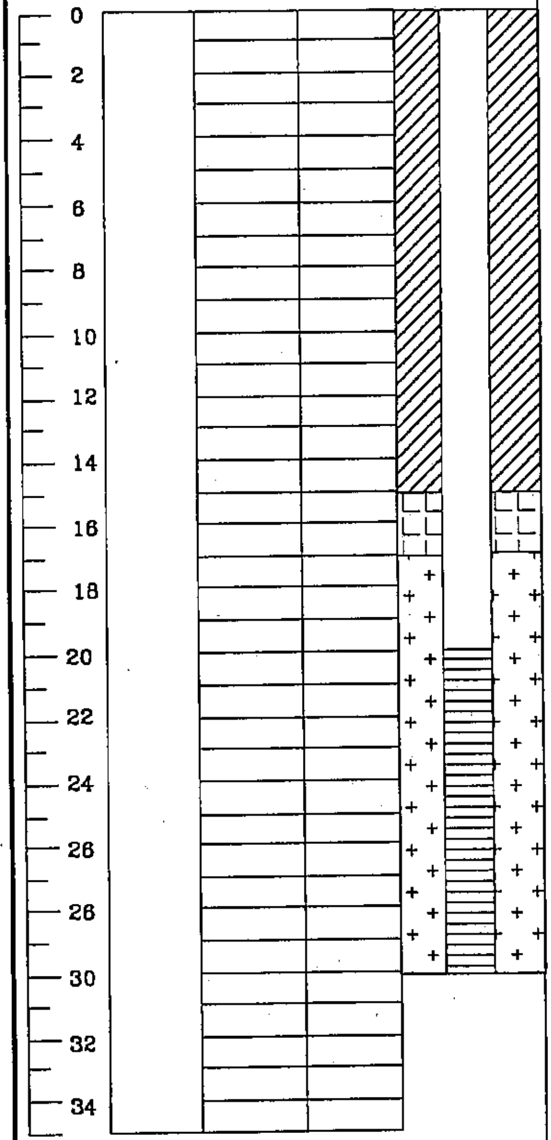
WELL CONSTRUCTION DETAIL

BORING NAME
PZ-8B

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-8B
Date Completed: 10/25/01
SUPERVISED BY: C. Dinan

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million; nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:

▨ Grout	trace=1-10%	very fine sand=0.6-0.13mm	∇ = ground water table	
Bentonite	little=10-20%	fine sand=0.13-0.25mm	f-gravel=2-4mm	
	some=20-30%	medium sand=0.25-0.50mm	m-gravel=4-64mm	
+ Sand	and=30-50%	course sand=0.5-1mm	c-gravel=64-256mm	
		very course sand=1-2mm		

Tyree Organization, Limited
Latham, NY

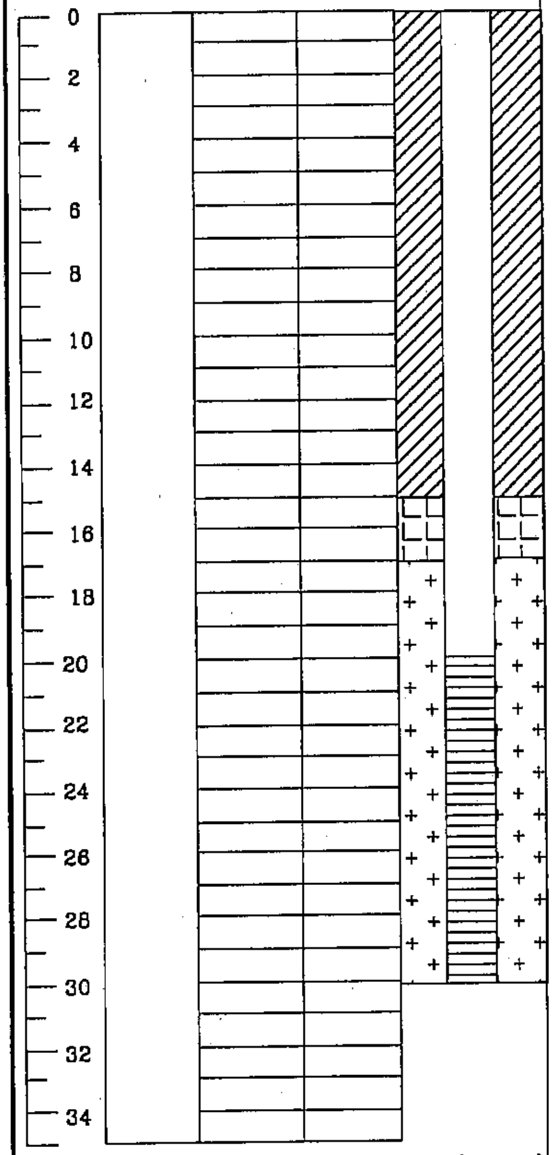
WELL CONSTRUCTION DETAIL

BORING NAME PZ-8C

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-8C
Date Completed: 10/25/01
SUPERVISED BY: C. Dinan

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil



N/A

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:
▨ Grout
▦ Bentonite
+ + Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Tyree Organization, Limited
Latham, NY

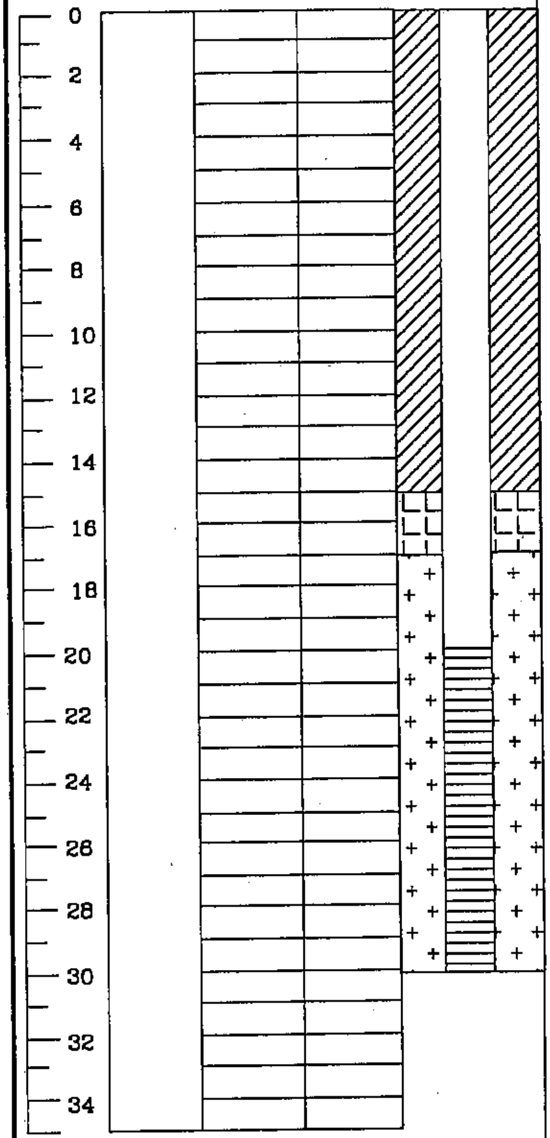
WELL CONSTRUCTION DETAIL

BORING NAME PZ-8D

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-8D
Date Completed: 10/25/01
SUPERVISED BY: C. Dinan

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:

▨	Grout
⊞	Bentonite
+ + +	Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Former Agway Site

- Groundwater Monitoring Wells

EARTH DIMENSIONS, INC.
Soil Investigations and Monitoring Well Installations
Roycroft Campus, 31 S. Grove St. • East Aurora, NY 14052 • (716) 655-1717

MONITORING WELL (MW-4)
HOLE NO 2-89
SURF ELV
PROJECT Monitoring well installation
4F88b Main & Whaley Sts., East Aurora, NY
CLIENT AGWAY PETROLEUM CORPORATION
LOCATION Approx. 10.0 feet south of SW corner of pump island
DATE STARTED 1/27/89 COMPLETED 1/27/89

DEPTH FEET	SAMPLE NO	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N
	1		5	5	4	10
	2	6	4	3	4	7
5	3	8	14	14	21	28
	4	7	6	7	4	13
10	5	10	12	13	12	25
	6	27	20	19	18	39
	7	1	4	7	9	11
15	8	11	12	11	14	23
	9	6	7	11	11	18
20						

DESCRIPTION & CLASSIFICATION

Concrete 0.4

Extremely moist gray crush gravel fill with 20 to 40% mostly concrete gravel, very fine to coarse sand size, loose 0.9

Extremely moist dark gray shaly silt loam (CLAYEY-SILT) fill with 15 to 40% shale gravel, stiff 2.5

- - - - grades downward to - - - -

Extremely moist olive brown silt loam (CLAYEY-SILT) fill with 5 to 15% gravel, trace to little very fine size sand, firm 4.0

Extremely moist distinctly mottled olive brown to olive gray shaly (CLAYEY-SILT) with 15 to 40% mostly shale gravel, very stiff becoming stiff below 6.0 feet, weakly stratified, noticed one (1) wet olive brown (SAND) lens between 4.1 to 4.2 feet 8.0

- - - - grades downward to - - - -

Extremely moist highly mottled olive gray very gravelly (SILTY-SAND) with 40 to 60% mostly subangular gravel, very fine to coarse size sand, some silt, compact, weakly stratified, noticed distinct petroleum odor 11.0

- - - - clear transition to - - - -

Wet alternating olive brown and gray (SAND) very fine to medium size sand, dense, tends to lquify when disturbed, thinly bedded with coarse silt lenses, noticed distinct petroleum odor with some oil sheen 12.0

- - - - grades downward to - - - -

WELL

Four (4) inch inside diameter PVC riser pipe.
Cement Bentonite Grout
4.7
(1)
6.6
7.3
Four (4) inch PVC slotted screen
#2 size sand
17.3
18.0

WATER TABLE & REMARKS

Concrete to 0.4 feet over crush gravel fill to 0.9 feet ove silty fill with some gravel to 2.5 feet over silty soil fill with little gravel trace to little sand to 4.0 feet over water sorted and deposited silt with some gravel to 8.0 feet over water sorted and deposite sand and gravel with some silt to 11.0 feet over water sorted and deposited sand to end of boring.

Advanced jack hammer through concrete to 0.4 feet.

Water level at 13.4 feet below ground surface with 8½ inch hollow stem augers at 18.0 feet.

(1) Bentonite pellet seal.

Continued on sheet 2.

N = NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb WT FALLING 30 " PER BLOW

LOGGED BY Dale M. Gramza/Geologist

SHEET 1 OF 2

EARTH DIMENSIONS, INC.

Soil Investigations and Monitoring Well Installations
Roycroft Campus, 31 S. Grove St. • East Aurora, NY 14052 • (716) 655-1717

ONITORING WELL
OLE NO. 2-89 Continued (MW-4)
ROJECT Monitoring well installation
F88b Main & Whaley Sts., East Aurora, NY
CLIENT AGWAY PETROLEUM CORPORATION

SURF ELV·
LOCATION Approx. 10.0 feet south of SW corner of pump island
DATE STARTED 1/27/89 COMPLETED 1/27/89

DEPTH FEET	SAMPLE NO	BLOWS ON SAMPLER	DESCRIPTION & CLASSIFICATION	WATER TABLE & REMARKS
			Wet gray (SAND) with fine to coarse size sand, compact, loose when disturbed, thinly bedded with occasional subrounded gravel fragment 15.0	
			Wet faintly mottled brown (SAND) with very fine to fine size sand, trace silt, compact, tends to liquify when disturbed, thinly bedded 18.0	
25			Boring completed at 18.0 feet.	
30				
35				
0				

OVM Readings

Sample#	Interval	ppm
1	0.0 - 2.0	0
2	2.0 - 4.0	0
3	4.0 - 6.0	0
4	6.0 - 8.0	11
5	8.0 - 10.0	165
6	10.0 - 12.0	227
7	12.0 - 14.0	174
8	14.0 - 16.0	4.6
9	16.0 - 18.0	4.1

N = NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb WT FALLING 30 " PER BLOW

LOGGED BY Dale M. Gramza/Geologist

SHEET 2 OF 2

Matrix Environmental Technologies Inc.

SUBSURFACE LOG

PROJECT/LOCATION: AGWAY/Main Street, East Aurora, NY
PROJECT #: 93-065
WELL/BORING #: MW7 AG 8
CLIENT: Agway Energy
DATE COMPLETED: 9/24/93
RECORDED BY: EAP
DATE STARTED: 2/12/93
AFTER COMPLETION:
GROUNDWATER DEPTH WHILE DRILLING:
DRILLERS: Buffalo Drilling
WEATHER: Sunny 55°
DRILL RIG: Mobil D-40 (track)
SAMPLER HAMMER: WEIGHT FALL
DRILL TYPE/SIZE: 3 3/4 Auger

MATERIAL CLASSIFICATION (BURMISTER SYSTEM)

f–fine
m–medium
c–coarse

"and" = 35 – 50%
"some" = 20 – 35%
"little" = 10 – 20%
"trace" = 0 – 10%

SAMPLE NO.	OVA/HNU READING	DEPTH OF SAMPLE (FEET) FROM	TO	SAMPLE TYPE	BLOWS ON SAMPLER PER 6"	N	AMOUNT	MATERIAL CLASSIFICATION
S1	0.0	4	6	SS	10-6-4-3	10	50%	Brown SILT and CLAY Dry no odor
S2	0.0	9	11	SS	4-6-10-8	16	75%	Brown fm SAND Damp no odor
S3	11.3	15	17	SS	5-8-7-12	15	75%	Brown mf SAND Wet no odor

REMARKS:

*SS–SPLIT SPOON SAMPLE U–UNDISTURBED TUBE P–PISTON TUBE C–CORE

Matrix Environmental Technologies Inc.

SUBSURFACE LOG

PROJECT/LOCATION: AGWAY/Main Street, East Aurora, NY
CLIENT: Agway Energy
DATE STARTED: 2/12/93
DATE COMPLETED: 9/24/93
GROUNDWATER DEPTH WHILE DRILLING:
WEATHER: Sunny 55°
DRILL RIG: Mobil D-40 (track)
DRILL TYPE/SIZE: 3 3/4 Auger
PROJECT #: 93-065
WELL/BORING #: MW8 AG9
RECORDED BY: EAP
AFTER COMPLETION:
DRILLERS: Buffalo Drilling
SAMPLER HAMMER: WEIGHT FALL

SAMPLE NO.	OVA/HNU READING	DEPTH OF SAMPLE (FEET) FROM	DEPTH OF SAMPLE (FEET) TO	SAMPLE TYPE	BLOWS ON SAMPLER PER 6"	N	AMOUNT	MATERIAL CLASSIFICATION (BURMISTER SYSTEM) f-fine m-medium c-coarse "and" = 35 - 50% "some" = 20 - 35% "little" = 10 - 20% "trace" = 0 - 10%
S1	0.0	4	6	SS	14-12-14-9	26	50%	Brown SILT and CLAY trace m GRAVEL (shale) Dry no odor
S2	0.0	9	11	SS	7-8-7-8	15	25%	Brown SILT and CLAY trace GRAVEL Moist no odor
S3	72.3	15	17	SS	2-5-7-5	12	100%	Brown SAND Wet slight petro odor

REMARKS:

*SS-SPLIT SPOON SAMPLE U-UNDISTURBED TUBE P-PISTON TUBE C-CORE

Matrix Environmental Technologies Inc.

SUBSURFACE LOG

ROJECT/LOCATION: AGWAY/Main Street, East Aurora, NY
CLIENT: Agway Energy
DATE STARTED: 2/12/93 DATE COMPLETED: 9/24/93
GROUNDWATER DEPTH WHILE DRILLING:
WEATHER: Sunny 55° DRILL RIG: Mobil D-40 (track)
DRILL TYPE/SIZE: 3 3/4 Auger

PROJECT #: 93-065
WELL/BORING #: MW9 AI-10
RECORDED BY: EAP
AFTER COMPLETION:
DRILLERS: Buffalo Drilling
SAMPLER HAMMER: WEIGHT FALL

MATERIAL CLASSIFICATION
(BURMISTER SYSTEM)

f-fine
m-medium
c-coarse

"and" = 35 - 50%
"some" = 20 - 35%
"little" = 10 - 20%
"trace" = 0 - 10%

SAMPLE NO.	OVA/HNU READING	DEPTH OF SAMPLE (FEET) FROM	DEPTH OF SAMPLE (FEET) TO	SAMPLE TYPE	BLOWS ON SAMPLER PER 6"	N	AMOUNT	MATERIAL CLASSIFICATION
S1	140.3	4	6	SS	4-5-10-9	15	75%	Gray fm SILT and CLAY trace m GRAVEL Damp petro odor
S2	140.6	9	11	SS	6-7-11-18	18	75%	Gray fm SILT and GRAVEL Damp petro odor
S3	49.5	15	17	SS	3-5-8-9	13	75%	Gray mc SAND Wet petro odor

WATER @ 12'10"

REMARKS:

*SS-SPLIT SPOON SAMPLE U-UNDISTURBED TUBE P-PISTON TUBE C-CORE

Previous and New Studies

- Malcoln-Pirnie - Remedial Investigation Studies
    - NYSDEC – Investigative Studies
        - EEEPC

BOREHOLE LOG MPI-1S

PROJECT: MR. C CLEANERS RI
PROJECT NO.: 0288-31-4
LOCATION: EAST AURORA, NEW YORK
SURVEY COORDINATES:
SURVEY DATUM: NEW YORK STATE SURVEY GRID

CLIENT: NYSDEC
DRILLING DATES: 03/17/94 - 03/18/94
DRILLING METHOD: 8.25-inch ID HSA
LOGGED/CHECKED BY: JPH/RHO
SURFACE ELEVATION: 915.38ft.

SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
SS3 Split Spoon (3in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
NR No Recovery
\- Sampler Refusal

JHS HNU reading in jar headspace
GAS Combustible Gas reading in augers

x——x Penetration Resistance ('N' Blows/1.0 ft.)
o——o Moisture Content ('M' %)

DEPTH (ft.BGS)	ELEVATION (ft AMSL)
1	914.38
2	913.38
3	912.38
4	911.38
5	910.38
6	909.38
7	908.38
8	907.38
9	906.38
10	905.38
11	904.38
12	903.38
13	902.38
14	901.38
15	900.38
16	899.38
17	898.38
18	897.38
19	896.38
20	895.38

SOIL/ROCK DESCRIPTION

TOPSOIL Dark brown CLAYEY SILT, trace fine sand, grass rootlets

TILL Light-moderate brown CLAYEY SILT, little clay, little subangular fine gravel,firm,CL

Light brown-olive moist CLAYEY SILT,some fine-coarse sand, little fine shale subangular gravel, blocky texture,stiff,CL

Greyish brown moist CLAYEY SILT,w/iron staining & mottling,trace-little clay, some plastisity, little subrounded gravel to 3/4" dia.,little fine-course sand,stiff,CL

Moderate olive-brown moist SANDY SILT,little-some fine gravel,numerous black shale clasts to 1/4" thick x 1" dia., trace-little clay,some coarse-very fine sand,loose,SM

Moderate brown wet v.fine-fine SAND, trace silt,loose,SP-SM

Moderate brown wet mostly fine,trace v.fine SAND w/faint bedding fabric as lighter,finer sand partings<1/4" thickness,liquifies when disturbed,loose,SP-SM w/SAND layer w/trace fine round gravel to 1/4" from 13.7-13.9' and brown wet SILTY SAND layer w/mostly v.fine sand, trace fine,liquifies when disturbed,compact,SP-SM,from 13.9-14.0'

Moderate gray wet v.fine SAND,trace-occ.fine gravel,trace-little silt,liquifies when disturbed,compact,SM

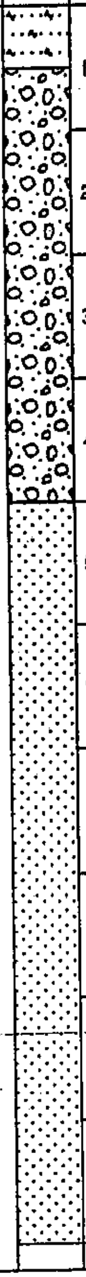
SILT & v.fine SAND, light brown-tan

Brown wet v.fine-fine SAND,trace medium,w/very fine sand partings as bedding fabric,liquifies when disturbed,loose,SP-SM

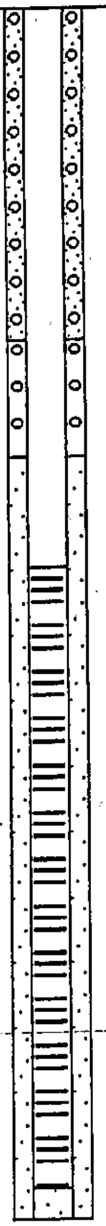
Brownish gray wet v.fine-fine SAND, trace silt&v.fine sand as bedding fabric,loose,SM

Boring complete at 20'. Set well.

SOIL DATA					ROCK DATA			
GRAPHIC LOG	SAMPLE NO. / RUN NO.	BLOWS / 6"	RECOVERY (ft)	'N'-VALUE	FROM/TO	DRILL RATE MIN./FT.	% REC.	% RQD.
	1 SS	1 2 3 3	0.8	5				
	2 SS	2 4 9 9	0.8	13				
	3 SS	3 7 4 11	1.8	11				
	4 SS	4 5 5 5	1.2	10				
	5 SS	2 2 2 3	0.3	4				
	6 SS	2 2 3 4	1.3	5				
	7 SS	5 6 6 12	2.0	12				
	8 SS	1 5 5 5	1.8	10				
	9 SS	WR WR 3 6	2.0	3				
	10 SS	3 4 4 5	1.4	8				



WELL DIAGRAM



COMMENTS (USCS)

JHS=0.1 ppm
JHS=0.2 ppm
JHS=0.1 ppm
JHS=0.3 p
JHS=0.1 ppm
JHS=0.2 ppm
JHS=0.5 ppm
JHS=0.8 ppm
JHS=0.6 ppm

MALCOLM PIRNIE, INC.

SHEET 1 OF 1

BOREHOLE LOG MPI-2S

PROJECT: MR. C CLEANERS RI
PROJECT NO.: 0266-31-4
LOCATION: EAST AURORA, NEW YORK
SURVEY COORDINATES:
SURVEY DATUM: NEW YORK STATE SURVEY GRID

CLIENT: NYSDEC
DRILLING DATES: 03/14/94
DRILLING METHOD: 8.25-inch ID HSA
LOGGED/CHECKED BY: JMA/RHO
SURFACE ELEVATION: 917.34ft.

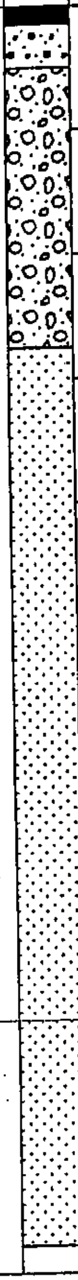
SYMBOLS AND DEFINITIONS

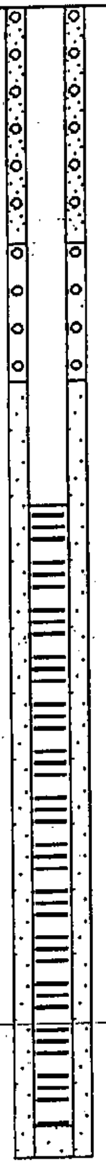
SS Split Spoon (2in.ID)
SS3 Split Spoon (3in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
NR No Recovery
\- Sampler Refusal

JHS HNU reading in jar headspace
GAS Combustible Gas reading in augers

x----x Penetration Resistance ('N' Blows/1.0 ft.)
o----o Moisture Content ('N' %)

DEPTH (ft.BGS)	ELEVATION (ft ANSL)	SOIL/ROCK DESCRIPTION	SAMPLE NO. / RUN NO.	BLOWS / 6"	RECOVERY (ft)	'N'-VALUE	FROM/TO	DRILL RATE MIN./FT.	% REC.	% RQD.	COMMENTS (USCS)
1	916.34	BLACKTOP Light grey crystaline material (Salty) with low specific gravity TOPSOIL dark brown frozen loam w/white specks	1 SS	8 7 4	1.0	13					JHS=0.3 ppm
2 3	915.34 914.34	TILL, brown moist CLAYEY SILT, little-some sand, little gravel, firm, CL	2 SS	1 2 3 3	0.8	5					JHS=0.3 ppm
4 5	913.34 912.34	Brown moist CLAYEY SILT, some sand, 25-40% gravel, stiff, CL	3 SS	4 6 4 4	0.8	10					JHS=0.3 ppm
6 7	911.34 910.34	STRATIFIED brown moist SILTY SAND, mostly coarse sand, trace-little silt, loose when disturbed, loose, SM	4 SS	3 4 6 6	0.4	10					JHS=0.3 ppm
8 9	909.34 908.34	Brown moist SAND, mostly fine-medium sand, trace coarse, trace-no silt, loose when disturbed, very loose, SP-SM	5 SS	1 1 1 3	1.1	2					JHS=0.3 ppm
10 11	907.34 906.34	Brown moist becoming wet at 11.0 SAND, mostly fine, little very fine sand, trace silt, liquifies when disturbed, loose, SP	6 SS	1 1 3 3	1.5	4					JHS=0.2 ppm
12 13	905.34 904.34	Brown wet SAND, mostly fine-medium sand, trace silt & gravel, gravel mostly subrounded and subangular, loose when disturbed, loose,SP	7 SS	3 3 5 6	1.6	8					JHS=0.2 ppm
14 15	903.34 902.34	Brown wet SILTY SAND, mostly fine & very fine sand, trace medium size, little silt, liquifies when disturbed, loose, SP-SM occasional Cobbles at 14.5'	8 SS	1 12 14 17	1.1	26					JHS=0.3 ppm
16 17	901.34 900.34		9 SS	1 2 5 5	1.2	7					JHS=0.2 ppm
18 19 20	899.34 898.34 897.34	Boring complete at 20' w/augers at 18.5'. Set well	10 SS	2 3 5 7	1.4	8					JHS=0.3 ppm





BOREHOLE LOG MPI-3S

PROJECT: MR. C CLEANERS RI
PROJECT NO.: 0266-31-4
LOCATION: EAST AURORA, NEW YORK
SURVEY COORDINATES:
SURVEY DATUM: NEW YORK STATE SURVEY GRID

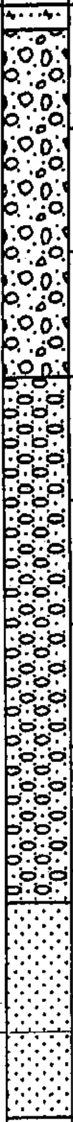
CLIENT: NYSDEC
DRILLING DATES: 03/18/94
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: JPH/RHO
SURFACE ELEVATION: 814.79ft.

SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
SS3 Split Spoon (3in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
NR No Recovery
\- Sampler Refusal

JHS HNU reading in jar headspace
GAS Combustible Gas reading in augers

x----x Penetration Resistance ('N' Blows/1.0 ft.)
o----o Moisture Content ('M' %)



DEPTH (ft.BGS)	ELEVATION (ft AMSL)	SOIL/ROCK DESCRIPTION	SOIL DATA: SAMPLE NO. / RUN NO.	SOIL DATA: BLOWS / 6"	SOIL DATA: RECOVERY (ln)	SOIL DATA: 'N'-VALUE	ROCK DATA: FROM/TO	ROCK DATA: DRILL RATE MIN./FT.	ROCK DATA: % REC.	ROCK DATA: % RQD.	COMMENTS (USCS)
		TOPSOIL dark brown moist gray CLAYEY SILTY, trace fine gravel, trace-little clay	1 SS	1 1 2 1	1.2	3					JHS-0.1 ppm
1	813.79	TILL brown ext. moist SANDY SILT, little fine-coarse sand trace-little gravel shale clasts, trace clay, blocky, v.loose, SM									
2	812.79		2 SS	1 1 1 1	0.8	2					JHS-0.1 ppm
3	811.79	Light brown moist SANDY SILT, trace-little black shale gravel clasts, little very fine-coarse sand & trace clay, soft, ML									
4	810.79		3 SS	1 4 7 8	1.1	11					JHS-0.2 ppm
5	809.79	Light brown-olive moist SILTY SAND, w/iron stained mottling, little-some fine gravel to 1/4" diameter, little very fine-coarse sand, compact, SP-SM									
6	808.79		4 SS	4 3 2 4	0	5					
7	807.79	No Recovery									
8	806.79	Grayish brown wet Sandy Gravel, fine-coarse sand, w/gravel, trace silt, mottled, iron stained, black shale gravel clasts to 1/2" dia., thin light gray silt parting to 1/2", loose when disturbed, compact, GW-GM	5 SS	2 4 9 12	1.0	13					JHS-0.8 ppm
9	805.79										
10	804.79		6 SS	4 10 9 15	0.5	19					JHS-1.8 ppm
11	803.79	Grayish brown wet GRAVEL, w/fine-coarse sand, little silt, black shale gravel clasts to 1/2" dia., lgt gray silt partings to 1/2", compact, GW-GM									
12	802.79		7 SS	10 12 14 19	1.4	26					JHS-1.2 ppm
13	801.79	Grayish brown wet fine-coarse GRAVEL w/1" diameter, some very fine-coarse sand, mottled, iron stains throughout, trace silt, compact, GW-GM									
14	800.79		8 SS	6 6 5 4	1.8	11					JHS-0.1 ppm
15	899.79	Gravel, subrounded to 1/4" diameter, compact, GP									
16	898.79	Orange-brown wet SAND, iron stained, v.fine-fine sand, trace-little silt, liquifies when disturbed, compact, SM		WR							JHS-0.1 ppm
17	897.79	Gray wet SAND, v.fine-fine sand, trace-little silt, liquifies when disturbed, compact, SM.	9 SS	2 2 2	0.9	4					
18	896.79	Gray wet SAND, v.fine sand, trace-little silt, occ. silty clay parting to 1/4" thick as bedding fabric, liquifies when disturbed, compact, SM									
19	895.79										
20	894.79	Boring complete at 18'. Set Well									

WELL/BOREHOLE MPI-4S CONSTRUCTION DETAILS

PROJECT: MR. C CLEANERS
PROJECT NO.: 0266-31-4
LOCATION: EAST AURORA, NEW YORK
SURVEY COORDINATES:
SURVEY DATUM: NEW YORK STATE SURVEY GRID

CLIENT: NYSDEC
DRILLING DATES: 3/18/94
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: JMA/RHO
SURFACE ELEVATION: 915.12ft.

SYMBOLS AND DEFINITIONS

▨ BENTONITE-CEMENT SEAL
0 to 6.8 feet

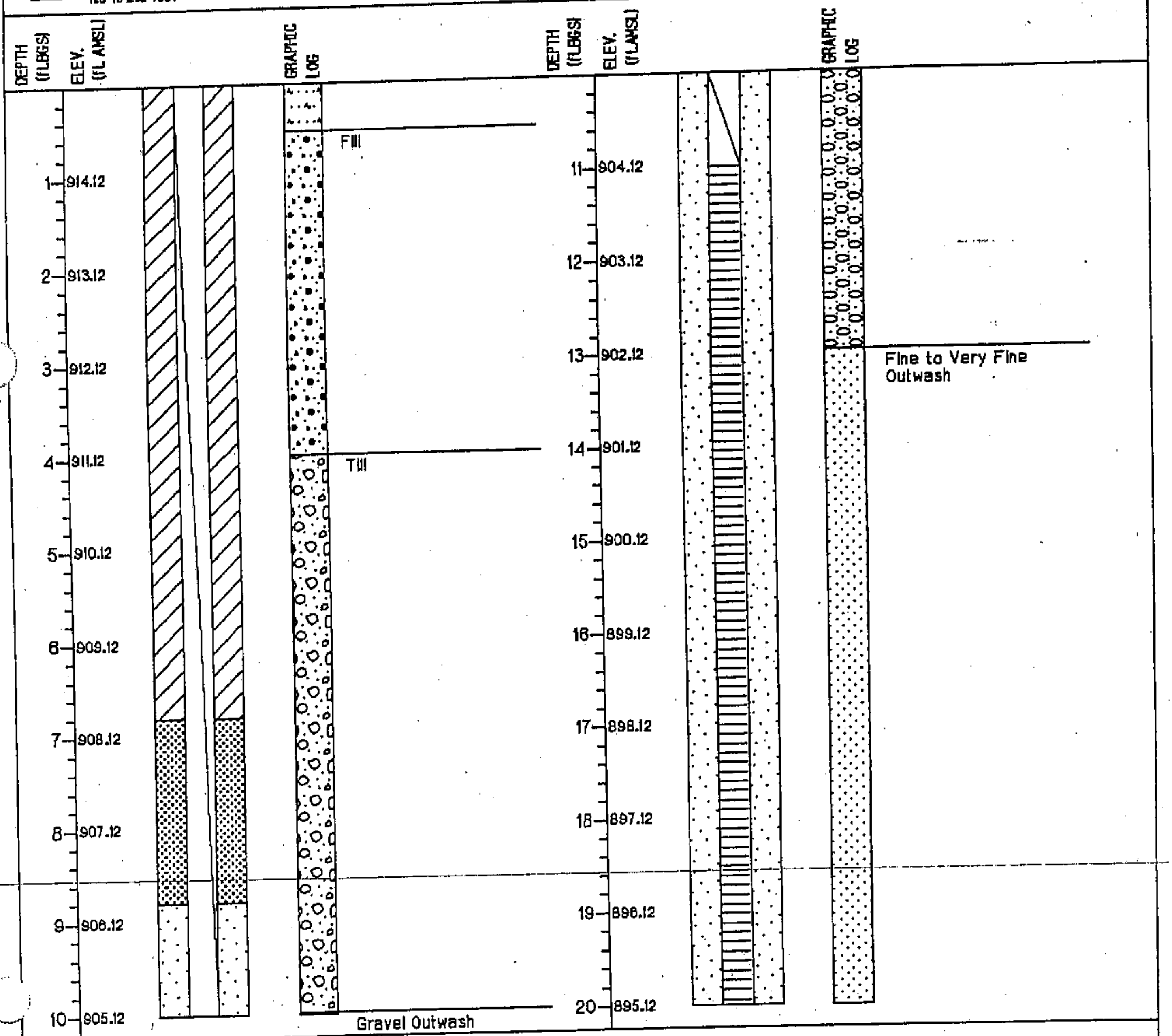
▩ BENTONITE PELLET SEAL
6.8 to 8.8 feet

⬚ MORIE #0 SAND PACK
8.8 to 21.5 feet

☰ 2-INCH DIAMETER SLOTTED (0.01") SCREEN
11.0 to 21.0 feet

2-INCH DIAMETER RISER
0 to 11.0 feet

GRAPHIC LOG
refer to
BOREHOLE LOG MPI-4D
for a
complete
description



NOTES: 1. 0.7 ft. long by 6-in. diameter curb box extends to approx .7 ft BGS.

SHEET 1 OF 2

MALCOLM PIRNIE, INC.

WELL/BOREHOLE MPI-4S CONSTRUCTION DETAILS

PROJECT: MR. C CLEANERS
PROJECT NO.: 0266-31-4
LOCATION: EAST AURORA, NEW YORK
SURVEY COORDINATES:
SURVEY DATUM: NEW YORK STATE SURVEY GRID

CLIENT: NYSDEC
DRILLING DATES: 3/16/94
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: JMA/RHO
SURFACE ELEVATION: 915.12ft.

SYMBOLS AND DEFINITIONS

▨ BENTONITE-CEMENT SEAL
0 to 5.6 feet

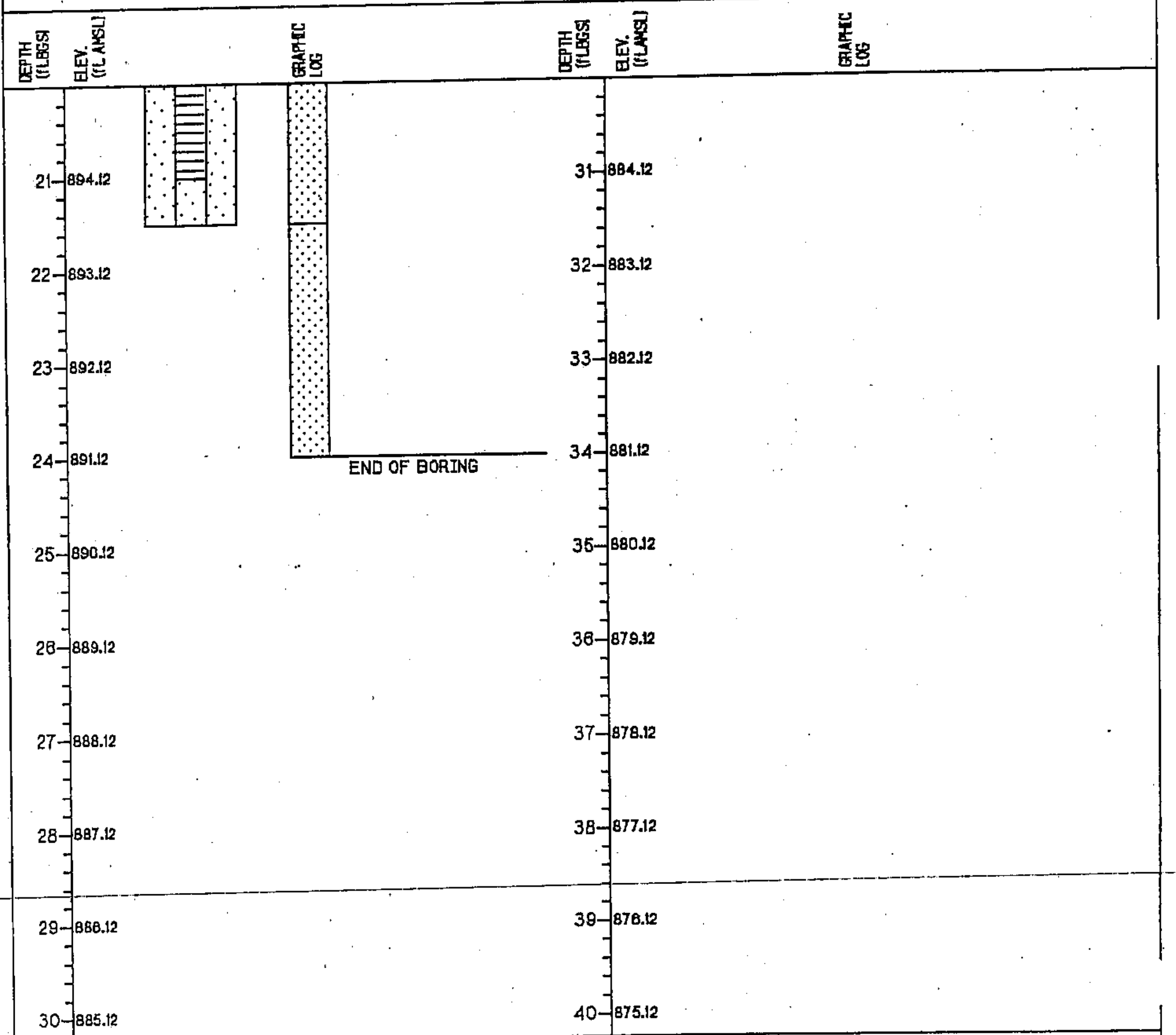
▩ BENTONITE PELLET SEAL
5.6 to 6.6 feet

⁘ MORIE #0 SAND PACK
6.6 to 21.5 feet

▤ 2-INCH DIAMETER SLOTTED (0.01")SCREEN
11.0 to 21.0 feet

2-INCH DIAMETER RISER
0 to 11.0 feet

GRAPHIC LOG
refer to
BOREHOLE LOG MPI-4D
for a
complete
description



NOTES: 1. 0.7 ft. long by 8-in. diameter curb box extends to approx .7 ft BGS.

MALCOLM PIRNIE, INC.

SHEET 2 OF 2

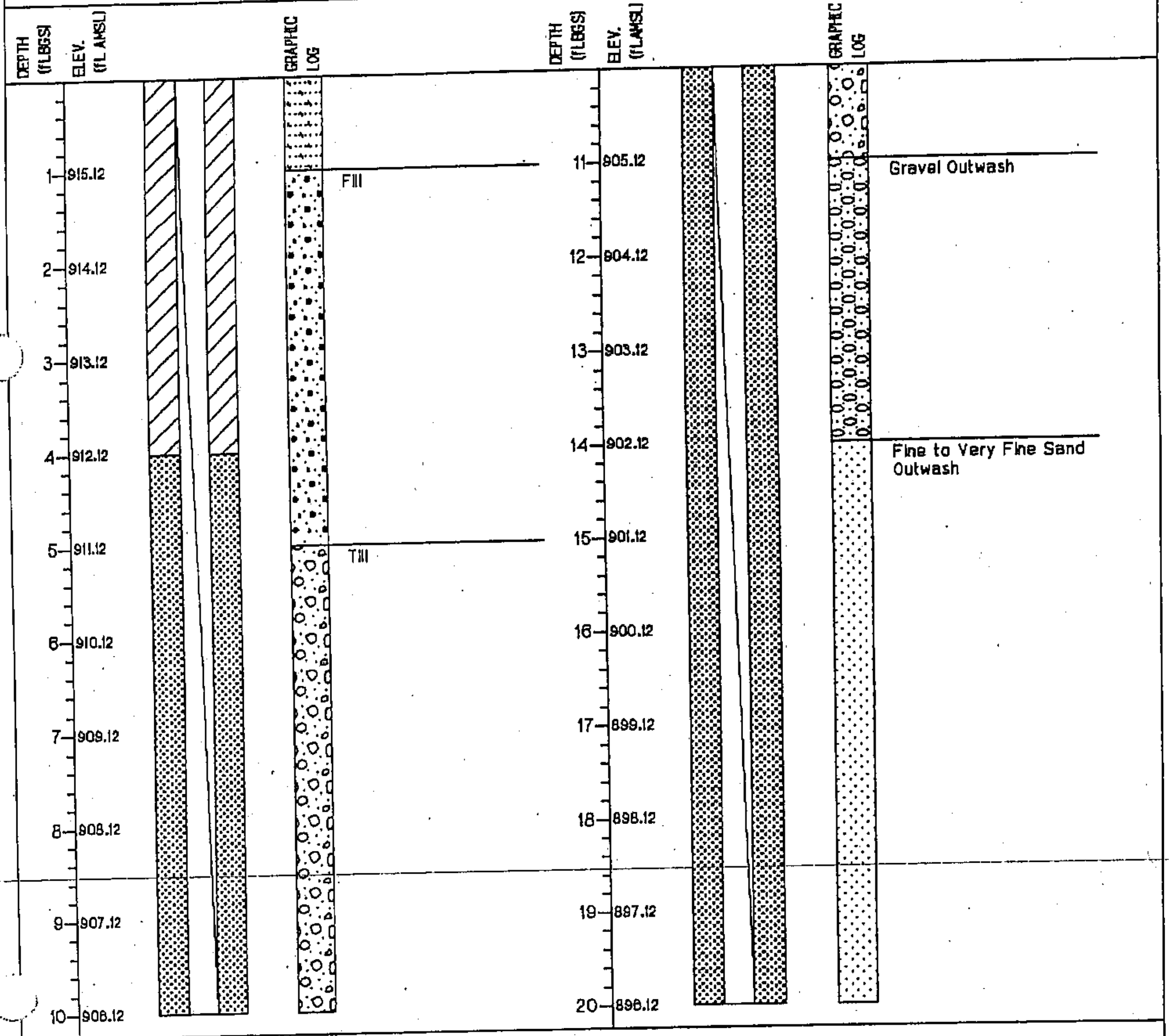
WELL/BOREHOLE MPI-4I CONSTRUCTION DETAILS

PROJECT: MR. C CLEANERS
ROJECT NO.: 0266-31-4
OCATION: EAST AURORA, NEW YORK
SURVEY COORDINATES:
SURVEY DATUM: NEW YORK STATE SURVEY GRID

CLIENT: NYSDEC
DRILLING DATES: 3/94
DRILLING METHOD: 8.25-inch ID HSA
LOGGED/CHECKED BY: JMA/RHO
SURFACE ELEVATION: 916.12ft.

SYMBOLS AND DEFINITIONS

- ▨ BENTONITE-CEMENT SEAL 0 to 4.0 feet
- ▒ BENTONITE SLURRY SEAL 4.0 to 28.6 feet
- ░ MORIE #00 SAND PACK 28.6 to 42.5 feet
- ☰ 2-INCH DIAMETER SLOTTED (0.006") SCREEN 32.0 to 42.0 feet
- ‖ 4-INCH DIAMETER CASING
- ▯ 2-INCH DIAMETER RISER 0 to 32.0 feet
- 8-INCH DIAMETER BOREHOLE
- | | 4-INCH DIAMETER BOREHOLE
- GRAPHIC LOG refer to BOREHOLE LOG MPI-4D for a complete description



NOTES: 1. 0.7 ft. long by 8-in. diameter curb box extends to 0.5 ft. BGS.

MALCOLM PIRNIE, INC.

Mr. C's Dry Cleaners Site
NYSDEC Site No. 9-15-157

Monitoring Well Construction Information

Long-Term Monitoring Well Construction Summary

Mr. C's Dry Cleaners Construction Project Installations

- Groundwater Pumping Wells – Tyree
- Piezometers – Tyree

Former Agway Site

- Groundwater Monitoring Wells – Earth Dimensions & Buffalo Drilling

Previous Studies

- Malcolm-Pirnie – Remedial Investigation Studies – Malcolm-Pirnie
- NYSDEC – Investigative Studies – Empire Soils & Matrix
- EEEPC – Replacement Wells – EEI

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Table 2-1 Long-Term Monitoring Well Construction Summary, Mr. C's Dry Cleaners, East Aurora, New York

Well ID	Well Casing/ Screen Inner Diameter	Total Well Depth (ft TOIC)	TOIC Casing Elevation (ft AMSL)	Ground Elevation (ft AMSL)	Screen Interval (ft BGS)	Sand Pack Interval (ft BGS)	Top of Seal (ft BGS)	Unit Screened	Northing[a]	Easting[a]	Proposed Action
EE-1	2	26.37	913.46	913.63	23 - 28	21 - 28.5	15	OA	1008334.03	491787.2	✓
EE-2	2	31.34	916.3	916.51	22 - 32	20 - 32	15	OA	1008521.26	491514.8	✓
ESI-1 Replacement	2	19.74	916.99	917.35	10.5 - 20.5	8 - 21	4	OA	1008488.4	492086.2	✓
ESI-3	2	15.42	915.85	916.41	7 - 17	6 - 18	4.1	OA	1008493.49	491938.8	✓
ESI-5	2	12.32	912.64	912.9	5 - 15	4 - 16	2	OA	1008120	491788.5	R
ESI-6	2	15.93	914.48	914.92	7 - 17	6 - 18	3.8	OA	1008309.02	491630.2	✓
MPI-1S	2	18.64	915.08	915.38	9 - 19	7.2 - 19.5	5.3	OA	1008394.23	491750.1	✓
MPI-3S	2	17.41	914.4	914.79	8 - 18	5.7 - 18.5	3.7	OA	1008418.03	491553.2	✓
MPI-4S	2	20.24	914.82	915.12	11 - 21	8.8 - 21.5	6.8	OA	1008564.07	491686.7	✓
MPI-4I	2	41.5	915.66	916.12	32 - 42	29.8 - 42.5	4	LA	1008554.34	491677.3	✓
MPI-5S	2	17.34	916.45	916.78	8 - 18	5.9 - 18.4	3.9	OA	1008711.63	491800.8	✓
MPI-6S	2	21.65	915.03	915.35	12.3 - 22.3	10 - 23	7.9	OA	1008725.14	491535.1	✓
MPI-7I	2	13.37	916.14	916.42	29.5 - 39.5	27.1 - 40	5.3	LA	1008497.89	491933.5	R
MPI-8S	2	6.54	NA	NA	8 - 18	6 - 18.5	4	OA	NA	NA	R
MPI-10B	2	31.11	915.68	916.07	16.5 - 31.5	13 - 32	11	OA	1008560.4	491801.5	✓
MPI-12B	2	34.62	911.19	911.44	20 - 35	15 - 35	11.5	OA	1008091.58	491611.5	✓
MPI-15B	2	28.15	NA	NA	NA	NA	NA	OA	1008822.54	491205.5	✓
MW-4	4	16.67	914.02	914.47	7.3 - 17.3	6.6 - 18	4.7	OA	1008495.05	491755.9	✓
MW-7	2	13.97	915.96	916.34	5 - 14.5	NA - 15	3	OA	1008569.02	491811.2	✓
MW-8	2	13.57	915.62	915.97	5 - 14.5	NA - 15	3	OA	1008685.39	491744.6	✓
RW-1	6	24.48	NA	NA	17.9 - 27.9	10 - 30	7	OA	1008529.43	491903.3	✓
PW-2	4	29.02	NA	NA	NA - 32	NA	NA	OA	1008567.08	491783.3	✓
PW-3	4	28.67	NA	NA	NA - 32	NA	NA	OA	1008612.06	491806.6	✓
PW-4	4	29.04	NA	NA	NA - 32	NA	NA	OA	1008623.23	491669.6	✓
PW-5	4	28.47	NA	NA	NA - 32	NA	NA	OA	1008656.69	491690.3	✓
PW-6	4	28.3	NA	NA	NA - 32	NA	NA	OA	1008679.07	491531.6	✓

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Table 2-1 Long-Term Monitoring Well Construction Summary, Mr. C's Dry Cleaners, East Aurora, New York

Well ID	Well Casing/ Screen Inner Diameter	Total Well Depth (ft TOIC)	TOIC Casing Elevation (ft AMSL)	Ground Elevation (ft AMSL)	Screen Interval (ft BGS)	Sand Pack Interval (ft BGS)	Top of Seal (ft BGS)	Unit Screened	Northing[a]	Easting[a]	Proposed Action
PW-7	4	26.49	NA	NA	NA - 32	NA	NA	OA	1008715.29	491547.6	✓
PW-8	4	26.82	NA	NA	NA - 32	NA	NA	OA	1008757.77	491465.1	✓
Abandoned or Missing Wells											
ESI-2	2	NA	NA	NA	9 - 19	8 - 20	6	OA	NA	NA	R
ESI-4	2	26.37	NA	NA	5 - 15	4 - 16	2	OA	NA	NA	✓
MW-1	2	NA	NA	NA	12 - 22	10.6 - 22	9	OA	NA	NA	A
MW-2	2	NA	NA	NA	10 - 15	NA	NA	OA	NA	NA	A
MW-3	4	NA	NA	NA	7 - 17	6.1 - 18	3.7	OA	NA	NA	A
MW-5	2	NA	NA	NA	10 - 15	NA	NA	OA	NA	NA	A
MW-6	2	NA	NA	NA	5 - 14.5	NA - 15	3	OA	NA	NA	A
MW-9	2	NA	NA	NA	5 - 14.5	NA - 15	3	OA	NA	NA	R
MW-10	2	NA	NA	NA	4 - 13.5	NA - 14	2	OA	NA	NA	A
MW-11	NA	NA	NA	NA	NA	NA	NA	--	NA	NA	A
MW-14	2	NA	NA	NA	NA - 18.2 (TOIC)	NA	NA	OA	1008530.72	491815.9	A
MPI-1D	NA	NA	NA	NA	NA	NA	NA	--	NA	NA	A
MPI-2S	2	9.52	NA	NA	8 - 18	6 - 18.5	3.8	OA	NA	NA	R
MPI-4D	8	NA	NA	915.97	66-76	64-77.5	60	--	NA	NA	A
MPI-5D	Borehole only – no well construction log										
MPI-5I	NA	NA	NA	NA	32 - 42	30 – 42.5	8	OA	NA	NA	A
MPI-7D	Borehole only – no well construction log										
MPI-9S	2	NA	NA	NA	8 - 18	6.5 - 18.5	4.5	OA	NA	NA	R
MPI-11B	2	NA	NA	NA	15 - 30	13 - 30.5	8.5	OA	NA	NA	R
MPI-13B	2	31.43	913.25	913.49	17 - 32	15 - 32	10	OA	1009024.45	491416.5	R
MPI-14B	2	27.54	913.18	913.68	15 - 30	11 - 30	8.5	OA	1009018.11	491574.9	R
OW-B	2	26.41	NA	NA	22.5 - 27.5	10.5 - 27.5	8	OA	NA	NA	A

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Table 2-1 Long-Term Monitoring Well Construction Summary, Mr. C's Dry Cleaners, East Aurora, New York

Well ID	Well Casing/ Screen Inner Diameter	Total Well Depth (ft TOIC)	TOIC Casing Elevation (ft AMSL)	Ground Elevation (ft AMSL)	Screen Interval (ft BGS)	Sand Pack Interval (ft BGS)	Top of Seal (ft BGS)	Unit Screened	Northing[a]	Easting[a]	Proposed Action
RW-2	*4*	*NA*	*NA*	*NA*	*18 - 28*	*10 - 28*	*8*	*OA*	*NA*	*NA*	*A*

Note:

Wells in *italic text* were previously abandoned or destroyed, or were otherwise not locatable in 2009.

[a] Coordinates system is New York State Plane West Zone (feet).

Key:
AMSL = Above mean sea level.
BGS = Below ground surface.
ft = Feet.
LA = Lacustrine aquifer.
NA = Not available.
OA = Outwash aquifer.
TOIC = Top of inner casing.
✓ = No Action
R = Replace, Abandon old well if able to locate
A = Abandon if able to locate

Previous and New Studies

- Malcoln-Pirnie - Remedial Investigation Studies
  - NYSDEC – Investigative Studies
    - EEEPC

BOREHOLE LOG MPI-2S

PROJECT: MR. C CLEANERS RI
PROJECT NO.: 0266-31-4
LOCATION: EAST AURORA, NEW YORK
SURVEY COORDINATES:
SURVEY DATUM: NEW YORK STATE SURVEY GRID

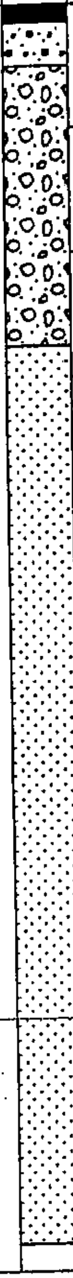
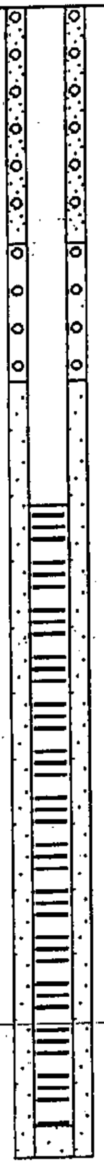
CLIENT: NYSDEC
DRILLING DATES: 03/14/94
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: JMA/RHO
SURFACE ELEVATION: 917.34ft.

SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
SS3 Split Spoon (3in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
NR No Recovery
\- Sampler Refusal

JHS HNU reading in jar headspace
GAS Combustible Gas reading in augers

x---x Penetration Resistance ('N' Blows/1.0 ft.)
o---o Moisture Content ('N' %)

			SOIL DATA					ROCK DATA					
DEPTH (ft.BGS)	ELEVATION (ft ANSL)	SOIL/ROCK DESCRIPTION	GRAPHIC LOG	SAMPLE NO. / RUN NO.	BLOWS / 6"	RECOVERY (ln)	'N'-VALUE	FROM/TO	DRILL RATE MIN./FT.	% REC.	% RQD.	WELL DIAGRAM	COMMENTS (USCS)
		BLACKTOP		1 SS	6 7 4	1.0	13						JHS=0.3 ppm
1	916.34	Light grey crystaline material (Salty) with low specific gravity											JHS=0.3 ppm
2	915.34	TOPSOIL dark brown frozen loam w/white specks		2 SS	1 2 3 3	0.8	5						
3	914.34	TILL, brown moist CLAYEY SILT, little-some sand, little gravel, firm, CL											JHS=0.3 ppm
4	913.34	Brown moist CLAYEY SILT, some sand, 25-40% gravel, stiff, CL		3 SS	4 6 4 4	0.8	10						
5	912.34												JHS=0.3 ppm
6	911.34	STRATIFIED brown moist SILTY SAND, mostly coarse sand, trace-little silt, loose when disturbed, loose, SM		4 SS	3 4 6 6	0.4	10						
7	910.34												JHS=0.3 ppm
8	909.34	Brown moist SAND, mostly fine-medium sand, trace coarse, trace-no silt, loose when disturbed, very loose, SP-SM		5 SS	1 1 1 3	1.1	2						
9	908.34												JHS=0.2 ppm
10	907.34	Brown moist becoming wet at 11.0 SAND, mostly fine, little very fine sand, trace silt, liquifies when disturbed, loose, SP		6 SS	1 1 3 3	1.5	4						
11	906.34												JHS=0.2 ppm
12	905.34	Brown wet SAND, mostly fine-medium sand, trace silt & gravel, gravel mostly subrounded and subangular, loose when disturbed, loose,SP		7 SS	3 3 5 6	1.6	8						
13	904.34												JHS=0.3 ppm
14	903.34	Brown wet SILTY SAND, mostly fine & very fine sand, trace medium size, little silt, liquifies when disturbed, loose, SP-SM occasional Cobbles at 14.5'		8 SS	1 12 14 17	1.1	26						
15	902.34												JHS=0.2 ppm
16	901.34			9 SS	1 2 5 5	1.2	7						
17	900.34												JHS=0.3 ppm
18	899.34			10 SS	2 3 5 7	1.4	8						
19	898.34												
20	897.34	Boring complete at 20' w/augers at 18.5'. Set well											

MALCOLM PIRNIE, INC.

SHEET 1 OF 1

WELL/BOREHOLE MPI-4I CONSTRUCTION DETAILS

PROJECT: MR. C CLEANERS
ROJECT NO.: 0266-31-4
OCATION: EAST AURORA, NEW YORK
SURVEY COORDINATES:
SURVEY DATUM: NEW YORK STATE SURVEY GRID

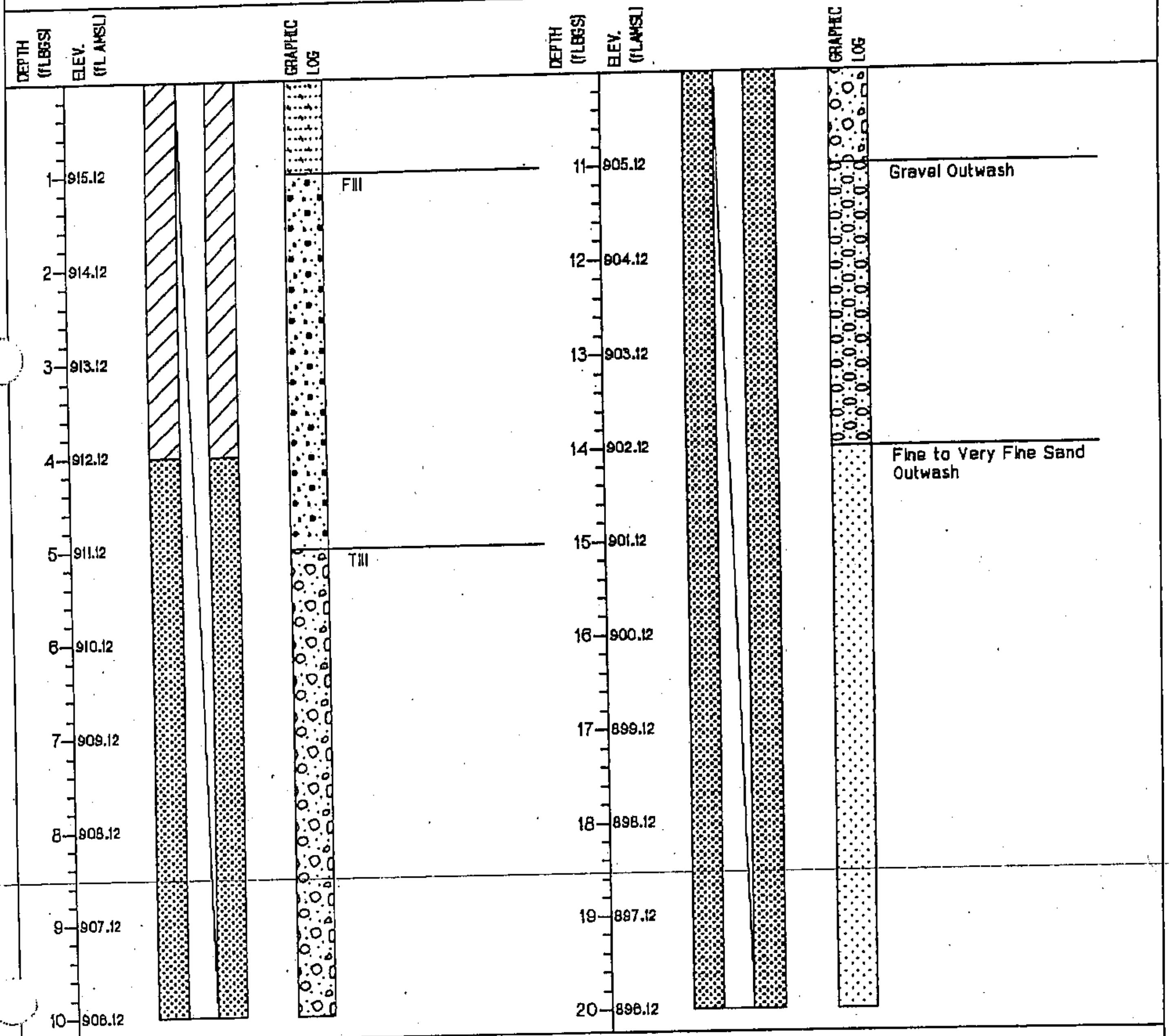
CLIENT: NYSDEC
DRILLING DATES: 3/94
DRILLING METHOD: 8.25-inch ID HSA
LOGGED/CHECKED BY: JMA/RHO
SURFACE ELEVATION: 916.12ft.

SYMBOLS AND DEFINITIONS

▨ BENTONITE-CEMENT SEAL 0 to 4.0 feet
▒ BENTONITE SLURRY SEAL 4.0 to 28.6 feet
░ MORIE #00 SAND PACK 28.6 to 42.5 feet
☰ 2-INCH DIAMETER SLOTTED (0.006") SCREEN 32.0 to 42.0 feet

4-INCH DIAMETER CASING
2-INCH DIAMETER RISER 0 to 32.0 feet
8-INCH DIAMETER BOREHOLE
4-INCH DIAMETER BOREHOLE

GRAPHIC LOG refer to BOREHOLE LOG MPI-4D for a complete description



NOTES: 1. 0.7 ft. long by 8-in. diameter curb box extends to 0.5 ft. BGS.

MALCOLM PIRNIE, INC.

WELL/BOREHOLE MPI-4I CONSTRUCTION DETAILS

PROJECT: MR. C CLEANERS
PROJECT NO.: 0266-31-4
LOCATION: EAST AURORA, NEW YORK
SURVEY COORDINATES:
SURVEY DATUM: NEW YORK STATE SURVEY GRID

CLIENT: NYSDEC
DRILLING DATES: 3/94
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: JMA/RHO
SURFACE ELEVATION: 916.12ft.

SYMBOLS AND DEFINITIONS

▨ BENTONITE-CEMENT SEAL 0 to 4.0 feet

▩ BENTONITE SLURRY SEAL 4.0 to 29.6 feet

⬚ MORIE #00 SAND PACK 29.6 to 42.5 feet

☰ 2-INCH DIAMETER SLOTTED (0.006") SCREEN 32.0 to 42.0 feet

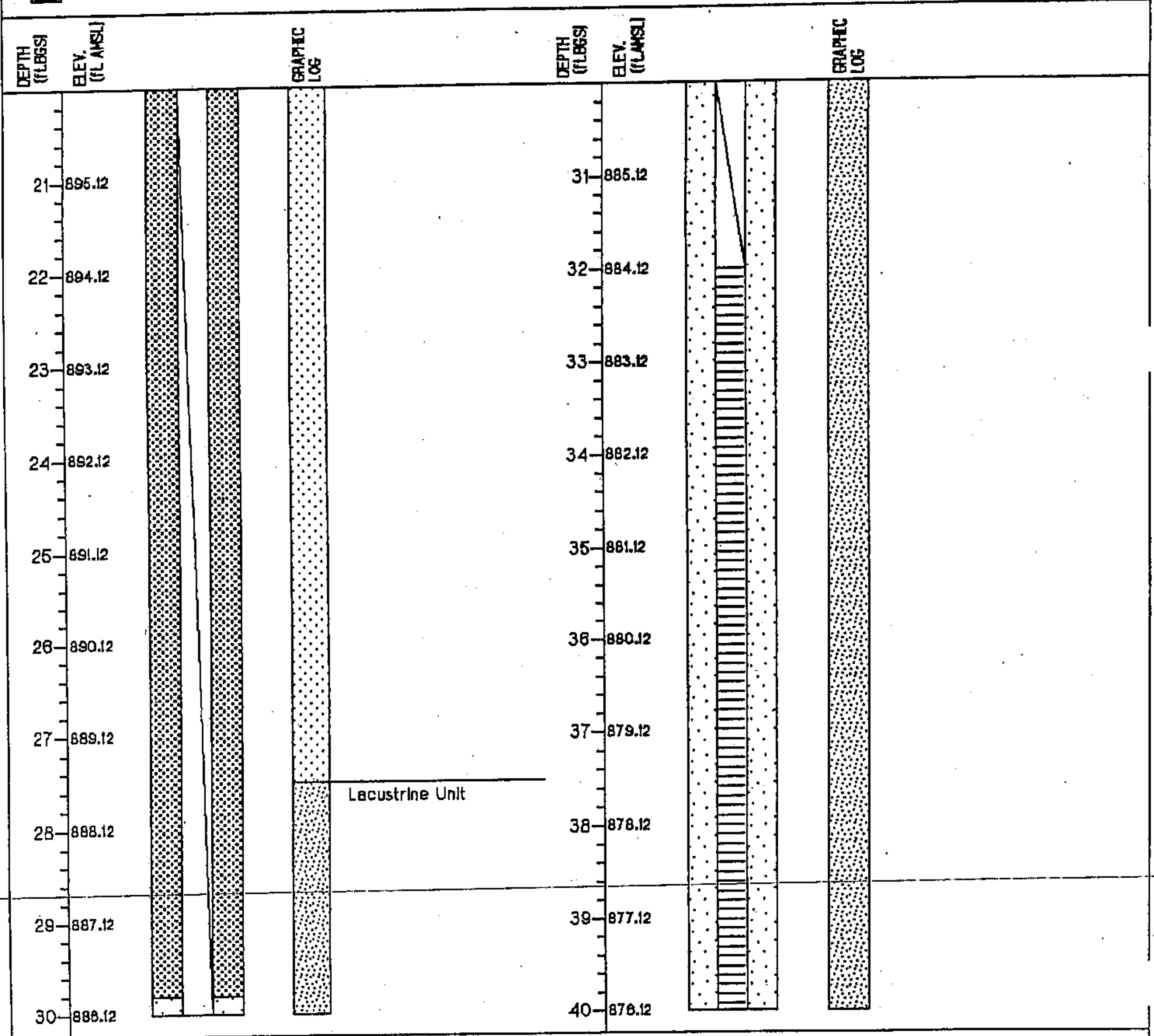
▮ ▮ 4-INCH DIAMETER CASING

▯ 2-INCH DIAMETER RISER 0 to 32.0 feet

6-INCH DIAMETER BOREHOLE

| | 4-INCH DIAMETER BOREHOLE

GRAPHIC LOG refer to BOREHOLE LOG MPI-4D for a complete description



NOTES: 1. 0.7 ft. long by 8-in. diameter curb box extends to 0.5 ft. BGS.

MALCOLM PIRNIE, INC.

SHEET 2 OF 3

WELL/BOREHOLE MPI-4I CONSTRUCTION DETAILS

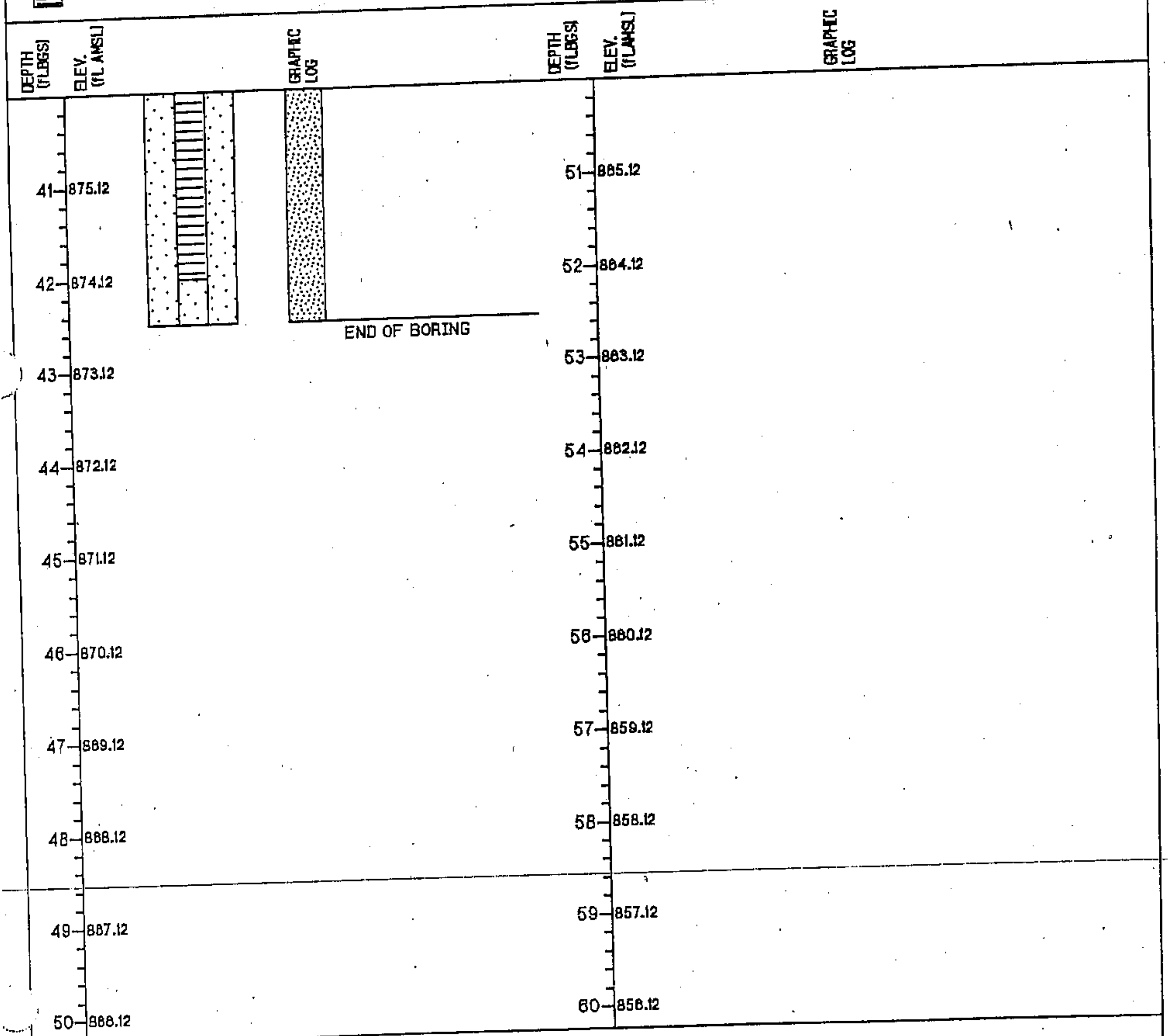
PROJECT: MR. C CLEANERS
PROJECT NO.: 0288-31-4
LOCATION: EAST AURORA, NEW YORK
SURVEY COORDINATES:
SURVEY DATUM: NEW YORK STATE SURVEY GRID

CLIENT: NYSDEC
DRILLING DATES: 3/94
DRILLING METHOD: 8.25-inch ID HSA
LOGGED/CHECKED BY: JMA/RHO
SURFACE ELEVATION: 916.12ft.

SYMBOLS AND DEFINITIONS

- ▨ BENTONITE-CEMENT SEAL 0 to 4.0 feet
- ▩ BENTONITE SLURRY SEAL 4.0 to 29.8 feet
- ⁘ MORIE #00 SAND PACK 29.8 to 42.5 feet
- ☰ 2-INCH DIAMETER SLOTTED (0.006") SCREEN 32.0 to 42.0 feet
- ‖ 4-INCH DIAMETER CASING
- ⧄ 2-INCH DIAMETER RISER 0 to 32.0 feet
- 8-INCH DIAMETER BOREHOLE
- | | 4-INCH DIAMETER BOREHOLE

GRAPHIC LOG refer to BOREHOLE LOG MPI-4D for a complete description



NOTES: 1. 0.7 ft. long by 8-in. diameter curb box extends to 0.5 ft. BGS.

SHEET 3 OF 3

MALCOLM PIRNIE, INC.

WELL/BOREHOLE MPI-7I CONSTRUCTION DETAILS

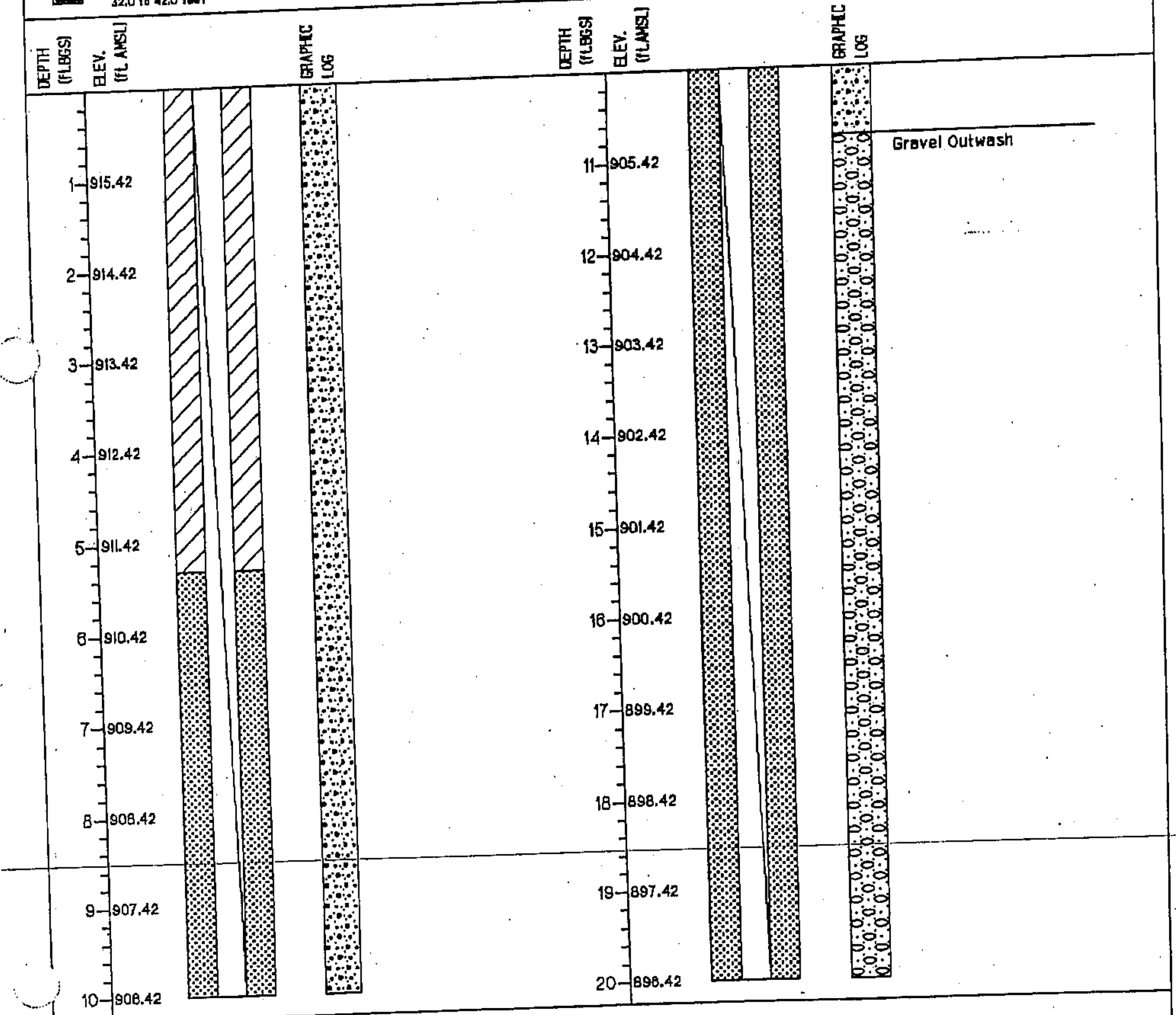
PROJECT: MR C CLEANERS
PROJECT NO.: 0266-31-4
LOCATION: EAST AURORA, NEW YORK
SURVEY COORDINATES:
SURVEY DATUM: NEW YORK STATE SURVEY GRID

CLIENT: NYSDEC
DRILLING DATES: 3/94
DRILLING METHOD: 8.25-inch ID HSA
LOGGED/CHECKED BY: JMA/RHO
SURFACE ELEVATION: 916.42ft.

SYMBOLS AND DEFINITIONS

- ▨ BENTONITE-CEMENT SEAL 0 to 5.3 feet
- ▩ BENTONITE SLURRY SEAL 5.3 to 27.1 feet
- ⬚ MORIE #00 SAND PACK 27.1 to 40 feet
- ☰ 2-INCH DIAMETER SLOTTED (0.006")SCREEN 32.0 to 42.0 feet
- ‖ 4-INCH DIAMETER CASING 0 feet
- ⧄ 2-INCH DIAMETER RISER 0 to 29.5 Feet
- | | 8-INCH DIAMETER BOREHOLE 0 feet
- 4-INCH DIAMETER BOREHOLE 0 feet

GRAPHIC LOG refer to BOREHOLE LOG MPI-7D for a complete description



NOTES: 1. 0.7 FT. long by 6-in. diameter curb box extends to 0.5 ft. BGS.

SHEET 1 OF 2

MALCOLM PIRNIE, INC.

BOREHOLE LOG MPI-8S

PROJECT: MR. C CLEANERS RI
PROJECT NO.: 0266-31-4
LOCATION: EAST AURORA, NEW YORK
SURVEY COORDINATES:
SURVEY DATUM: NEW YORK STATE SURVEY GRID

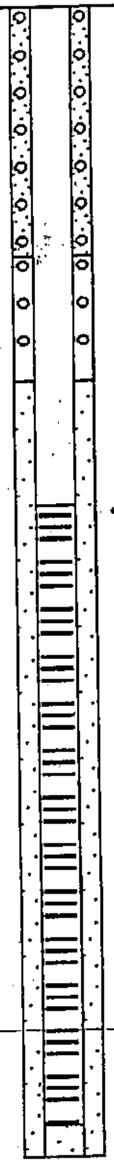
CLIENT: NYSDEC
DRILLING DATES: 03/21/94
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: JPH/RHO
SURFACE ELEVATION: 915.01ft.

SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
SS3 Split Spoon (3in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
NR No Recovery
– Sampler Refusal

JHS HNU reading in jar headspace
GAS Combustible Gas reading in augers

x——x Penetration Resistance ('N' Blows/1.0 ft.)
o——o Moisture Content ('N' %)

			SOIL DATA					ROCK DATA					
DEPTH (ft.BGS)	ELEVATION (ft AMSL)	SOIL/ROCK DESCRIPTION	GRAPHIC LOG	SAMPLE NO. / RUN NO.	BLOWS / 6"	RECOVERY (ft)	'N'-VALUE	FROM/TO	DRILL RATE MIN./FT.	% REC.	% RQD.	WELL DIAGRAM	COMMENTS (USCS)
		Augered 1' through asphalt, pavement, and concrete		1 SS	4 4	0.7							JHS=0.8 ppm
1	914.01	FILL dark brown moist CLAY and SILT, little course sand and fine gravel, CL											JHS=1.3 ppm
2	913.01	Brownish yellow moist SAND, fine-medium sand, trace-little fine gravel,compact,SP		2 SS	3 3 10 5	0.8	13						
3	912.01	Moderate-dark brown moist GRAVELLY SILT, little-some subround gravel (shale) to 3/4" diameter, trace-little sand, trace clay, few Brick fragments,compact,GM											JHS=0.7 ppm
4	911.01			3 SS	8 10 12 18	0.5	22						
5	910.01	TILL, SILTY SANDY GRAVEL, to 3/4" diameter, little- some brown-orange silt and fine-medium sand, compact, GM											JHS=1.1 ppm
6	909.01			4 SS	13 9 9 14	0.9	18						
7	908.01	Dark gray moist SANDY GRAVEL, with trace silt and some medium to course sand, fine gravel to 3/4" dia., loose when disturbed,compact,GW-GM											JHS=5.8 ppm
8	907.01			5 SS	3 4 4 4	1.2	8						
9	906.01												JHS=2.2 ppm
10	905.01	SILT light brown, bedded laminae, trace sand, moist, stiff		6 SS	4 4 4 3	1.1	8						
11	904.01	GRAVEL, to 1/4" diameter, little fine-medium sand, trace-little silt, loose, GM											JHS=0.4 ppm
12	903.01	Wet SILTY SAND, w/little silt,heavily stained iron/siderite contact with laminae very fine-medium sand, liquifies when disturbed, loose, SM		7 SS	3 3 5 5	1.4	8						
13	902.01												JHS=3.4 ppm
14	901.01	Dark gray wet SAND, mostly medium, fine-course sand, well drained, loose,w/very fine grained laminae as bedding fabirc,loose,SP		8 SS	2 4 5 6	1.1	9						
15	900.01												JHS=3.2 ppm
16	899.01			9 SS	2 3 3 4	1.0	6						
17	898.01												JHS=8.2 ppm
18	897.01	Dark gray wet SAND, very fine-fine sand, trace silt as thin laminated bedding fabric,loose,SM		10 SS	1 2 5 5	1.1	7						
19	896.01	Boring complete at 20'. Set well											
20	895.01												

MALCOLM PIRNIE, INC.

SHEET 1 OF 1

BOREHOLE LOG MPI-13B

PROJECT: MR. C CLEANERS REMEDIAL INVESTIGATION	CLIENT: NYSDEC
PROJECT NO.: 0266-31-4	DRILLING DATES: 1/10/95
LOCATION: EAST AURORA, NEW YORK	DRILLING METHOD: 6-1/4" HSA
SURVEY COORDINATES:	LOGGED/CHECKED BY: JMA/RHO
SURVEY DATUM:	SURFACE ELEVATION: 913.88ft.FT. ABOVE NGVD

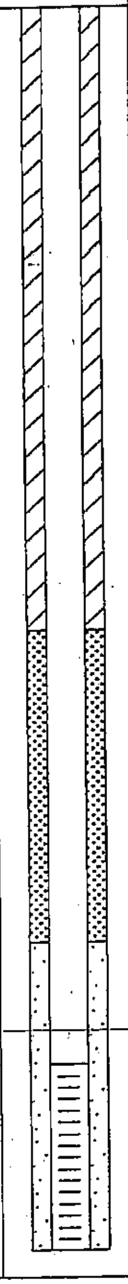
SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
SS3 Split Spoon (3in.ID)
ST Shelby Tube (2.9in.ID)
WR Weight of Rods
NR No Recovery
\- Sampler Refusal

JHS HNU reading in jar headspace
GAS Combustible Gas reading in augers

x---x Penetration Resistance ('N' Blows/1.0 ft.)
o---o Moisture Content ('N' %)

DEPTH (ft.BGS)	ELEVATION (ft AMSL)	SOIL/ROCK DESCRIPTION	SOIL DATA: GRAPHIC LOG	SOIL DATA: SAMPLE NO. / RUN NO.	SOIL DATA: BLOWS / 6"	SOIL DATA: RECOVERY (ft)	SOIL DATA: 'N'-VALUE	ROCK DATA: FROM/TO	ROCK DATA: DRILL RATE MIN./FT.	ROCK DATA: % REC.	ROCK DATA: % RQD.	WELL DIAGRAM	COMMENTS (USCS)
1	912.88	FILL, Asphalt to 0.2' and concrete to 1.0', fill to 2.0 feet		-	-	-	-						
2	911.88	Brown moist SANDY SILT, little fine to coarse sand, trace fine gravel, blocky, loose, reworked soil											JHS-0 ppm
3	910.88			1 SS	1 3 3 1	1.3	6						
4	909.88	TILL, yellowish brown moist CLAYEY SANDY SILT, little f-c sand, trace clay & gravel, trace roots, blocky, loose, ML											JHS-0.3 ppm
5	908.88	Brown w/gray mottling moist CLAYEY SILT, w/15-25% mostly shale gravel, massive, medium consistence, CL		2 SS	2 5 7 7	1.3	12						
6	907.88												JHS-0.4 ppm
7	906.88	Brown wet SILTY GRAVELLY SAND, w/mostly coarse sand, little fine to medium, little silt, little gravel, exhibits some cohesion, medium consistency, SM		3 SS	9 5 5 5	0.9	10						
8	905.88												JHS-0.2 ppm
9	904.88	STRATIFIED, Brown wet SAND, mostly coarse sand, little med. sand, trace-little silt & grav, loose when disturbed, loose, SP-SM		4 SS	WR 1 1 1	0.6	2						
10	903.88												JHS-0.1 ppm
11	902.88	LAMINATED, brown wet SAND, mostly very fine and fine sand, trace-little silt, liquifies when disturbed, loose, SP-SM		5 SS	WR 1 2 2	0.7	3						
12	901.88												JHS-0.1 ppm
13	900.88	Gray wet v fine & fine SAND, little silt, liq. when dist, loose, SP-SM		6 SS	4 3 4 3	1.4	7						
14	899.88	Gray wet CLAYEY SILT, w/some v.fine&fine sand, CL											JHS-0.1 ppm
15	898.88	Gray wet SANDY SILT, some v.fine&fine sand, 2 clay seams @ 14.3' 1/8" thick, liq. when dist, loose, ML		7 SS	1 1 2 3	0.9	3						
16	897.88												JHS-0.1 ppm
17	896.88	STRAT. Brown wet GRAV. coarse SAND, trace silt, some grav, loose when dist, firm, SP		8 SS	10 10 10 10	0.2	20						
18	895.88	Gray wet f-c SAND, med sand layer 0.1' thick @ 18.0', f. sand layer 18.1-18.2', m-c layer 18.2-18.5, loose when dist, firm, SW											JHS-0.1 ppm
19	894.88			9 SS	2 4 8 10	1.2	12						
20	893.88	Brown wet GRAV SAND, f-c sand, some grav, trace silt, loose when dist, loose, SW											



SHEET 1 OF 2

MALCOLM PIRNIE, INC.

BOREHOLE LOG MPI-13B

PROJECT: MR. C CLEANERS REMEDIAL INVESTIGATION
PROJECT NO.: 0288-31-4
LOCATION: EAST AURORA, NEW YORK
SURVEY COORDINATES:
SURVEY DATUM:

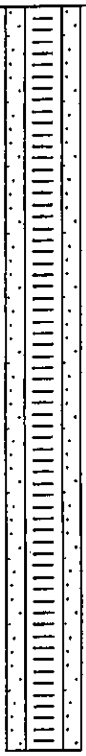
CLIENT: NYSDEC
DRILLING DATES: 1/10/95
DRILLING METHOD: 8-1/4" HSA
LOGGED/CHECKED BY: JMA/RHO
SURFACE ELEVATION: 913.88ft.FT. ABOVE NGVD

SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
SS3 Split Spoon (3in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
NR No Recovery
\- Sampler Refusal

JHS HNU reading in jar headspace
GAS Combustible Gas reading in augers

x---x Penetration Resistance ('N' Blows/1.0 ft.)
o---o Moisture Content ('N' %)



DEPTH (ft.BGS)	ELEVATION (ft AMSL)	SOIL/ROCK DESCRIPTION	SOIL DATA: GRAPHIC LOG	SOIL DATA: SAMPLE NO. / RUN NO.	SOIL DATA: BLOWS / 6"	SOIL DATA: RECOVERY (ft)	SOIL DATA: 'N'-VALUE	ROCK DATA: FROM/TO	ROCK DATA: DRILL RATE MIN./FT.	ROCK DATA: % REC.	ROCK DATA: % RQD.	WELL DIAGRAM	COMMENTS (USCS)
													JHS=0.8 ppm
21	892.88			10 SS	2 5 7 8	0.8	12						
22	891.88	Brown wet SANDY GRAVEL, some medium – coarse sand, fine gravel, trace silt, loose when disturbed, firm, GW		11 SS	7 5 9 9	1.4	14						JHS=0.4 ppm
23	890.88												
24	889.88	Brown wet medium-coarse SAND, trace to little gravel, loose when disturbed, firm, SP		12 SS	5 9 7 9	1.0	16						JHS=-- ppm
25	888.88	Brown wet SAND, medium sand, trace gravel, loose when disturbed, firm, SP											
26	887.88	Brown wet GRAVEL and SAND, medium to coarse sand, fine subrounded gravel, loose when disturbed, SP		13 SS	8 12 10 12	1.4	22						JHS=0.3
27	886.88												
28	885.88	LAMINATED,gray wet SAND, mostly fine, liquifies when disturbed, loose, SP		14 SS	WR WR 3 4	1.3	<4						JHS=0 ppm
29	884.88												
30	883.88			15 SS	5 6 5 6	1.4	11						JHS=0 ppm
31	882.88												
32	881.88			16 SS	WR WR 1 2	0.3	<2						JHS=0 ppm
33	880.88												
34	879.88	Boring complete at 34'. Installed well @ 32.3'.											
35	878.88												
36	877.88												
37	876.88												
38	875.88												
39	874.88												
40	873.88												

DATE
STARTED: 5-8-92
FINISHED: 5-8-92

EMPIRE
SOILS INVESTIGATIONS INC.

SUBSURFACE LOG
BTA-92-100

BORING NO.: ESI-5
SURF. ELEV.: 912.9 ±
SHEET 1 OF 1

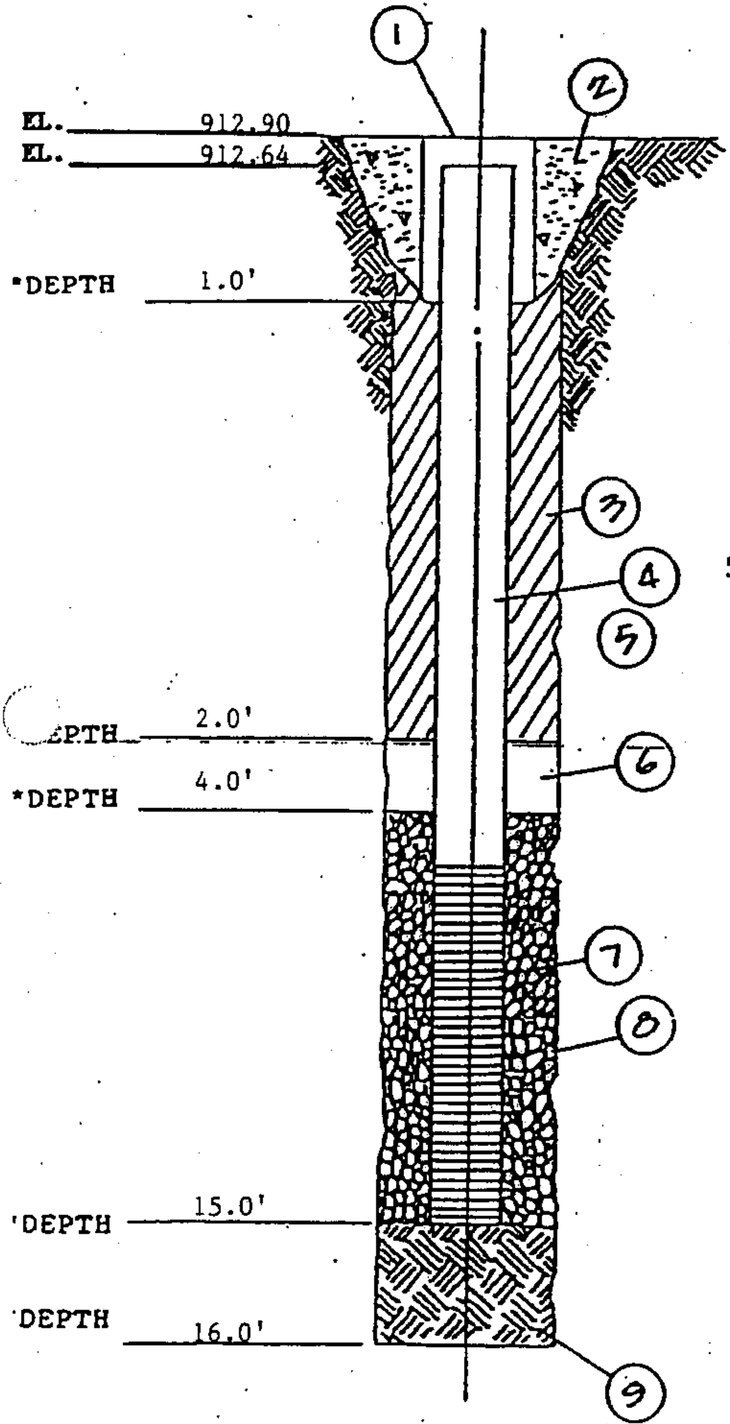
PROJECT: Spill No. 9109437
CLIENT: NYSDEC Pin No. SP91343
LOCATION: First Presbyterian Church
East Aurora, New York

DEPTH-FT.	SAMPLES	SAMPLE NO	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	P.I.D.	SYMBOL	SOIL OR ROCK CLASSIFICATION	NOTES
0	☒		AU	G	E	R			■	1' ASPHALTIC CONCRETE	
	☒								▨	6" SUBBASE STONE	
	▨	1	9	7	7	11	14	BG	▨	Brown Clayey Silt, Little Sand, trace broken shale fragment, trace cinder (Moist, FILL)	
5	▨	2	8	6	5	10	11	BG	▨		
	▨	3	8	6	5	5	11	*	░		* No Recovery on Sample #3
	▨	4	4	4	4	7	8	BG	░	Brown Fine - Medium SAND, Little Silt (Wet, Loose) (Firm)	Driller Notes Water at Approximately 8-feet
10	▨	5	17	5	7	9	12	BG	░		
	▨	6	7	7	10	13	17	BG	░		
15	▨	7	4	4	6	7	10	BG	░		
20										Boring Complete at 16' Ground Water Monitoring Well Installed at Boring Completion Well Tip Set at 15' below ground surface Refer to Well Installation Diagram for Details	Free Standing Water not measured at Boring Completion P.I.D. = Organic vapor measurements taken with a Photoionization Detector (PID). Measurements recorded in parts per million (ppm). BG = Background PID measurements = 1.5 - 2.0 ppm
25											
30											
35											
40											

DRILLER: Ken Fuller
DRILL RIG: Acker ADII
METHOD OF INVESTIGATION: ASTM D-1586 Using 4 - 1/4" Hollow Stem Augers
WEATHER: Sunny, Warm
CLASSIFIED BY: L.A. Zimmerman

MONITOR WELL COMPLETION REPORT:

WELL No. ES-5 JOB No. BTA-92-100
PROJECT: NYSDEC SPILL NO. 9109437
FIRST PRESBYTERIAN CHURCH, EAST AURORA



*DEPTH IN FEET BELOW GROUND SURFACE.

1. GATE BOX I.D.: 12 INCHES
2. SURFACE SEAL TYPE: "Quickrete" Concrete
3. BOREHOLE DIAMETER 10 INCHES
4. RISER PIPE:
   - a. TYPE 40 SCHEDULE PVC
   - b. I.D. 2 INCHES
   - c. LENGTH 5 FEET
   - d. JOINT TYPE FLUSH COUPLE THREADED
5. BACKFILL:
   - a. TYPE TYPE I PORTLAND CEMENT
   - b. INSTALLATION POUR FROM SURFACE
6. TYPE OF SEAL: BENTONITE PELLET
7. SCREEN:
   - a. TYPE 40 SCHEDULE PVC
   - b. I.D. 2 INCHES
   - c. SLOT SIZE 0.010 In.
   - d. LENGTH 10 FT.
8. SCREEN FILTER TYPE: #0 DRY MORIE
9. BACKFILL TYPE: NATURAL RUNNING SANDS

EMPIRE
SOILS INVESTIGATIONS INC.

FIGURE 3

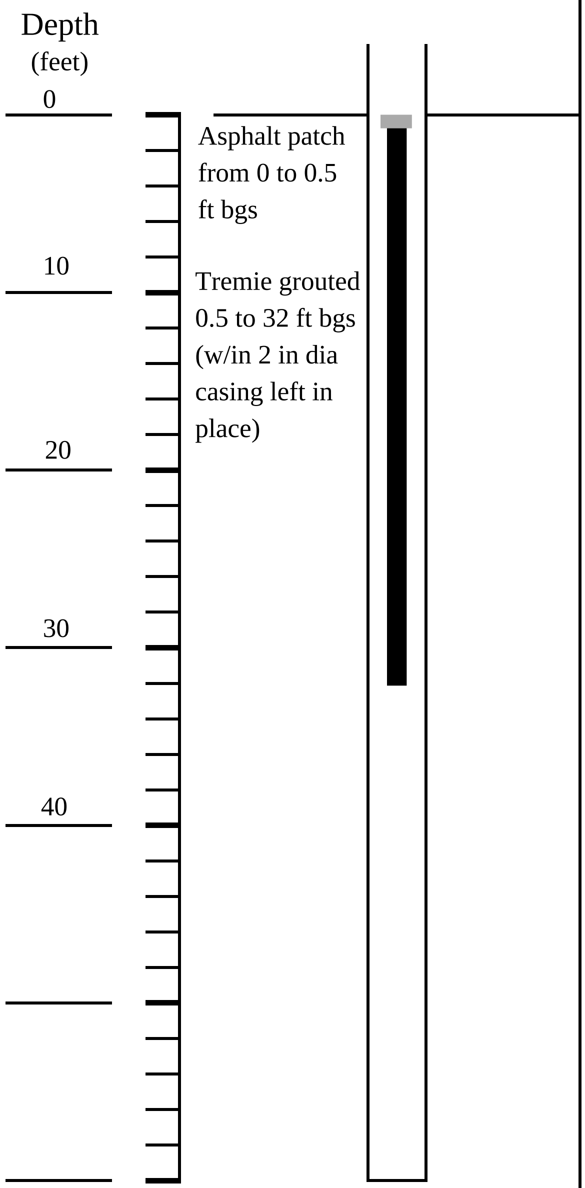
WELL DECOMMISSIONING RECORD

Site Name: Mr. C's Dry Cleaners, NYSDEC Site No. 9-15-157	Well I.D.: MPI-13B
Site Location: East Aurora, NY	Driller: Jason Tojdowski
Drilling Co.: Quality Inspection Services, Inc.	Inspector: Nicole Jarzyniecki (GES)
	Date: 5-4-12

DECOMMISSIONING DATA
(Fill in all that apply)

OVERDRILLING	
Interval Drilled	NA
Drilling Method(s)	NA
Borehole Dia. (in.)	NA
Temporary Casing Installed? (y/n)	NA
Depth temporary casing installed	NA
Casing type/dia. (in.)	NA
Method of installing	NA
CASING PULLING	
Method employed	NA
Casing retrieved (feet)	NA
Casing type/dia. (in)	NA
CASING PERFORATING	
Equipment used	NA
Number of perforations/foot	NA
Size of perforations	NA
Interval perforated	NA
GROUTING	
Interval grouted (FBLS)	0.5-32 ft bgs
# of batches prepared	2
For each batch record:	
Quantity of water used (gal.)	10
Quantity of cement used (lbs.)	100
Cement type	Portland
Quantity of bentonite used (lbs.)	2
Quantity of calcium chloride used (lbs.)	NA
Volume of grout prepared (gal.)	20
Volume of grout used (gal.)	10

WELL SCHEMATIC*



Asphalt patch from 0 to 0.5 ft bgs

Tremie grouted 0.5 to 32 ft bgs (w/in 2 in dia casing left in place)

COMMENTS: ft bgs = feet below ground surface, in. = inches,
HSA = Hollow Stem Auger,
Grout remaining from MPI-13B abandonment was used to abandon ESI-5

* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

Groundwater and Environmental Services, Inc. (GES)
Drilling Contractor

Will Welling - NYSDEC
Department Representative

MONITORING WELL

Groundwater & Environmental Services, Inc.

ID NO. **MPI-7I-R**

Page 1 of 2

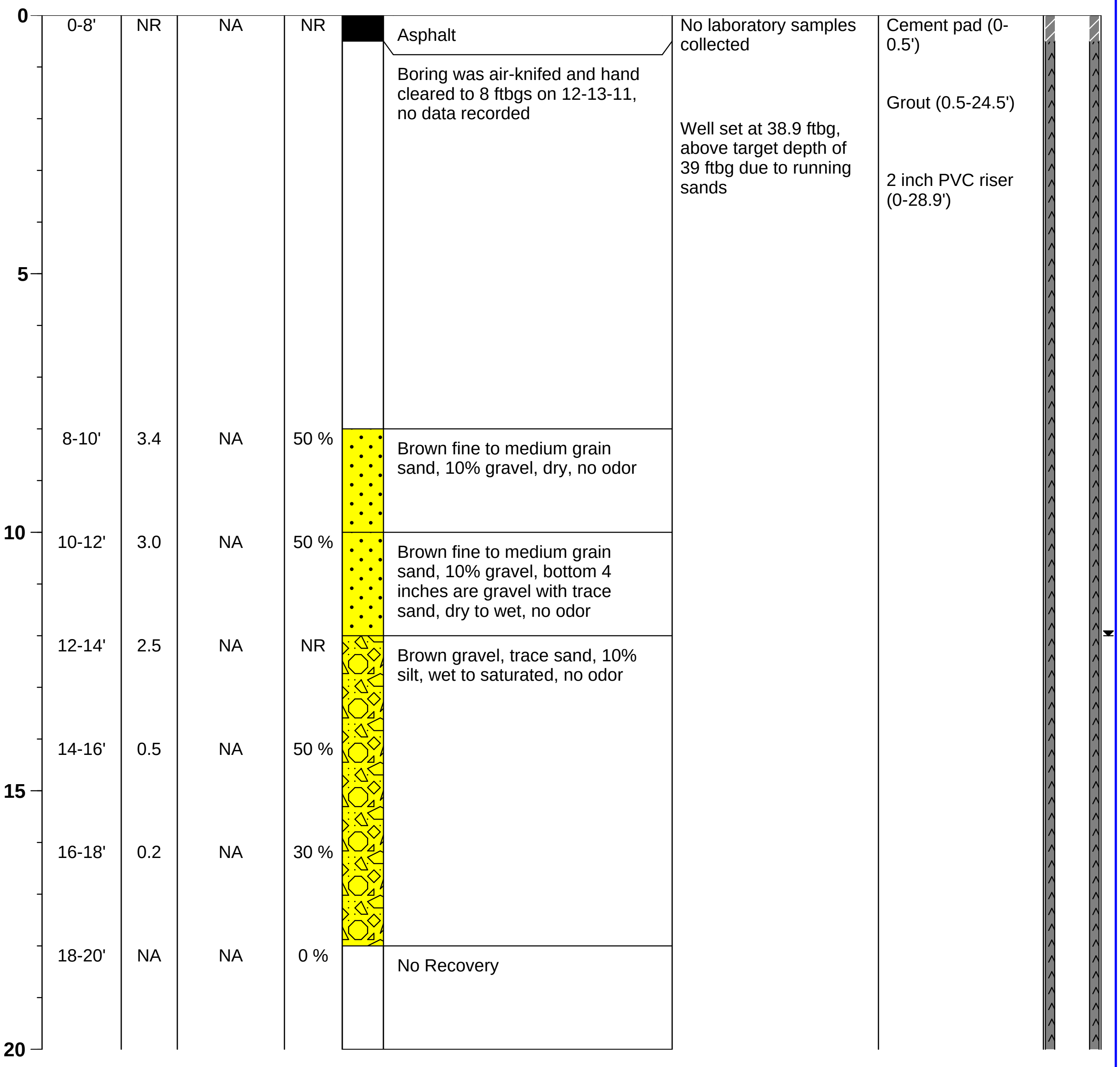
PROJECT: **Mr C's (NYSDEC Site No. 9-15-157)**
ADDRESS: **East Aurora, NY**
JOB NO. **0901467**

SURFACE ELEV.: **NR**
WATER DEPTH: **Approx 12 ftbgs**
BOREHOLE DIA.: **8 inches**

TOTAL DEPTH: **39 ftbgs**
CASING EL.: **NR**
WELL DIA.: **2 in.**

Logged By: **Nicole Jarzyniecki**
Dates Drilled: **12-14-11**
Drilling Company: **Quality Inspection Services, Inc.**
Drill Rig Type: **Acker Soil Max (Truck Mount)**

Drilling Method: **Hollow Stem Auger**
Sampling Method: **Split Spoon**
Soil Class. System: **Modified Burmister**
Field Screening: **MiniRae 2000 PID, 10.6 eV Lamp (results in ppm)**



Depth (feet)	Sample Interval	Field Screen	Blow Counts	Rec.	SAMPLE LITHOLOGY	COMMENTS	COMPLETION DETAILS
0	0-8'	NR	NA	NR	Asphalt Boring was air-knifed and hand cleared to 8 ftbgs on 12-13-11, no data recorded	No laboratory samples collected Well set at 38.9 ftbg, above target depth of 39 ftbg due to running sands	Cement pad (0-0.5') Grout (0.5-24.5') 2 inch PVC riser (0-28.9')
	8-10'	3.4	NA	50 %	Brown fine to medium grain sand, 10% gravel, dry, no odor		
10	10-12'	3.0	NA	50 %	Brown fine to medium grain sand, 10% gravel, bottom 4 inches are gravel with trace sand, dry to wet, no odor		
	12-14'	2.5	NA	NR	Brown gravel, trace sand, 10% silt, wet to saturated, no odor		
	14-16'	0.5	NA	50 %			
15	16-18'	0.2	NA	30 %			
	18-20'	NA	NA	0 %	No Recovery		

Location:
Northing/Latitude: **NA**
Easting/Longitude: **NA**
Horizontal Datum: **NA**
Vertical Datum: **NA**

General Comments:
NA = Not Applicable
NR = Not Recorded
ftbgs = feet below ground surface

Symbol Key:
Apparent Water Level ▼
Lab Sample Location ☒

MONITORING WELL

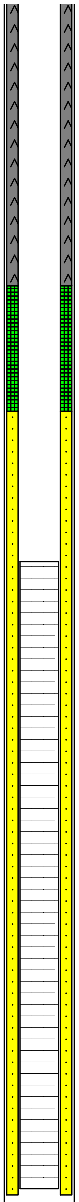
Groundwater & Environmental Services, Inc.

ID NO. **MPI-7I-R**

PROJECT:	**Mr C's (NYSDEC Site No. 9-15-157)**	SURFACE ELEV.: **NR**	TOTAL DEPTH: **39 ftbgs**
ADDRESS:	**East Aurora, NY**	WATER DEPTH: **Approx 12 ftbgs**	CASING EL.: **NR**
JOB NO.	**0901467**	BOREHOLE DIA.: **8 inches**	WELL DIA.: **2 in.**

Logged By:	**Nicole Jarzyniecki**	Drilling Method:	**Hollow Stem Auger**
Dates Drilled:	**12-14-11**	Sampling Method:	**Split Spoon**
Drilling Company:	**Quality Inspection Services, Inc.**	Soil Class. System:	**Modified Burmister**
Drill Rig Type:	**Acker Soil Max (Truck Mount)**	Field Screening:	**MiniRae 2000 PID, 10.6 eV Lamp (results in ppm)**

Depth (feet)	Sample Interval	Field Screen	Blow Counts	Rec.	SAMPLE LITHOLOGY	COMMENTS	COMPLETION DETAILS
20	20-22'	0.2	NA	15 %	Black and brown gravel, 5-10% sand, 5-10% silt, saturated, no odor		
	22-24'	NA	NA	<5 %	Gravel, low recovery	Gravel in shoe	
25	24-26'	0.8	NA	25 %	Black and brown gravel, 5-10% sand, 5-10% silt, saturated, no odor		Bentonite (24.5-26.5')
	26-28'	0.4	NA	60 %	Brown fine to medium grain gravelly sand to fine to medium grain sand with 10% gravel, wet, no odor		Sandpack (26.5-39')
	28-30'	0.1	NA	10 %	Brown fine to medium grain sand, trace gravel, saturated, no odor		2 inch PVC screen (28.9-38.9')
30	30-32'	0.2	NA	25 %	Brown sand with trace silt and gravel to brown silt in last 3 inches, saturated, no odor		
	32-34'	0.2	NA	100 %	Brown silt with trace to 30% sand, saturated, no odor		
35	34-36'	0.2	NA	30 %	Brown sandy silt, 30 to 40% sand, saturated, no odor		
	36-38'	0.2	NA	30 %			
	38-39'	NA	NA	0 %	No Recovery		
40						End of boring at 39'	Well Bottom at 38.9'



Location:
Northing/Latitude: **NA**
Easting/Longitude: **NA**
Horizontal Datum: **NA**
Vertical Datum: **NA**

General Comments:
NA = Not Applicable
NR = Not Recorded
ftbgs = feet below ground surface

Symbol Key:
Apparent Water Level ▼
Lab Sample Location ⊠

MONITORING WELL

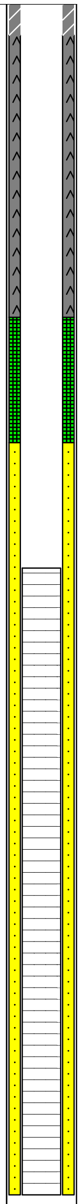
ID NO. **ESI-2-R**

Groundwater & Environmental Services, Inc.

Page 1 of 1

PROJECT:	**Mr C's (NYSDEC Site No. 9-15-157)**	SURFACE ELEV.:	**NR**	TOTAL DEPTH:	**19 ftbgs**
ADDRESS:	**East Aurora, NY**	WATER DEPTH:	**NR**	CASING EL.:	**NR**
JOB NO.	**0901467**	BOREHOLE DIA.:	**8 inches**	WELL DIA.:	**2 in.**

Logged By:	**Nicole Jarzyniecki**	Drilling Method:	**Hollow Stem Auger**
Dates Drilled:	**12-15-11**	Sampling Method:	**NA**
Drilling Company:	**Quality Inspection Services, Inc.**	Soil Class. System:	**Modified Burmister**
Drill Rig Type:	**Acker Soil Max (Truck Mount)**	Field Screening:	**MiniRae 2000 PID, 10.6 eV Lamp (results in ppm)**

Depth (feet)	Sample Interval	Field Screen	Blow Counts	Rec.		SAMPLE LITHOLOGY	COMMENTS	COMPLETION DETAILS
0	None collected	NA	NA	NA		NR	No samples or logging, augered to depth and installed well	Cement pad (0-0.5') Grout (0.5-5') 2 inch PVC riser (0-9') 
5								Bentonite (5-7')
								Sandpack (7-19')
								2 inch PVC screen (9-19')
10								
15								
							End of boring at 19'	Well Bottom at 19'
20								

Location:
Northing/Latitude: **NA**
Easting/Longitude: **NA**
Horizontal Datum: **NA**
Vertical Datum: **NA**

General Comments:
NA = Not Applicable
NR = Not Recorded
ftbgs = feet below ground surface

Symbol Key:
Apparent Water Level ▼
Lab Sample Location ⊠

MONITORING WELL

ID NO. **EE-3**

Groundwater & Environmental Services, Inc.

PROJECT: **Mr C's (NYSDEC Site No. 9-15-157)**
ADDRESS: **East Aurora, NY**
JOB NO. **0901467**

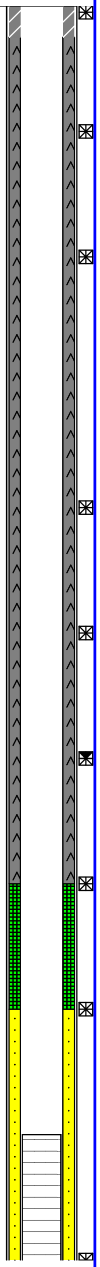
SURFACE ELEV.: **NR**
WATER DEPTH: **Approx 12 ftbgs**
BOREHOLE DIA.: **8 inches**

TOTAL DEPTH: **28 ftbgs**
CASING EL.: **NR**
WELL DIA.: **2 in.**

Logged By: **Nicole Jarzyniecki**
Dates Drilled: **12-16-11**
Drilling Company: **Quality Inspection Services, Inc.**
Drill Rig Type: **Acker Soil Max (Truck Mount)**

Drilling Method: **Hollow Stem Auger**
Sampling Method: **Split Spoon**
Soil Class. System: **Modified Burmister**
Field Screening: **MiniRae 2000 PID, 10.6 eV Lamp (results in ppm)**

Depth (feet)	Sample Interval	Field Screen	Blow Counts	Rec.	SAMPLE LITHOLOGY	COMMENTS	COMPLETION DETAILS
0	0-1'	NR	NA	100 %	Topsoil, moist	Laboratory samples collected for 0-2', 2-4', 4-5', 8-10', 10-12', 12-14', 14-16', 16-18', 20-22', 22-24', 24-26' and 26-28' intervals	Cement pad (0-0.5')
	1-2'	0.0	NA	100 %	Brown silty clay, trace gravel, moist, no odor		Grout (0.5-14')
	2-4'	0.0	NA	100 %	Brown silty clay, 10-15% gravel, moist, no odor	0-5' were hand cleared due to possibility of utilities in location of boring. Samples were collected with hand auger.	2 inch PVC riser (0-18')
	4-5'	0.1	NA	100 %			
5	5-6'	NA	NA	100 %	No recovery		
	6-8'	0.1	NA	<5 %	Low recovery, gravelly silt and clay, rock in shoe	No sample collected for 6-8' interval due to poor recovery	
	8-10'	0.1	NA	60 %	Brown silty clay, 15-20% gravel, moist to very moist, no odor		
10	10-12'	0.1	NA	50 %	Brown silty clay, 30% gravel, moist, no odor		
	12-14'	0.1	NA	40 %	Brown gravel and silt, wet to saturated, no odor		
	14-16'	0.4	NA	50 %			Bentonite (14-16')
15	16-18'	1.4	NA	60 %	Reddish brown to brown gravel and silt, saturated, no odor		Sandpack (16-28')
	18-20	NA	NA	0 %	No recovery	Two peices of gravel in sampler	2 inch PVC screen (18-28')
20							



Location:
Northing/Latitude: **NA**
Easting/Longitude: **NA**
Horizontal Datum: **NA**
Vertical Datum: **NA**

General Comments:
NA = Not Applicable
NR = Not Recorded
ftbgs = feet below ground surface

Symbol Key:
Apparent Water Level ▼
Lab Sample Location ☒

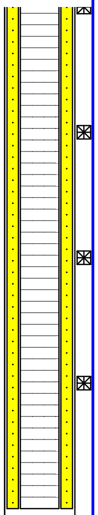
MONITORING WELL

ID NO. **EE-3**

PROJECT:	**Mr C's (NYSDEC Site No. 9-15-157)**	SURFACE ELEV.:	**NR**	TOTAL DEPTH:	**28 ftbgs**
ADDRESS:	**East Aurora, NY**	WATER DEPTH:	**Approx 12 ftbgs**	CASING EL.:	**NR**
JOB NO.	**0901467**	BOREHOLE DIA.:	**8 inches**	WELL DIA.:	**2 in.**

Logged By:	**Nicole Jarzyniecki**	Drilling Method:	**Hollow Stem Auger**
Dates Drilled:	**12-16-11**	Sampling Method:	**Split Spoon**
Drilling Company:	**Quality Inspection Services, Inc.**	Soil Class. System:	**Modified Burmister**
Drill Rig Type:	**Acker Soil Max (Truck Mount)**	Field Screening:	**MiniRae 2000 PID, 10.6 eV Lamp (results in ppm)**

Depth (feet)	Sample Interval	Field Screen	Blow Counts	Rec.	SAMPLE LITHOLOGY	COMMENTS	COMPLETION DETAILS
20	20-22'	3.7	NA	30 %	Brown sand and and gravel, wet, no odor	Driller added approximately 10 gallons of clean water to the boring due to running sands	
	22-24'	6.7	NA	80 %	Brown to grayish brown sand and gravel to sand, fine to medium grain sand, wet, no odor		
	24-26'	0.8	NA	30 %	Grayish brown sand and gravel to silty sand, larger rock between layers (lithology change), wet, no odor	Sample sent with jar half full per Ecology and Environment Engineering, P.C. personnel request, due to larger rock in sampler there was no enough of the sample to fill the jar	
25							
	26-28'	0.2	NA	90 %	Grayish brown silty sand, wet, no odor		
						End of boring at 28'	Well Bottom at 28'
30							



Location:

Northing/Latitude: **NA**

Easting/Longitude: **NA**

Horizontal Datum: **NA**

Vertical Datum: **NA**

General Comments:

NA = Not Applicable

NR = Not Recorded

ftbgs = feet below ground surface

Symbol Key:

Apparent Water Level ▼

Lab Sample Location ⊠

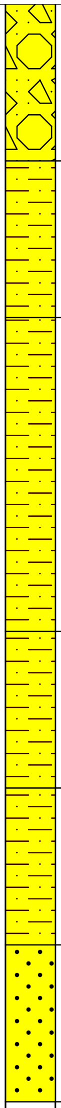
MONITORING WELL

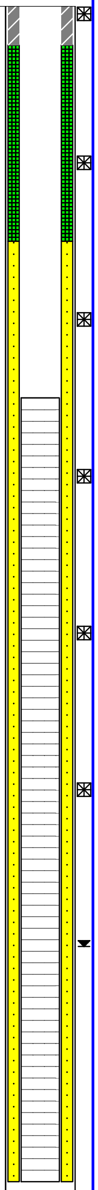
ID NO. **EE-4**

PROJECT:	**Mr C's (NYSDEC Site No. 9-15-157)**	SURFACE ELEV.: **NR**	TOTAL DEPTH: **15 ftbgs**
ADDRESS:	**East Aurora, NY**	WATER DEPTH: **Approx 12 ftbgs**	CASING EL.: **NR**
JOB NO.	**0901467**	BOREHOLE DIA.: **8 inches**	WELL DIA.: **2 in.**

Logged By:	**Nicole Jarzyniecki**	Drilling Method:	**Hollow Stem Auger**
Dates Drilled:	**12-16-11**	Sampling Method:	**Split Spoon**
Drilling Company:	**Quality Inspection Services, Inc.**	Soil Class. System:	**Modified Burmister**
Drill Rig Type:	**Acker Soil Max (Truck Mount)**	Field Screening:	**MiniRae 2000 PID, 10.6 eV Lamp (results in ppm)**

Depth (feet)	Sample Interval	Field Screen	Blow Counts	Rec.	SAMPLE LITHOLOGY	COMMENTS	COMPLETION DETAILS
0	0-2'	2.4	NA	60 %	Gray fill, rock and silty sand, dry, no odor	Laboratory samples collected for 0-2', 2-4', 4-6', 6-8', 8-10' and 10-12'	Cement pad (0-0.5') Bentonite (0.5-3')
	2-4'	0.2	NA	40 %	Brown gravelly silt with black (organic?) layers, dry, no odor	No grout, per work plan	2 inch PVC riser (0-5') Sandpack (3-15')
5	4-6'	0.4	NA	40 %	Brown to reddish brown, silt with black (organic?) layers, 10% clay, trace gravel, dry to slightly moist, no odor		2 inch PVC screen (5-15')
	6-8'	0.4	NA	40 %			
	8-10'	0.5	NA	60 %	Brown to reddish brown, silt with black (organic?) layers, increasing clay content, trace gravel, moist to wet with depth (last 3" very wet), no odor		
10	10-12'	0.4	NA	25 %	Brown to reddish brown, silt with black (organic?) layers, increasing clay content, trace gravel, moist to slightly wet, no odor		
	12-14'	0.6	NA	<5%	Rock in she, some sand above, wet, no odor	No sample collected for 12-14' interval due to poor recovery	
	14-15'	3.2	NA	0 %	No recovery, strong odor on sampler, sampler is wet	Strong odor on sampler, PID screening result is from inside augers after sample was pulled	
15						End of boring at 15'	Well Bottom at 15'





<u>Location:</u>

Northing/Latitude: **NA**
Easting/Longitude: **NA**
Horizontal Datum: **NA**
Vertical Datum: **NA**

<u>General Comments:</u>

NA = Not Applicable
NR = Not Recorded
ftbgs = feet below ground surface

<u>Symbol Key:</u>

Apparent Water Level ▼
Lab Sample Location ☒

MONITORING WELL

ID NO. **MPI-2S-R**

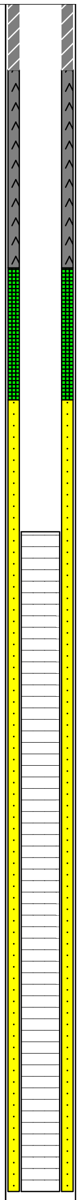
Groundwater & Environmental Services, Inc.

Page 1 of 1

PROJECT:	**Mr C's (NYSDEC Site No. 9-15-157)**	SURFACE ELEV.:	**NR**	TOTAL DEPTH:	**18 ftbgs**
ADDRESS:	**East Aurora, NY**	WATER DEPTH:	**NR**	CASING EL.:	**NR**
JOB NO.	**0901467**	BOREHOLE DIA.:	**8 inches**	WELL DIA.:	**2 in.**

Logged By:	**Tom Palmer**	Drilling Method:	**Hollow Stem Auger**
Dates Drilled:	**12-19-2011**	Sampling Method:	**NA**
Drilling Company:	**Quality Inspection Services, Inc.**	Soil Class. System:	**Modified Burmister**
Drill Rig Type:	**Acker Soil Max (Truck Mount)**	Field Screening:	**MiniRae 2000 PID, 10.6 eV Lamp (results in ppm)**

Depth (feet)	Sample Interval	Field Screen	Blow Counts	Rec.	SAMPLE LITHOLOGY	COMMENTS	COMPLETION DETAILS
0	None collected	NA	NA	NA	NR	No samples or logging, augered to depth and installed well	Cement pad (0-1')
							Grout (1-5')
							2 inch PVC riser (0-8')
							Bentonite (4-6')
5							
							Sandpack (6-18')
							2 inch PVC screen (8-18')
10							
15							
						End of boring at 18'	Well Bottom at 18'



Location:

Northing/Latitude: **NA**

Easting/Longitude: **NA**

Horizontal Datum: **NA**

Vertical Datum: **NA**

General Comments:

NA = Not Applicable

NR = Not Recorded

ftbgs = feet below ground surface

Symbol Key:

Apparent Water Level ▼

Lab Sample Location ☒

MONITORING WELL

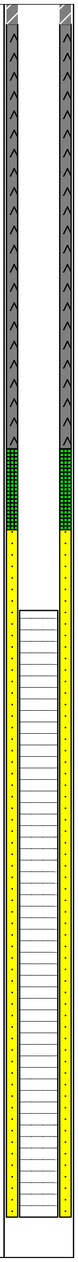
ID NO. **MPI-14B-R**

Groundwater & Environmental Services, Inc.

PROJECT:	**Mr C's (NYSDEC Site No. 9-15-157)**	SURFACE ELEV.:	**NR**	TOTAL DEPTH:	**30 ftbgs**
ADDRESS:	**East Aurora, NY**	WATER DEPTH:	**NR**	CASING EL.:	**NR**
JOB NO.	**0901467**	BOREHOLE DIA.:	**8 inches**	WELL DIA.:	**2 in.**

Logged By:	**Tom Palmer**	Drilling Method:	**Hollow Stem Auger**
Dates Drilled:	**12-19-2011**	Sampling Method:	**NA**
Drilling Company:	**Quality Inspection Services, Inc.**	Soil Class. System:	**Modified Burmister**
Drill Rig Type:	**Acker Soil Max (Truck Mount)**	Field Screening:	**MiniRae 2000 PID, 10.6 eV Lamp (results in ppm)**

Depth (feet)	Sample Interval	Field Screen	Blow Counts	Rec.	SAMPLE LITHOLOGY	COMMENTS	COMPLETION DETAILS
0	None collected	NA	NA	NA	NR	No samples or logging, augered to depth and installed well	Cement pad (0-0.5') 2 inch PVC riser (0-15') Grout (0.5-11')
5							
10							Bentonite (11-13') Sandpack (13-30')
15							2 inch PVC screen (15-30')
20							
25							
30						End of boring at 30'	Well Bottom at 30'



Location:

Northing/Latitude: **NA**

Easting/Longitude: **NA**

Horizontal Datum: **NA**

Vertical Datum: **NA**

General Comments:

NA = Not Applicable

NR = Not Recorded

ftbgs = feet below ground surface

Symbol Key:

Apparent Water Level ▼

Lab Sample Location ☒

MONITORING WELL

ID NO. **ESI-5-R**

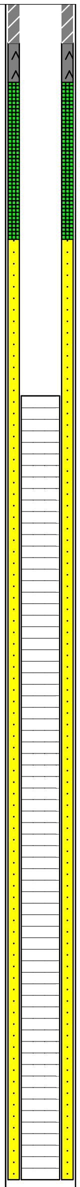
Groundwater & Environmental Services, Inc.

Page 1 of 1

PROJECT:	**Mr C's (NYSDEC Site No. 9-15-157)**	SURFACE ELEV.:	**NR**	TOTAL DEPTH:	**15 ftbgs**
ADDRESS:	**East Aurora, NY**	WATER DEPTH:	**NR**	CASING EL.:	**NR**
JOB NO.	**0901467**	BOREHOLE DIA.:	**8 inches**	WELL DIA.:	**2 in.**

Logged By:	**Thomas Palmer**	Drilling Method:	**Hollow Stem Auger**
Dates Drilled:	**5-7-12**	Sampling Method:	**NA**
Drilling Company:	**Quality Inspection Services, Inc.**	Soil Class. System:	**Modified Burmister**
Drill Rig Type:	**Acker Soil Max (Truck Mount)**	Field Screening:	**MiniRae 2000 PID, 10.6 eV Lamp (results in ppm)**

Depth (feet)	Sample Interval	Field Screen	Blow Counts	Rec.	SAMPLE LITHOLOGY	COMMENTS	COMPLETION DETAILS
0	None collected	NA	NA	NA	NR	No samples or logging, augered to depth and installed well	Cement pad (0-0.5') Grout (0.5-1') Bentonite (1-3')
							Sandpack (3-15')
							2 inch PVC riser (0-5')
5							2 inch PVC screen (5-15')
10							
15						End of boring at 15'	Well Bottom at 15'



Location:

Northing/Latitude: **NA**

Easting/Longitude: **NA**

Horizontal Datum: **NA**

Vertical Datum: **NA**

General Comments:

NA = Not Applicable

NR = Not Recorded

ftbgs = feet below ground surface

Symbol Key:

Apparent Water Level	▼
Lab Sample Location	☒

Groundwater & Environmental Services, Inc.

MONITORING WELL

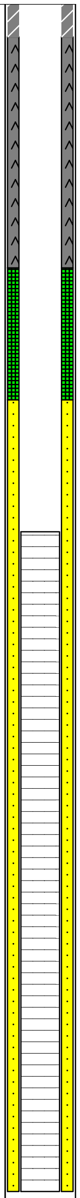
ID NO. **MPI-8S-R**

Page 1 of 1

PROJECT:	**Mr C's (NYSDEC Site No. 9-15-157)**	SURFACE ELEV.:	**NR**	TOTAL DEPTH:	**18 ftbgs**
ADDRESS:	**East Aurora, NY**	WATER DEPTH:	**NR**	CASING EL.:	**NR**
JOB NO.	**0901467**	BOREHOLE DIA.:	**8 inches**	WELL DIA.:	**2 in.**

Logged By:	**Tom Palmer**	Drilling Method:	**Hollow Stem Auger**
Dates Drilled:	**5-7-12**	Sampling Method:	**NA**
Drilling Company:	**Quality Inspection Services, Inc.**	Soil Class. System:	**Modified Burmister**
Drill Rig Type:	**Acker Soil Max (Truck Mount)**	Field Screening:	**MiniRae 2000 PID, 10.6 eV Lamp (results in ppm)**

Depth (feet)	Sample Interval	Field Screen	Blow Counts	Rec.	SAMPLE LITHOLOGY	COMMENTS	COMPLETION DETAILS
0	None collected	NA	NA	NA	NR	No samples or logging, augered to depth and installed well	Cement pad (0-0.5') 2 inch PVC riser (0-8') Grout (0.5-4')
							Bentonite (4-6')
5							
							Sandpack (6-18')
							2 inch PVC screen (8-18')
10							
15							
						End of boring at 18'	Well Bottom at 18'



Location:

Northing/Latitude: **NA**

Easting/Longitude: **NA**

Horizontal Datum: **NA**

Vertical Datum: **NA**

General Comments:

NA = Not Applicable

NR = Not Recorded

ftbgs = feet below ground surface

Symbol Key:

Apparent Water Level ▼

Lab Sample Location ⊠

Groundwater & Environmental Services, Inc.

MONITORING WELL

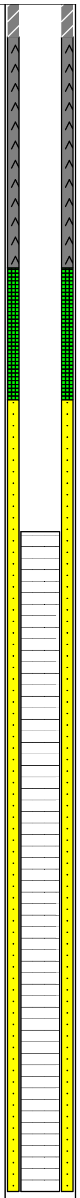
ID NO. **MPI-9S-R**

Page 1 of 1

PROJECT:	**Mr C's (NYSDEC Site No. 9-15-157)**	SURFACE ELEV.:	**NR**	TOTAL DEPTH:	**18 ftbgs**
ADDRESS:	**East Aurora, NY**	WATER DEPTH:	**NR**	CASING EL.:	**NR**
JOB NO.	**0901467**	BOREHOLE DIA.:	**8 inches**	WELL DIA.:	**2 in.**

Logged By:	**Tom Palmer**	Drilling Method:	**Hollow Stem Auger**
Dates Drilled:	**5-7-12**	Sampling Method:	**NA**
Drilling Company:	**Quality Inspection Services, Inc.**	Soil Class. System:	**Modified Burmister**
Drill Rig Type:	**Acker Soil Max (Truck Mount)**	Field Screening:	**MiniRae 2000 PID, 10.6 eV Lamp (results in ppm)**

Depth (feet)	Sample Interval	Field Screen	Blow Counts	Rec.	SAMPLE LITHOLOGY	COMMENTS	COMPLETION DETAILS
0	None collected	NA	NA	NA	NR	No samples or logging, augered to depth and installed well	Cement pad (0-0.5') 2 inch PVC riser (0-8') Grout (0.5-4')
5							Bentonite (4-6') Sandpack (6-18') 2 inch PVC screen (8-18')
10							
15							
						End of boring at 18'	Well Bottom at 18'



Location:

Northing/Latitude: **NA**

Easting/Longitude: **NA**

Horizontal Datum: **NA**

Vertical Datum: **NA**

General Comments:

NA = Not Applicable

NR = Not Recorded

ftbgs = feet below ground surface

Symbol Key:

Apparent Water Level	▼
Lab Sample Location	⊠

MONITORING WELL

ID NO. **MPI-13B-R**

Groundwater & Environmental Services, Inc.

Page 1 of 1

PROJECT: **Mr C's (NYSDEC Site No. 9-15-157)**
ADDRESS: **East Aurora, NY**
JOB NO. **0901467**

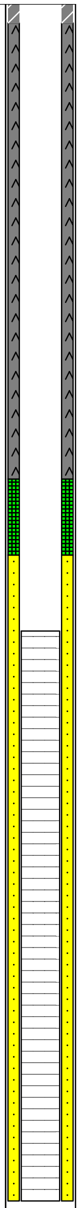
SURFACE ELEV.: **NR**
WATER DEPTH: **NR**
BOREHOLE DIA.: **8 inches**

TOTAL DEPTH: **31.5 ftbgs**
CASING EL.: **NR**
WELL DIA.: **2 in.**

Logged By: **Tom Palmer**
Dates Drilled: **5-8-12**
Drilling Company: **Quality Inspection Services, Inc.**
Drill Rig Type: **Acker Soil Max (Truck Mount)**

Drilling Method: **Hollow Stem Auger**
Sampling Method: **NA**
Soil Class. System: **Modified Burmister**
Field Screening: **MiniRae 2000 PID, 10.6 eV Lamp (results in ppm)**

Depth (feet)	Sample Interval	Field Screen	Blow Counts	Rec.	SAMPLE LITHOLOGY	COMMENTS	COMPLETION DETAILS
0	None collected	NA	NA	NA	NR	No samples or logging, augered to depth and installed well	Cement pad (0-0.5') 2 inch PVC riser (0-16.5') Grout (0.5-12.5')
5							
10							Bentonite (12.5-14.5')
15							Sandpack (14.5-31.5') 2 inch PVC screen (16.5-31.5')
20							
25							
30						End of boring at 31.5'	Well Bottom at 31.5'



Location:
Northing/Latitude: **NA**
Easting/Longitude: **NA**
Horizontal Datum: **NA**
Vertical Datum: **NA**

General Comments:
NA = Not Applicable
NR = Not Recorded
ftbgs = feet below ground surface

Symbol Key:

Apparent Water Level	▼
Lab Sample Location	⊠

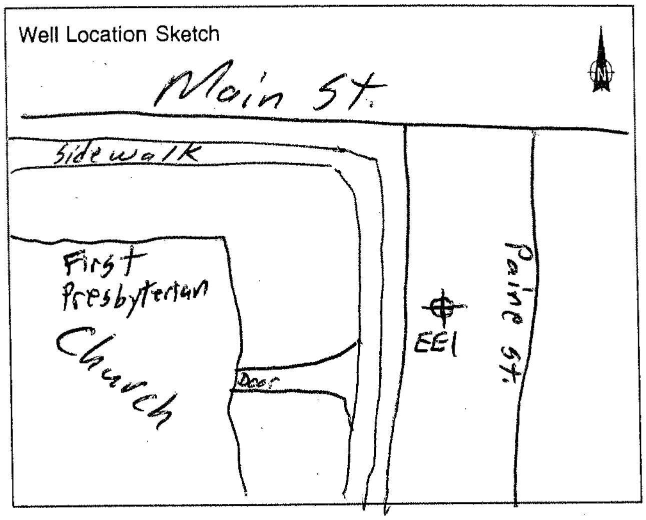
DRILLING LOG FOR EE-1 (Former ESI-4)

Project Name Mr. C's
Site Location East Aurora NY

Date Started/Finished 5-25-04/5-25-04
Drilling Company SJB Services/BYS
Driller's Name Tony Jakubczak
Geologist's Name Robert Meyers
Geologist's Signature Robert A Meyers
Rig Type (s) CME-75
Drilling Method (s) HSA
Bit Size (s) 7/8" Auger Size (s) 4 1/4" ID
Auger/Split Spoon Refusal
Total Depth of Borehole Is 28' bgs
Total Depth of Corehole Is NA

Water Level (TOIC)		
Date	Time	Level(Feet)

Well Location Sketch



Depth(Feet)	Sample Number	Blows on Sampler	Soil Components Rock Profile CL SL S GR	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	PID ~~HNu/OVA~~ (ppm)	Comments
1										Auger to 20' (Abandon/overdrill ESI-4)
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

SCREENED WELL

Stick-up Flushmount ft

Top of Grout ≤0.5 ft BGS

Top of Seal at 15 ft

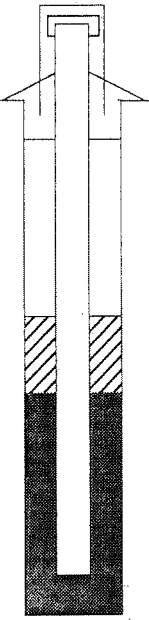
Top of Sand Pack 21 ft

Top of Screen at 23 ft

Bottom of Screen at 28 ft

Bottom of Hole at 28.5 ft

Bottom of Sandpack at 28.5'



Lock Number ____________

Inner Casing Material PVC

Inner Casing Inside Diameter 2 inches

GROUND SURFACE

Quantity of Material Used:

Bentonite Pellets ____________

Cement ____________

Borehole Diameter 8 inches

Cement/ Bentonite ____________

Grout ____________

Screen Slot Size .010"

Screen Type Sch. 40

☒ PVC ____________

☐ Stainless Steel ____________

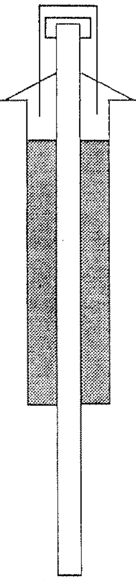
Pack Type/Size: No. 0

☒ Sand

☐ Gravel ____________

☐ Natural ____________

OPEN-HOLE WELL



Stick-up ____________ ft

Inner Casing Material ____________

Inner Casing Inside Diameter ____________ inches

Outer Casing Diameter ____________ inches

Borehole Diameter ____________ ft

Bedrock ____________ ft

Bottom of Rock Socket/ Outer Casing ______ ft

Bottom of Inner Casing ____________ ft

Corehole Diameter ____________

Bottom of Corehole ____________ ft

NOTE: See pages 136 and 137 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
1	Auger 0'-20' (overdrill existing well ESI-4)	○	○	○
2		○	○	○
3		○	○	○
4		○	○	○
5		○	○	○
6		○	○	○
7		○	○	○
8		○	○	○
9		○	○	○
10		○	○	○
11		○	○	○
12		○	○	○
13		○	○	○
14		○	○	○
15		○	○	○

Depth(feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	PID ~~HNu~~/OVA (ppm) off SS	Comments
16												
17												
18												
19												
20												
21	SS1	5 3	4 3		0946 →			1.6'			0ppm	1.6' Rec. Saturated
22												
23	SS2	2 4	2 5			0951		1.8'			0	Saturated
24												
25	SS3	1 5	2 7			0959		2.0'			0	〃
26												
27	SS4	5 7	7 7			1006		2.0'			0	〃
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												

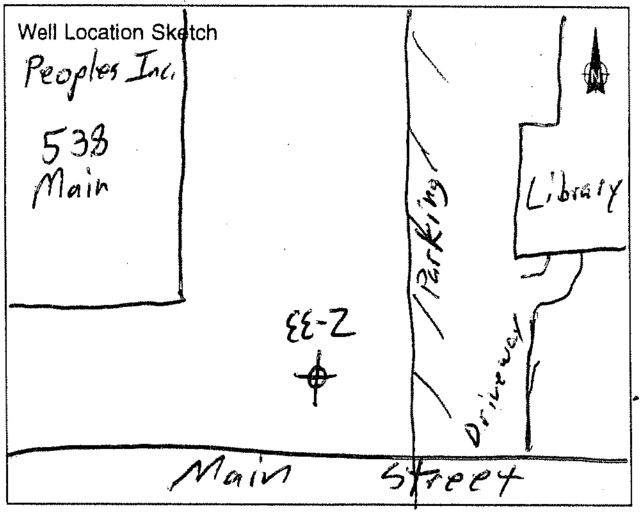
Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	 Moist	 Wet
16		○	○	○
17		○	○	○
18		○	○	○
19		○	○	○
20		○	○	○
21	SS#1, 20'-22', Saturated VF to Fine light brown	○	○	⊗
22	SAND.	○	○	⊗
23	SS#2, 22'-24', Saturated, Uniform Fine light brown	○	○	⊗
24	SAND	○	○	⊗
25	SS#3, 24'-26, Saturated, Uniform Fine Sand as above	○	○	⊗
26		○	○	⊗
27	SS#4, 26'-27.2' Sand as above.	○	○	⊗
28	27.2'-27.65', Gray Fine to Medium Sand.	○	○	⊗
29	27.65'-28', Uniform light brown Lacustrine	○	○	⊗
30	silt.	○	○	⊗
31	B.O.H @ 28' BGS	○	○	○
32		○	○	○
33		○	○	○
34		○	○	○
35		○	○	○
36		○	○	○
37		○	○	○
38		○	○	○
39		○	○	○
40		○	○	○
41		○	○	○
42		○	○	○
43		○	○	○
44		○	○	○
45		○	○	○

DRILLING LOG FOR EE-2

Project Name Mr. C's
Site Location East Aurora
New York
Date Started/Finished 5-26-04 / 5-26-04
Drilling Company SJB Services/BFS
Driller's Name Tony Jakubczak
Geologist's Name Robert Meyers
Geologist's Signature Robert A Meyers
Rig Type (s) CME-75
Drilling Method (s) HSA
Bit Size (s) 7 7/8" Auger Size (s) 4 1/4" ID
Auger/Split Spoon Refusal NA
Total Depth of Borehole Is 32' BGS
Total Depth of Corehole Is NA

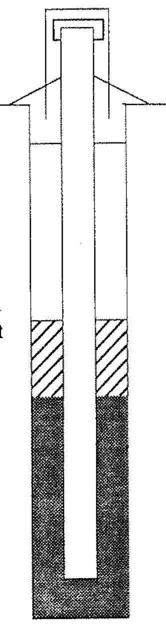
Water Level (TOIC)		
Date	Time	Level(Feet)

Well Location Sketch



Depth(Feet)	Sample Number	Blows on Sampler		Soil Components Rock Profile CL SL S GR	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	PID ~~HNu/OVA~~ (ppm) off SSpoon	Comments
1	SS1	1	1		0833		0.9'			0ppm	
2		3	4								
3											
4											
5											
6	SS2	1	4		0842		1.9'			0ppm	
7		5	8								
8											
9											
10											
11	SS3	3	5		0901		0'			NA	
12		5	7								
13											
14											
15											

SCREENED WELL



Stick-up NA ft

Top of Grout 0.5' ft

Top of Seal at 15 ft

Top of Sand Pack 20 ft

Top of Screen at 22 ft

Bottom of Screen at 32 ft

Bottom of Hole at 32 ft

Bottom of Sandpack at 32

Lock Number

Inner Casing Material PVC

Inner Casing Inside Diameter 2 inches

GROUND SURFACE

Quantity of Material Used:

Bentonite Pellets

Cement

Borehole Diameter 8 inches

Cement/ Bentonite

Grout

Screen Slot Size .010"

Screen Type sch. 40

☒ PVC

☐ Stainless Steel

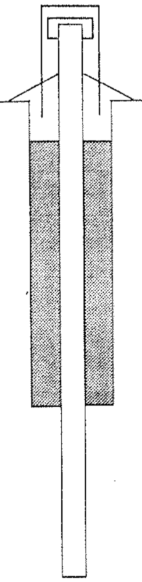
Pack Type/Size:

☒ Sand No. 0

☐ Gravel

☐ Natural

OPEN-HOLE WELL



Stick-up ft

Inner Casing Material

Inner Casing Inside Diameter inches

Outer Casing Diameter inches

Borehole Diameter ft

Bedrock ft

Bottom of Rock Socket/ Outer Casing ft

Bottom of Inner Casing ft

Corehole Diameter

Bottom of Corehole ft

NOTE: See pages 136 and 137 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
	0'-2', Med. brown clayey SILT with little	○	⊗	○
1	rounded Gravel & few VF to coarse SAND, loose	○	✓	○
2		○	○	○
3		○	○	○
4		○	○	○
5	5'-7', light brown/Tan Silt & VF SAND (Uniform)	○	⊗	○
6	with Shale Frags & Gravel w/Silt & Clay from 6.7 to 7' BGS	○	✓	○
7		○	○	○
8		○	○	○
9		○	○	○
10	10'-12', No Recovery	○	○	○
11		○	○	○
12		○	○	○
13				
14		○	○	○
15		○	○	○

Depth(feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	PID ~~HNu/OVA~~ (ppm) off Splitspoons	Comments
16	SS4	9 28	16 26			0913		1.4'			0ppm	Saturated
17												
18												
19												
20												
21	SS5	15 12	15 11			0928		1.7'			0ppm	
22												
23	SS6	5 5	6 6			0934		1.6'			0ppm	
24												
25	SS7	7 6	7 5			0945		1.5'			0ppm	
26												
27	SS8	5 3	3 3			0950		1.6'			0ppm	
28												
29	SS9	4 7	5 8			1001		1.7'			0ppm	
30												
31	SS10	4 3	3 3			1010		0.8			0ppm	
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content		
		Dry	Moist	Wet
	15'-17' Med. dense Gravel (Primarily shale) some	○	○	☒
16	VF Sand & silt and few med. to coarse sand, Saturated	○	○	☒
17		○	○	○
18		○	○	○
19		○	○	○
20	20'-22', VF to Fine gray SAND, Uniform, Saturated.	○	○	☒
21		○	○	☒
22	22'-24', SAND as above	○	○	☒
23		○	○	☒
24	24'-26', VF Gray SAND, Uniform, loose, Saturated	○	○	☒
25		○	○	☒
26	26'-28', Sand as above w/≃ 1/4" clay seam	○	○	☒
27	(horizontal) @ 27.7' BGS	○	○	☑
28	28'-30', VF to Fine Gray SAND, Uniform, loose,	○	○	☒
29	Saturated	○	○	☑
30	30'-32' Sand as above with few med. sand.	○	○	☒
31		○	○	☒
32	B.O.H @ 32' BGS.	○	○	○
33		○	○	○
34		○	○	○
35		○	○	○
36		○	○	○
37		○	○	○
38		○	○	○
39		○	○	○
40		○	○	○
41		○	○	○
42		○	○	○
43		○	○	○
44		○	○	○
45				

DRILLING LOG FOR ESI-1 (Replacement)

Project Name Mr. C's

Site Location East Aurora
New York

Date Started/Finished 6-23-04/6-23-04

Drilling Company SJB Drilling Services/BCS

Driller's Name Tony Jakubczak

Geologist's Name Robert Meyers

Geologist's Signature Robert A. Meyers

Rig Type (s) CME-75

Drilling Method (s) HSA

Bit Size (s) 7⅞" Auger Size (s) 4¼" ID

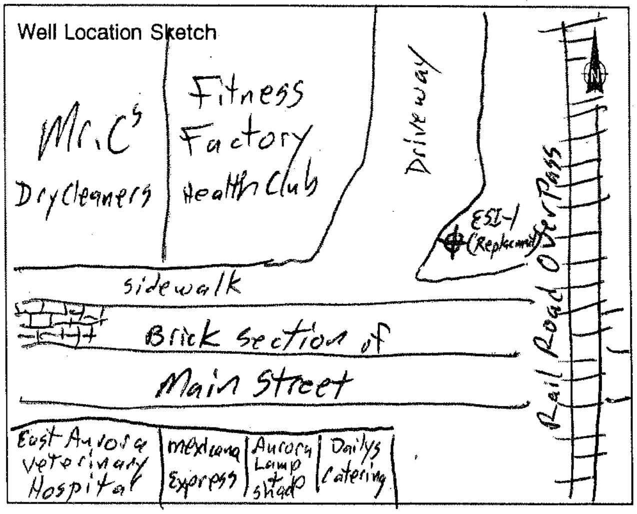
Auger/Split Spoon Refusal NA

Total Depth of Borehole Is 21' BGS

Total Depth of Corehole Is NA

Water Level (TOIC)		
Date	Time	Level(Feet)

Well Location Sketch



Depth(Feet)	Sample Number	Blows on Sampler	Soil Components Rock Profile CL SL S GR	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
1										
2										
3										
4										
5										
6										PID Readings all 0ppm in BZ during Drilling.
7										
8										
9										
10										
11										
12										
13										
14										
15										

RAM

Overdrill Existing ESI-1, which had filled with debris

★ Removed all existing well Materials

SCREENED WELL

Stick-up NA ft

Sakrete 1.5' to Surface

Top of Grout 1.5 ft

Top of Seal at 4 ft

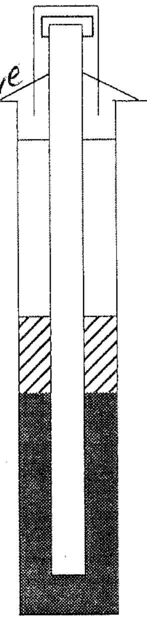
Top of Sand Pack 8 ft

Top of Screen at 10.5 ft

Bottom of Screen at 20.5 ft

Bottom of Hole at 21 ft

Bottom of Sandpack at 21' BGS



Lock Number ____

Inner Casing Material PVC

Inner Casing Inside Diameter 2 inches

GROUND SURFACE

Quantity of Material Used:

Bentonite Pellets ____

Cement ____

Borehole Diameter 8 inches

Cement/ Bentonite ____

Grout ____

Screen Slot Size .010"

Screen Type sch. 40

☒ PVC threaded

☐ Stainless Steel ____

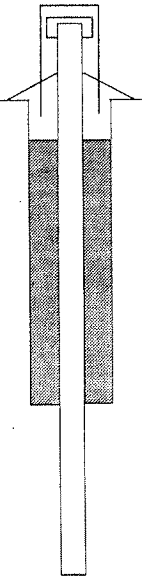
Pack Type/Size:

☒ Sand No. 0

☐ Gravel ____

☐ Natural ____

OPEN-HOLE WELL



Stick-up ____ ft

Inner Casing Material ____

Inner Casing Inside Diameter ____ inches

Outer Casing Diameter ____ inches

Borehole Diameter ____ ft

Bedrock ____ ft

Bottom of Rock Socket/ Outer Casing ____ ft

Bottom of Inner Casing ____ ft

Corehole Diameter ____

Bottom of Corehole ____ ft

NOTE: See pages 136 and 137 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
1	Note: No Splitspoons Collected, See Original ESI-1	○	○	○
2	Time Log for Geologic Details.	○	○	○
3	1012 Unable to Pull Well, Begin Auger over former	○	○	○
4	ESI-1.	○	○	○
5	1027 Removed bentonite seal & Continue Augering Down.	○	○	○
6	1108 Complete Drilling to 21' BGS, Begin setting new	○	○	○
7	monitoring well ESI-1 (Replacement).	○	○	○
8	1125 Install Bentonite Seal & Hydrate	○	○	○
9	1132 Begin Pumping Well w/ Whale Submersible pump as	○	○	○
10	Pre-Development.	○	○	○
11	1142 Pumped 15 Gals,	○	○	○
12	1159 Comp. Pumping, Water Clear, (Surged 4 times). 40 gals	○	○	○
13	Pumped.	○	○	○
14	1219 W.L. = 12.2' BGS & Rising, drillers go to buy Topsoil & Grass Seed.	○	○	○
15	1313 Drillers back on-site, Will Set Flushmount Pro-casing & Clean up.	○	○	○

DRILLING LOG FOR BH1

Project Name Mr. C's

Site Location East Aurora
New York

Date Started/Finished 5/25/04 / 5/25/04

Drilling Company SJB Services/BDS

Driller's Name Tony Jakubczak

Geologist's Name Robert Meyers

Geologist's Signature Roberta Meyers

Rig Type (s) CME-75

Drilling Method (s) HSA

Bit Size (s) 7 7/8" Auger Size (s) 4 1/4" ID

Auger/Split Spoon Refusal NA

Total Depth of Borehole Is 8' BGS

Total Depth of Corehole Is NA

Water Level (TOIC)

Date	Time	Level(Feet)

Well Location Sketch

See BH-2 Log

Depth(Feet)	Sample Number	Blows on Sampler		Soil Components Rock Profile CL SL S GR	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	PID ~~HNu/OVA~~ (ppm)	Comments
1	SS1	/ 2	1 1		1450		0.3'			0ppm	Hand dug 0-0.5'
2											
3	SS2	2 4	3 7		1452		0.9'			0ppm	
4											
5	SS3	2 4	3 4		1501		1.7'			0ppm	
6											Water @ 6' BGS
7	SS4	2 1	1 1		1505		0.8'			0.5ppm	1510 Collect
8											Soil Sample
9											~~BH1-6-8~~ RAM
10											BH1-6-8
11											for VOC Analysis
12											(method 8260)
13											
14											
15											

SCREENED WELL

Stick-up ____________ft

Top of Grout ____________________ft

Top of Seal at _________ft

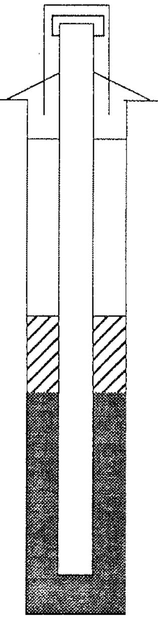
Top of Sand Pack ________ft

Top of Screen at _______ ft

Bottom of Screen at _____________ ft

Bottom of Hole at ________________ ft

Bottom of Sandpack at __________



Lock Number ____________

Inner Casing Material ________________

Inner Casing Inside Diameter ____ inches

GROUND SURFACE

Quantity of Material Used:

Bentonite Pellets__________________

Cement__________________

Borehole ________ inches Diameter

Cement/ Bentonite________________

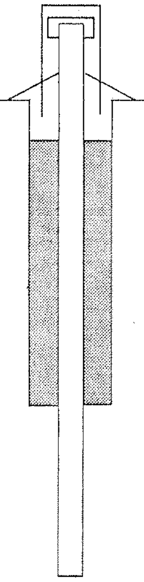
Grout__________________

Screen Slot Size _________

Screen Type _________
☐ PVC____________
☐ Stainless Steel _____

Pack Type/Size:
☐ Sand ____________
☐ Gravel ___________
☐ Natural ___________

OPEN-HOLE WELL



Stick-up ____________ft

Inner Casing Material _______________

Inner Casing Inside Diameter __________inches

Outer Casing Diameter __________inches

Borehole Diameter _________ft

Bedrock ___________ft

Bottom of Rock Socket/ Outer Casing _______ft

Bottom of Inner Casing ____________ft

Corehole Diameter_____________

Bottom of Corehole ____________ft

NOTE: See pages 136 and 137 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
1	0'-0.3' Black top Parking lot, 0.3'-2' Fill Materials, Gravel	○	⊗	○
2	w/silt & VF to coarse sand.	○	⊗	○
3	2'-4' light brown Clayey silt and rounded Gravel	○	⊗	○
4		○	⊗	○
5	4'-6', light brown Silty CLAY and Rounded Gravel	○	⊗	○
6	with some silt & VF to coarse Sand.	○	⊗	○
7	6'-8', Water @ 6', Silty Clay & Gravel (Rounded) as above	○	○	⊗
8		○	○	⊗
9		○	○	○
10		○	○	○
11		○	○	○
12		○	○	○
13		○	○	○
14		○	○	○
15		○	○	○

DRILLING LOG FOR BH-2

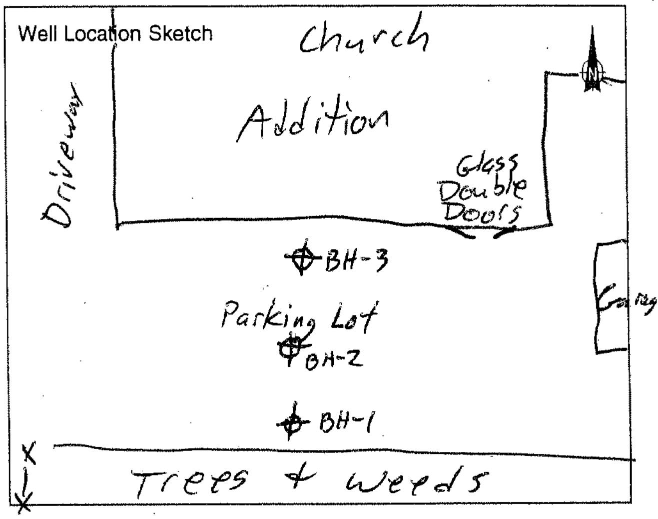
Project Name Mr. C^s
Site Location East Aurora NY

Date Started/Finished 5-26-04 / 5-26-04
Drilling Company SJB Services/B&S
Driller's Name Tony Jakubczak
Geologist's Name Robert Meyers
Geologist's Signature Robert a Meyers
Rig Type (s) CME-75
Drilling Method (s) HSA
Bit Size (s) 7 7/8" Auger Size (s) 4 1/4" ID
Auger/Split Spoon Refusal NA
Total Depth of Borehole Is 8'
Total Depth of Corehole Is NA

Water Level (TOIC)

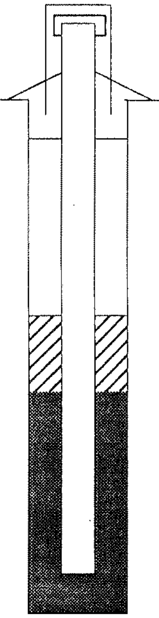
Date	Time	Level(Feet)

Well Location Sketch



Depth(Feet)	Sample Number	Blows on Sampler	Soil Components Rock Profile CL SL S GR	Penetration Times	Run Number	Core - Recovery	RQD	Fracture Sketch	PID ~~HNu/OVA~~ (ppm) from splitspoon	Comments
1	SS1	/ 3 3 4		1332		1.5'			100.2 ppm	1333 Collect Sample BH2-0.5-1.5 for VOC^s (8260)
2										
3	SS2	4 3 3 3		1334		0.6'			2.4	
4										
5	SS3	4 5 7 7		1337		1.8'			0	
6										
7	SS4	6 5 3 3		1342		0.8'			0	1343 Collect Sample BH2-6-7 for VOC's (8260) @ the Request of G. Sutton NYSDEC
8										
9										
10										
11										
12										Wate @
13										≃ 7' BGS
14										
15										

SCREENED WELL



Stick-up ____________ ft

Top of Grout ________________ ft

Top of Seal at ________ ft

Top of Sand Pack ________ ft

Top of Screen at _______ ft

Bottom of Screen at _____________ ft

Bottom of Hole at ________________ ft

Bottom of Sandpack at __________

Lock Number ___________

Inner Casing Material ________________

Inner Casing Inside Diameter ____ inches

GROUND SURFACE

Quantity of Material Used:

Bentonite Pellets ________________

Cement ________________

Borehole Diameter ________ inches

Cement/ Bentonite ________________

Grout ________________

Screen Slot Size ________

Screen Type ___________

☐ PVC ____________

☐ Stainless Steel _____

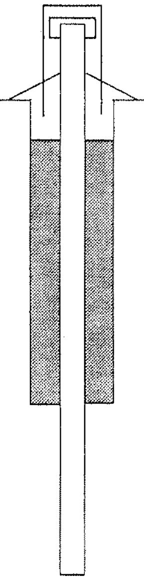
Pack Type/Size:

☐ Sand ____________

☐ Gravel ____________

☐ Natural ____________

OPEN-HOLE WELL



Stick-up ____________ ft

Inner Casing Material ______________

Inner Casing Inside Diameter __________ inches

Outer Casing Diameter __________ inches

Borehole Diameter ________ ft

Bedrock __________ ft

Bottom of Rock Socket/ Outer Casing _______ ft

Bottom of Inner Casing ___________ ft

Corehole Diameter ______________

Bottom of Corehole ____________ ft

NOTE: See pages 136 and 137 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moisture Content Moist	Moisture Content Wet
1	0'-0.2' Black Top, 0.2' to 0.5', Fill base for Parking lot.	☒	☒	○
2	0.5'-2.0', Clayey SILT & Rounded Gravel	☒	☒	○
3	2'-4' Clayey SILT (Yellow/Tan to Med. brown) with some	○	☒	○
4	rounded Gravel.	○	☒	○
5	4' to 6', Till, Clay with some silt & vf to Med. sand,	○	☒	○
6	slightly to moderately cohesive, iron staining throughout	○	☒	○
7	6' to 8', Till as above, Water @ ≃ 7' bgs	○	○	○
8	B.O.H @ 8'	○	○	○
9		○	○	○
10		○	○	○
11		○	○	○
12		○	○	○
13		○	○	○
14		○	○	○
15		○	○	○

DRILLING LOG FOR BH-3 (Redrill), Note: 1st Attempt had very poor Splitspoon Recoveries.

Project Name Mr. C's
Site Location East Aurora
New York
Date Started/Finished 5-26-04 / 5-26-04
Drilling Company SJB Services/B&S
Driller's Name Tony Jakubczak
Geologist's Name Robert Meyers
Geologist's Signature Robert A Meyers
Rig Type (s) CME-75
Drilling Method (s) HSA
Bit Size (s) 7 7/8" Auger Size (s) 4 1/4" ID
Auger/Split Spoon Refusal NA
Total Depth of Borehole Is 8'
Total Depth of Corehole Is NA

Water Level (TOIC)

Date	Time	Level(Feet)

Well Location Sketch

See BH-2 Log

Depth(Feet)	Sample Number	Blows on Sampler	Soil Components Rock Profile CL SL S GR	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	PID ~~HNu/OVA~~ (ppm)	Comments
1	SS1	/ 1 1 1		1501		1.2'			0ppm	
2										
3	SS2	1 1 1 1		1504		1.8'			0ppm	
4										
5	SS3	Weight of hammer 4' to 5.5' / 3		1507		0.9'			0ppm	
6										
7	SS4	3 3 3 2		15.11		1.4'			0ppm	Water @ 7.5' BGS 1513 Collect Soil Sample BH3-7-8
8										
9										
10										
11										
12										
13										
14										
15										

SCREENED WELL

Stick-up ____________ft

Top of Grout
__________________ft

Top of
Seal at_________ft

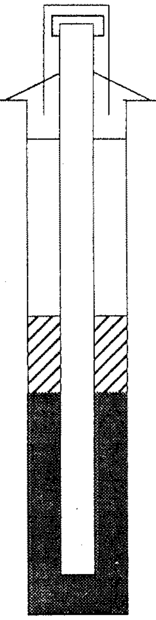
Top of Sand Pack _________ft

Top of
Screen at _______ ft

Bottom of
Screen at ______________ ft

Bottom of
Hole at __________________ ft

Bottom of Sandpack at ___________



Lock Number ____________

Inner Casing
Material _______________

Inner Casing Inside
Diameter _____ inches

GROUND SURFACE

Quantity of Material Used:
Bentonite
Pellets ________________

Cement ________________

Borehole _________ inches
Diameter

Cement/
Bentonite ______________

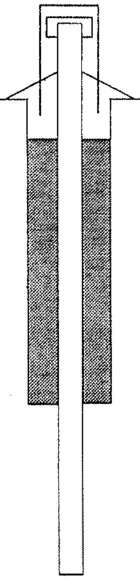
Grout _________________

Screen Slot Size _________

Screen Type ___________
☐ PVC ____________
☐ Stainless Steel ______

Pack Type/Size:
☐ Sand ____________
☐ Gravel ___________
☐ Natural ___________

OPEN-HOLE WELL



Stick-up _____________ft

Inner Casing
Material _______________

Inner Casing Inside
Diameter ___________inches

Outer Casing
Diameter ___________inches

Borehole
Diameter _________ft

Bedrock __________ft

Bottom of Rock Socket/
Outer Casing _______ft

Bottom of Inner
Casing ___________ft

Corehole
Diameter _____________

Bottom of
Corehole ____________ft

NOTE: See pages 136 and 137 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
1	0'-0.5' BlackTop & Base stone, 0.5'-2', med. brown Clayey silt	⊗	⊗	○
2	with little VF sand & few Gravel.	○	⊗	○
3	2'-4' light brown SILT & VF Sand w/Trace gravel, Soft,	○	⊗	○
4	little iron staining.	○	✓	○
5	4'-6', Silt as above from 4' to 5.7'. Clay (Gray) with	○	⊗	○
6	little sand from 5.7' to 6' (soft).	○	⊗	○
7	6'-8', VF to Coarse SAND and Fine Gravel with little	○	⊗	○
8	Silt. Water @ ≈ 7.5' BGS.	○	○	⊗
9		○	○	○
10	B.O.H @ 8'	○	○	○
11		○	○	○
12		○	○	○
13				
14		○	○	○
15		○	○	○

F2 – Well Decommissioning Logs

Appendix F2

Well Decommissioning Logs

FIGURE 3
WELL DECOMMISSIONING RECORD

Site Name:	Mr. C's Dry Cleaners, NYSDEC Site No. 9-15-157	Well I.D.:	MPI-7I
Site Location:	East Aurora, NY	Driller:	Ron Brown
Drilling Co.:	Quality Inspection Services, Inc.	Inspector:	Nicole Jarzyniecki (GES)
		Date:	12-14-11 and 12-15-11

DECOMMISSIONING DATA
(Fill in all that apply)

OVERDRILLING

Interval Drilled	0-5 ft bgs
Drilling Method(s)	HSA
Borehole Dia. (in.)	8 in
Temporary Casing Installed? (y/n)	N
Depth temporary casing installed	NA
Casing type/dia. (in.)	2 in PVC
Method of installing	NA

CASING PULLING

Method employed	NA
Casing retrieved (feet)	NA
Casing type/dia. (in)	NA

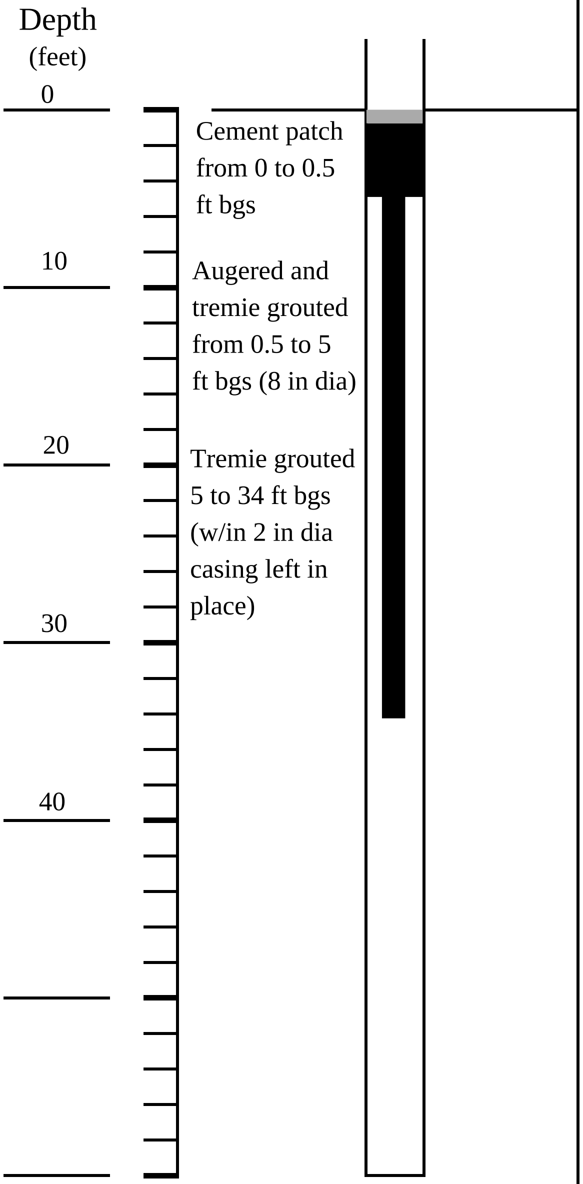
CASING PERFORATING

Equipment used	NA
Number of perforations/foot	NA
Size of perforations	NA
Interval perforated	NA

GROUTING

Interval grouted (FBLS)	0.5-34 ft bgs
# of batches prepared	1
For each batch record:	
Quantity of water used (gal.)	20
Quantity of cement used (lbs.)	282
Cement type	Portland
Quantity of bentonite used (lbs.)	10
Quantity of calcium chloride used (lbs.)	NA
Volume of grout prepared (gal.)	30
Volume of grout used (gal.)	15

WELL SCHEMATIC*



* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

COMMENTS: ft bgs = feet below ground surface, in. = inches,
HSA = Hollow Stem Auger,
It should be noted that running sands were observed during MPI-7I-R well install and that some of the grout may have been lost to the formation - none observed running into the replacement well (this was monitored).

Groundwater and Environmental Services, Inc. (GES)
Drilling Contractor

Will Welling - NYSDEC
Department Representative

FIGURE 3

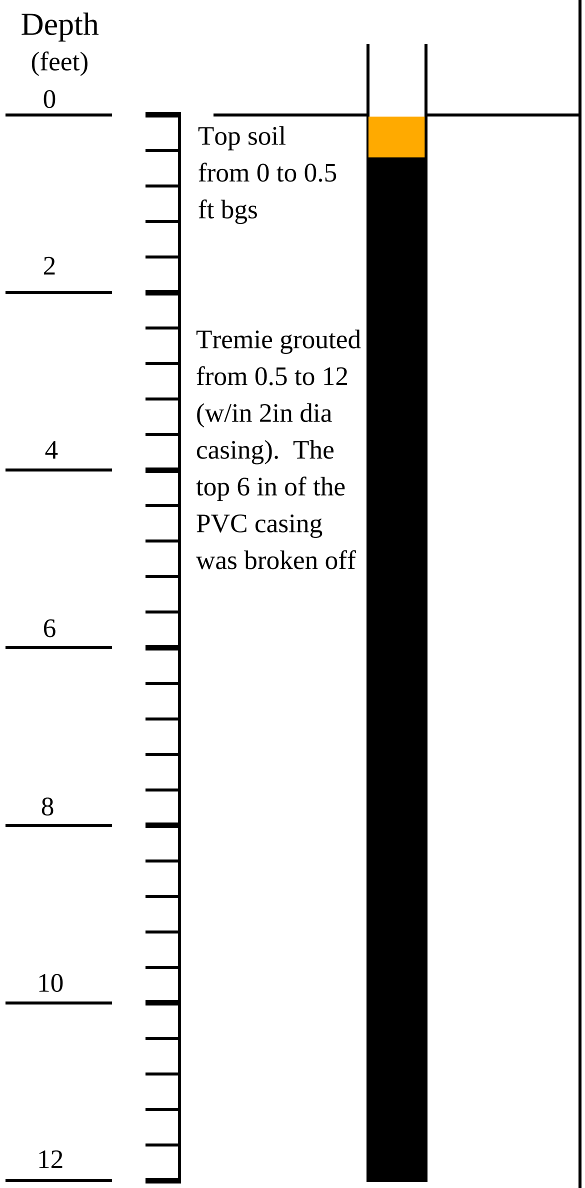
WELL DECOMMISSIONING RECORD

Site Name: Mr. C's Dry Cleaners, NYSDEC Site No. 9-15-157	Well I.D.: MPI-4D
Site Location: East Aurora, NY	Driller: Ron Brown
Drilling Co.: Quality Inspection Services, Inc.	Inspector: Nicole Jarzyniecki (GES)
	Date: 12-19-11

DECOMMISSIONING DATA
(Fill in all that apply)

OVERDRILLING	
Interval Drilled	NA
Drilling Method(s)	NA
Borehole Dia. (in.)	NA
Temporary Casing Installed? (y/n)	N
Depth temporary casing installed	NA
Casing type/dia. (in.)	2 in PVC
Method of installing	NA
CASING PULLING	
Method employed	NA
Casing retrieved (feet)	NA
Casing type/dia. (in)	NA
CASING PERFORATING	
Equipment used	NA
Number of perforations/foot	NA
Size of perforations	NA
Interval perforated	NA
GROUTING	
Interval grouted (FBLS)	0.5-12 ft bgs
# of batches prepared	1
For each batch record:	
Quantity of water used (gal.)	10
Quantity of cement used (lbs.)	94
Cement type	Portland
Quantity of bentonite used (lbs.)	2
Quantity of calcium chloride used (lbs.)	NA
Volume of grout prepared (gal.)	12
Volume of grout used (gal.)	3

WELL SCHEMATIC*



Top soil from 0 to 0.5 ft bgs

Tremie grouted from 0.5 to 12 (w/in 2in dia casing). The top 6 in of the PVC casing was broken off

COMMENTS: ft bgs = feet below ground surface, in. = inches,
HSA = Hollow Stem Auger, w/in = within
MPI-4D was set within 6 in dia steel casing. The steel casing was left in place.

* Sketch in all relevant decommissioning data, including:
interval overdrilled, interval grouted, casing left in hole,
well stickup, etc.

Groundwater and Environmental Services, Inc. (GES)
Drilling Contractor

Will Welling - NYSDEC
Department Representative

FIGURE 3
WELL DECOMMISSIONING RECORD

Site Name: Mr. C's Dry Cleaners, NYSDEC Site No. 9-15-157

Site Location: East Aurora, NY

Drilling Co.: Quality Inspection Services, Inc.

Well I.D.: MPI-2S

Driller: Ron Brown

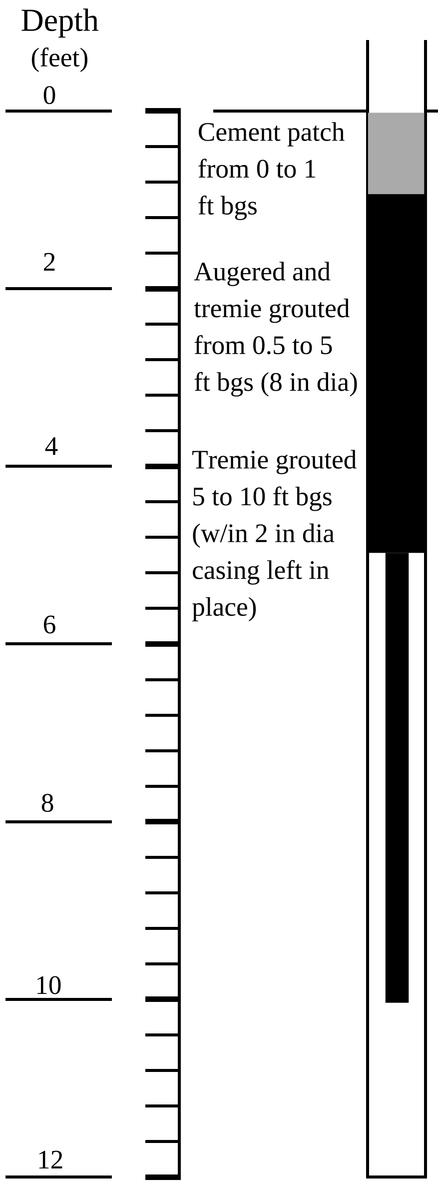
Inspector: Nicole Jarzyniecki (GES)

Date: 12-20-11

DECOMMISSIONING DATA
(Fill in all that apply)

<u>OVERDRILLING</u>	
Interval Drilled	0-5 ft bgs
Drilling Method(s)	HSA
Borehole Dia. (in.)	8 in
Temporary Casing Installed? (y/n)	N
Depth temporary casing installed	NA
Casing type/dia. (in.)	2 in PVC
Method of installing	NA
<u>CASING PULLING</u>	
Method employed	NA
Casing retrieved (feet)	NA
Casing type/dia. (in)	NA
<u>CASING PERFORATING</u>	
Equipment used	NA
Number of perforations/foot	NA
Size of perforations	NA
Interval perforated	NA
<u>GROUTING</u>	
Interval grouted (FBLS)	0.5-10 ft bgs
# of batches prepared	1
<u>For each batch record:</u>	
Quantity of water used (gal.)	10
Quantity of cement used (lbs.)	94
Cement type	Portland
Quantity of bentonite used (lbs.)	2
Quantity of calcium chloride used (lbs.)	NA
Volume of grout prepared (gal.)	12
Volume of grout used (gal.)	6

WELL SCHEMATIC*



COMMENTS: ft bgs = feet below ground surface, in. = inches,
HSA = Hollow Stem Auger,

* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

Groundwater and Environmental Services, Inc. (GES)
Drilling Contractor

Will Welling - NYSDEC
Department Representative

FIGURE 3

WELL DECOMMISSIONING RECORD

Site Name: Mr. C's Dry Cleaners, NYSDEC Site No. 9-15-157
Site Location: East Aurora, NY
Drilling Co.: Quality Inspection Services, Inc.

Well I.D.: ESI-5
Driller: Jason Tojdowski
Inspector: Nicole Jarzyniecki (GES)
Date: 5-4-12

DECOMMISSIONING DATA
(Fill in all that apply)

OVERDRILLING

Interval Drilled	NA
Drilling Method(s)	NA
Borehole Dia. (in.)	NA
Temporary Casing Installed? (y/n)	NA
Depth temporary casing installed	NA
Casing type/dia. (in.)	NA
Method of installing	NA

CASING PULLING

Method employed	NA
Casing retrieved (feet)	NA
Casing type/dia. (in)	NA

CASING PERFORATING

Equipment used	NA
Number of perforations/foot	NA
Size of perforations	NA
Interval perforated	NA

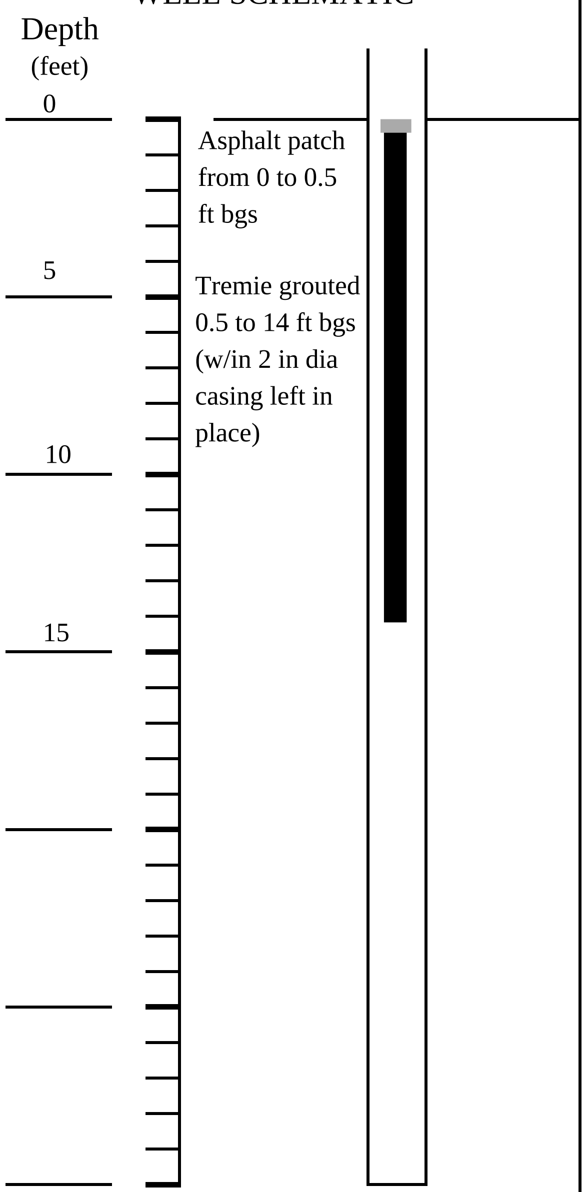
GROUTING

Interval grouted (FBLS)	0.5-14 ft bgs
# of batches prepared	2

For each batch record:

Quantity of water used (gal.)	10
Quantity of cement used (lbs.)	100
Cement type	Portland
Quantity of bentonite used (lbs.)	2
Quantity of calcium chloride used (lbs.)	NA
Volume of grout prepared (gal.)	20
Volume of grout used (gal.)	8

WELL SCHEMATIC*



Asphalt patch from 0 to 0.5 ft bgs

Tremie grouted 0.5 to 14 ft bgs (w/in 2 in dia casing left in place)

COMMENTS: ft bgs = feet below ground surface, in. = inches,
HSA = Hollow Stem Auger,
Grout remaining from MPI-13B abandonment was used to abandon ESI-5
NOTE - The well was not over-drilled or casing pulled due to potential of degrading the road

* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

Groundwater and Environmental Services, Inc. (GES)
Drilling Contractor

Will Welling - NYSDEC
Department Representative

FIGURE 3

WELL DECOMMISSIONING RECORD

Site Name: Mr. C's Dry Cleaners, NYSDEC Site No. 9-15-157	Well I.D.: MPI-8S
Site Location: East Aurora, NY	Driller: Jason Tojdowski
Drilling Co.: Quality Inspection Services, Inc.	Inspector: Nicole Jarzyniecki (GES)
	Date: 5-4-12

DECOMMISSIONING DATA
(Fill in all that apply)

OVERDRILLING

Interval Drilled	NA
Drilling Method(s)	NA
Borehole Dia. (in.)	NA
Temporary Casing Installed? (y/n)	NA
Depth temporary casing installed	NA
Casing type/dia. (in.)	NA
Method of installing	NA

CASING PULLING

Method employed	NA
Casing retrieved (feet)	NA
Casing type/dia. (in)	NA

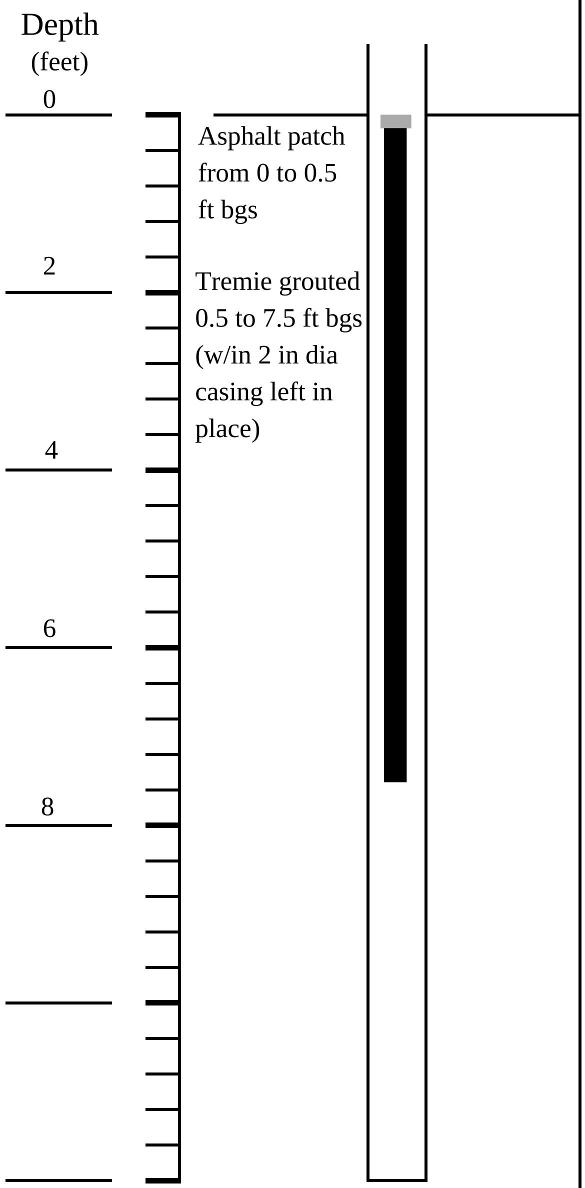
CASING PERFORATING

Equipment used	NA
Number of perforations/foot	NA
Size of perforations	NA
Interval perforated	NA

GROUTING

Interval grouted (FBLS)	0.5-7.5 ft bgs
# of batches prepared	1
For each batch record:	
Quantity of water used (gal.)	6
Quantity of cement used (lbs.)	50
Cement type	Portland
Quantity of bentonite used (lbs.)	2
Quantity of calcium chloride used (lbs.)	NA
Volume of grout prepared (gal.)	8
Volume of grout used (gal.)	1 1/4

WELL SCHEMATIC*



COMMENTS: ft bgs = feet below ground surface, in. = inches,
HSA = Hollow Stem Auger,
NOTE - The well was not over-drilled or casing pulled due to potential of degrading the road.

* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

Groundwater and Environmental Services, Inc. (GES)
Drilling Contractor

Will Welling - NYSDEC
Department Representative

G

Record Drawings for Off-Site SSDS

G1 – Record Drawings Prepared for the First Presbyterian Church as Part of the SSDS Installation Documentation

Seeler Engineering, P.C.

December 2, 2004

Ms. Linda Grimmer
Branch Manager
Op-Tech Environmental Services, Inc.
108 Sawyer Avenue
Tonawanda, New York 14150

Re: First Presbyterian Church, East Aurora, NY
Slab Ventilation System Documentation

Dear Linda:

Enclosed please find as-built documentation for the slab ventilation system installed at the First Presbyterian Church in East Aurora, New York. We have evaluated the system for conformance to design and installation guidelines for radon as outlined in the October 1993 USEPA document entitled "Radon Reduction Techniques for Existing Detached Houses – Technical Guidance" (EPA/625/R-93/011). The system as installed is in general conformance with the guidelines with two exceptions. The system does not contain a mechanism for alerting system operators of system failure (primarily loss of air flow) and the system is not labeled in a way that would help avoid inadvertent alterations to the system by future occupants.

While neither of these guidelines diminishes the effectiveness of the active system currently operating they are intended to assist in continued effective operation over a long term period.

Should you have any questions about the enclosed documentation, please do not hesitate to contact me at the number listed below or by email at timseeler@seelerengineering.com .

Very truly yours,
Seeler Engineering, P.C.
Tim A. Seeler
Tim A. Seeler, P.E.
Principal

w/enc.

15 FISHERS ROAD • SUITE 111 • PITTSFORD, NEW YORK 14534
FAX 585-248-9532 • PHONE 585-248-9520

SLAB VENTILATION SYSTEM
SYSTEM DOCUMENTATION REPORT
FIRST PRESBYTERIAN CHURCH
EAST AURORA, NEW YORK

PREPARED FOR:
OP-TECH ENVIRONMENTAL SERVICES, INC.
TONAWANDA, NEW YORK

DECEMBER 2004

TIM A. SEELER
058036

Seeler Engineering, P.C.

1. Introduction

On Monday November 1, 2004 Seeler Engineering, P.C. (Seeler) conducted a site visit to the First Presbyterian Church in East Aurora, New York for the purpose of preparing as-built documentation of the slab ventilation system installed by Op-Tech Environmental Services, Inc.. The system was designed by others. An as-built drawing is included in this report as Drawing Number 1. Photographs of the system as installed are included as Appendix A. The visit was also conducted for the purpose of determining if the system had been constructed in general conformance to guidelines established in the Technical Guidance Manual dated October 1993 and entitled "Radon Reduction Techniques for Existing Detached Houses" prepared by the USEPA Office of Research & Development, Washington, DC, 20460 (EPA/625/R-93/011).

The system installed at the First Presbyterian Church is characterized as an Active Sub Slab Depressurization (SSD) System. Applicable design and installation criteria are found in Section 4 of the above referenced USEPA document. System components as installed were observed and compared to the key criteria for such a system as established by the guidance document. A discussion of Seeler's observations is presented in the following section.

SECTION 2
SYSTEM OBSERVATIONS

2.1 Selection of the Number of Suction Pipes (Section 4.1)

Selection of the number of suction pipes for a given system is performance based given the nature of the existing structure(s) within which the system is to operate. Seeler Engineering, P.C. was not asked to review basis of design information and make an assessment of the adequacy of the system as installed. It should be noted that eleven suction pipes (points) have been installed in three separate piping systems. These points appear to be distributed effectively throughout the building space. Ongoing monitoring of the parameters of concern, however, will determine the effectiveness of the design.

2.2 Selection of Suction Pipe Location (Section 4.2)

Selection of the location of the suction pipe is also performance based. Comments made in Section 2.1 are applicable to the selection of pipe location as well.

2.3 Selection of Suction Pipe Type and Diameter (Section 4.3)

The system is constructed of 4 inch diameter rigid, non-perforated PVC with cemented joints and is consistent with the guidelines.

2.4 Selection of Suction Fan (Section 4.4)

A suction fan is installed on each of the three piping systems. The fans are all identical and manufactured by Air Movement Group, Ltd. (Model AMGEAGLE). All units are mounted outside and were operating quietly. These fans are intended for outdoor use. Design criteria were not available however pressure manometers installed in each system indicated the fans had developed adequate vacuum within the system. The fans therefore conform to the guidelines.

2.5 Installation of Suction Pipes Beneath the Slab (Section 4.5)

Each suction pipe floor penetration is carefully saw-cut to allow a good fit by the suction pipe. A urethane calk has been carefully applied between the pipe and the floor penetration to provide an effective seal. The excavation of the pit below the slab was not observed. On the basis of the observations made however, the pipes appear to conform to the guidelines.

2.6 Design/Installation of Piping Network and Fan (Section 4.6)

All pipe and fittings are compatible. The piping systems are sound and effectively supported at acceptable intervals by pipe straps securely anchored to the building structure. Horizontal runs of piping are sloped to allow for drainage of condensate to beneath the slab at the points of the floor penetrations. All three fans are installed outdoors near grade. The fans are connected to system piping using tightly clamped flexible connections. Discharge piping is piped to run tightly against the exterior wall of the building and contains a sample port two feet above the fan. The fan and piping are not insulated. Piping is not labeled, however, to determine if the pipe is rated for outdoor use (UV exposure). The pipe discharges approximately 2 to 3 feet above the eve. No rain cap or bird/insect screens are installed. The systems were operating at the time of the visit. Each of the three systems operated silently and without vibration. The systems as installed conform, in general, to the guidelines however Op-Tech may wish to consider installing a rain cap and bird/insect screen on the discharge piping to prevent excess condensate or insects from entering the pipe and restricting air flow.

2.7 Slab Sealing in Conjunction with SSD (Section 4.7)

Floor coverings throughout the building did not allow for observations of the integrity of the concrete slab to determine if the presence or absence of cracks or other openings would impact effective air flow through the building spaces. Most of the floors are covered with vinyl tile and are in excellent condition. The installed flooring systems do provide a barrier. All floor penetrations observed (primarily system piping) were effectively sealed.

2.8 Gauges/Alarms and Labeling (Section 4.8)

A manometer is installed on each of the three pipe systems and is in conformance with guidelines. The manometer is located at the "end" of each system and is easily read. Guidance does recommend installation of alarms which would indicate that the system has stopped operating. Guidance also recommends that the system be labeled to prevent inadvertent alteration. These items should be considered. If systems are not practical, management practices should be put in place to accomplish the same objective.

Slab Ventilation System Documentation
Photograph Log for First Presbyterian Church
East Aurora, New York

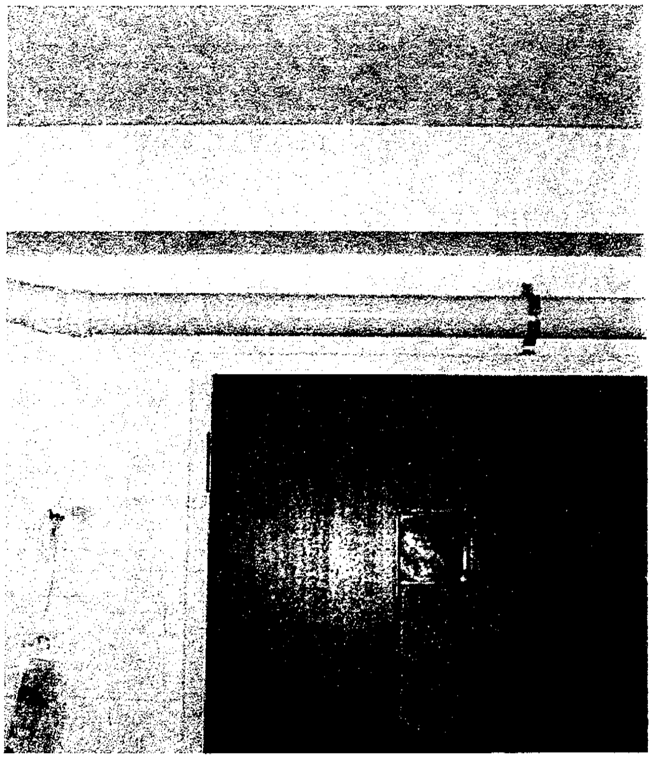
Picture	Location	Content
Picture 1-1	Room 111	South System P-2 to P-3
Picture 1-2	Room 111	South System P-2 to P-3
Picture 1-3	Room 111	South System P-3
Picture 1-4	Room 111	South System P-3
Picture 1-5	Hallway	South System P-3 to P-4
Picture 1-6	Hallway	South System P-3 to P-4
Picture 1-7	Preschool Office	South System P-4
Picture 1-8	Preschool Office	South System P-4
Picture 1-9	Room 112	South System Pipe Entrance to P-1
Picture 1-10	Room 112	South System P-1 to P-2
Picture 1-11	Room 112	South System P-1 to P-2
Picture 1-12	Room 112	South System P-1 to P-2
Picture 1-13	Room 112	South System P-1 to P-2
Picture 1-14	Room 112	South System P-1 to P-2
Picture 1-15	Room 112	South System P-2 to Penetration for P-3
Picture 1-16	Room 112	South System P-2
Picture 1-17	Room 111	South System P-1 to P-5
Picture 1-18	Room 111	South System P-1 to P-5

Picture	Location	Content
Picture 1-19	Room 111	South System P-5 to P-6
Picture 1-20	Room 111	South System P-5 to P-6
Picture 1-21	Room 111	South System P-5 to P-6
Picture 1-22	Room 111	South System P-6
Picture 1-23	Room 111	South System P-6
Picture 1-24	Room 114 Bathroom	East System Entrance Point
Picture 1-25	Room 114 Bathroom	East System Entrance to P-3
Picture 1-26	Room 114 Bathroom	East System Entrance to P-3
Picture 1-27	Room 114	East System Entrance to P-3
Picture 1-28	Room 114	East System Entrance to P-3
Picture 1-29	Room 114	East System Entrance to P-3
Picture 1-30	Room 114	East System P-3
Picture 1-31	Room 114	East System P-3
Picture 2-1	Room 114	East System P-3
Picture 2-2	Room 114 Bathroom	East System Entrance to P-2
Picture 2-3	Room 114	East System Entrance to P-2
Picture 2-4	Room 114	East System Entrance to P-2
Picture 2-5	Room 114	East System P-2
Picture 2-6	Room 114 Bathroom	East System Entrance to P-1
Picture 2-7	Room 114 Bathroom	East System Entrance to P-1
Picture 2-8	Room 113	East System Entrance to P-1
Picture 2-9	Room 113	East System Entrance to P-1

Picture	Location	Content
Picture 2-10	Room 113	East System Entrance to P-1
Picture 2-11	Room 113	East System P-1
Picture 2-12	Meeting Room	Original Structure Entrance to P-1
Picture 2-13	Meeting Room	Original Structure Entrance to P-1
Picture 2-14	Meeting Room	Original Structure P-1
Picture 2-15	Meeting Room	Original Structure P-1 to P-2
Picture 2-16	Meeting Room	Original Structure P-1 to P-2
Picture 2-17	Meeting Room	Original Structure P-2 Elbow
Picture 2-18	Meeting Room	Original Structure P-2
Picture 2-19	Meeting Room	Original Structure P-2
Picture 2-20	Exterior	South System Fan
Picture 2-21	Exterior	South System Fan
Picture 2-22	Exterior	South System Fan Label
Picture 2-23	Exterior	South System Effluent Pipe with Sample Port
Picture 2-24	Exterior	South System Effluent Pipe
Picture 2-25	Exterior	West System Fan
Picture 2-26	Exterior	West System Fan
Picture 2-27	Exterior	West System Fan Label
Picture 2-28	Exterior	West System Effluent Pipe with Sample Port
Picture 2-29	Exterior	West System Effluent Pipe
Picture 2-30	Exterior	Original Structure Fan

Picture	Location	Content
Picture 2-31	Exterior	Original Structure Effluent Pipe with Sample Port
Picture 3-1	Exterior	Original Structure System Effluent Pipe
Picture 3-2	Exterior	Original Structure System Effluent Pipe

SLAB VENTILATION SYSTEM



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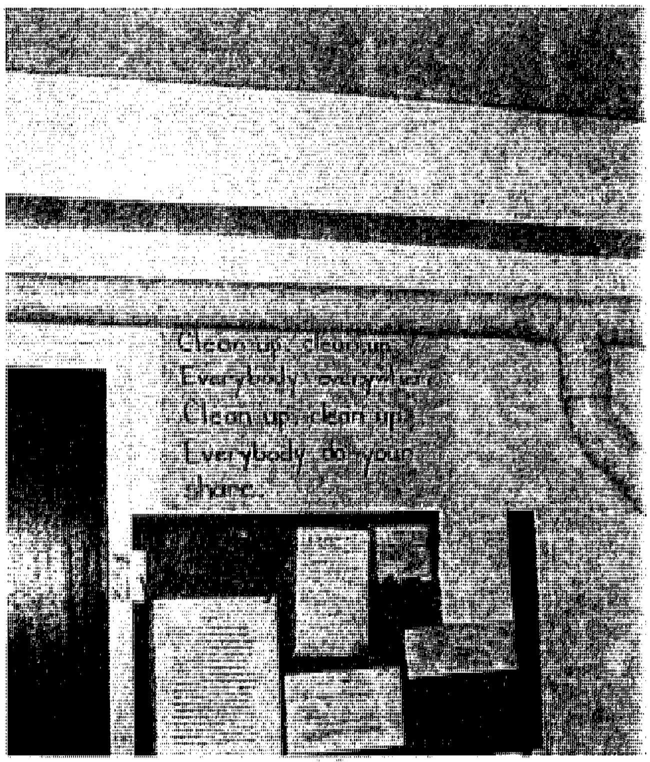

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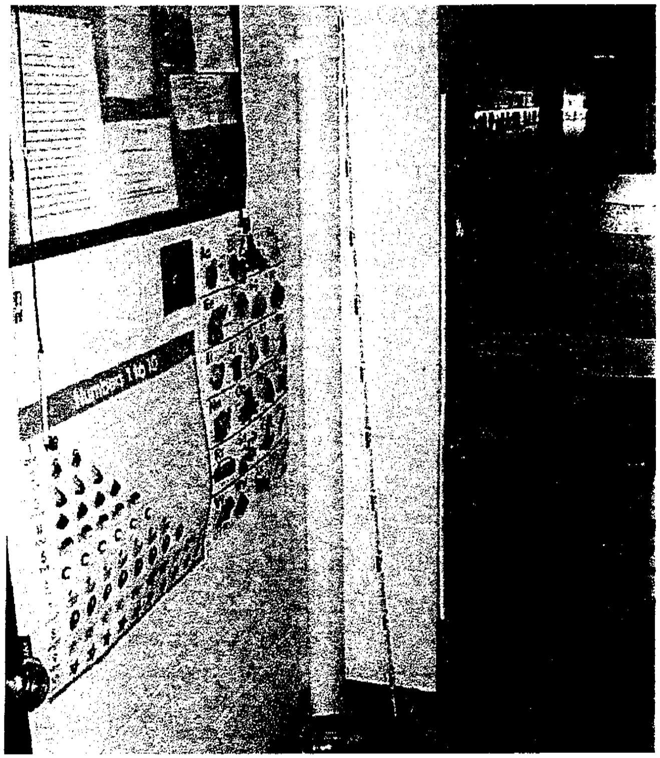

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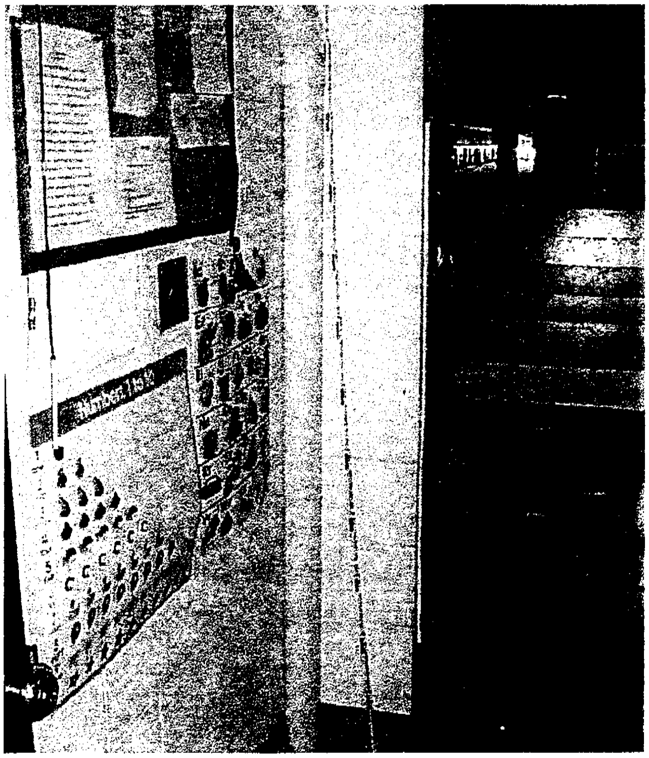
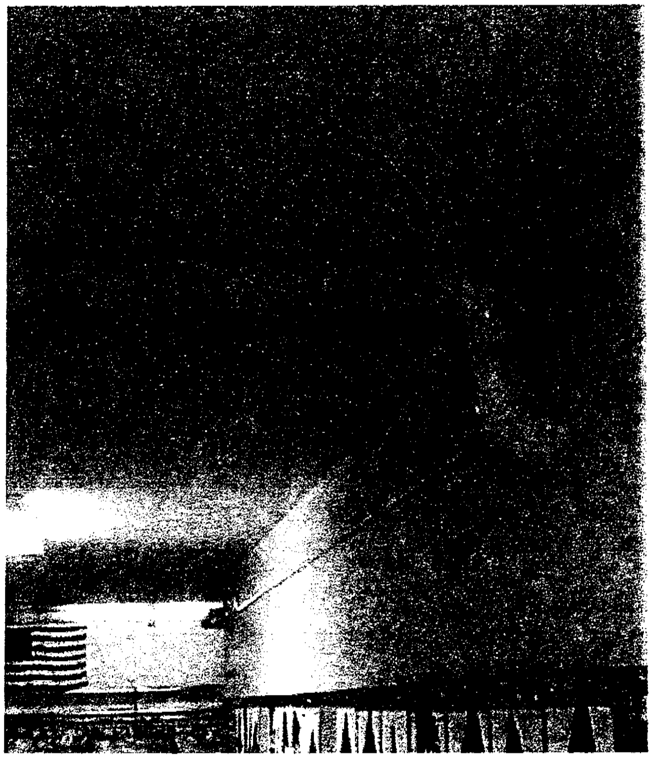


1-4

SLAB VENTILATION SYSTEM



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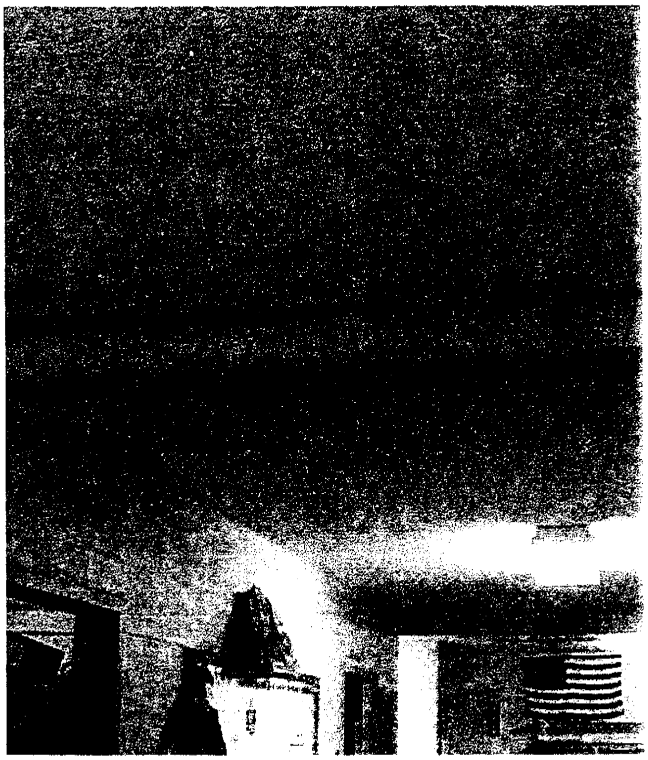

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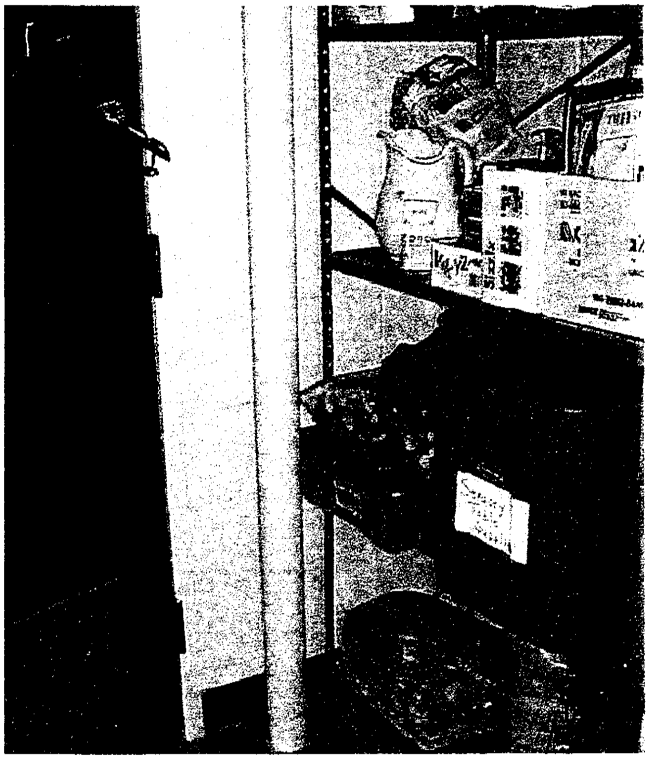

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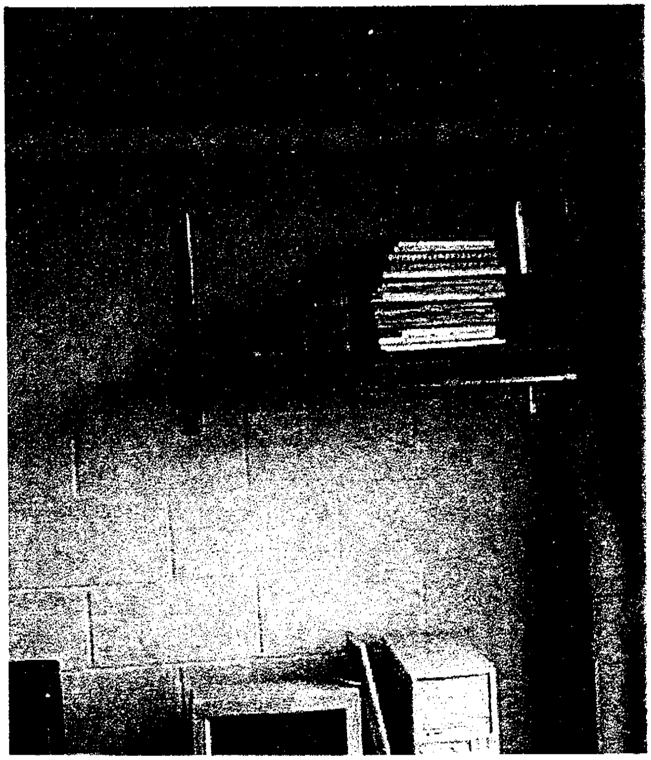
SLAB VENTILATION SYSTEM

1-9



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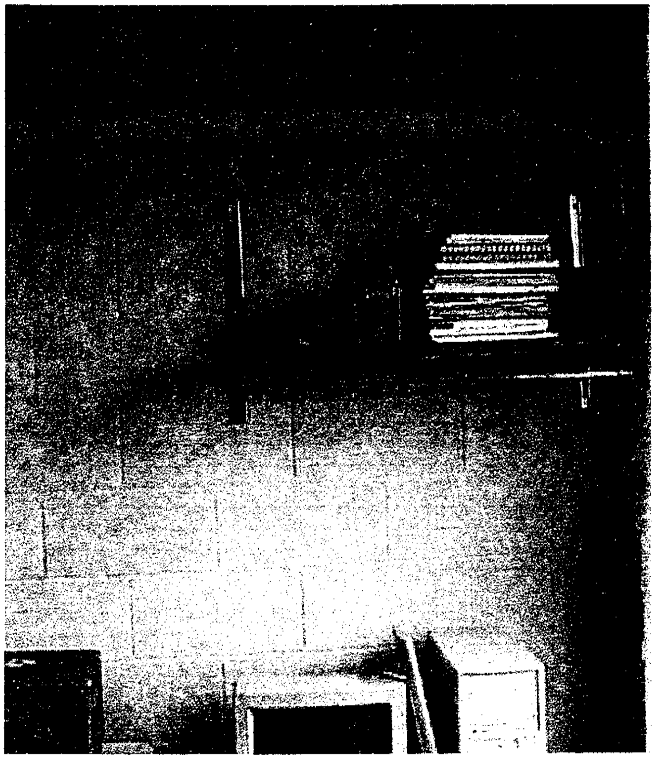

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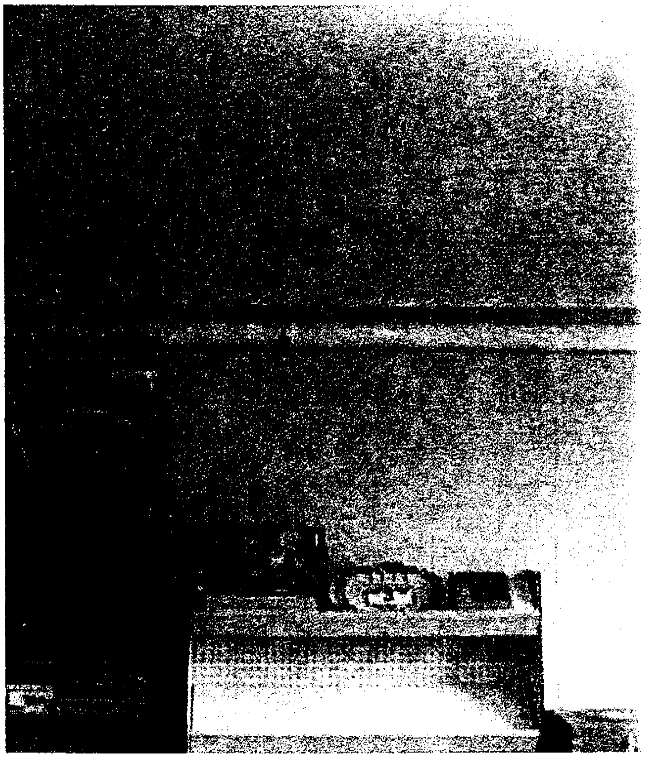

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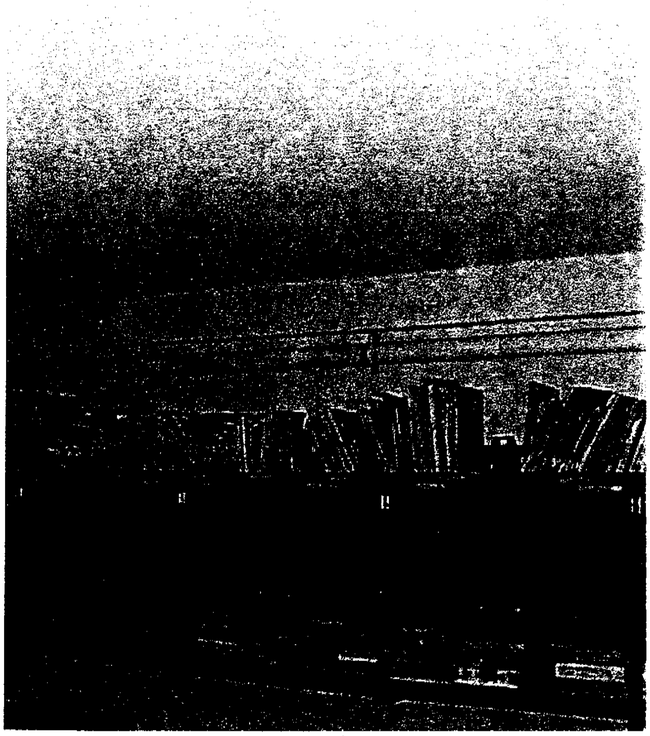
SLAB VENTILATION SYSTEM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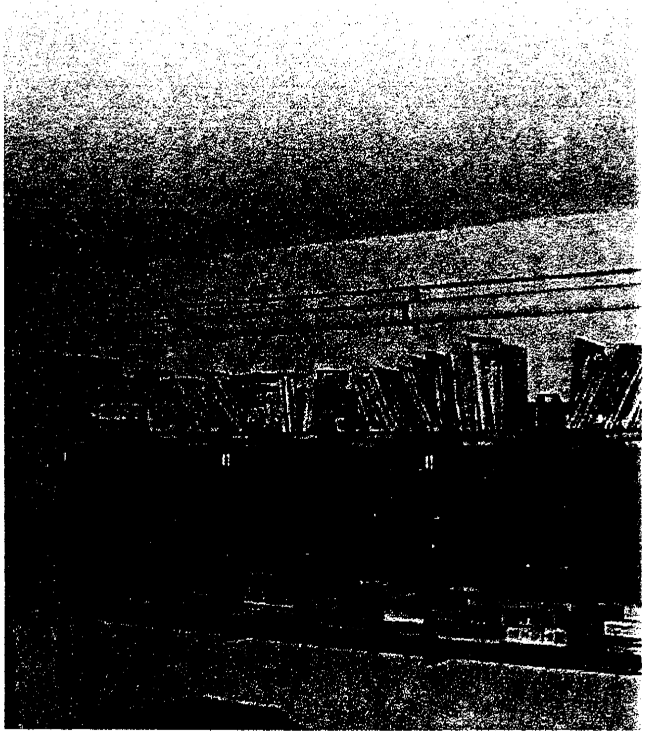
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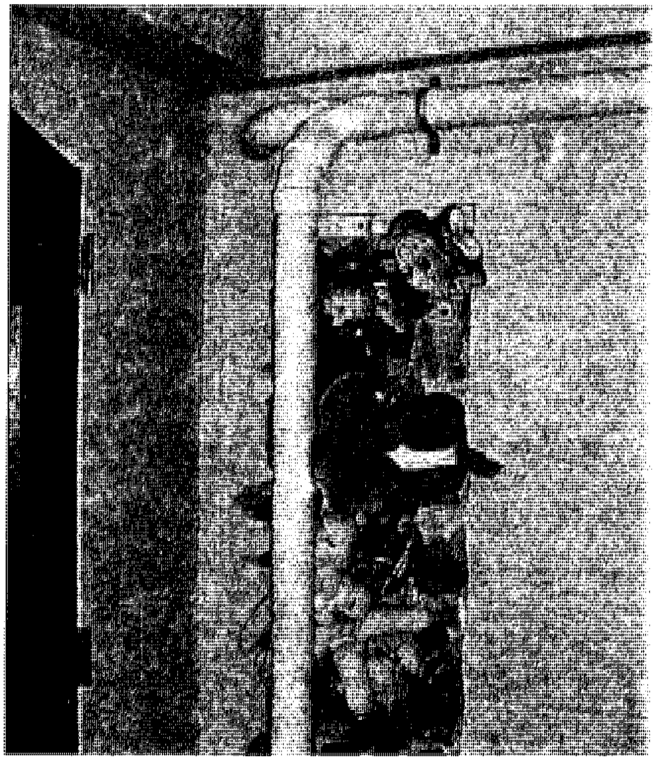
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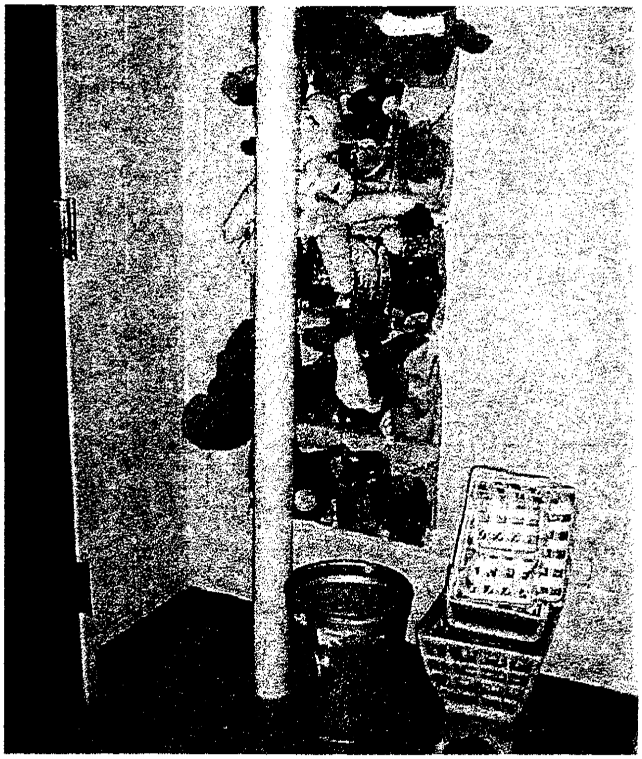
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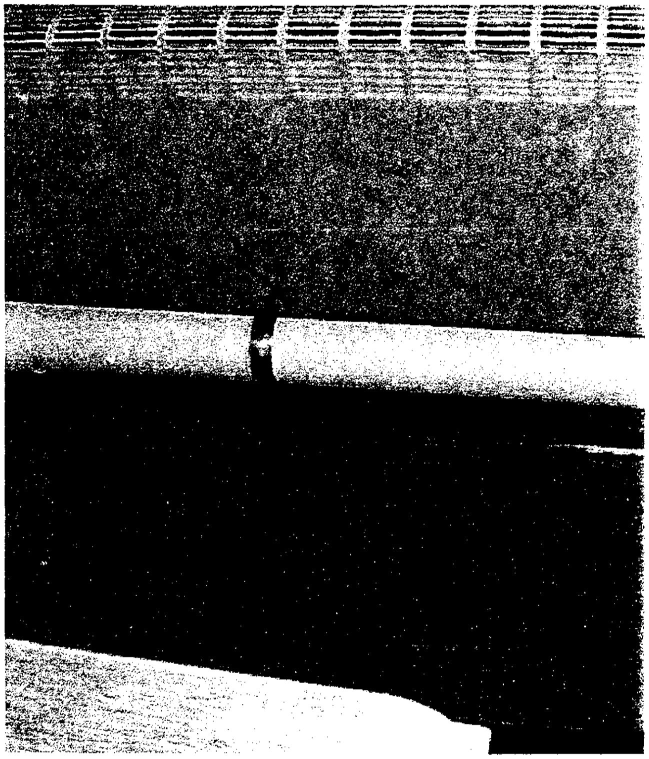
SLAB VENTILATION SYSTEM

1-17



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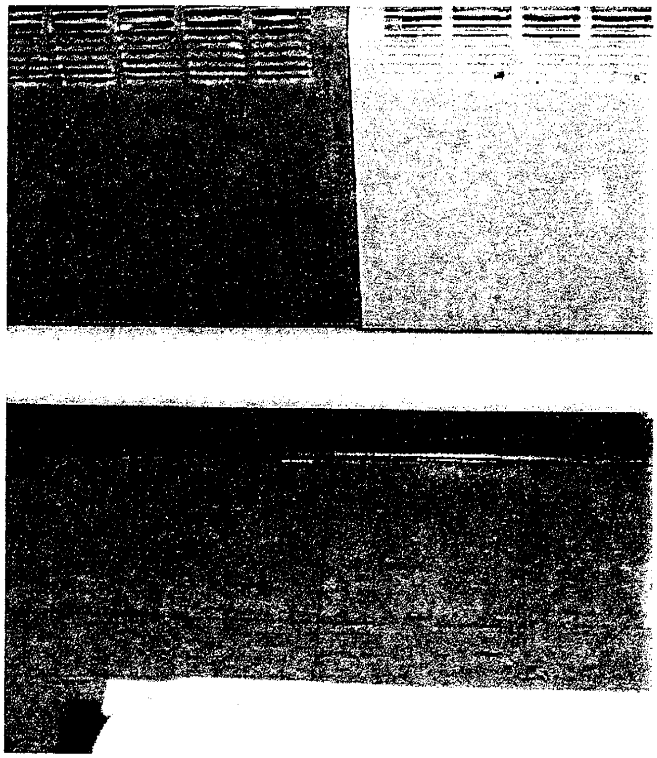

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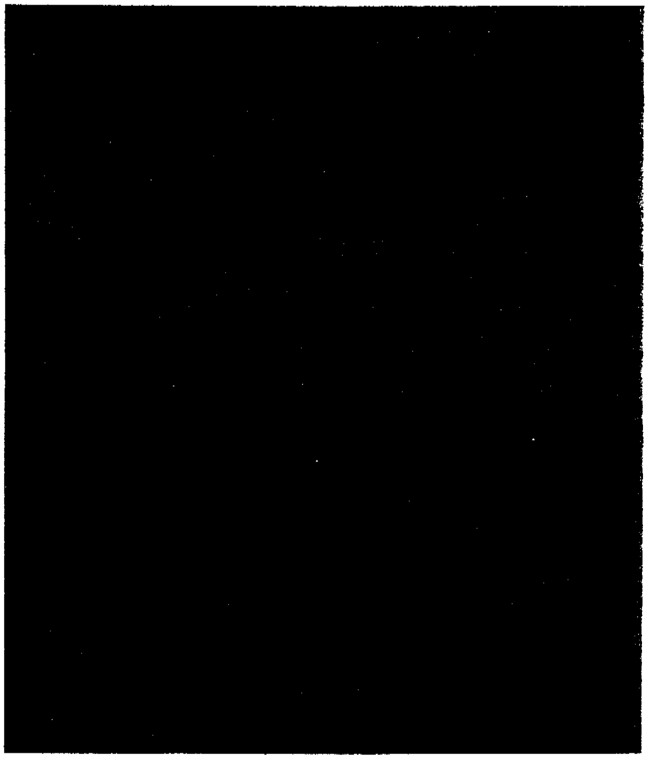

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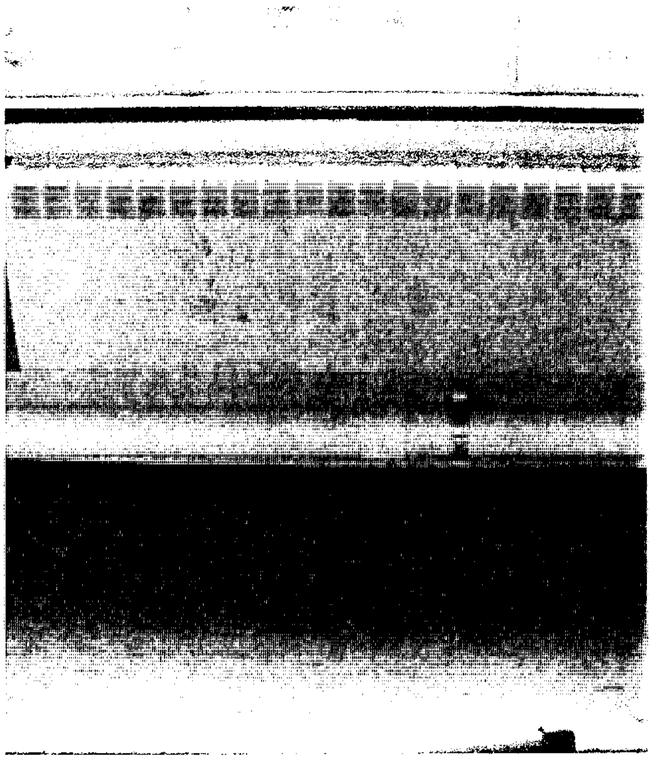
SLAB VENTILATION SYSTEM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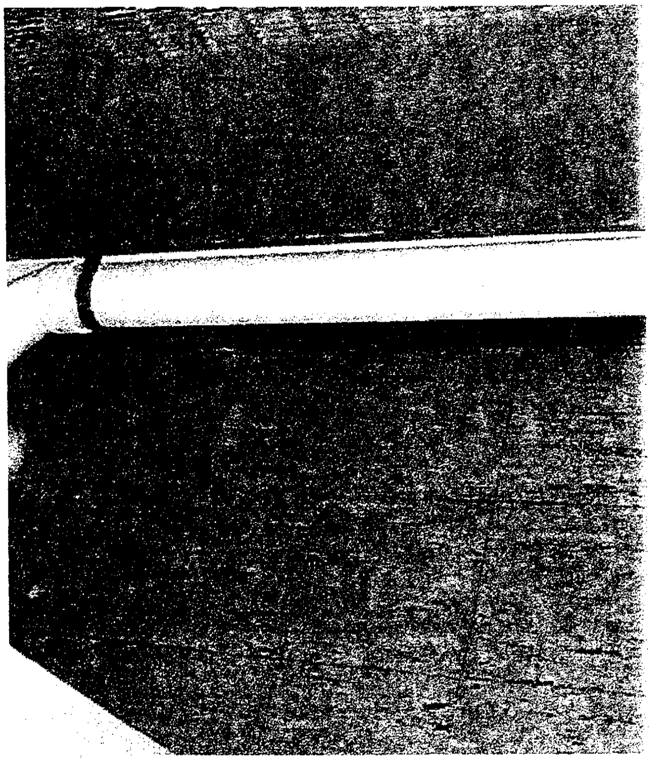
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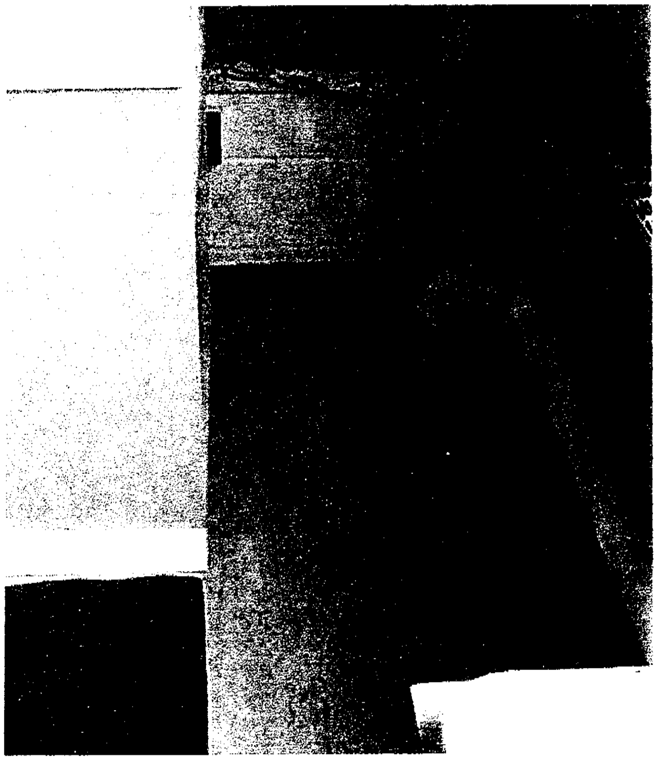
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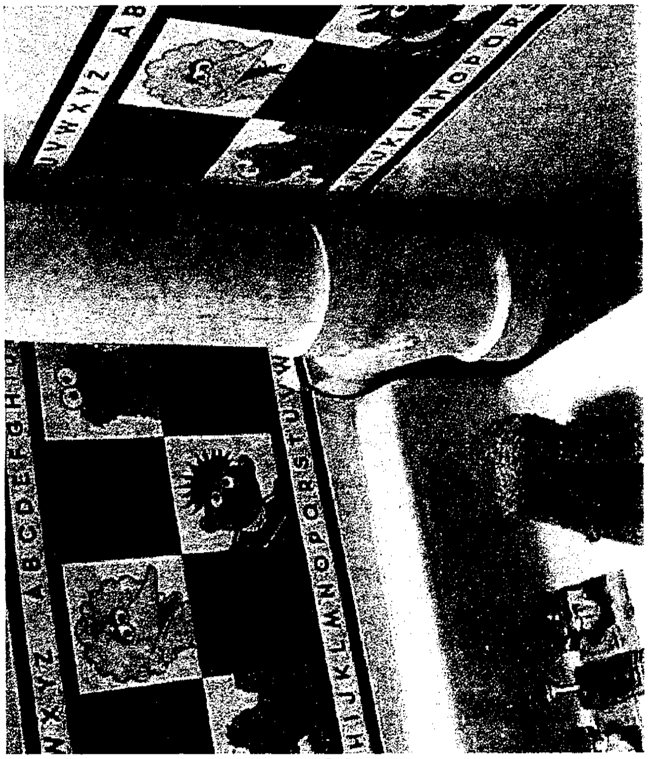

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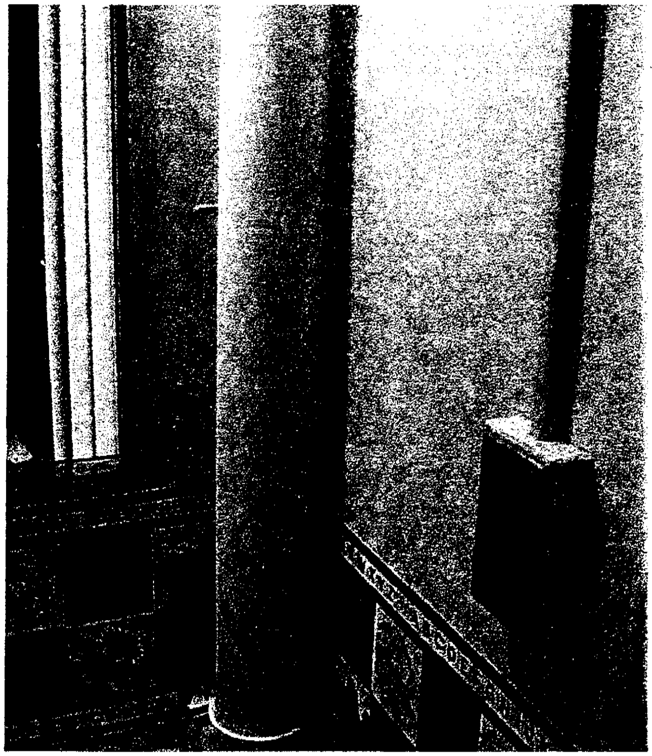
SLAB VENTILATION SYSTEM



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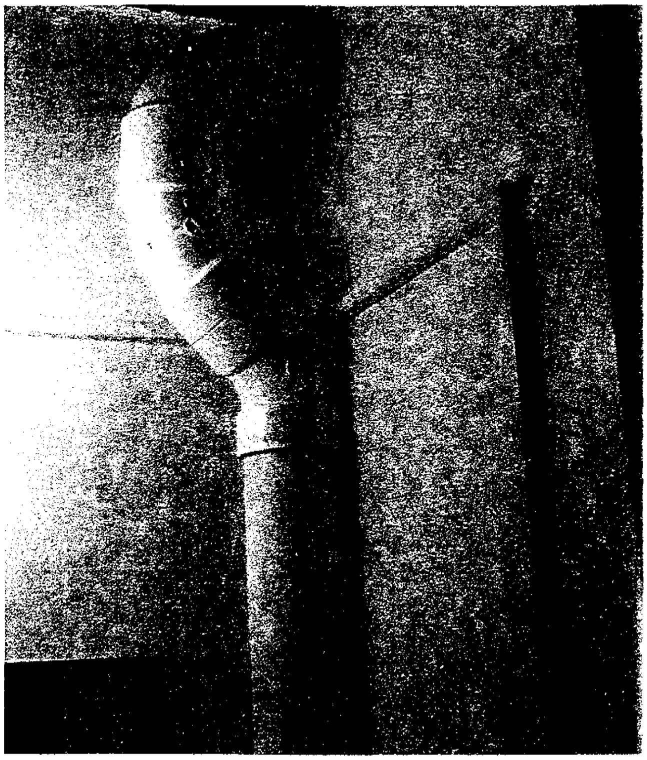

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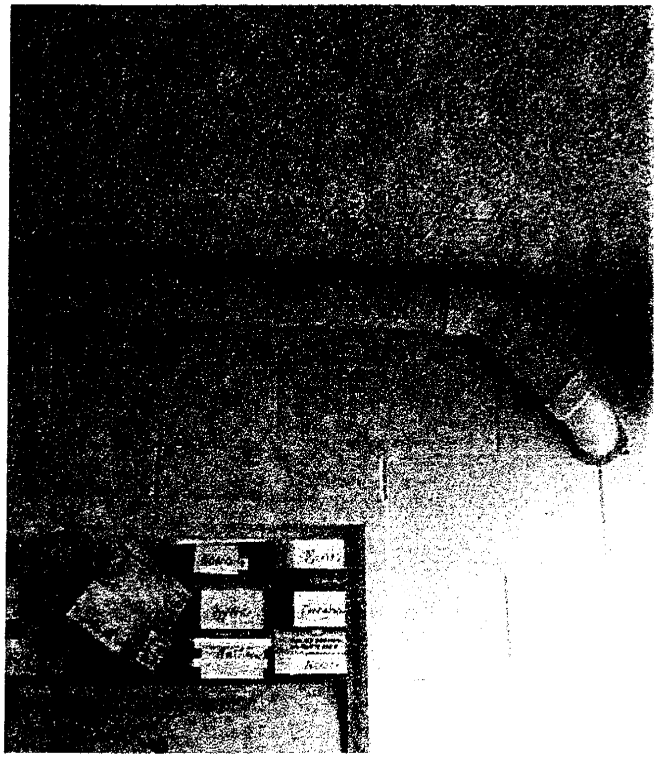

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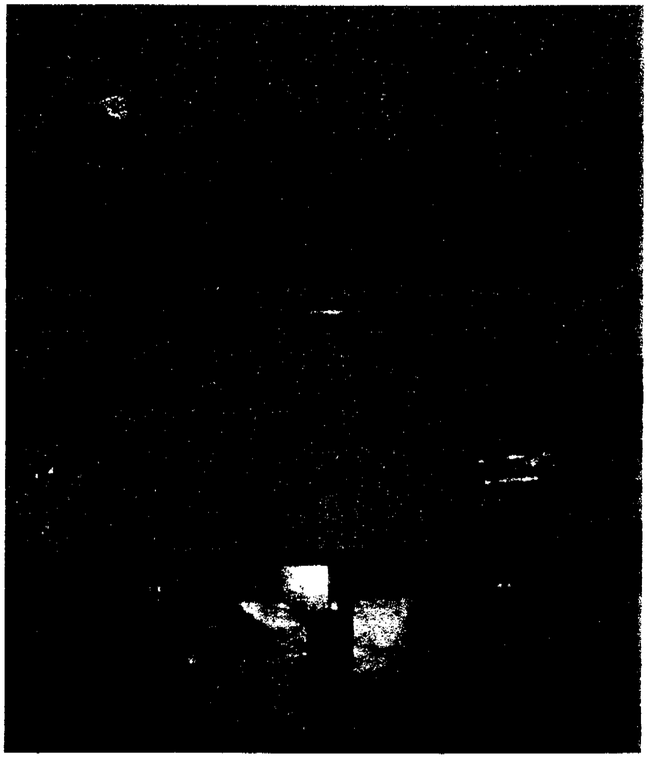

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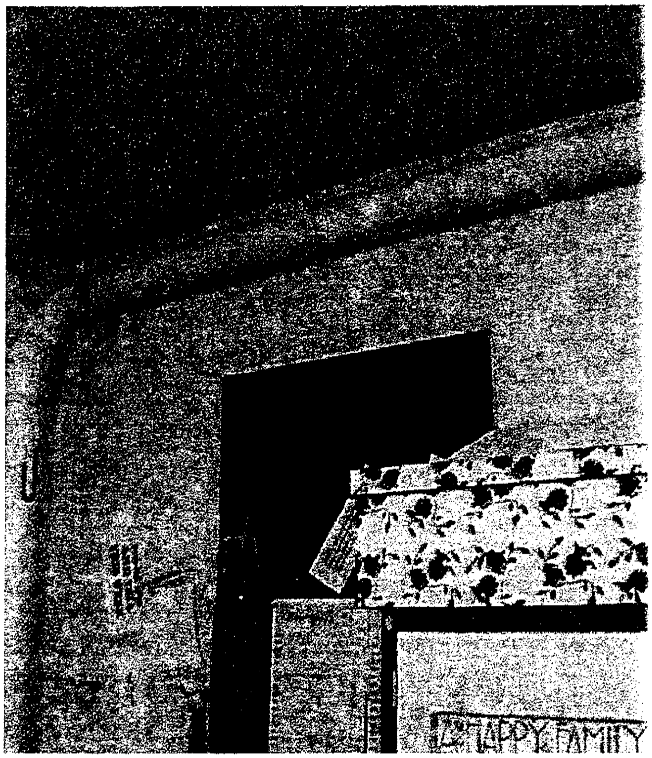
SLAB VENTILATION SYSTEM



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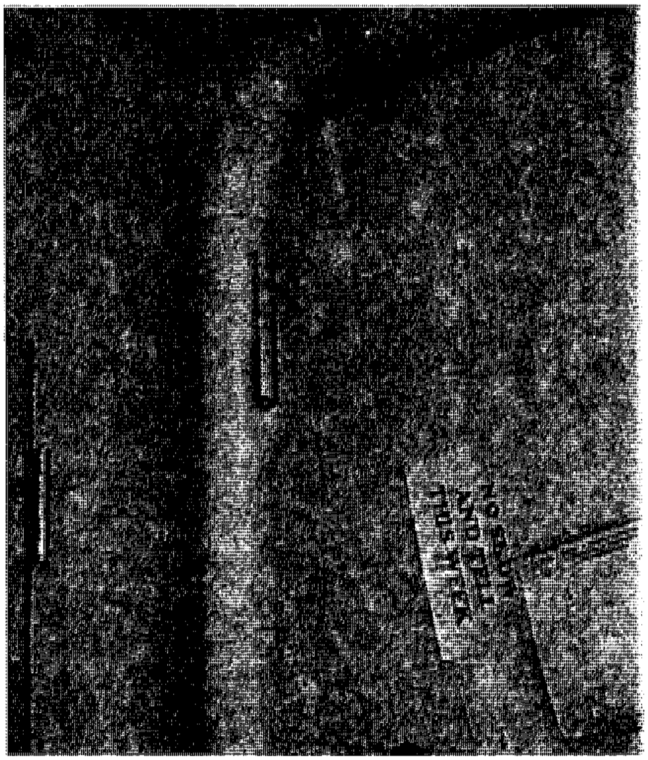

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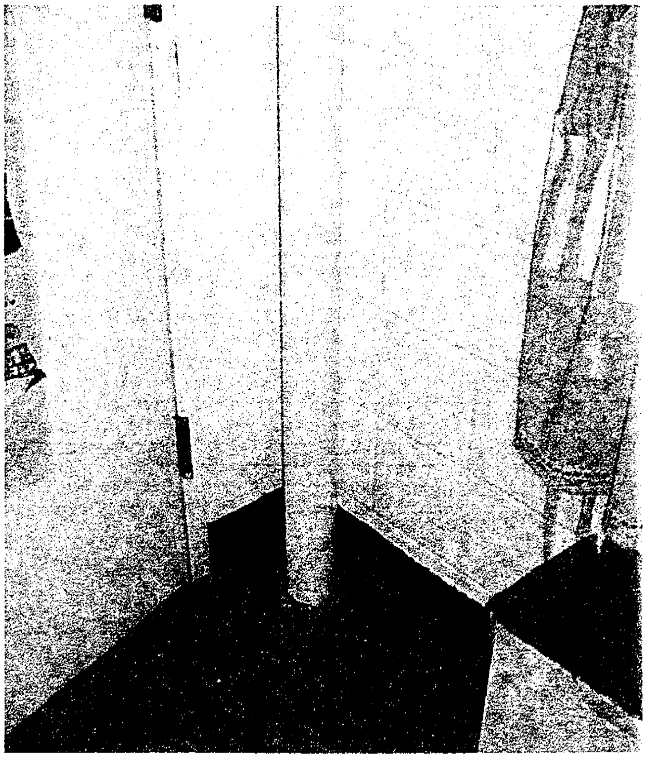

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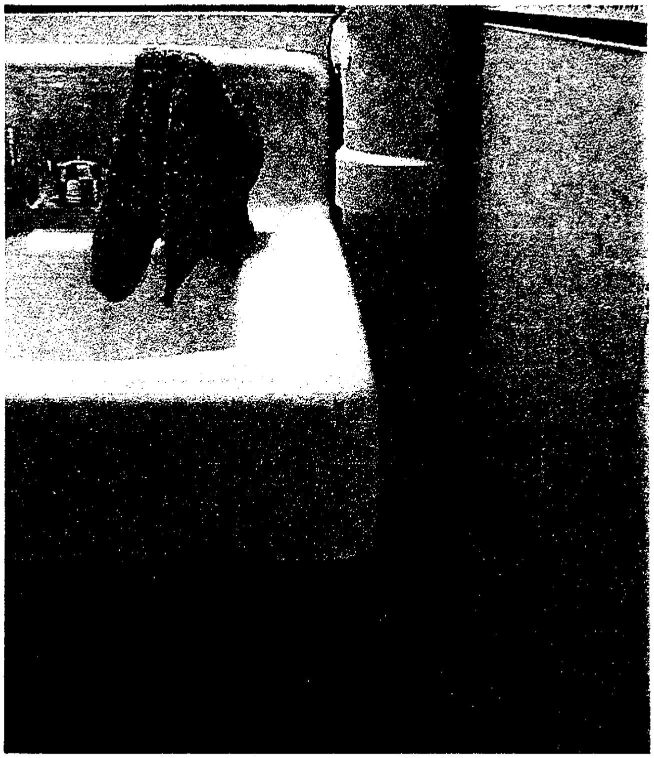

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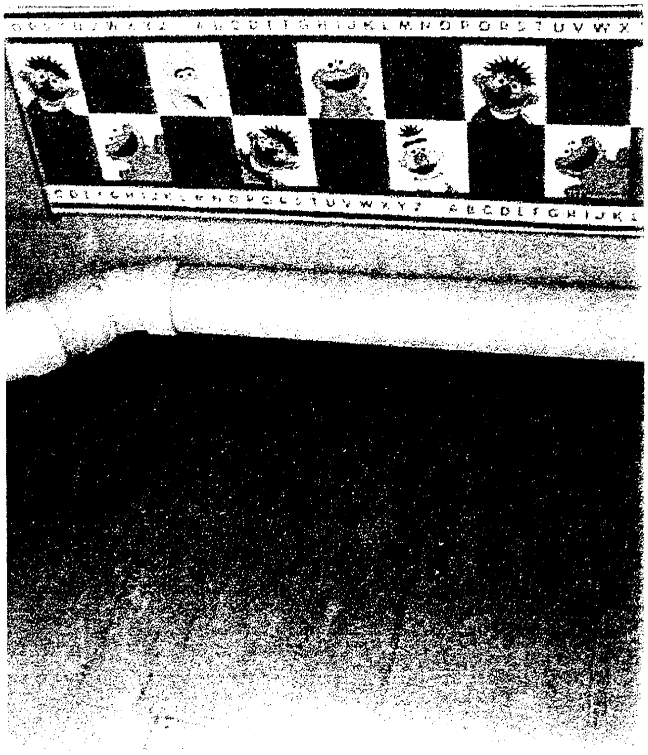

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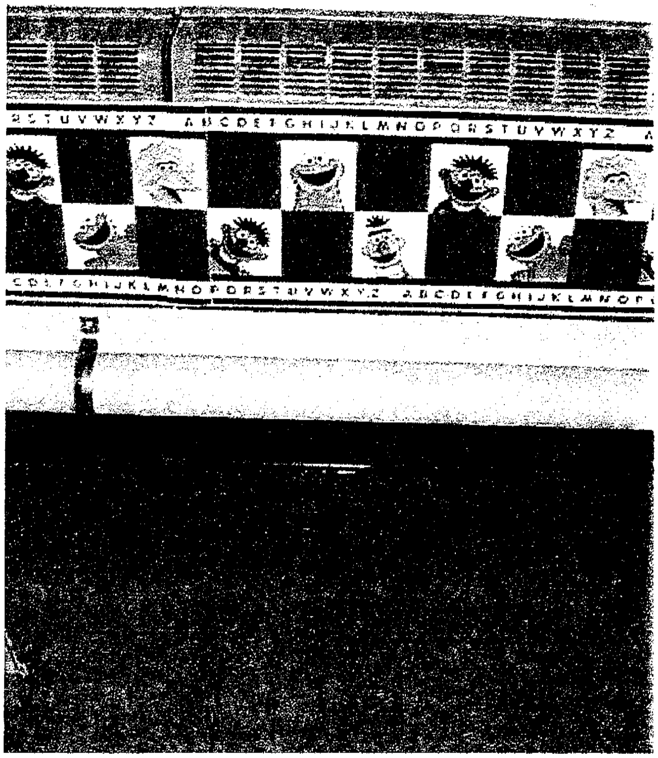

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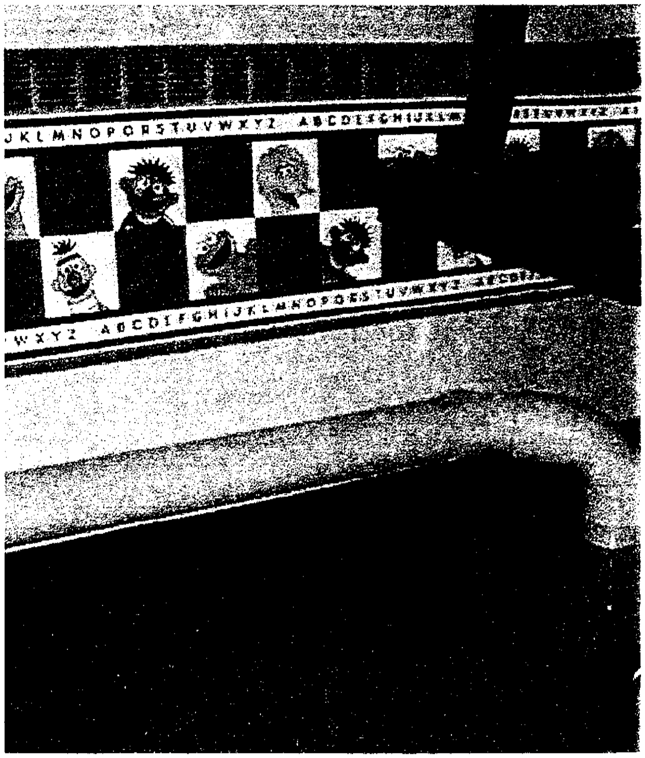

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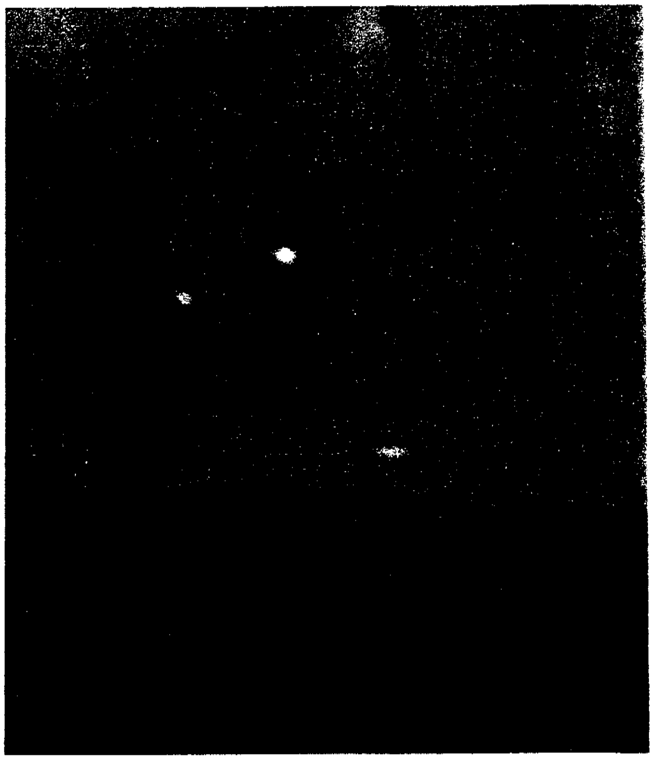

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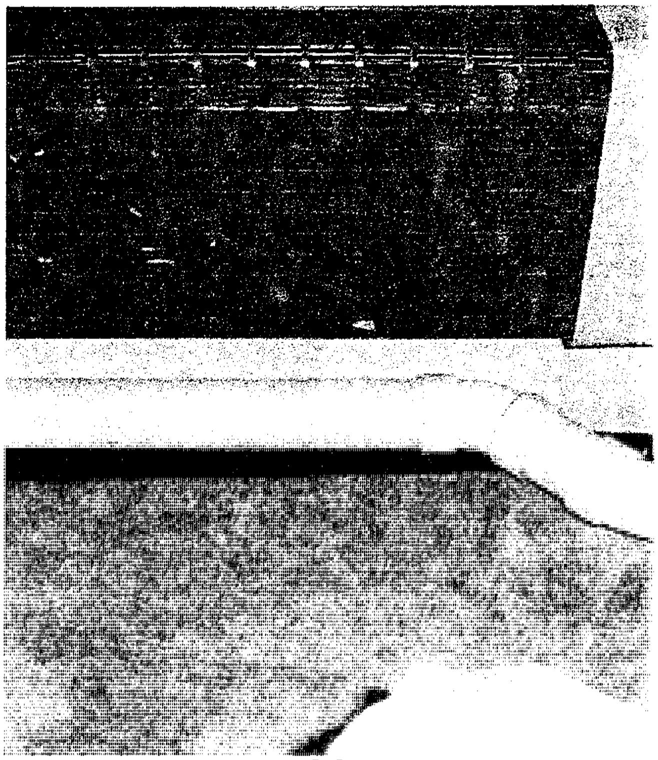

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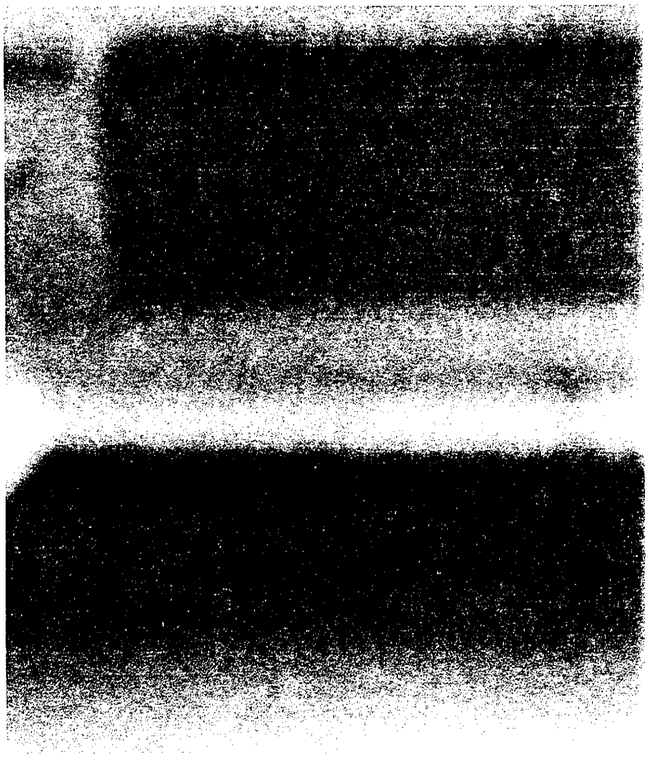

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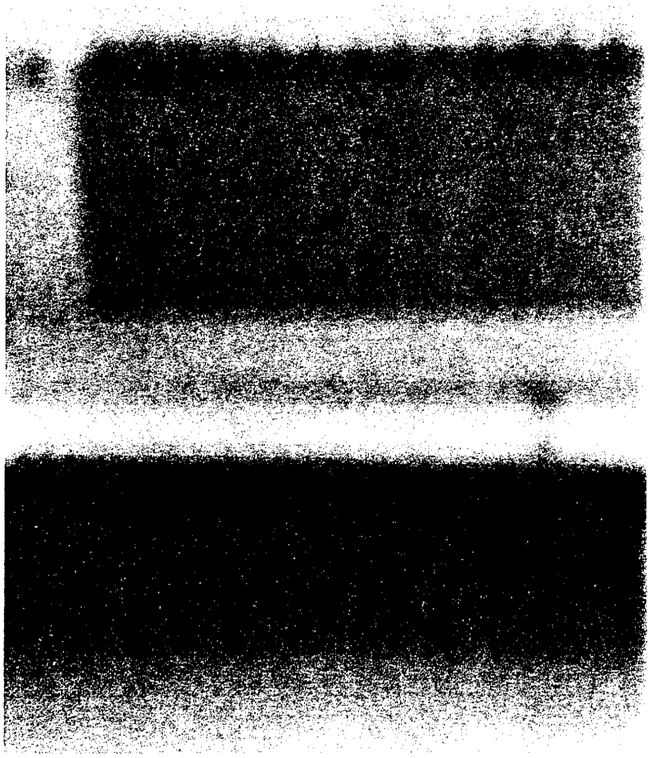

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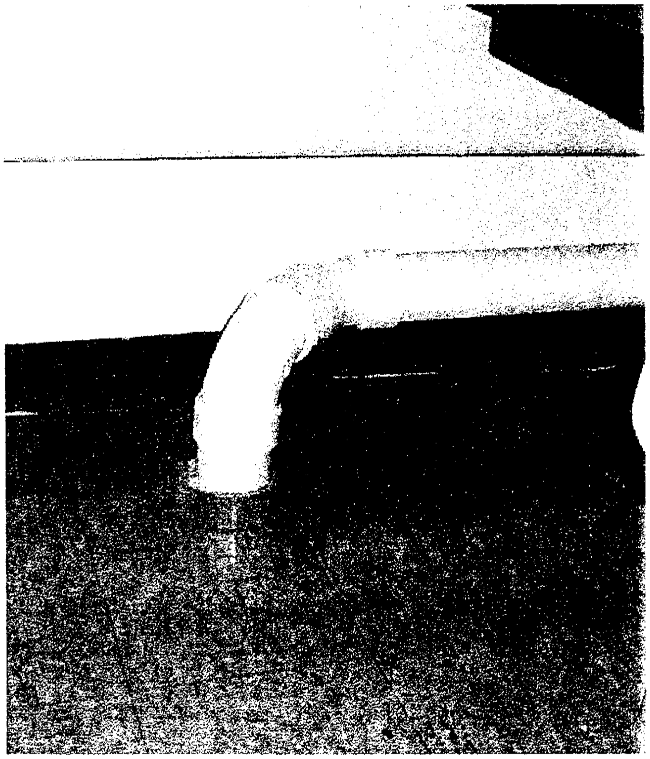

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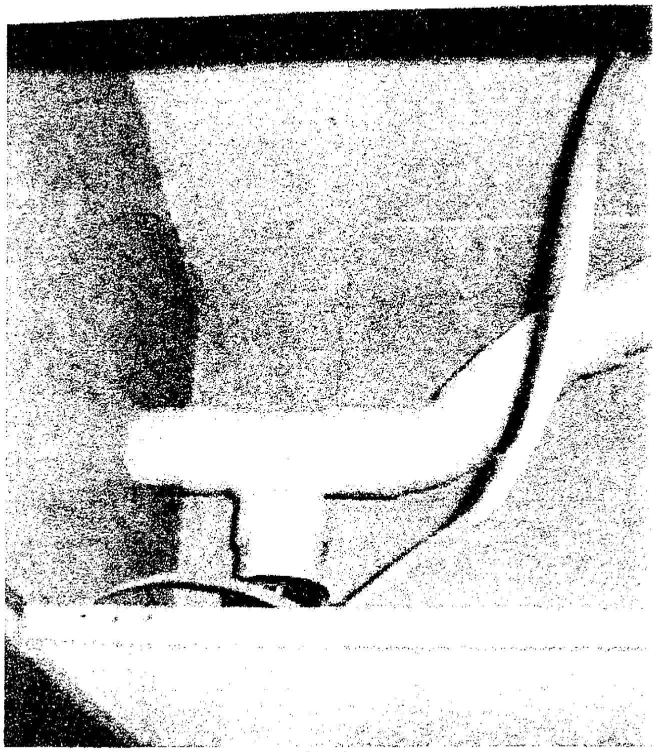

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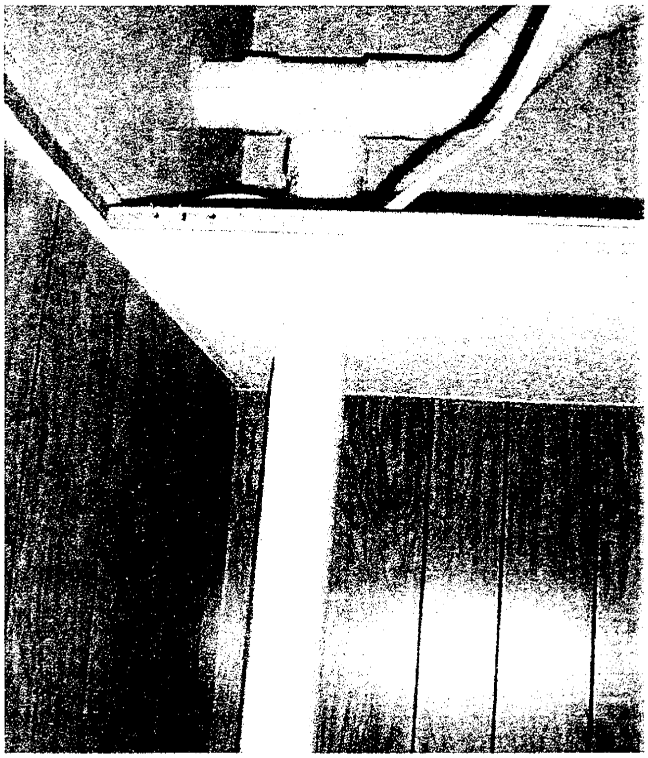

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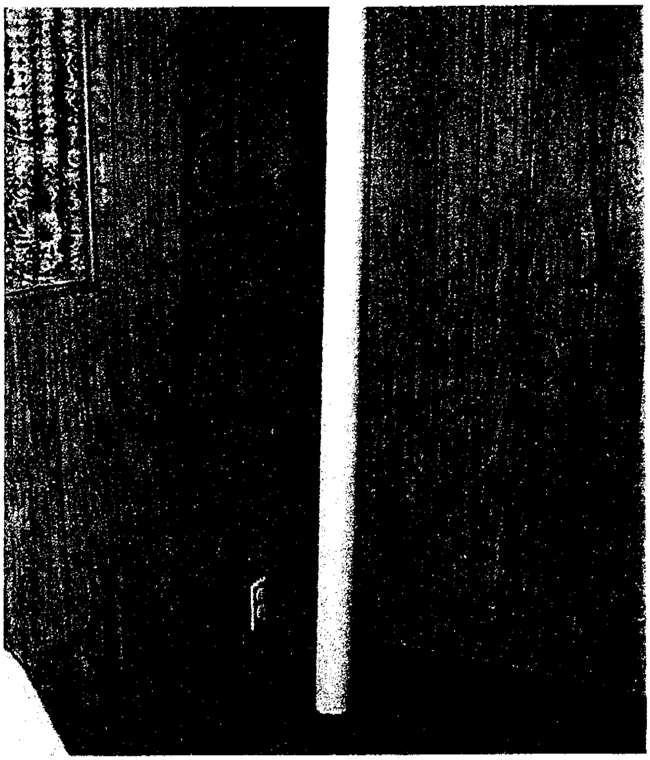

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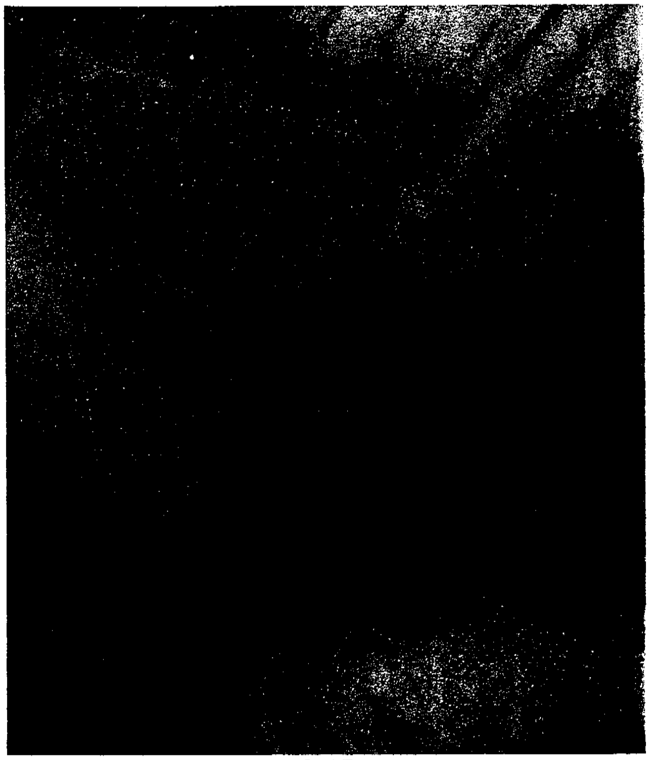

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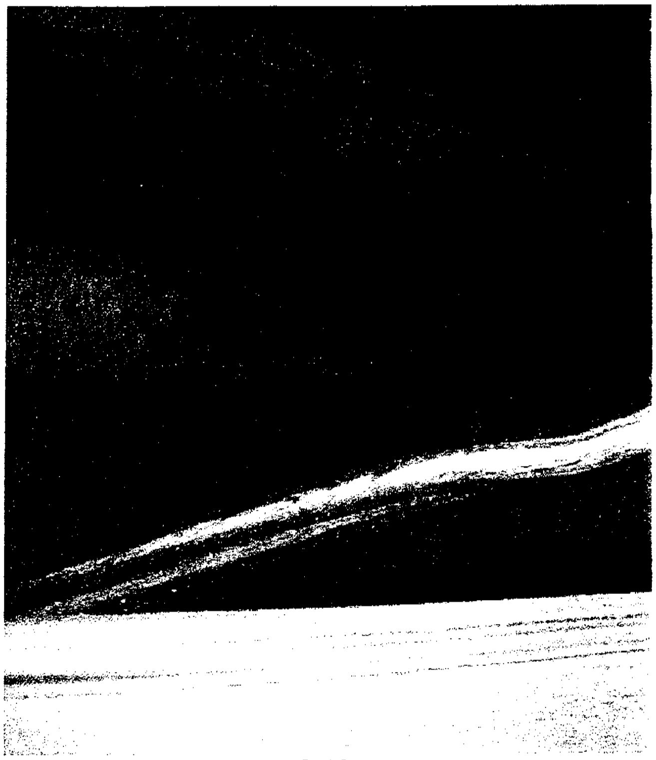

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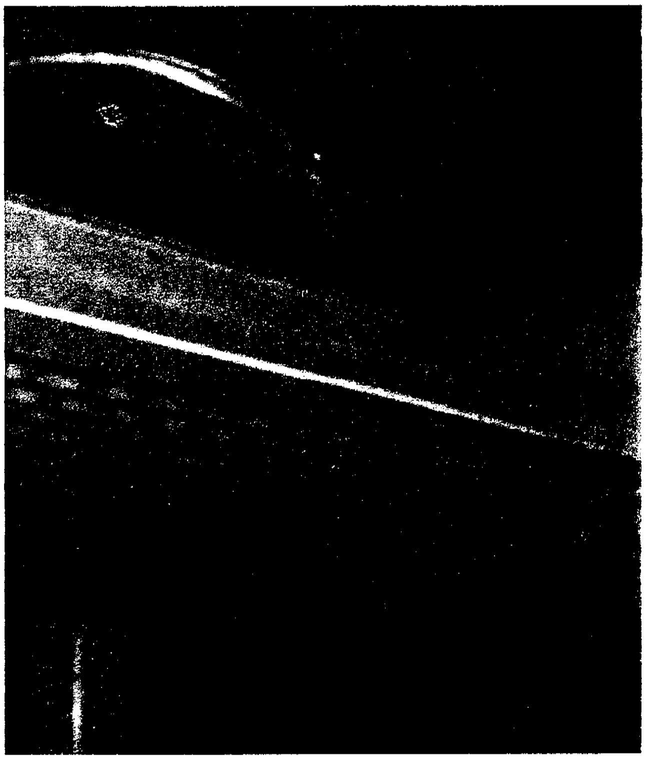

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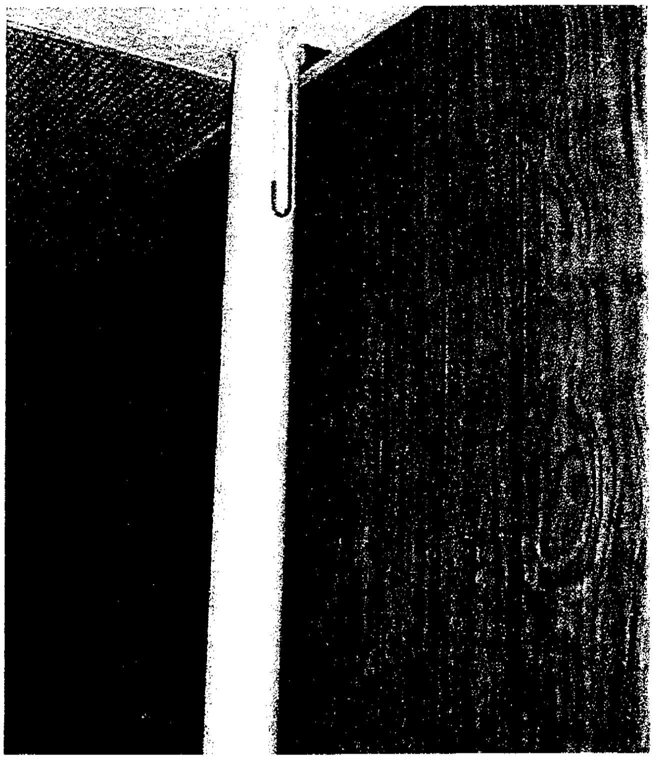
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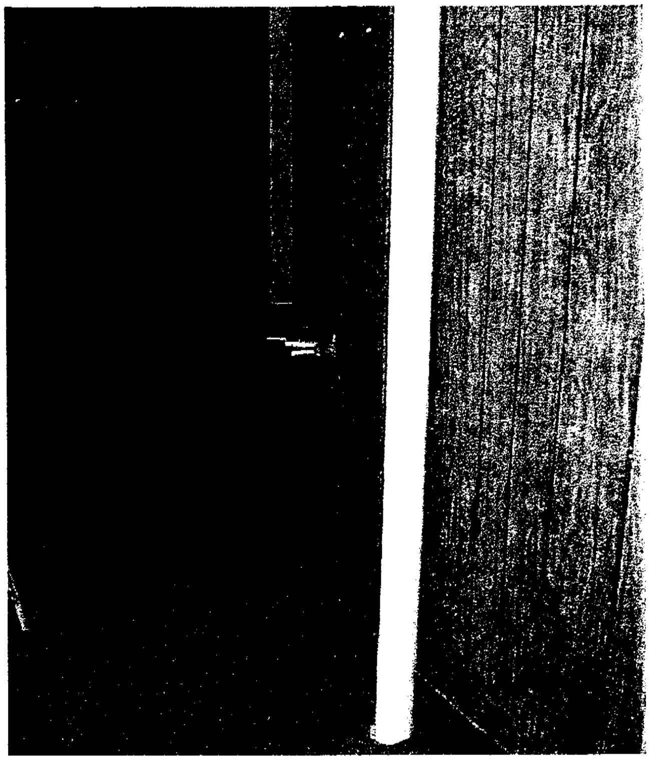
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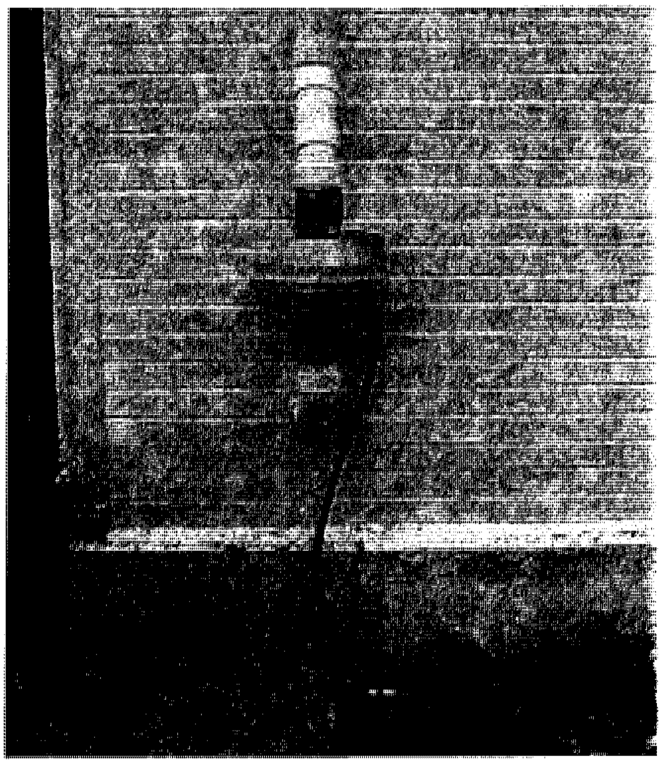
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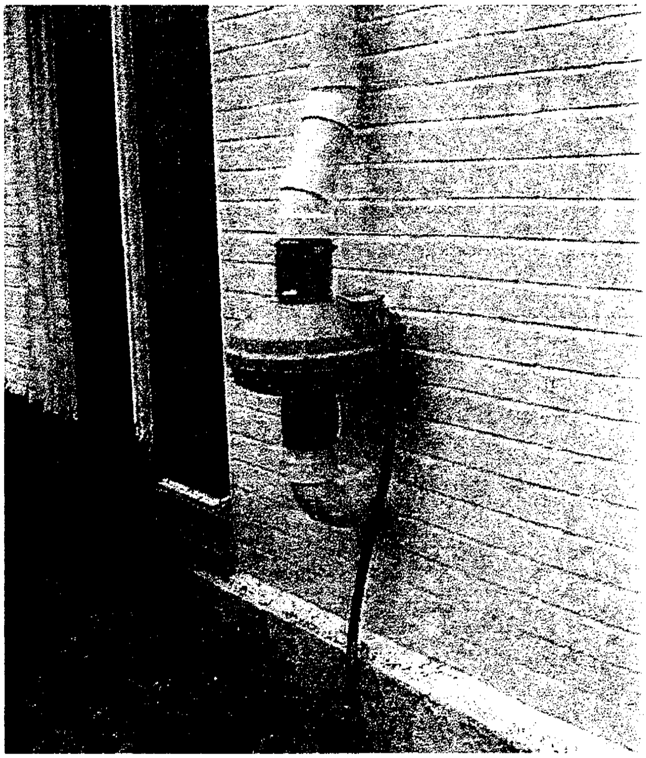
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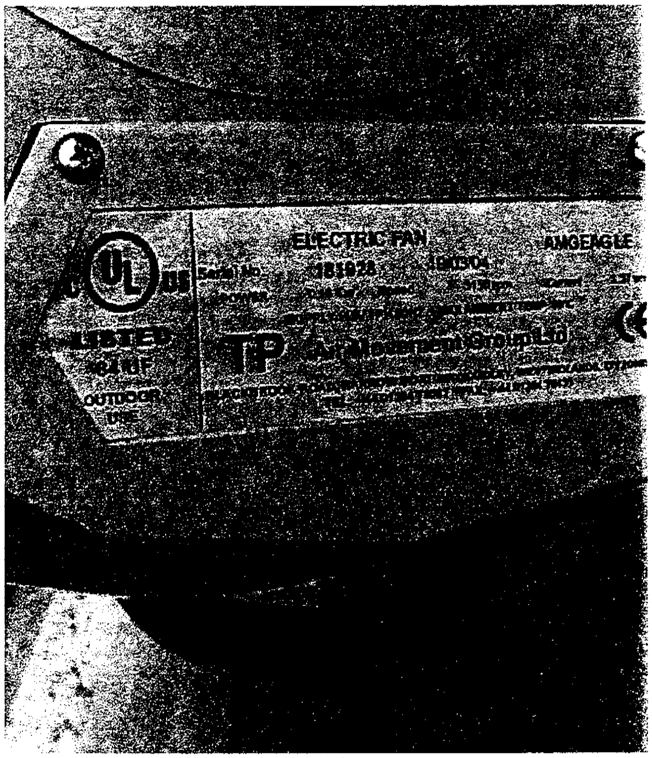
SLAB VENTILATION SYSTEM



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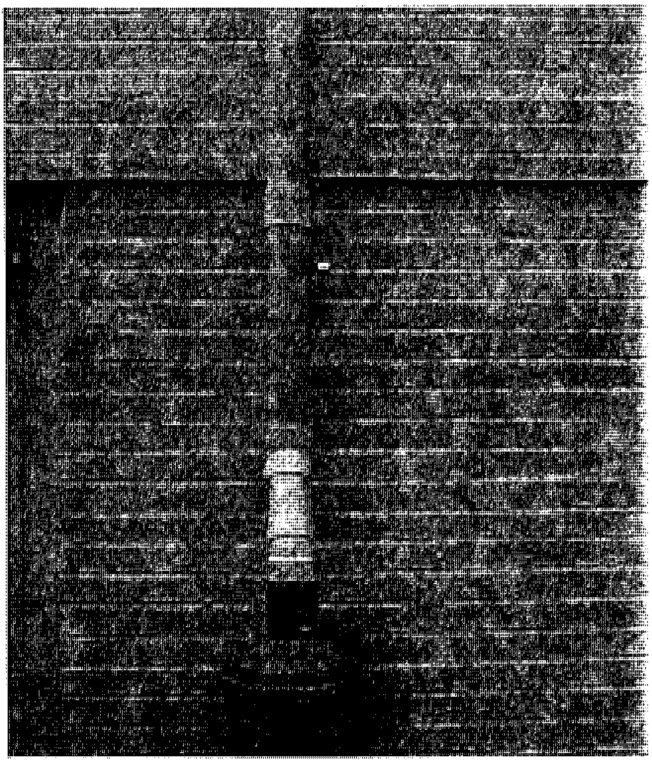

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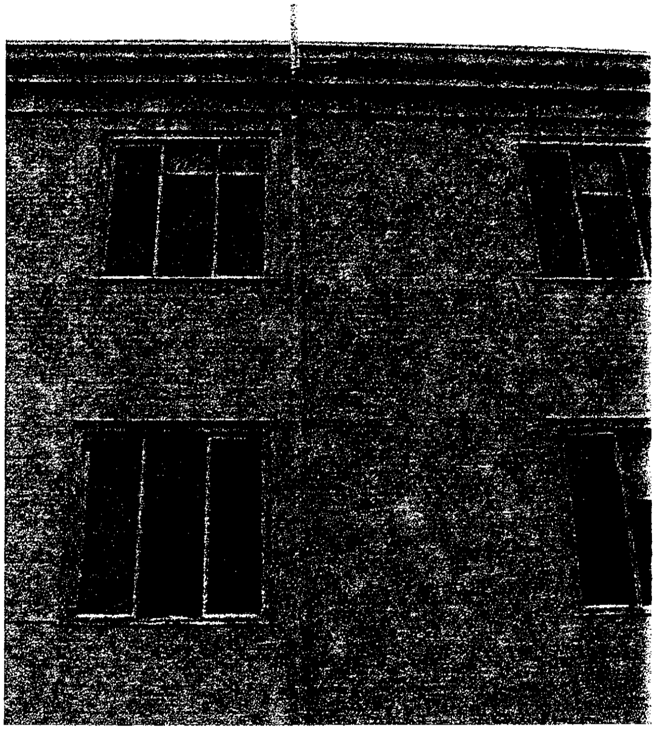

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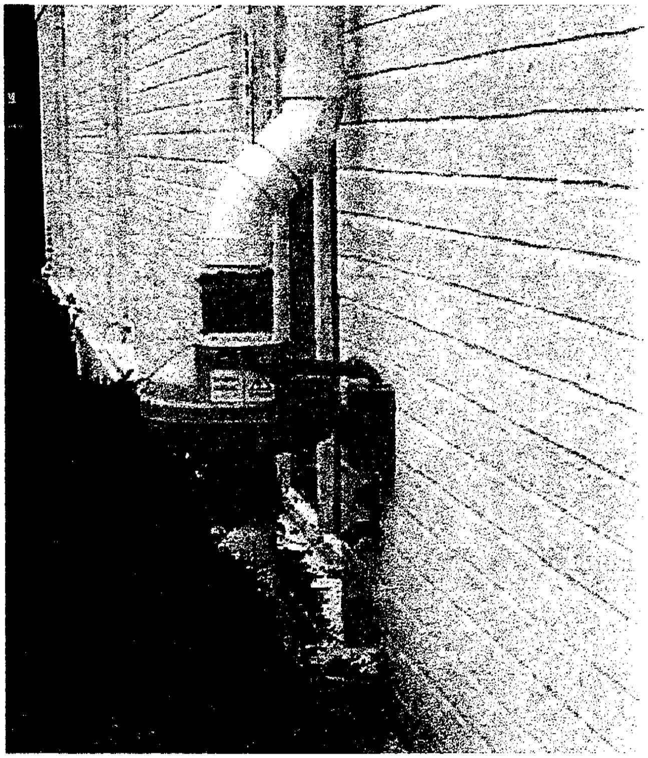

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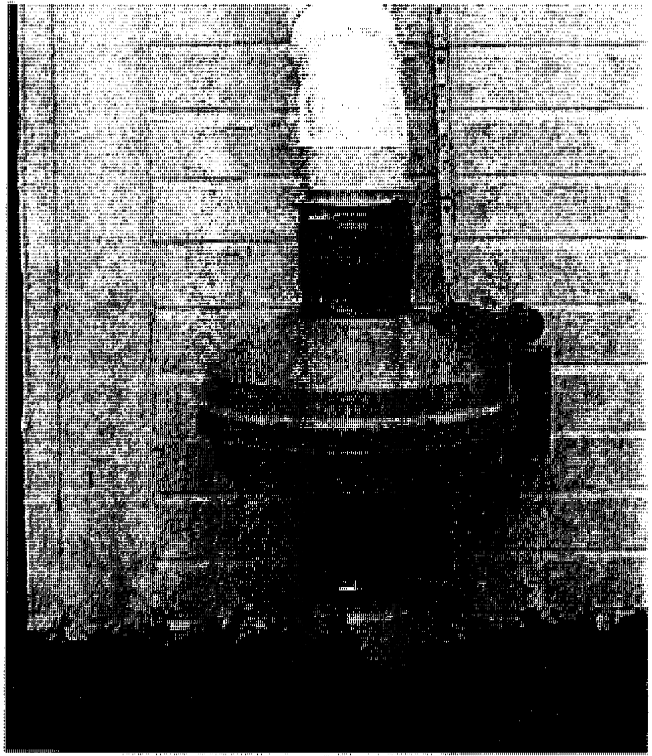

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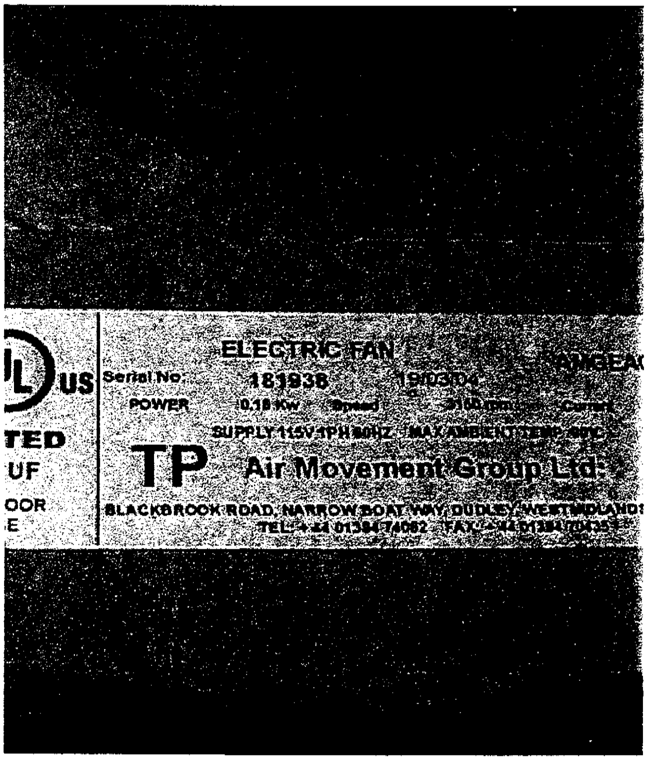

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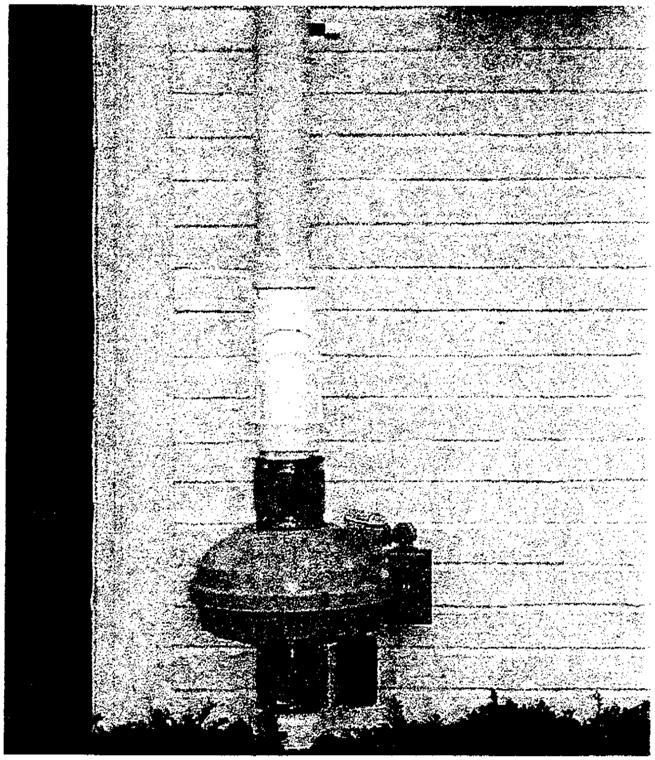

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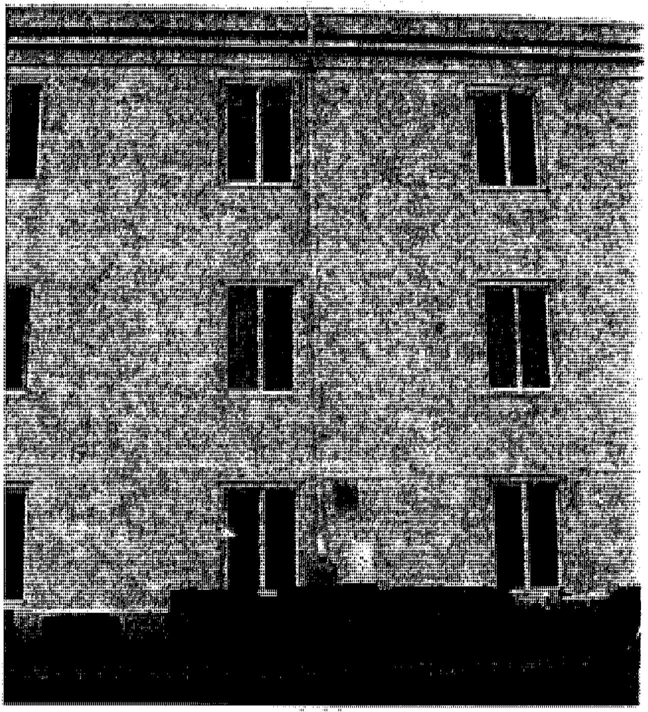

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SLAB VENTILATION SYSTEM


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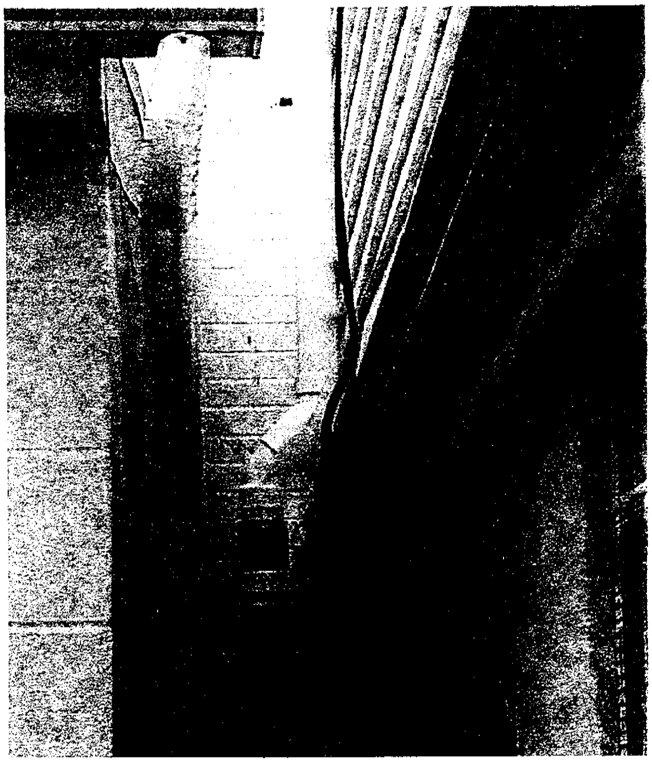
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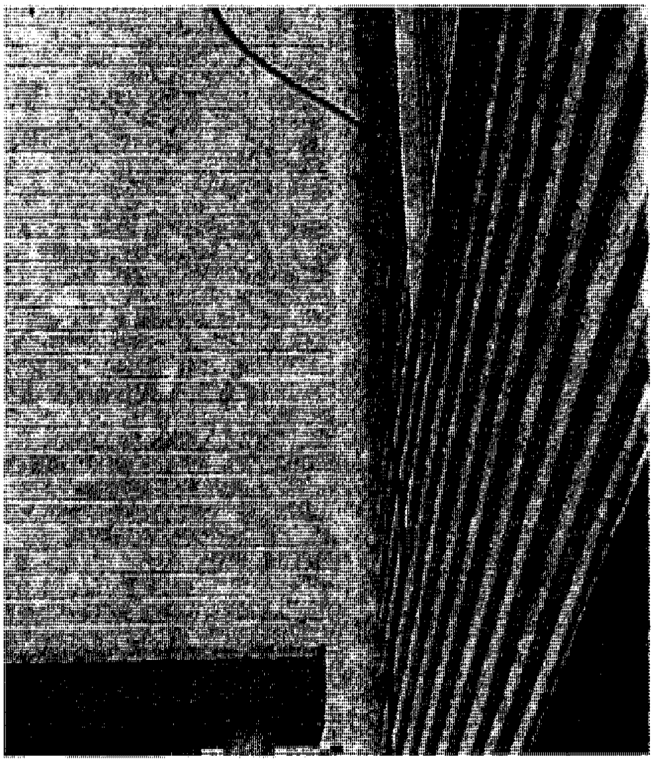
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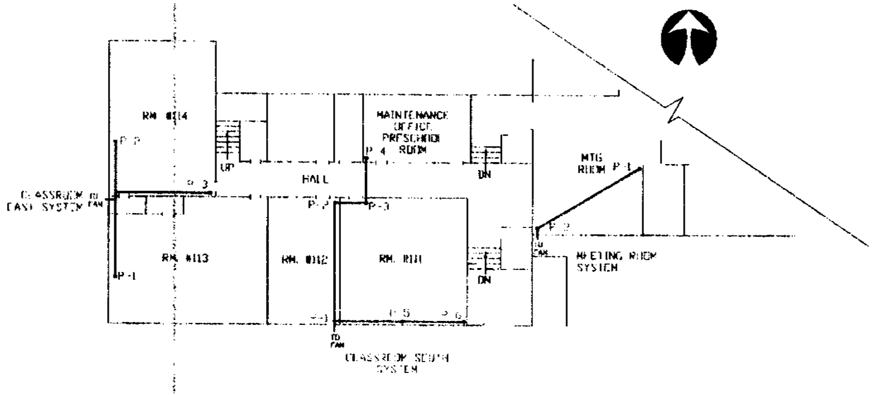
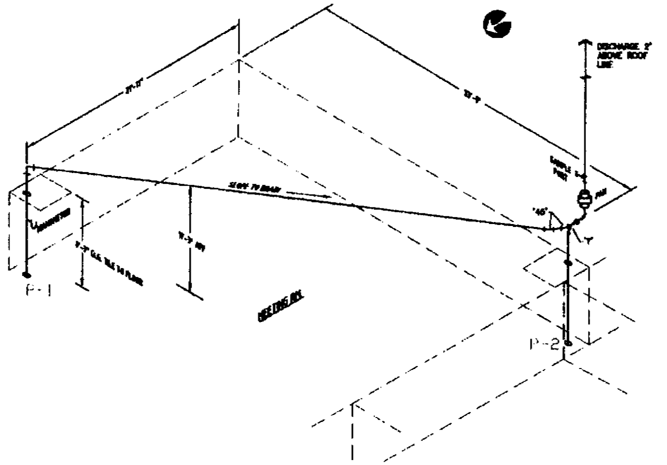
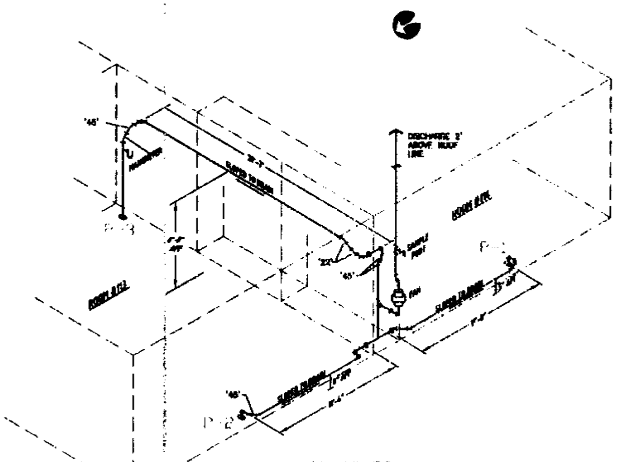


SYSTEM
PLAN



MEETING ROOM
SYSTEM
ISOMETRIC



CLASSROOM EAST
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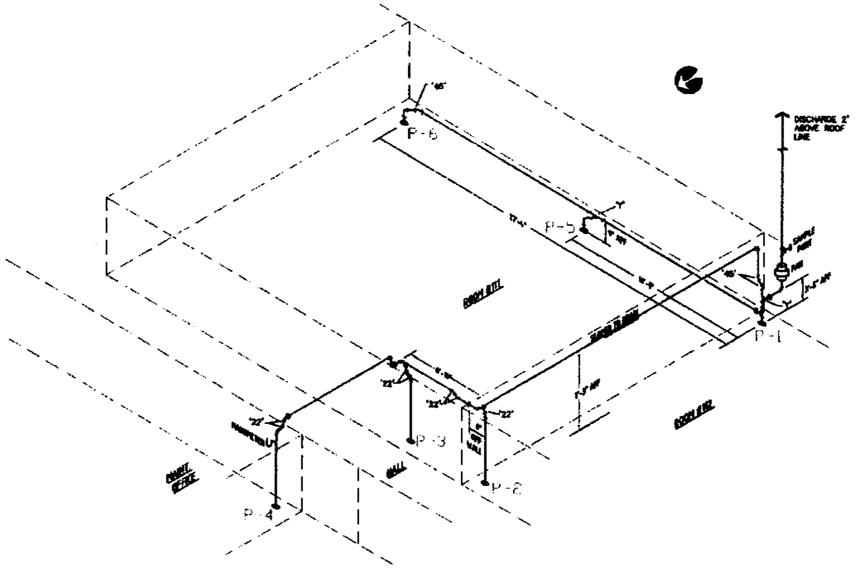
ISOMETRIC



CLASSROOM SOUTH
SYSTEM
ISOMETRIC

NOTES:
- DRAWING IS NOT TO SCALE.
- ALL DIMENSIONS ARE TO CENTER OF PIPE.
- ALL PIPING IS 4"ø PVC.

REVISIONS

NO.	DATE	BY	CHKED	DESCRIPTION
1				

Seeler Engineering, P.C.
15 FISHERS ROAD, SUITE 111 PITTSFORD, NEW YORK 14532
PHONE 585-248-9520 FAX 585-248-9532

AS-BUILT DRAWING
SLAB VENTILATION SYSTEM
FIRST PRESBYTERIAN CHURCH
EAST AURORA, NEW YORK

DATE	DRAWN	CHECKED
12/2/04	DAM	TAS

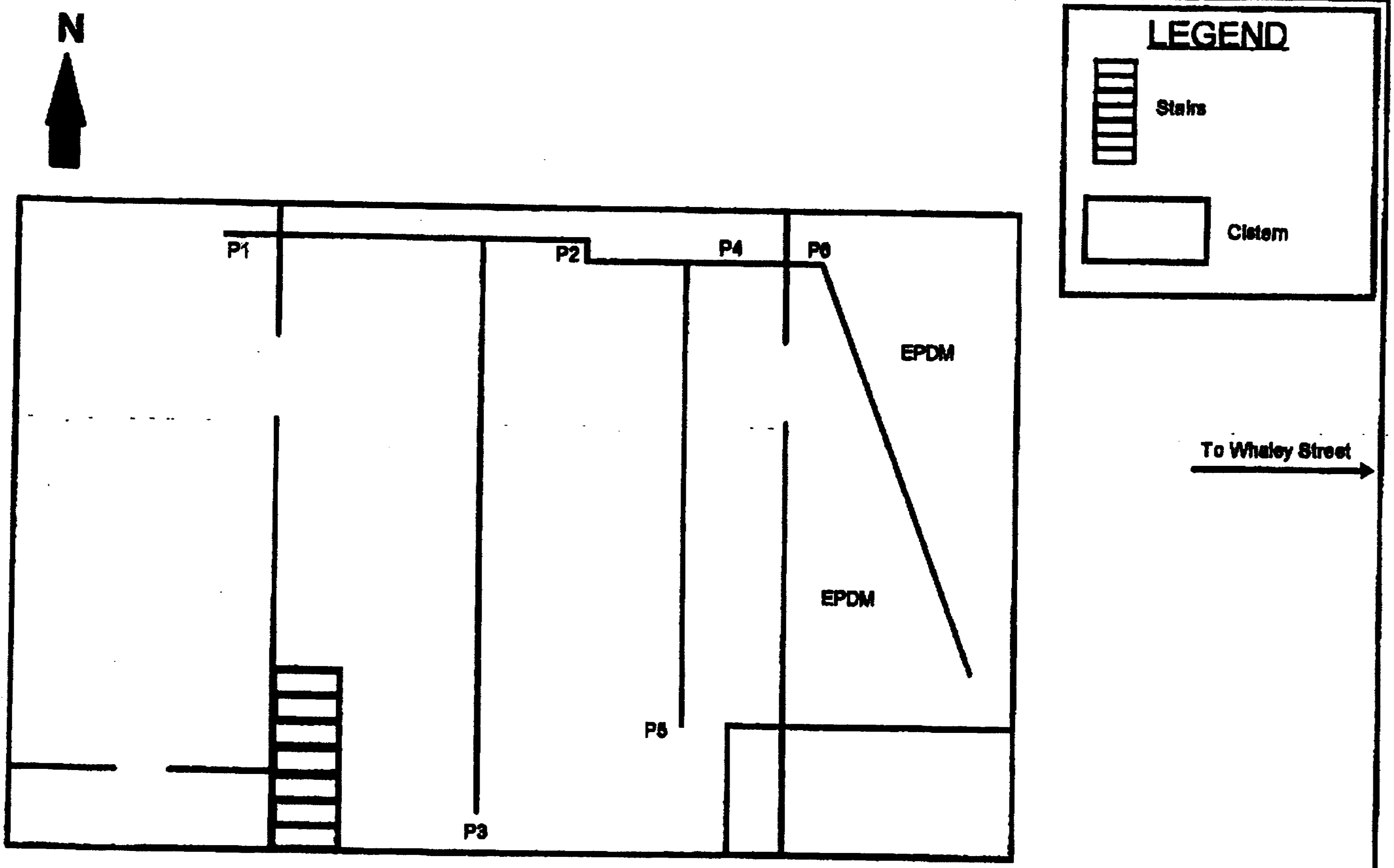
SCALE AS NOTED
SHEET TITLE

PROJECT NUMBER
001.015

1
DRAWING NUMBER

G2 – Record Drawings Prepared for 27 Whaley Avenue as Part of the SSDS Installation Documentation

27 Whaley Avenue, East Aurora, New York
OP-TECH Schematic and Photo Documentation
Depressurization / Evacuation System Installation



OP-TECH ENVIRONMENTAL SERVICES, INC.

Date:	February 2005	**Project No.:**	FDCH 0003
Scale:	Not To Scale	**Figure No.:**	1
Drawn By:	LG/jaw	**Location:**	East Aurora, NY

27 Whaley Street
Basement

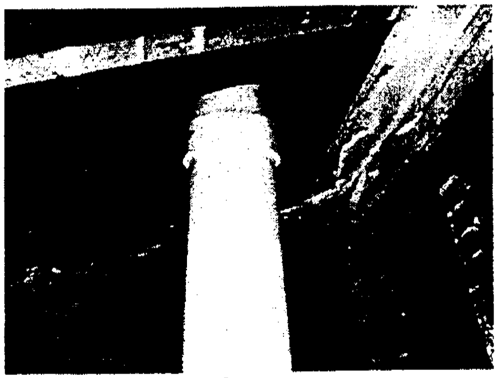
NYSDEC Region 9
27 Whaley Street
East Aurora, NY

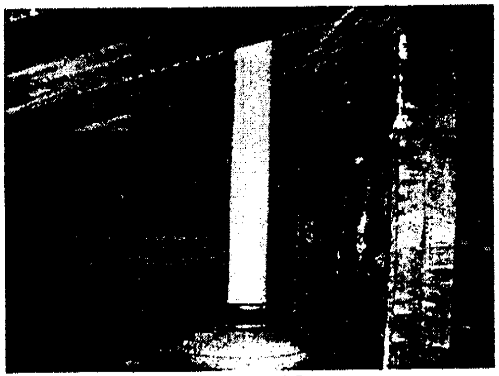

During Installation-Sencond Floor penetration


During Installation-Sencond Floor penetration

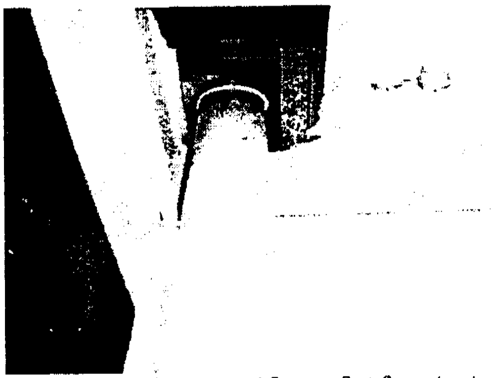

During Installation-Trench & Piping under EPDM membrane

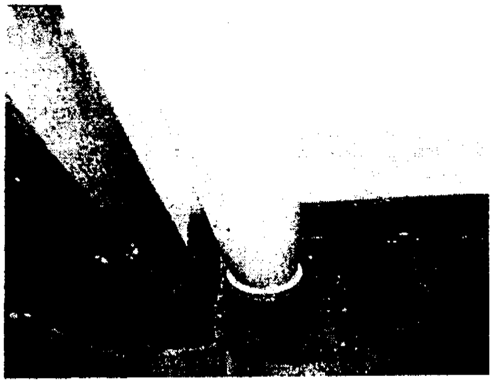

During Installation-Trench & Piping under EPDM membrane


Penetration through roof


Fan in void space on second floor

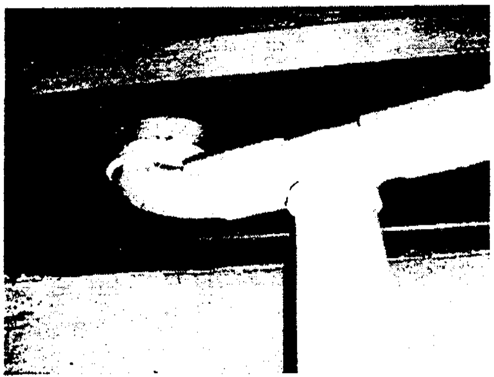

Fan in void space-Penetration in second floor


Penetration from second floor to first floor closet

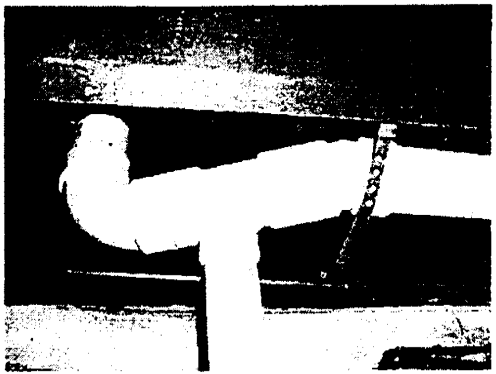


Piping in closet

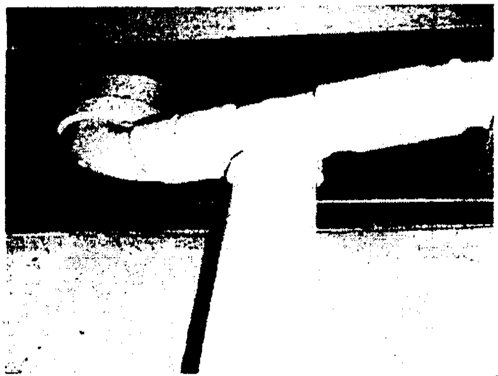
Piping in closet



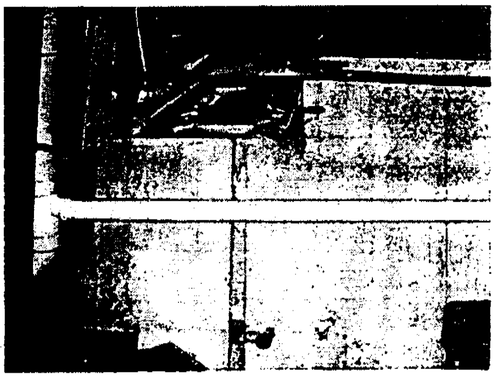
Penetration from 1st floor to basement



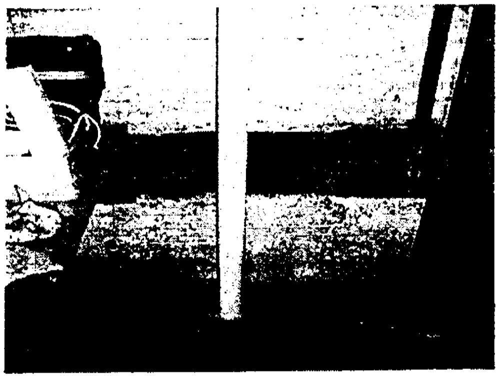
Penetration from 1st floor to basement – Piping to Point P1



Penetration from 1st floor to basement piping to Point P1

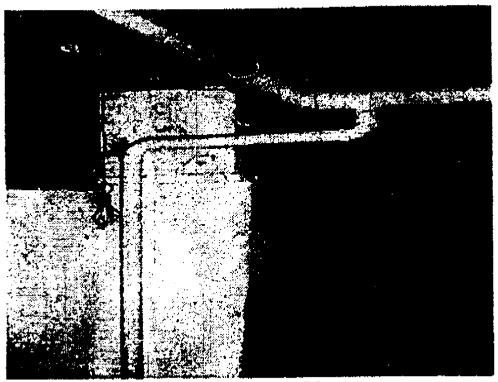


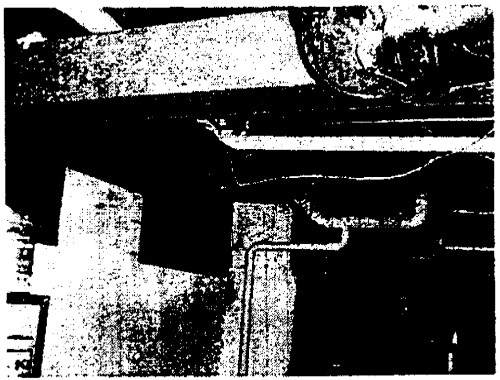
Piping to Point P1



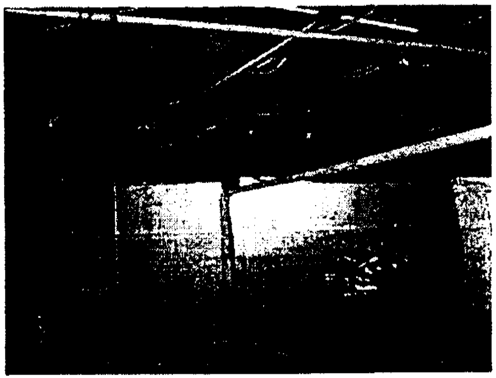
Point 1 penetration in floor

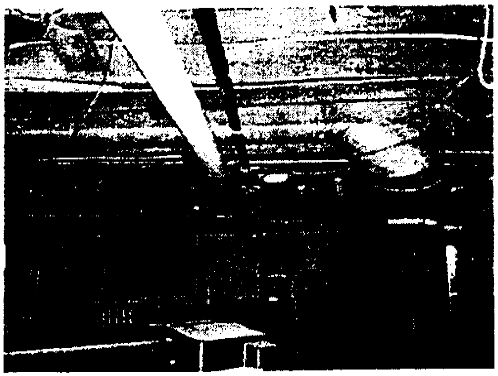
Piping from Point P1 to Point P2

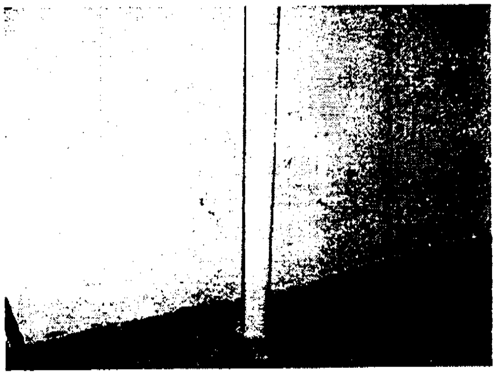

Piping from P1 to P2

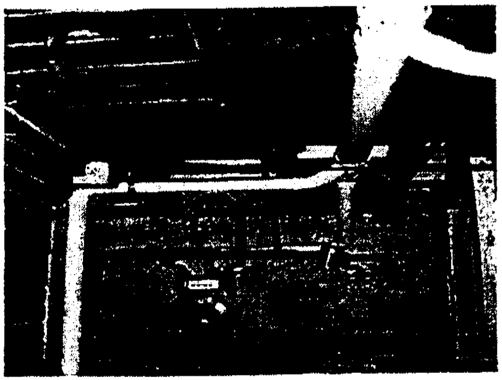

Piping from P1 to P2 pipe run to P3

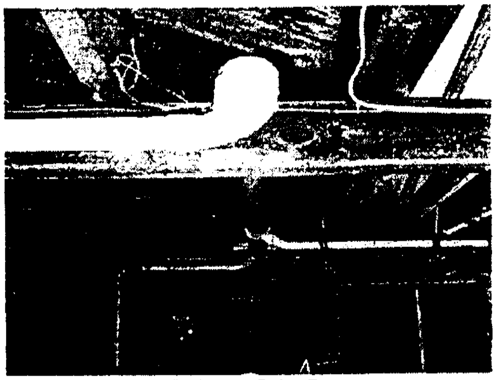

Point P2


Piping to P3


Piping to Point P3

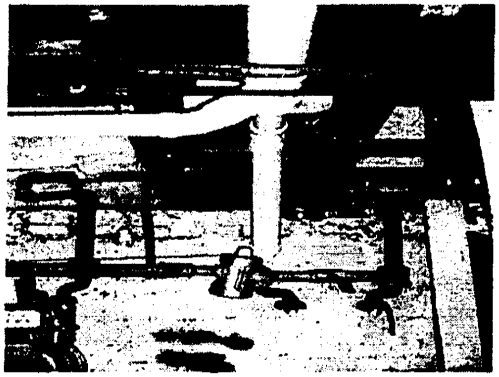

Point P3

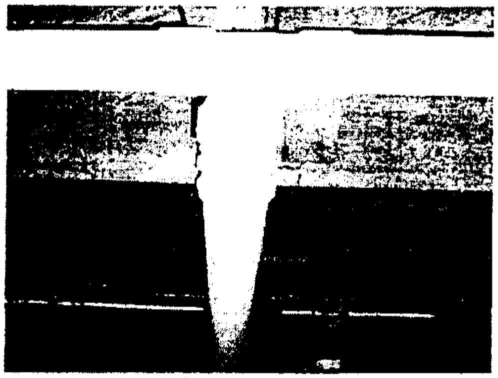

Piping to Point P4

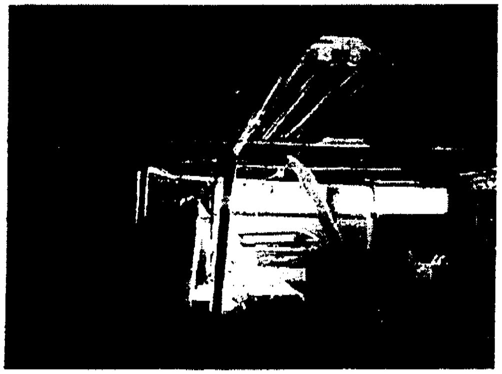

Piping to Point P4


Point P4

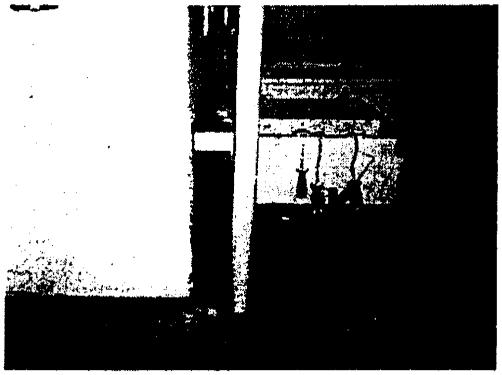

Point P4

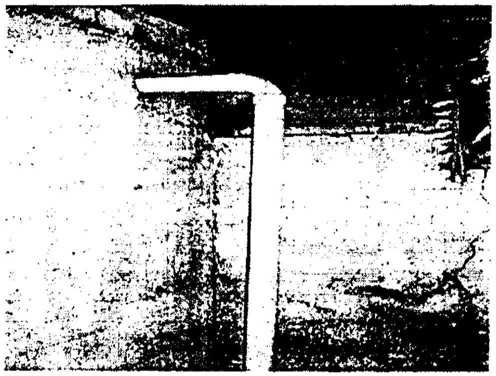

Piping from P4 to P6

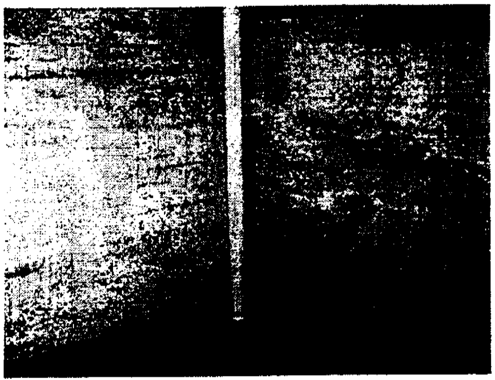

Piping to Point P5

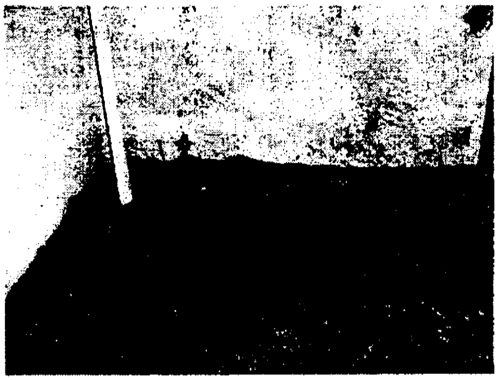

Piping to Point P5


Point P5


Point P5

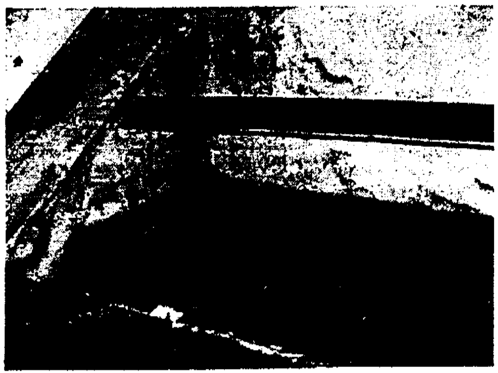

Piping from P4 to P6 wall penetration


Piping to P6 Piping under EDPM


Point P6

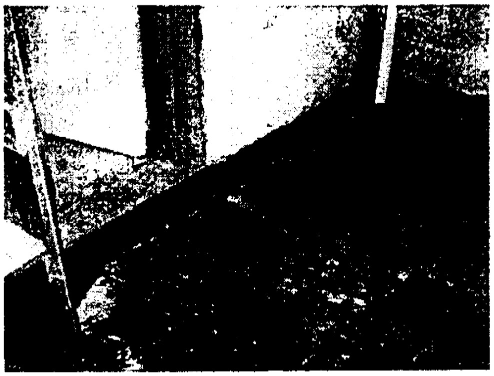

EDPM with seal

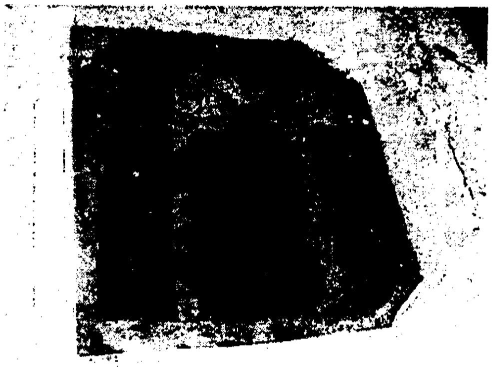

EDPM with seal


EDPM with seal

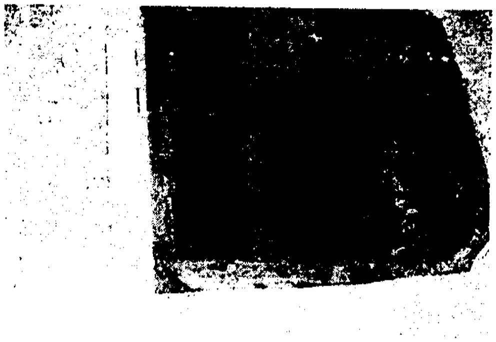

EDPM with seal


EDPM with seal


EDPM with seal



Sealed piping access in basement floor



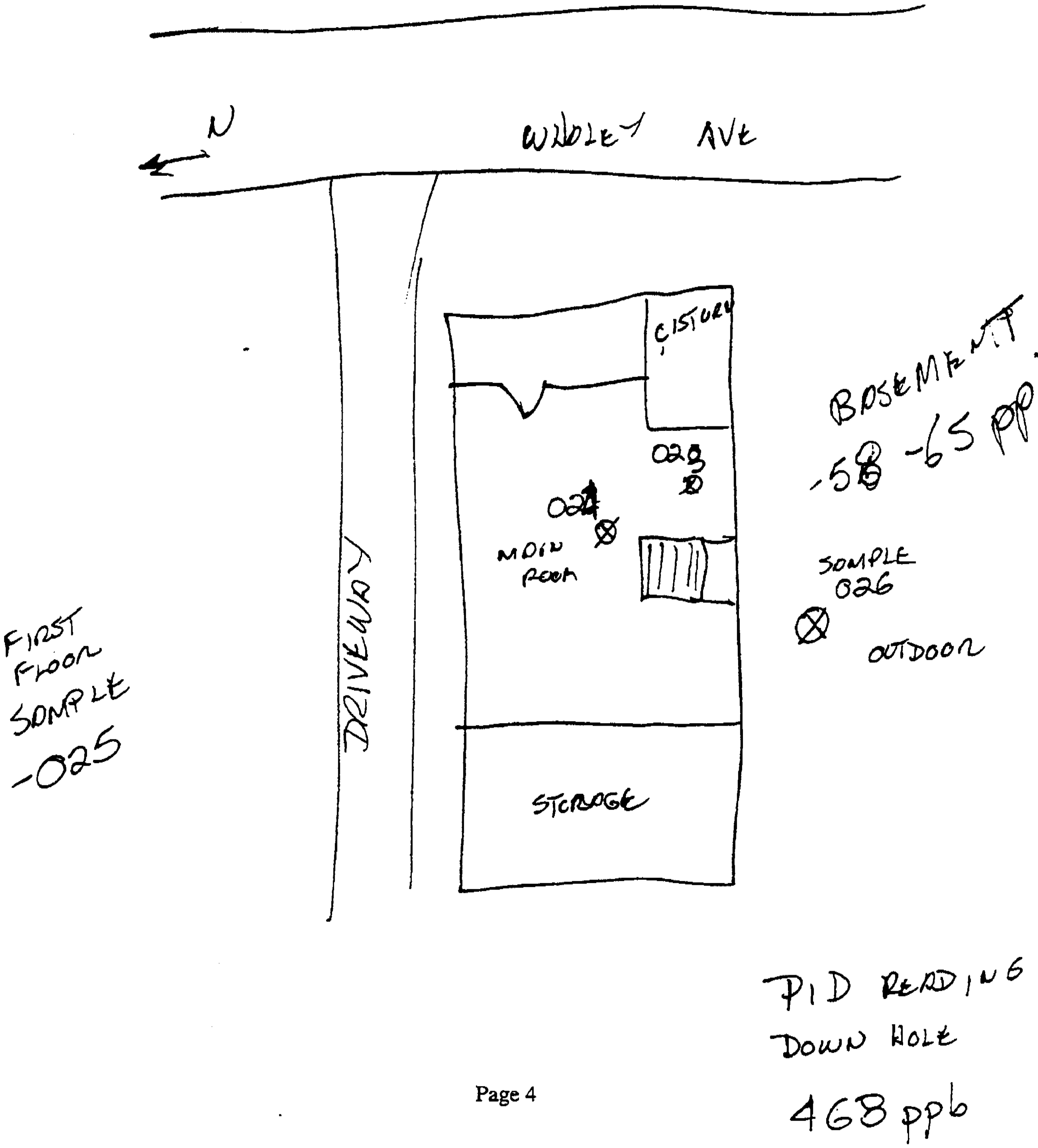
Sealed piping access in basement floor

Wooden cover over sealed piping access in basement floor

OSR-3 (continued)

F. Plan View

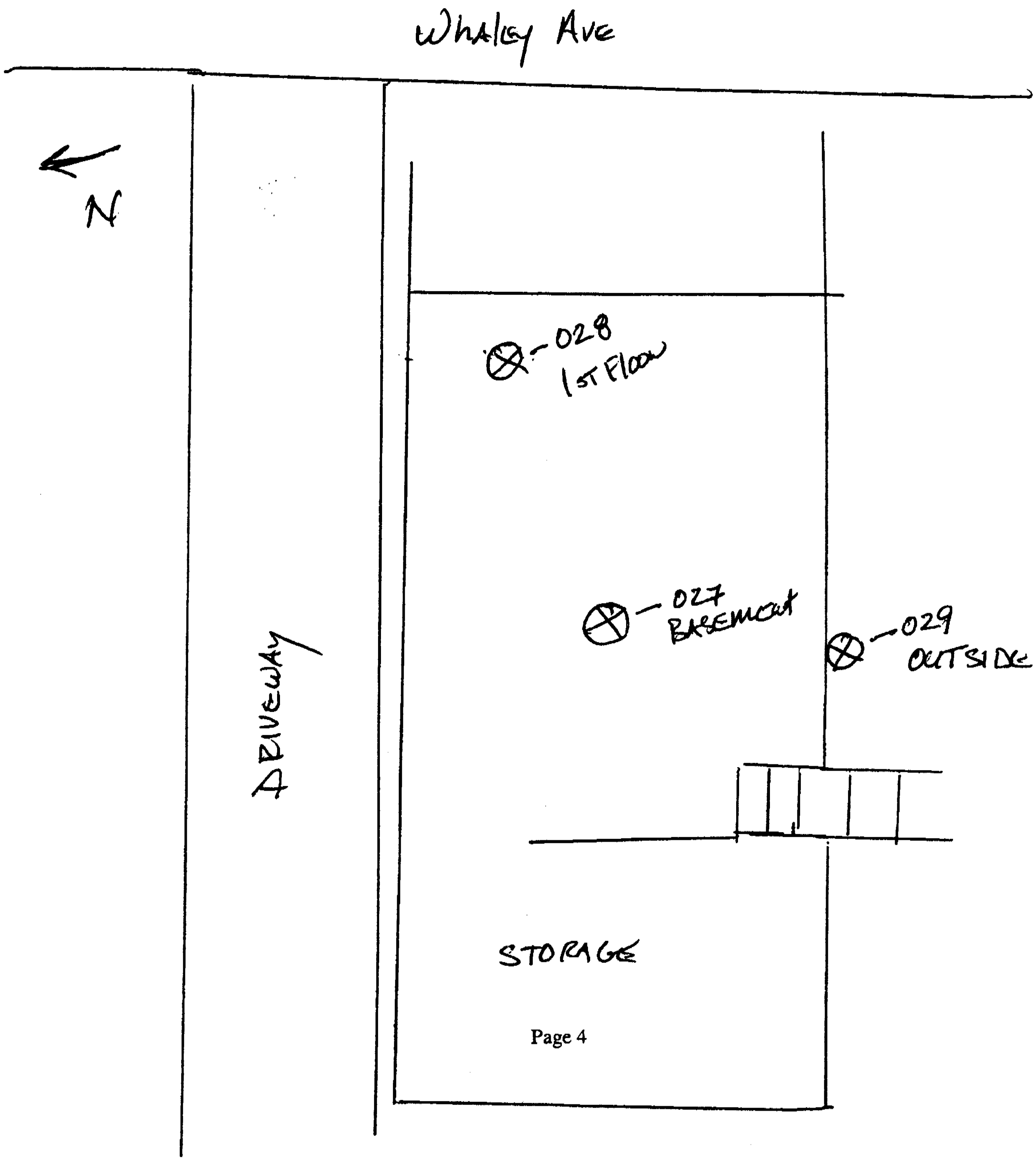
Draw a plan view sketch for each floor of the residence and if applicable, indicate air sampling locations, possible indoor air pollution sources and PID meter readings.



OSR-3 (continued)

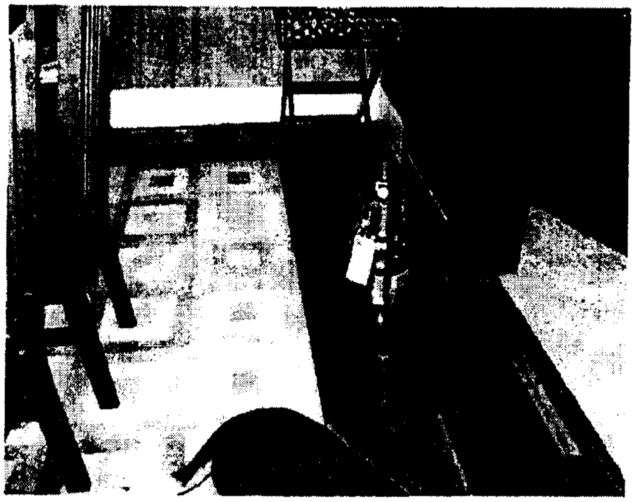
F. Plan View

Draw a plan view sketch for each floor of the residence and if applicable, indicate air sampling locations, possible indoor air pollution sources and PID meter readings.

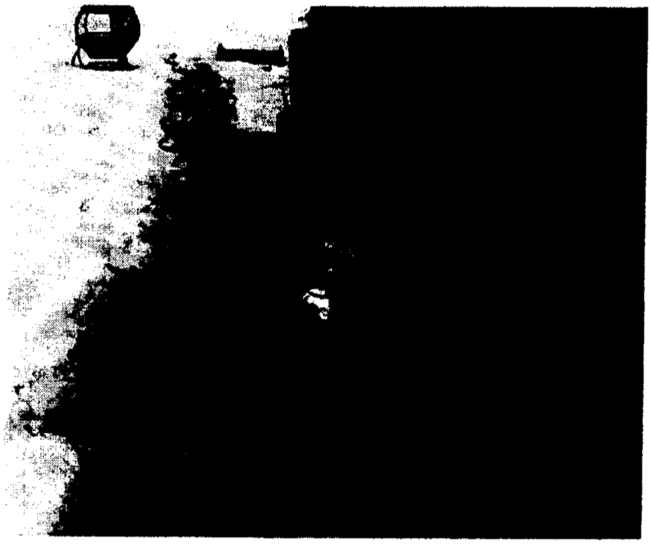


Indoor Air Quality (IAQ) Sampling
27 Whaley Avenue, East Aurora, New York
February 14, 2005

Ambient Basement Sample Location

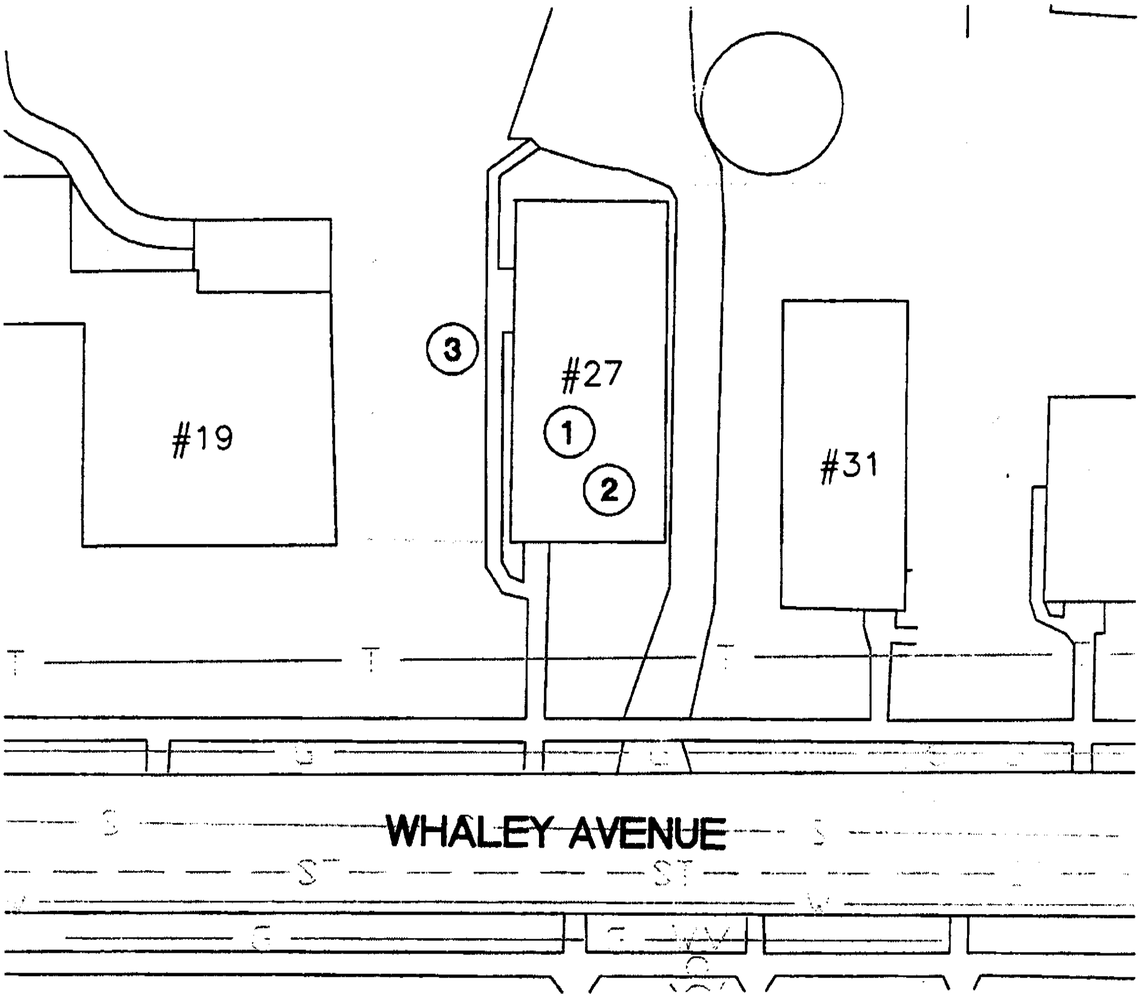


1st Floor Ambient Air Sampling Location



Outdoor Ambient Air Sampling Location

F:\MrC\2005\27Whaley.dwg



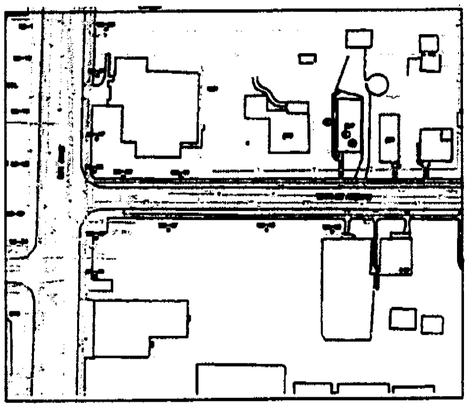
N

AMBIENT SAMPLE LOCATIONS

SCALE IN FEET

0 30 60 90

KEY PLAN



- ① BASEMENT
- ② FIRST FLOOR
- ③ OUTDOORS

ATTACHMENT 1

G3 – Record Drawings Prepared for 572-576 Main Street as Part of the SSDS Installation Documentation

IYER ENVIRONMENTAL GROUP, PLLC

MEMORANDUM

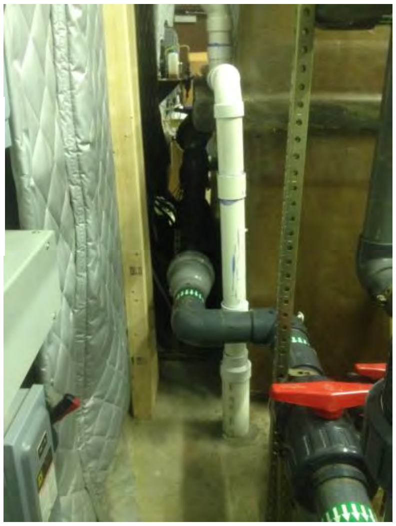
TO:	Mike Steffan (E&E); Will Welling (NYSDEC)
FROM:	Dharma Iyer (IEG)
DATE:	April 15, 2014
RE:	Subslab Vapor Extraction System – Installation & Startup

IEG installed the subslab vapor extraction system (SVES) over the last two weeks and got it operational today in the groundwater treatment building at Mr. C's site. The purpose of this SVES is to draw out chlorinated organics in the vadose zone below the concrete slab of the building. The subslab vapor was sampled at two locations in 2012 following the removal of dry cleaning equipment at Mr. C's. PCE was found at elevated levels (4,279 & 21,903 $\mu g/m^3$) with TCE at trace levels (ND & 18 $\mu g/m^3$).

Two vapor extraction points were located either side of the equalization tank. Holes were cored through the concrete floor to fit a 4" PVC pipe (Sched. 40), and approx. 5-gallon space was dug out below the slab. Collection pipes (3") with shutoff valves were run from the extraction points to a continuously running fan. The discharge piping was run above the fan (with a condensate trap) and secured to the ceiling at three locations. It exits the building through the air stripper air inlet in the roof. The discharge pipe is secured on the roof with the outlet several yards away prevent vapors from reentering the treatment room. A manometer is installed on the inlet side of the fan. Both extractions points have a port each for flow measurements and air sampling.

LEFT: Extraction fan (RadonAway, model GP5001; rated 80 cfm at 2" WC static suction) with condensate bypass on discharge side to drain moisture during cold weather.

RIGHT: Extraction points were dug out approx. 5-gal below slab to facilitate air flow.

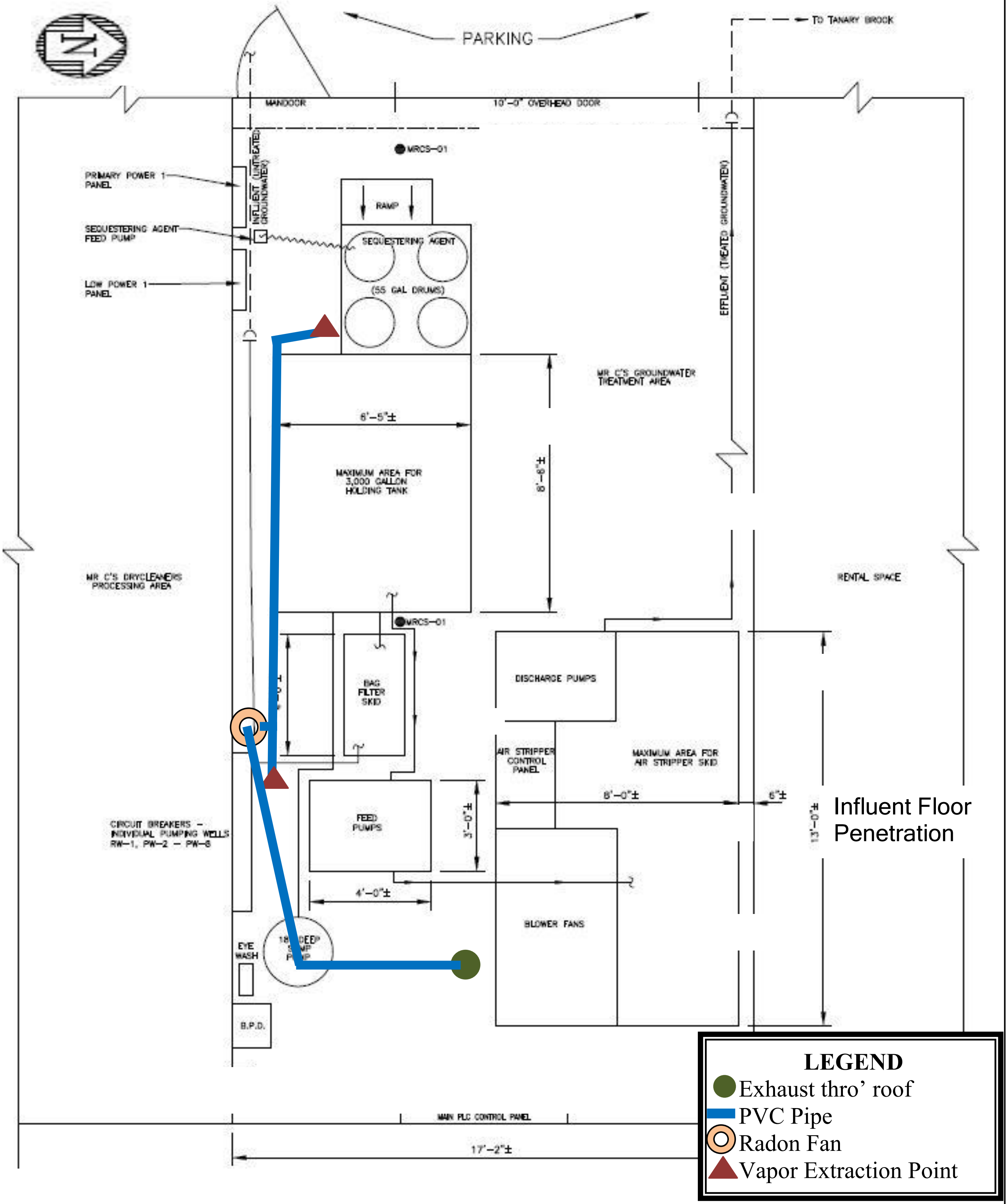


READINGS AT START-UP - APRIL 15, 2014

MANOMETER: 2.25 in. WC

(Fan Inlet)

	west	east
FLOW (fpm):	914	435
FLOW (cfm):	46	22
VACUUM GAUGE (in WC)	1.9	1.9

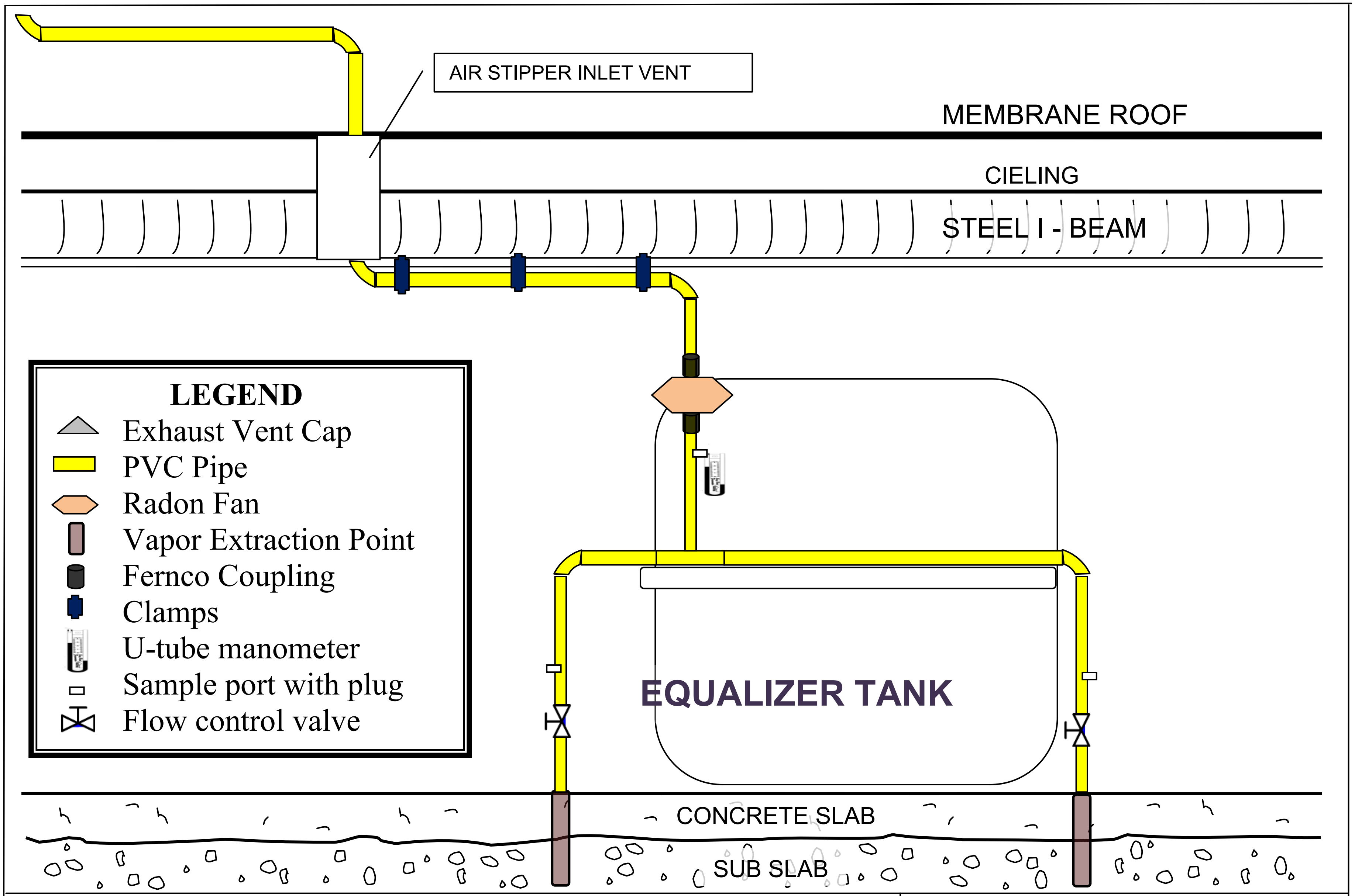


Mr C's DRY CLEANERS SITE

SUB SLAB VAPOR EXTRACTION SYSTEM LAYOUT

FIGURE 1

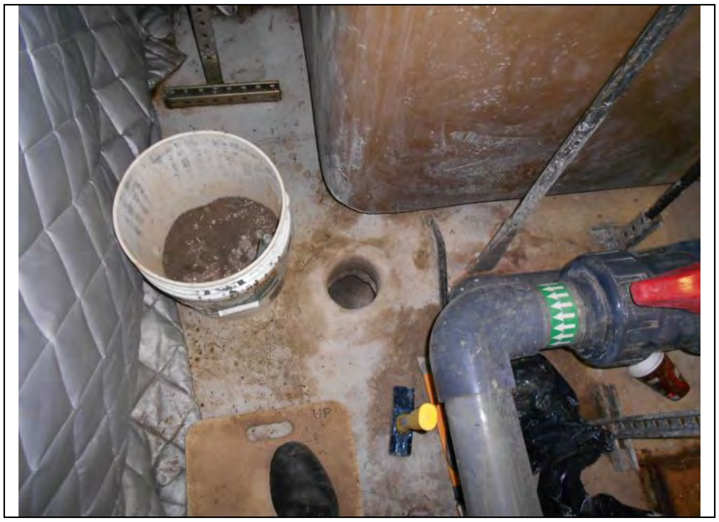
IEG



Mr C's DRY CLEANERS SITE
SUB SLAB VAPOR EXTRACTION SYSTEM LAYOUT

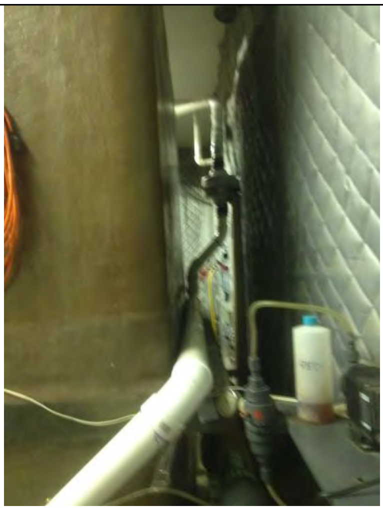
FIGURE 2

IEG

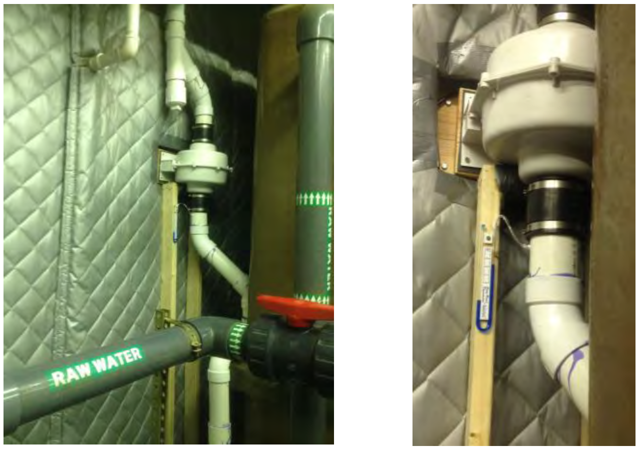


1. Digging extraction point east of Equalization tank

2. Installing riser pipes with valves west and east of tank



3. Pipe from west extraction point rests on back shelf of tank



4. Extraction Fan on wall behind southeast corner of tank
(RadonAway Model GP501; rated 80 cfm at 2” WC)

5. Discharge piping is secured to the ceiling at three locations

6. Installing pipe through air stripper inlet vent on the roof

SUBSLAB VAPOR EXTRACTION SYSTEM INSTALLATION
April 2014

Mr. C’s Dry Cleaners Site, East Aurora, NY

PHOTO PAGE
1 of 1

G4 – Record Drawings Prepared for 578-580 Main Street as Part of the SSDS Installation Documentation

Installation Summary Report

572-576 Main Street
East Aurora, New York
Site No.: 915157

Groundwater & Environmental Services Inc. (GES) installed two Sub-Slab Depressurization Systems (SSDSs), at the location of 572-576 Main Street, East Aurora, New York. Fan sizing and suction locations of the SSDSs was based on communication testing done on July 17, 2014 by GES and TREC Environmental personnel, as well as the *Scope of Work and Technical Specifications* provided by NYSDEC and Ecology & Environment Engineering, P.C.

The above referenced site consists of a three-story commercial building with a footprint of approximately 4,000 square feet, with a partitioned basement as shown in **Figure 1**. The eastern side of the basement is currently being used for storage of inventory by a bicycle shop located directly above. The western side of the basement is located beneath a fitness center does not appear to be actively used.

From August 11-15, 2014, two SSDSs were installed in the basement of the building; one for each partitioned side of the basement. The SSDSs were nearly identical in construction, with the exception of the specific pattern for the pathway for the main suction lines.

For each SSDS, three suction points were drilled through the concrete slab, as shown on **Figure 1**. Each suction point was drilled using an electric core drill with a 4 inch diamond tip core bit. The slab thickness at this location was approximately 3.0 inches. The sub-slab material was a dry gravel and brown dirt mixture. Approximately ½ to 1 cubic foot of material was taken from each extraction point. The tips of the suction points were cut at a slight angle to prevent any subsurface material or standing water from blocking flow into the system. The suction points were sealed at the surface using backer rod and urethane caulk.

At each suction point, 3" diameter schedule 40 PVC pipe was run vertically from the existing piping at the suction point to a main horizontal line along the floor joists and out the north side of the building through former basement window openings that are currently covered and buried. Each suction point was fitted with a sliding gate valve for isolation or adjustment of flow if needed. For each system the piping runs into a RadonAway RP145 fan mounted on the northern side of the exterior of the building; one each located along the eastern and western ends, respectively. Effluent piping is constructed of 3" by 4" PVC gutter-style decorative riser pipe and is routed up the side of the building to a location 2 feet above the eave of the roof line and greater than 10 feet away from any openings on the building. Unistrut bars and brackets were used to mount the effluent piping to the brick exterior of the building. Varmint guards were fitted to the top of the effluent piping to keep animals out of the effluent piping.

The RP145 fans were hardwired to a dedicated breaker and labeled accordingly. Exterior electrical piping consists of flexible conduit with a weather proof switch. Once inside, the electrical is transitioned to armored wire to the breaker panel. Electrical components were installed by Delmar Electrical Construction Corp., with 3rd party inspection performed by Commonwealth Electrical Inspection Service, Inc. on August 18, 2014.

Vacuum indicators (U-tube manometers) and system labeling were attached at each suction point. Contact numbers are provided on the system piping in case of an emergency or if the system is to go down.

The basement of this building contained numerous floor and wall penetrations, including three sewer pipe repair excavations in the floor, open sewer pipes, covered windows, and missing mortar at some locations in the basement walls. These items were addressed to minimize any short circuiting of the SSDSs and optimize effectiveness. Floor penetrations were patched with bagged 5000 psi strength concrete that was mixed on-site. Sewer pipes were capped with compression plugs. The covered windows and walls were patched with urethane caulking and/or spray foam.

During the project no other waste other than general refuse was generated and disposed.

Post-installation communication testing points are shown on **Figure 1** and the results are as follows:

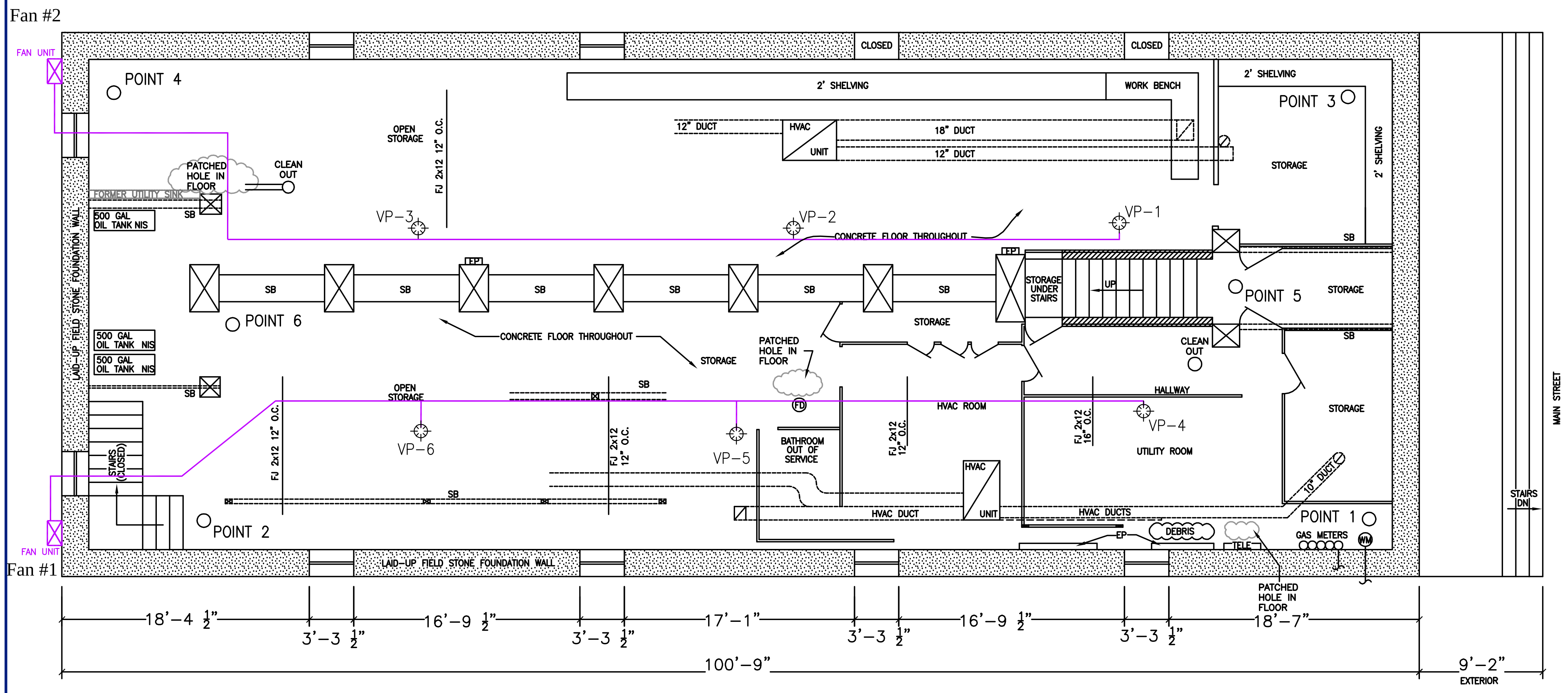
Test Point	Location Description	Recorded Vacuum (wci)
1	SW Corner	0.055
2	NW Corner	0.064
3	SE Corner	0.038
4	NE Corner	0.018
5	South Side Foot of Stairs	0.114
6	North Side	0.031

GROUNDWATER & ENVIRONMENTAL SERVICES, INC.

Eric D. Popken
Project Manager

Attachments:

Figure 1 – SSDS Layout (572-576 Main Street)
Photographs of SSDS Installation
Product Information Sheets and Warranties
Contractor Daily Reports
Electrical Inspection Certificate



LEGEND

WM	WATER METER
SB	SUPPORT BEAM
FD	FLOOR DRAIN
GM	GAS METER
⊗ ☒	SUPPORT COLUMN
▨	FIELDSTONE, CONCRETE, OR BRICK FOUNDATION
◩	HVAC DUCTWORK THROUGH FLOOR
⌖	SUCTION POINT – SSDS UNIT
—	CONVEYANCE PIPE HUNG FROM BOTTOM OF FLOOR JOIST (PROVIDE SUPPORT AS REQUIRED)
☒	SSDS FAN LOCATION
POINT 3 ○	COMMUNICATION TEST POINT

GENERAL NOTES

1. BASEMENT FEATURES WERE MEASURED IN THE FIELD AND THEIR LOCATIONS ARE APPROXIMATE.
2. DRAWING WAS CREATED FROM BASEMENT PLAN VIEW CREATED BY ECOLOGY & ENVIRONMENT ENGINEERING.

DRAFTED BY: W.G.S. (N.J.)
CHECKED BY:
REVIEWED BY:

SSDS LAYOUT

NYSDEC
DOEING PROPERTY
572-576 MAIN STREET
EAST AURORA, NEW YORK

Groundwater & Environmental Services, Inc.
495 AERO DRIVE, SUITE 3, CHEEKTOWAGA, NEW YORK 14225

NORTH

SCALE IN FEET
0 APPROXIMATE 10

DATE
11-6-14

FIGURE
1

M:\Graphics\0900-Buffalo\NYSDEC\East Aurora (Mr. C's Cleaners)\East Aurora (Mr. C's Dry Cleaners)\East Aurora (Mr. C's Cleaners) SM.dwg, B-10 (572-576 MAINSTREET(DOEING PROPERTY)), 11/6/2014 11:01:17 AM, WShea

SSDS Installation Photo Documentation
Mr. C's Dry Cleaning
Site #915157
572-576 Main Street
East Aurora, New York

Suction point beneath bicycle shop.

Example of repair to floor penetration with concrete.

SSDS piping beneath fitness center exiting building through former basement window.

Vacuum indicator for SSDS beneath fitness center.

View of north side of 572-576 Main Street showing exhaust piping.

View of eastern exhaust pipe showing SSDS fan and electrical components.

Daily Field Report

Contractor Name:
GES
495 Aero Drive, Suite 3
Cheektowaga, New York 14225
800-287-7857

Subcontractor Name:
Trec Environmental
1018 Washington Street
Spencerport, New York 14559
585-594-545

Personnel Onsite:

Name	Company	Onsite	Offsite
Nicole Lindner	~~GTREC~~ GES	845	1615
Steve Stockmaster	TREC	915	325 PM
Jim Agar	TREC	915	325 PM
Craig McCaffrey	Delmar	1000	1615
Joe McCaffrey	Delmar	1000	1615
Larry Roedl	ENE	730	1600

Site Activities Performed:
Electric - run through basement to outside - pre hook up (the basements under bike shop & fitness gym. Unloaded & stored equip. Sealed holes

Minutes of Safety Meeting:
Review SOW, HASP, JSAs, working around trip hazards & merchandise, ladder safety - 3 pts contact

Equipment Used/Materials Consumed (also use bid form):
Hand tools

Samples Taken and Disposition:
N/A

Site Visitors:
N/A

Site Supervisor Signature:

Daily Field Report

Subcontractor Name:
Trec Environmental
1018 Washington Street
Spencerport, New York 14559
585-594-545

Contractor Name:
GES
495 Aero Drive, Suite 3
Cheektowaga, New York 14225
800-287-7857

Personnel Onsite:

Name	Company	Onsite	Offsite
Nicole Linder	GES	830	1615
Larry Roddl	ENE	830	1600
Steve Stockmaster	TREC	815	1615
Jim Agar	TREC	815	1615
Kurt Ballwstein	TREC	830	1600
Craig McCaffrey	Delmar	1030	1330
Joe McCaffrey	Delamar	1145	1330

Site Activities Performed:
Review SOW HASP JSAs working indoors & out, (trip hazards, working around merchandise) ladder safety - 3pt contact) t-storms in forecast - move indoors if t-storm seen imminent - two people carry awkward/heavy items

Minutes of Safety Meeting:
Drill points C1-C3 → install pipe run, run electric in 3rd basement

Equipment Used/Materials Consumed (also use bid form):
HAnd TOOLS

Samples Taken and Disposition:
N/A

Site Visitors: N/A

Site Supervisor Signature:

8/12/14

Daily Field Report

Contractor Name:
GES
495 Aero Drive, Suite 3
Cheektowaga, New York 14225
800-287-7857

Subcontractor Name:
Trec Environmental
1018 Washington Street
Spencerport, New York 14559
585-594-545

Personnel Onsite:

Name	Company	Onsite	Offsite
ERIC POPKEN	GES	0800	1730
LARRY ROEDEL	ENE		
STEVE STOCKMASTER	TREC		
KURT BALLERSTEIN	TREC		
STEVE WARNER	TREC		
JIM AGAR	TREC		
JUSTIN HOFFSCHNEIDER	TREC		

Site Activities Performed:
Install all 6 suction points, piping inside buildg w/Bike Shop + Gym.
Installed outdoor piping + fans. Stopped at fans.
Prepared Th two large basement holes for concrete tomorrow.
Found open sewer pipe. Covered w/Fernco cap.

Minutes of Safety Meeting:
PPE, SPSAs, HASP, scope of Work. Weather hazards.

Equipment Used/Materials Consumed (also use bid form):
Piping, fans, hangers, struts, valves.
Hand tools.

Samples Taken and Disposition:
NONE

Site Visitors:
NONE

Site Supervisor Signature:

8/13/14

Daily Field Report

Contractor Name:
GES
495 Aero Drive, Suite 3
Cheektowaga, New York 14225
800-287-7857

Subcontractor Name:
Trec Environmental
1018 Washington Street
Spencerport, New York 14559
585-594-545

Personnel Onsite:

Name	Company	Onsite	Offsite
ERIC POTTBEN	GES	0800	1530
Steve Stockmaster	TREC	830	↓
JUSTIN HOPSCHNEIDER	↓	↓	
KURT BALLERSTEIN	DNE	830	
LARRY ROEDL	TREC	830	
JIM AGAR			

Site Activities Performed:
Install majority of outdoor downspout at 572-574 main st.
Install all exhaust at 578-580 main. Plugged/sealed various penetrations and set concrete in all Floor holes. Sealed pipe pentrations into Buildings.
PIPES.

Minutes of Safety Meeting:
PPE, SWPE, SBSA, HASP. AERIAL lift safety

Equipment Used/Materials Consumed (also use bid form):
AERIAL Manlift. Piping. Downspout.
Hand tools.

Samples Taken and Disposition:
NONE

Site Visitors:
NONE

Site Supervisor Signature:

8/14/14

Daily Field Report

Contractor Name:
GES
495 Aero Drive, Suite 3
Cheektowaga, New York 14225
800-287-7857

Subcontractor Name:
Trec Environmental
1018 Washington Street
Spencerport, New York 14559
585-594-545

Personnel Onsite:

Name	Company	Onsite	Offsite
ERIC POPKEN	GES	800	1530
Larry ROEDL	ENE	↓	1530
Steve Stockmaster	TREC	↓	1315
Jim Agar	TREC	↓	↓
Steve Warner	TREC	↓	↓
Kurt Ballerstein	TREC	↓	↓
JOE McCaffry	Delmar Electric.	930	1230

Site Activities Performed:
Completed Installation of SSDSs. All outdoor Piping installed.
~~Ea~~ Holes in Basement plugged or capped. Applied labels, manometers.
Activated all 3 systems. Performed Post-install influence testing.
Delmar completes electrical hookup.

Minutes of Safety Meeting: AERIAL LIFT hazards, traffic control. HASP.
PPE, SPSA, Scope,
Weather issues.

Equipment Used/Materials Consumed (also use bid form):
AERIAL Lift
Hand tools.

Samples Taken and Disposition:
Drum sample of soil.

Site Visitors:
NONE

Site Supervisor Signature:

8/15/14

Daily Field Report

Contractor Name:
GES
495 Aero Drive, Suite 3
Cheektowaga, New York 14225
800-287-7857

Subcontractor Name:
Trec Environmental
1018 Washington Street
Spencerport, New York 14559
585-594-545

Personnel Onsite:

Name	Company	Onsite	Offsite
NICOLE LINDNER	GES	700	1330
Steve Stockmaster	TREC	700	1330
JIM AGAR	TREC	700	1330
Mike STEFFAN	ENE		

Site Activities Performed:
PIPING MODIFICATIONS AS PER DEC + ENE request

Minutes of Safety Meeting:
PPE, SPSA, JSA, HASP, cutting tool usage

Equipment Used/Materials Consumed (also use bid form):
SAWS, Power tools, Piping.

Samples Taken and Disposition:
NONE

Site Visitors:
NONE

Site Supervisor Signature:

9/12/14

33793

Insp. Date: 8/18/2014
Appl #: PC14-1539

ELECTRICAL CERTIFICATE

COMMONWEALTH ELECTRICAL INSPECTION SERVICE, INC.

176 DOE RUN ROAD, MANHEIM, PA 17545
TELEPHONE: (717) 664-2347
New York Office: (585) 624-2380

Premises of: DAVE / MARK KERN / JAWORSKI as
Address: 574 MAIN STREET, EAST AURORA NY
County of: ERIE Permit #:

Installed by: DEL-MAR ELECTRIC CONSTRUCTION

Apparatus: RADON GAS, 3 FANS, 3 DISCONNECTS.

Inspected by: PAT CULLINAN

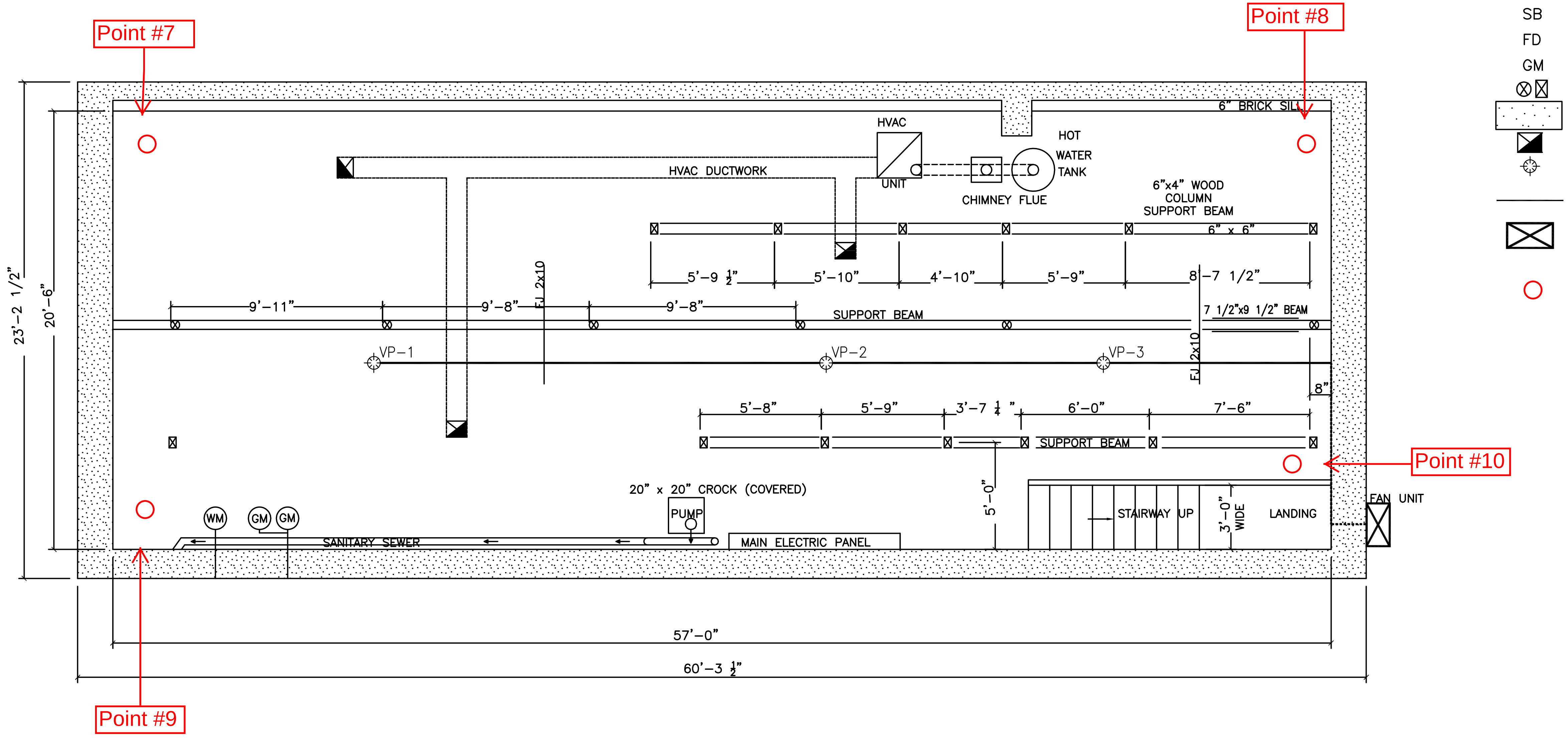
The conditions following governed issuance of this certificate, and any certificate previously issued is cancelled. Failure to have the property reinspected when additional equipment or wiring is added; or within one year from the date of the certificate shall void the certificate in its entirely and the company shall not be liable for any damages whatsoever;

This certificate does not guarantee efficiency, wearing qualities, maintenance or repair and the company shall not be liable for any damages resulting from any defect or fault in the plans or specifications, including repair, reconstruction, personal injury or for the death of any person; and

This certificate only covers visual inspection of wiring and does not cover manufacture or use of wiring.

Inspectors of this Company shall have the privilege of making inspections at any time, and if its rules are violated, the Company shall have the right to revoke the certificate.

G5 – Record Drawings Prepared for 586 Main Street (Suite 3) as Part of the SSDS Installation Documentation



LEGEND

WM	WATER METER
SB	SUPPORT BEAM
FD	FLOOR DRAIN
GM	GAS METER
⊗ ☒	SUPPORT COLUMN
▨	FIELDSTONE, CONCRETE, OR BRICK FOUNDATION
◪	HVAC DUCTWORK THROUGH FLOOR
⌖	SUCTION POINT – SSDS UNIT
—	CONVEYANCE PIPE HUNG FROM BOTTOM OF FLOOR JOIST (PROVIDE SUPPORT AS REQUIRED)
☒	SSDS LOCATION
○	Test Pont

GENERAL NOTES

1. BASEMENT FEATURES WERE MEASURED IN THE FIELD AND THEIR LOCATIONS ARE APPROXIMATE.

2. DRAWING WAS CREATED FROM BASEMENT PLAN VIEW CREATED BY ECOLOGY & ENVIRONMENT ENGINEERING.

DRAFTED BY:
E.M.E.
(N.J.)

CHECKED BY:

REVIEWED BY:

NORTH

SSDS LAYOUT

NYSDEC
BROWNSHIDLE PROPERTY
578-580 MAIN STREET
EAST AURORA, NEW YORK

Groundwater & Environmental Services, Inc.
495 AERO DRIVE, SUITE 3, CHEEKTOWAGA, NEW YORK 14225

SCALE IN FEET
0 APPROXIMATE 6

DATE
9-8-14

FIGURE

M:\Graphics\0900-Buffalo\NYSDEC\East Aurora (Mr. C's Dry Cleaners)\East Aurora (Mr. C's Cleaners) SM.dwg, B- (578-580 MAIN STREET(BROWNSCHILDE PROPERTY)), 9/9/2014 2:02:22 PM, EEdwards

H

Historical System Drawings for the Agway AS/SVE (Decommissioned December 2011)

M. Stetton

RECEIVED
BY MGS DATE 10/17/01

October 2, 2001

MATRIX
Environmental Technologies Inc.
5835 Ellis Road
P.O. Box 427
Orchard Park, N. Y. 14127-0427
Voice: (716) 662-0745
Fax: (716) 662-0946
www.matrixbiotech.com

OCT 5

Mr. Tim Dieffenbach
NYSDEC Region 9
270 Michigan Avenue
Buffalo, New York 14203

Re: Former Agway Facility
566 Main Street
East Aurora, New York
Matrix Project #93-065
NYSDEC Spill# 87-03755

Dear Mr. Dieffenbach:

Attached are the equipment specifications, as-built diagram and well construction details you requested for the site referenced above. The equipment was installed during the week of September 17, 2001. Activation of the equipment is scheduled for the week of October 1, 2001. Baseline groundwater samples will be obtained prior to system activation. Sampling of the air discharge for BTEX and tetrachloroethene and completion of the SVES data sheet will be submitted within 30 days of activation as requested.

If you have any questions or require more information please feel free to contact me.

Sincerely,
Matrix Environmental Technologies Inc.

Steve Marchetti
Senior Project Manager

Enclosure

cc: Mr. Richard Williams – Agway Energy Products
David Chiusano – NYSDEC Div. of Environmental Remediation
Mr. Sean R. Carter – Matrix Environmental

SPARGE/VENT EQUPIMENT SPECS

Former Agway Facility
566 Main Street
East Aurora, New York

SVE

ROTRON, Regenerative Turbine Blower
- 2HP /230 Vac/1ph. motor
  30 Gallon Inlet Separator/Silencer
- 1" Bypass/Dilution Valve

SPARGE

CHAMPION Reciprocating Compressor
- 5HP /230 Vac/1ph, TEFC motor
- Pressure Regulator
- 8 Point Manifold System (2-sets of 4, equipped with a 24-hour cycle timer)
- Qty 8, DWYER M# RMC-121-BV (1-10 SCFM Flowmeter with Brass Needle Valve Flow Regulator
- Qty 8, Stainless Steel, Liquid-Filled, 0-30 PSI, Pressure Gauge

SPARGE POINT CONSTRUCTION DETAIL

PROJECT LOCATION: 566 Main Street, East Aurora, New York

WELL NUMBER: SP1 - SP8

DATE COMPLETED: May 8, 10 - 11, 2001

SUPERVISED BY: Steve Marchetti

PROJECT NUMBER: 93-065

POINT SIZE AND TYPE: 3/4" ID SCH 40 PVC

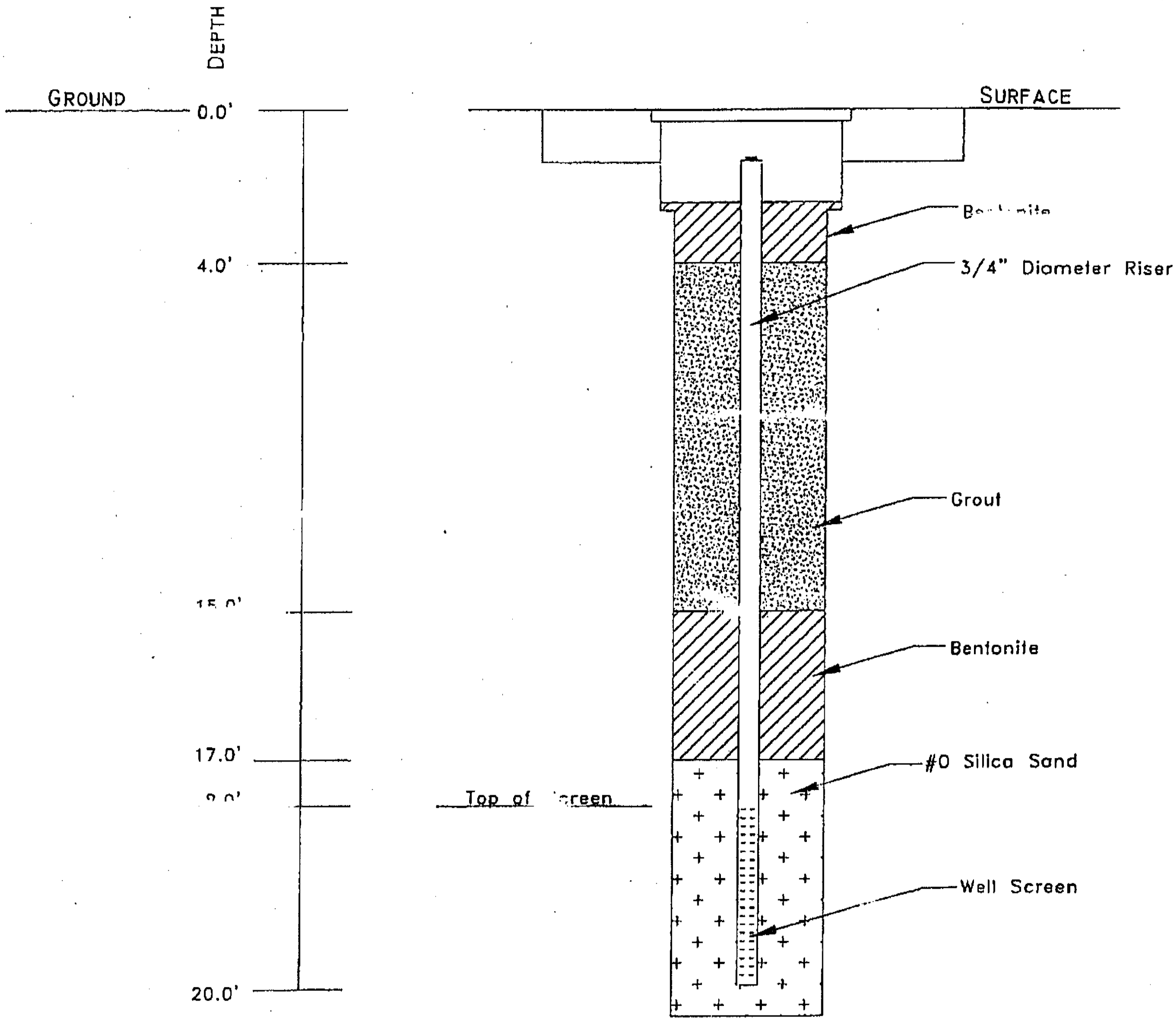
DRILLING COMPANY: SJB

SCREEN SIZE AND TYPE: 3/4" ID 0.020" Slot SCH 40 PVC

DRILLERS NAMES: Tony and Jim

BOREHOLE SIZE: 2" Diameter

DRILL RIG MODEL: CME 85



NOT TO SCALE

VAPOR EXTRACTION
POINT CONSTRUCTION DETAIL

PROJECT LOCATION: 566 Main Street, East Aurora, New York

WELL NUMBER: VP1,VP2,VP4,VP5,VP7,VP9

DATE COMPLETED: May 10 & 11, 2001

SUPERVISED BY: Steve Hess

PROJECT NUMBER: 93-065

WELL SIZE AND TYPE: 4" ID SCH 40 PVC

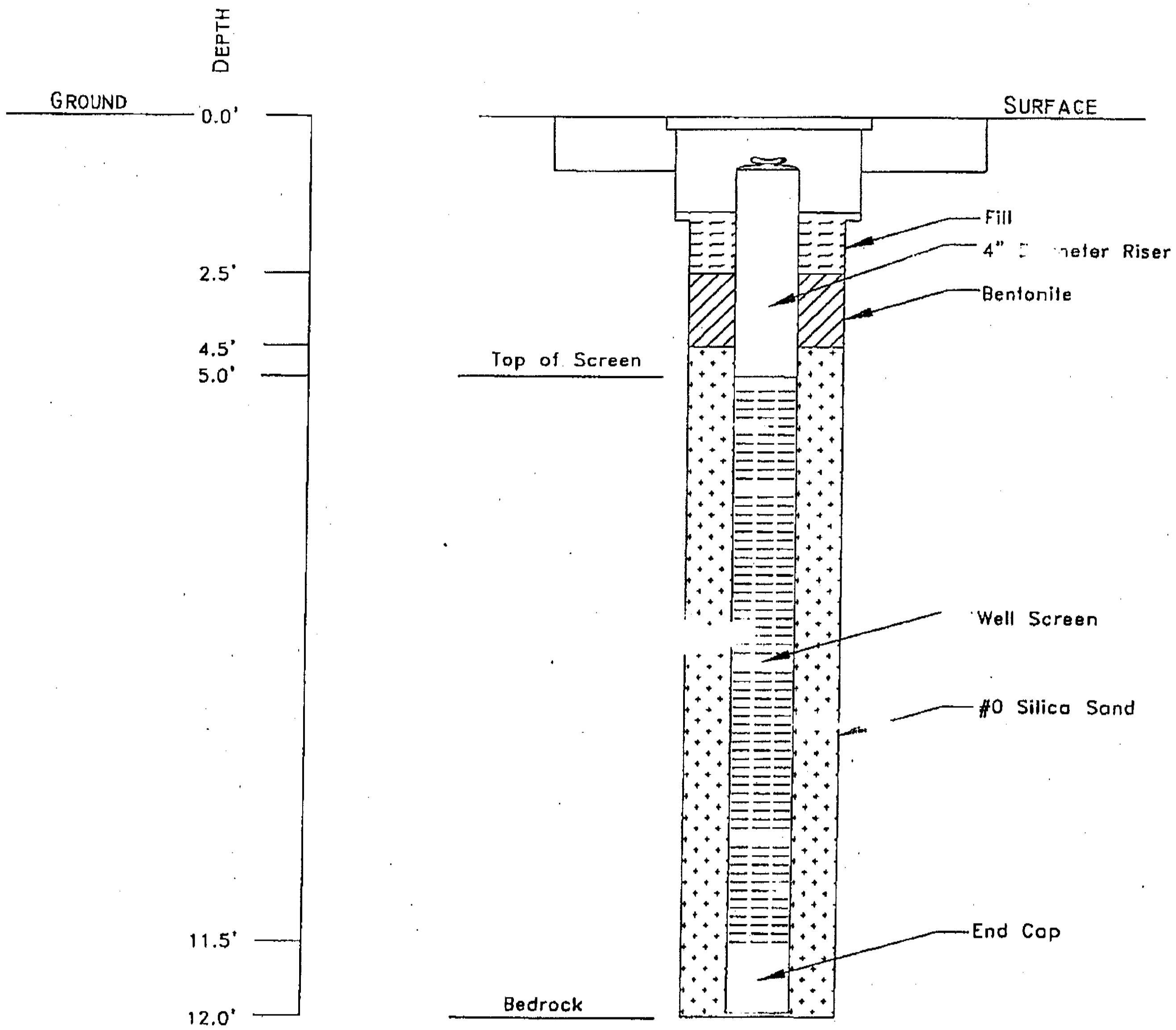
DRILLING COMPANY: SJB

SCREEN SIZE AND TYPE: 4" ID 0.020 Slot, SCH 40 PVC

DRILLERS NAMES: Tony and Jim

BOREHOLE SIZE: 6 1/4"" Diameter

DRILL RIG MODEL: CME 85



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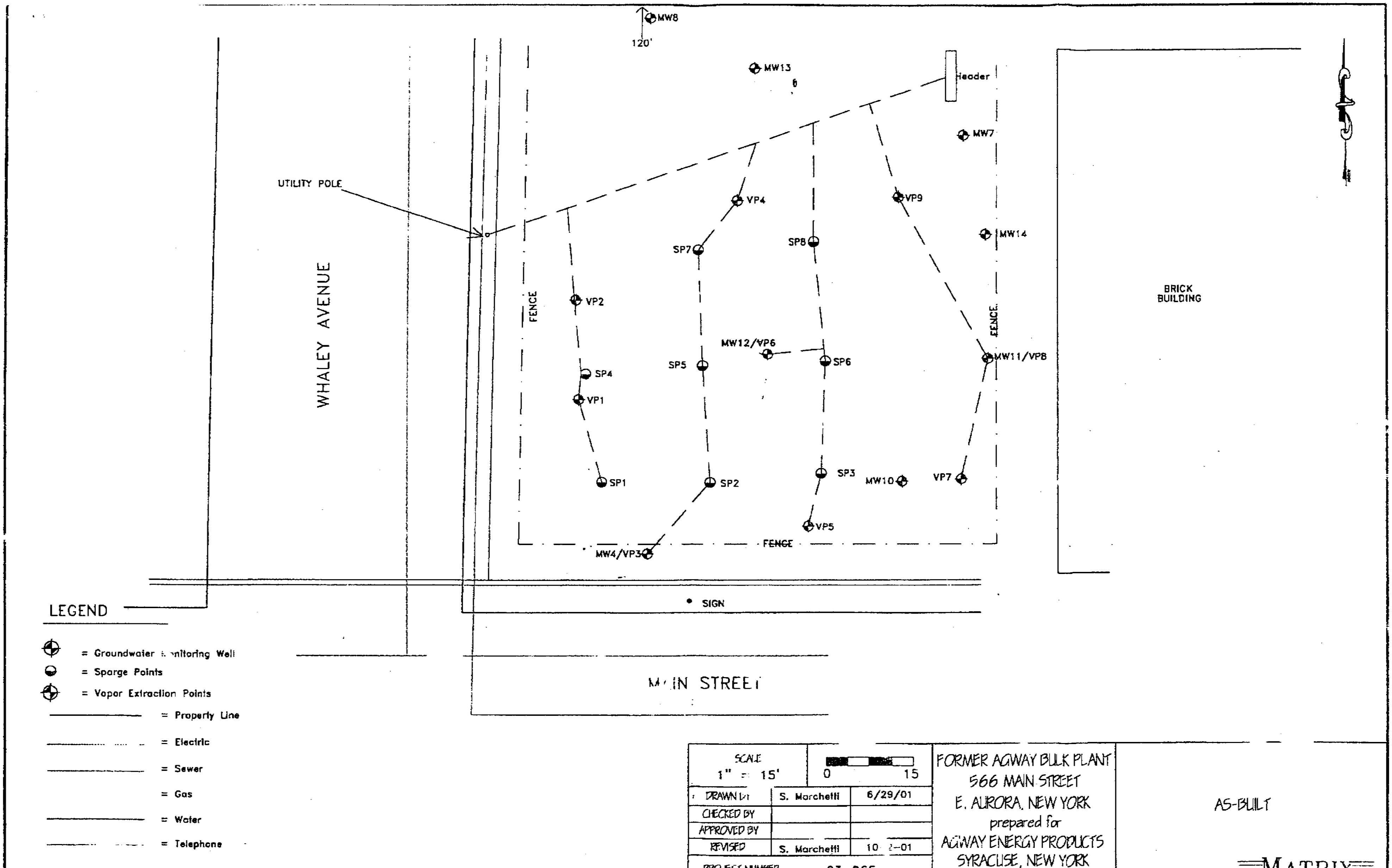
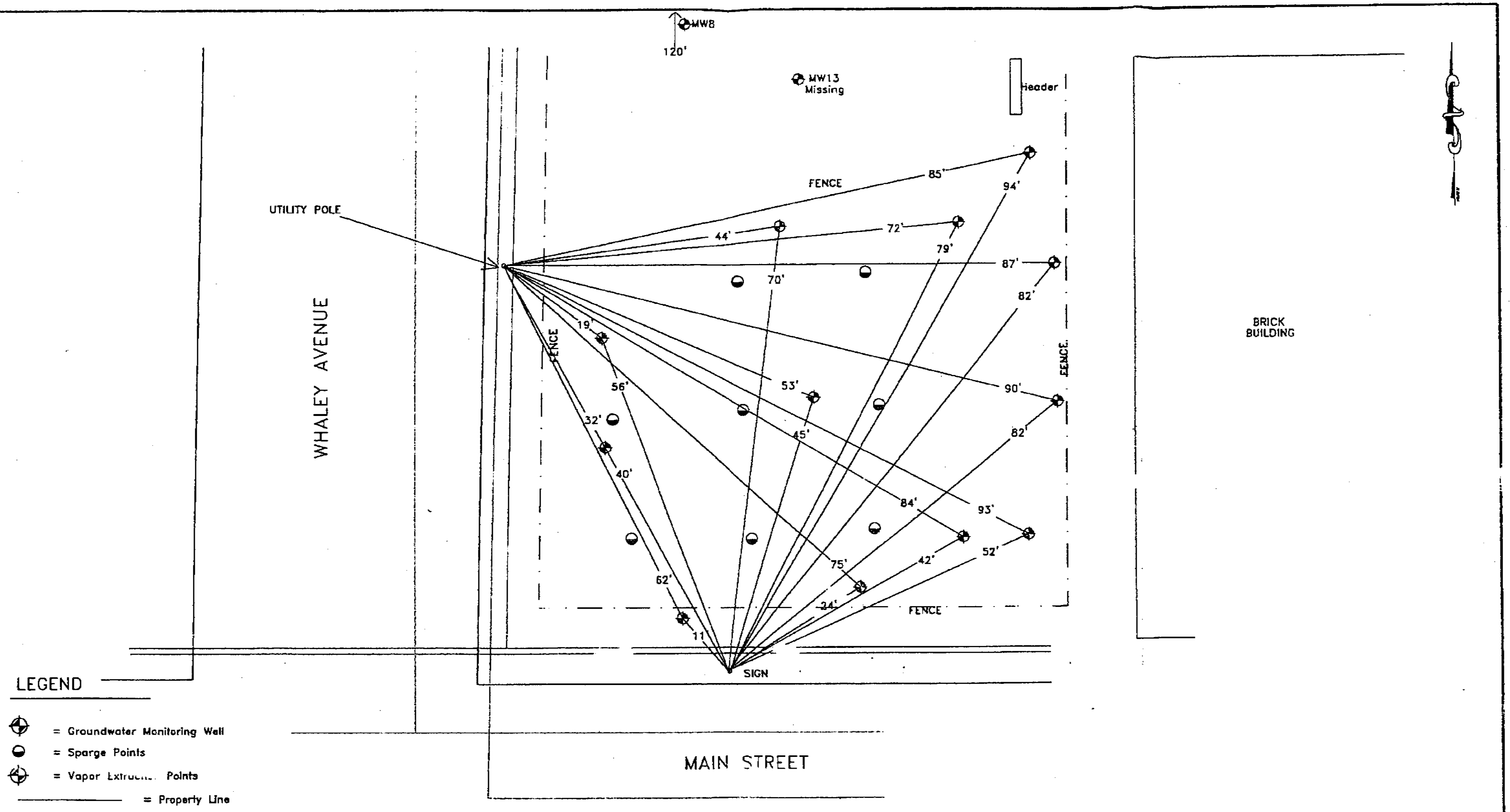


SCALE 1" = 15'	0 15	
DRAWN BY	S. Marchetti	6/29/01
CHECKED BY		
APPROVED BY		
REVISED	S. Marchetti	10-2-01
PROJECT NUMBER	93-065	

FORMER AGWAY BULK PLANT
566 MAIN STREET
E. AURORA, NEW YORK
prepared for
AGWAY ENERGY PRODUCTS
SYRACUSE, NEW YORK

AS-BUILT

MATRIX
Environmental T[illegible]logies



LEGEND

- ⊕ = Groundwater Monitoring Well
- ◒ = Sparge Points
- ⊕ = Vapor Extraction Points
- ——— = Property Line
- ——— = Electric
- - - - = Sewer
- = Gas
- ——— = Water
- - · - = Telephone

SCALE 1" = 15'	0 15	
DRAWN BY	S. Marchetti	6/29/01
CHECKED BY		
APPROVED BY		
REVISED	S. Marchetti	9/27/01
PROJECT NUMBER	93-065	

FORMER AGWAY BULK PLANT
566 MAIN STREET
E. AURORA, NEW YORK
prepared for
AGWAY ENERGY PRODUCTS
SYRACUSE, NEW YORK

VENT POINT AND MONITORING WELL
TIE IN MAP

ATRIX
Environmental Technologies

I

Groundwater Sampling Procedures

Groundwater Monitoring Well Sampling Procedures
Work Plan for Mr. C's Dry Cleaners - NYSDEC Site No. 915957

Prepared by: Benjamin Cole, Ecology and Environment Engineering, P.C. (EEEPC)

Reviewed by: Mike Steffan, EEEPC Work Assignment Project Manager

Accepted for Use: December 27, 2012

Revisions:

Dated:	**Revisions:**	**By:**

1 Introduction

1.1 Site Location and Description

The Mr. C's Dry Cleaners Site is located at 586 Main Street in the Village of East Aurora in Erie County, New York on an approximately ½-acre parcel. The site is located in a mixed-use area of residential, municipal, and light commercial properties. It is an inactive dry cleaning facility, and is located in the front portion of a one-story building on a concrete slab foundation with an adjacent paved parking lot. The remainder of the building is occupied by various other commercial businesses (see Figure 1-2 in the SMP). Tetrachloroethene (PCE) and its daughter products are the contaminants of concern in the groundwater at the site.

1.2 Site History

Mr. C's Dry Cleaners has been in operation since 1970. Prior to that, the property was used for several other commercial uses, including laundry services and auto repair/painting and has also served as a hotel. In December of 1991, the New York State Department of Environmental Conservation (NYSDEC) investigated complaints of odors in a neighboring property southwest of the site. Subsequently, NYSDEC collected air samples from basements, as well as soil vapor, groundwater, and sanitary sewer wastewater samples on several occasions and detected the presence of tetrachloroethene (PCE). The site was then designated as a Class 2 Hazardous Waste Site (Site Number 9-15-157) by NYSDEC, meaning that the site is believed to pose a significant risk to public health and the environment. A Remedial Investigation (RI) was conducted in 1994 and found the highest concentration of PCE beneath the Mr. C's Dry Cleaners building. The RI also determined the horizontal and vertical extents of the contamination and found that other contaminants at the site consisted of volatile organic compounds (VOCs) including petroleum hydrocarbons and other compounds resulting from PCE degradation. A Feasibility Study was completed in November 1996, which recommended remediation of the source plume using in-situ air-stripping wells. A remedial action consisting of the installation of eight in-situ air-stripping wells was selected and a Record of Decision was signed in March 1997. Additional pre-design investigations were conducted in December 1998 and April 1999 to confirm the limits of the groundwater contamination plume. An Explanation of Significant Differences was issued in April 2000 as justification for modification of the selected remedy to a conventional groundwater pump and treat system. Remedial design, including the preparation of Contract Documents and Drawings, was completed in October 2000.

Construction of the treatment system and groundwater pumping system was completed in March 2003. Since March 2003, the treatment system has operated continuously. In November 2011, a number of wells were decommissioned and the well network surrounding the site was improved. The most recent long-term monitoring well sampling event occurred in 2012.

1.3 Purpose of this Work Plan

Ecology and Environment Engineering, P. C. (EEEPC) was contracted by NYSDEC to install and develop new monitoring wells, abandon existing wells, sample new and existing wells, and perform minor well maintenance. EEEPC is currently under contract by NYSDEC to perform long-term groundwater monitoring. This procedure details the activities used to complete this task.

2 Site Monitoring Wells

2.1 Monitoring Well Description

A total of 34 active groundwater monitoring wells and pumping wells are present within the vicinity of the Mr. C's Site. The well network is part of a remedial groundwater pump-and-treat system. The treatment system for extracted groundwater includes a sequestering agent feed system, bag filters, a 3,000-gallon holding tank, and a low-profile air stripper that are housed inside the Mr. C's building. There are eight pumping wells located around the area that are constructed of 4-inch and 6 inch diameter PVC screen and risers and range from in depth to approximately 30 feet, each with 10 feet of screen. Monitoring wells are located throughout the area and are constructed of 2-inch and 4-inch diameter PVC and range in depth from 14 to 42 feet, each with approximately 10 feet of screen. Well construction details are provided in Table 2-1 of the SMP and the locations of the wells are shown on Figure 2-5a and 2-5b in the SMP.

2.2 Monitoring Well Inspection

During the sampling of each monitoring well, an inspection of the well's physical condition will be performed. Minor well repairs, including well labeling and replacing missing well flush-mount cover bolts, will be made as needed. The need for more extensive repairs will be noted, if necessary. More extensive well repairs will be noted on the Monitoring Well Inspection Checklist (see Attachment A). The Site Management Plan (SMP) should be consulted for information regarding monitoring well decommissioning, abandonment, and repairs. The NYSDEC Project manager will approve all activities prior to implementation, as required, among other things, per the SMP.

3 Groundwater Sampling

3.1 Analytical Plan

Groundwater monitoring wells will be sampled and analyzed in accordance with NYSDEC Analytical Services Protocol for volatile organic compounds (VOCs) using EPA SW-846

Method 8260B. Groundwater sampling will be performed using the equipment and procedures described below.

3.2 Equipment and Supplies

- Water level indicator;
- Access key to the Mr. C's Treatment building to stage equipment and disposal of purge water;
- Appropriate keys for well cap locks;
- Timepiece, logbook, data collection forms, and calculator;
- Centrifugal pump with power source and dedicated polyethylene tubing, or new disposable polyethylene bailer with new nylon or polypropylene line of sufficient length;
- Water quality meter(s) capable of reading pH, temperature, specific conductance, dissolved oxygen (DO), oxidation-reduction potential (ORP), and turbidity;
- Decontamination supplies;
- Sample bottles, labels, custody seals, chain-of-custody forms, tape, self-sealing bags; and
- Cooler with packing material and ice.

3.3 Site and Area Access

Most groundwater monitoring and pumping wells locations are within public right-of-way, on public property, or have access agreements currently in place.

Sampling team should be aware that cars or commercial vehicles may park on top of monitoring and pumping well to be sampled that are along streets and parking lots. Early reconnaissance should be performed by the sampling team to allow for additional contact of the property owners with access agreements to make them aware that sampling is going to be performed. For example: the East Aurora Public Library parking lot, East Aurora Police Station, Mr. C's parking lot and Agway parking lot may need to be contacted.

3.4 Monitoring Well Groundwater Sampling Procedures

3.4.1 Well Purging

All wells will be purged prior to sampling using one of two methods: low-flow purging and sampling or standard purging and sampling. Prior to purging or installation of any equipment into the well, record the static depth to water and total well depth as measured from the top of inner casing to within ±0.01 foot in each well. Refer to Table 2-1 (in the SMP) for existing well construction information. Calculate the volume of standing water in gallons or liters. Record the groundwater well purge and sample record information on the form provided in Attachment B.

Low-Flow Purging
The preferred method of purging and sampling is to use the low-flow purging procedures as follows:

- Install sampling pump by slowly lowering the pump, tubing, and electrical lines into the well to the appropriate depth. The pump intake must be kept at least 1 foot above the bottom of the well to prevent disturbance and suspension of sediment. Record the depth to which the pump is lowered.

- Before starting the pump, measure the water level again with the pump in the well. Leave the water level measuring device in the well.

- Start pumping the well at approximately 500 milliliters per minute (ml/min) or less. Measure the flow rate using a graduated container and timepiece. The water level should be monitored approximately every 5 minutes during purging. Ideally, a steady flow rate should be maintained that results in a stabilized water level (drawdown of 0.3 feet or less). Pumping rates should, if needed, be reduced to the minimum capabilities of the pump to ensure stabilization of the water level. The flow rate may also be increased up to 1 liter per minute (1,000 ml/min) as long as the water level stabilizes with less than 0.3 feet of drawdown. Care should be taken to maintain pump suction and to avoid entrainment of air in the tubing. Record each adjustment made to the pumping rate and the water level measured immediately after each adjustment.

- During purging of the well, monitor and record water quality parameters (turbidity, temperature, specific conductance, pH, DO, and ORP) approximately every 5 minutes. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings as follows:

    - +0.1 for pH;
    - +3% for specific conductance;
    - +10 millivolts for ORP; and
    - +10% for DO and turbidity.

Dissolved oxygen and turbidity usually require the longest time to achieve stabilization.

Standard Purging
As an alternative to utilizing low-flow purging procedures, the standard purging and sampling method may also be used. The goal of purging using the standard method is the same as the low-flow method, to obtain samples of groundwater representative of existing conditions within the aquifer. The standard purging method is similar to that described above for the low-flow method but is better suited to low-yield wells and is as follows:

- Install sampling pump as described above. A bailer may also be used for purging in the cases of shallow wells of low yield.

- Start pumping the well at approximately 500 milliliters per minute (ml/min) or less. Adjust the flow rate so that it will be sustainable during purging and sampling without drying out the well. Do not over-pump the well such that it will become dry in less than one static volume. Measure the flow rate using a graduated container and timepiece. The water level should be monitored periodically during purging. Care should be taken to maintain pump suction and to avoid entrainment of air in the tubing. Record each adjustment made to the pumping rate and the water level measured immediately after each adjustment.

- During purging of the well, monitor and record water quality parameters (turbidity, temperature, specific conductance, and pH) at least once per well volume or more often if possible. DO and ORP measurements may also be recorded if available on the instrumentation being used, but are not a requirement of this method. A minimum of three static wells volumes of water should be purged and the water quality parameters must be stable prior to sampling except in the case where a low-yield well dries out during purging. The well is considered stabilized and ready for sample collection when the water quality parameters have stabilized for three consecutive readings as follows:

    - +0.1 for pH;
    - +3% for specific conductance; and
    - +10% for turbidity.

- If the water quality parameters are not stable after purging three well volumes, or if the turbidity is above 50 NTU and continues to decline, then continue purging until five static well volumes have been purged.

- If a low-yield well dries out during purging, remove the pump and all sampling equipment, secure the well, and return within 24 hours for sampling after sufficient recharge has occurred.

3.4.2 Sample Collection

For the low-flow purging method, the pump must not be removed from the well between purging and sampling. Collect samples at a flow rate between 100 and 250 ml/min. For the standard purging method, the pump should also not be removed; however, the pump may be removed if the well dried out during purging and a bailer will be used to collect the sample. VOC samples must be collected directly into sample containers (see below). All sample containers should be filled with minimal turbulence by allowing the water to flow from the tubing gently down the inside of the container. In the case of a bailer, it must be lowered very slowly into the water column and to the depth of the screen for sample collection. Fill sample bottles leaving no headspace.

Proper collection of a sample for dissolved VOCs requires minimal disturbance of the sample to limit volatilization and subsequent loss of volatiles from the sample. Bottles for VOC analysis may or may not include chemical preservative (hydrochloric acid [HCl]) depending on whether the laboratory can meet the applicable holding time (7 days from collection without preservative or 14 days from collection with preservative). If using chemical preservative, the vials should be pre-preserved with HCL by the laboratory. The following procedures should be followed when collecting samples for VOC analysis:

- Open the vial and set the cap in a clean place. Use caution and appropriate personal protective equipment (PPE) if using pre-preserved sample containers;

- Fill the vial to the top until a convex meniscus forms on the top of the vial. Do not overfill the vial;

- Place the cap directly over the top and screw down firmly. Do not over tighten. Over tightening the sample container cap may result in cap breakage;

- Invert the vial, tap gently, and observe sample for air bubbles. If an air bubble appears, gently open the sample vial and place a small amount of additional sample inside. Use caution to avoid flushing sample (and preservative if applicable) from the vial. No entrapped air should remain in the sample vial; and

- Place the vial in a cooler with ice and appropriate packaging in accordance with Section 6.0.

Label sample bottles, prepare chain-of-custody documents, package samples, and store the samples under chain-of-custody pending shipment in accordance with the procedures specified in Section 5 of this Appendix.

3.5 Pumping Wells Sampling Procedures

The eight pumping wells are active groundwater pumping locations that need to be turned off and electrically isolated prior to sampling. Each pumping well has an individual circuit breaker located in the treatment room located at 586 Main Street.

Shutdown and isolation of the individual pumping wells shall be performed using electrical lock-out and tag-out procedures before sampling is performed. Each circuit breaker is marked for the individual pumping well.

Upon completion of the groundwater pumping well sampling program, the pumps will need to be re-energized and returned to actively pumping the groundwater.

3.5.1 Well Purging

All pumping wells will be purged prior to sampling using one of two methods: low-flow purging and sampling or standard purging and sampling. Prior to purging or installation of any equipment into the well, record the static depth to water and total well depth as measured from the top of inner casing to within ±0.01 foot in each well. Refer to Table 2-1 (in the SMP) for existing well construction information. Calculate the volume of standing water in gallons or liters. Record the groundwater well purge and sample record information on the form provided in Attachment B.

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- Install sampling pump by slowly lowering the pump, tubing, and electrical lines into the well to the appropriate depth. The pump intake must be kept at least 1 foot above the bottom of the well to prevent disturbance and suspension of sediment. Record the depth to which the pump is lowered.

- Before starting the pump, measure the water level again with the pump in the well. Leave the water level measuring device in the well.

- Start pumping the well at approximately 500 milliliters per minute (ml/min) or less. Measure the flow rate using a graduated container and timepiece. The water level should be monitored approximately every 5 minutes during purging. Ideally, a steady flow rate should be maintained that results in a stabilized water level (drawdown of 0.3 feet or less). Pumping rates should, if needed, be reduced to the minimum capabilities of the pump to ensure stabilization of the water level. The flow rate may also be increased up to 1 liter per minute (1,000 ml/min) as long as the water level stabilizes with less than 0.3 feet of drawdown. Care should be taken to maintain pump suction and to avoid entrainment of air in the tubing. Record each adjustment made to the pumping rate and the water level measured immediately after each adjustment.

- During purging of the well, monitor and record water quality parameters (turbidity, temperature, specific conductance, pH, DO, and ORP) approximately every 5 minutes. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings as follows:

    - +0.1 for pH;
    - +3% for specific conductance;
    - +10 millivolts for ORP; and
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Dissolved oxygen and turbidity usually require the longest time to achieve stabilization.

Standard Purging

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- Start pumping the well at approximately 500 milliliters per minute (ml/min) or less. Adjust the flow rate so that it will be sustainable during purging and sampling without drying out the well. Do not over-pump the well such that it will become dry in less than one static volume. Measure the flow rate using a graduated container and timepiece. The water level should be monitored periodically during purging. Care should be taken to maintain pump suction and to avoid entrainment of air in the tubing. Record each adjustment made to the pumping rate and the water level measured immediately after each adjustment.

- During purging of the well, monitor and record water quality parameters (turbidity, temperature, specific conductance, and pH) at least once per well volume or more often if possible. DO and ORP measurements may also be recorded if available on the instrumentation being used, but are not a requirement of this method. A minimum of three static wells volumes of water should be purged and the water quality parameters must be stable prior to sampling except in the case where a low-yield well dries out during purging. The well is considered stabilized and ready for sample collection when the water quality parameters have stabilized for three consecutive readings as follows:
    - +0.1 for pH;
    - +3% for specific conductance; and
    - +10% for turbidity.

- If the water quality parameters are not stable after purging three well volumes, or if the turbidity is above 50 NTU and continues to decline, then continue purging until five static well volumes have been purged.

- If a low-yield well dries out during purging, remove the pump and all sampling equipment, secure the well, and return within 24 hours for sampling after sufficient recharge has occurred.

3.5.2 Sample Collection

For the low-flow purging method, the pump must not be removed from the well between purging and sampling. Collect samples at a flow rate between 100 and 250 ml/min. For the standard purging method, the pump should also not be removed; however, the pump may be removed if the well dried out during purging and a bailer will be used to collect the sample. VOC samples must be collected directly into sample containers (see below). All sample containers should be filled with minimal turbulence by allowing the water to flow from the tubing gently down the inside of the container. In the case of a bailer, it must be lowered very slowly into the water column and to the depth of the screen for sample collection. Fill sample bottles leaving no headspace.

Proper collection of a sample for dissolved VOCs requires minimal disturbance of the sample to limit volatilization and subsequent loss of volatiles from the sample. Bottles for VOC analysis may or may not include chemical preservative (hydrochloric acid [HCl]) depending on whether the laboratory can meet the applicable holding time (7 days from collection without preservative or 14 days from collection with preservative). If using chemical preservative, the vials should be pre-preserved with HCL by the laboratory. The following procedures should be followed when collecting samples for VOC analysis:

- Open the vial and set the cap in a clean place. Use caution and appropriate personal protective equipment (PPE) if using pre-preserved sample containers;

- Fill the vial to the top until a convex meniscus forms on the top of the vial. Do not overfill the vial;

- Place the cap directly over the top and screw down firmly. Do not over tighten. Over tightening the sample container cap may result in cap breakage;

- Invert the vial, tap gently, and observe sample for air bubbles. If an air bubble appears, gently open the sample vial and place a small amount of additional sample inside. Use caution to avoid flushing sample (and preservative if applicable) from the vial. No entrapped air should remain in the sample vial; and

- Place the vial in a cooler with ice and appropriate packaging in accordance with Section 6.0.

Label sample bottles, prepare chain-of-custody documents, package samples, and store the samples under chain-of-custody pending shipment in accordance with the procedures specified in Section 5 of this Appendix.

4 Field Quality Control Samples

Field QC samples help determine whether project data quality objectives are being met. Analyzed in the laboratory as ordinary field samples, they are used to assess sampling and transport procedures as possible sources of sample contamination and to document overall sampling and analytical precision. The following field QC samples will be collected:

- One duplicate sample will be collected per 20 samples per sampling round.

- Extra volume will be collected for laboratory matrix spike/matrix spike duplicate (MS/MSD) analysis at a frequency of one set per 20 field samples per sampling round. Unless otherwise directed by the laboratory, each MS/MSD will consist of two additional sets of containers (for a total of three including the original sample) all labeled the same as the original sample.

- Trip blanks for water samples will be prepared by the laboratory, transported to the site with the laboratory bottles, and returned to the lab for analysis at the rate of one per shipping cooler containing water samples for VOC analysis; and

- Rinsate blanks will be collected from non-dedicated or non-disposable sampling equipment, including reusable submersible pumps for groundwater sampling. One rinsate blank will be collected per 20 field samples by passing organic-free deionized water supplied by the laboratory or other suitable source over the decontaminated equipment and directly into pre-preserved laboratory containers;

5 Sample Containers, Labeling, Packaging, Shipping, and Custody

The sample volumes, containers, and preservative requirements are presented in Table 1. Pre-washed sample containers, prepared in accordance with U.S. Environmental Protection Agency (EPA) bottle washing procedures will be provided by the laboratory. Sample containers for analyses requiring chemical preservation will be pre-preserved by the laboratory.

5.1 Sample Labeling

All samples will be assigned a unique sample identifier (sys_sample_code) based on the well's location identifier (sys_loc_code). Labels for each sample container will contain the sample identifier, date of sample collection, analytical parameters, and type of preservation used. Any change in the label information prepared prior to the sample collection will be initialed by the sampler.

An example of the sample identifier is MPI-7I-R-MMMYY, where:

MPI-7I-R = groundwater monitoring well identifier; and

MMMYY = abbreviated month and year of sample collection.

5.2 Sample Packaging and Shipping

Sample containers will be placed inside sealed plastic bags as a precaution against cross-contamination caused by leakage or breakage. The bags will be placed in coolers with inert packaging such as bubble wrap in such a manner as to minimize the chance of breakage during shipment. Ice in plastic bags will be placed in the coolers to chill the samples with the goal of achieving 4 ±2 degrees Celsius (°C) throughout shipment.

Sample shipment will be performed in accordance with applicable U.S. Department of Transportation regulations. Samples from this site will be considered non-hazardous materials. The samples will be shipped to a designated laboratory certified by the New York State Department of Health's Environmental Laboratory Approval Program (ELAP).

5.3 Sample Custody

A sample is considered to be in custody under the following situations:

- The sample is directly in your possession;
- The sample is clearly in your view;
- The sample is placed in a locked location; or
- The sample is in a designated secure area.

In order to demonstrate that the samples and coolers have not been tampered with during shipment, adhesive custody seals will be used. The custody seals will be placed either around the cap of each sample container or across the cooler lids in such a manner that they will be visibly disturbed upon opening of the sample container or cooler. The seals will be signed or initialed and dated by field personnel when affixed to the container and cooler.

Documentation of sample chain-of-custody is necessary to demonstrate that the integrity of the samples has not been compromised between collection and delivery to the laboratory. Each sample cooler will be accompanied by a chain-of-custody record to document the transfer of custody from the field to the laboratory. All information requested in the chain-of-custody record will be completed. One copy of the chain-of-custody form will be retained by the samplers and placed in the project file. The original will be sealed in a plastic bag and placed inside the cooler. Upon receipt at the laboratory, the chain-of-custody documents will be completed. It is the responsibility of the laboratory to document the condition of custody seals and sample integrity upon receipt.

5.4 Turnaround Time and Laboratory Reporting

A standard turnaround time will be requested for sample analysis results unless otherwise instructed by the Project Manager. Sample results will be reported by the laboratory in a manner consistent with the requirements for a NYSDEC ASP Category B deliverable. In addition, the laboratory will provide an electronic data deliverable (EDD) in the EQuIS-based format required by the NYSDEC Environmental Information Management System (EIMS).

6 Health and Safety

Health and safety procedures will be as described in the site-specific Health and Safety Plan (sHASP) and any amendments prepared for this groundwater sampling task. Care will be taken when opening any well to avoid inhaling vapors that may have accumulated in the headspace inside the well. Wasps/bees nesting in well casings and vehicular traffic are additional safety concerns. All work is expected to be completed in Level D personal protection.

The site-specific Health and Safety Plan for this work plan is provided as Appendix N of the Site Management Plan.

7 Decontamination Procedures

Sampling methods and equipment have been chosen to minimize decontamination requirements and prevent the possibility of cross-contamination. Any non-dedicated sampling equipment will be decontaminated using the following procedure:

- Initially remove all foreign matter;
- Wash in a laboratory-grade detergent solution (e.g. Alconox);
- Rinse with deionized or distilled water; and
- Allow to air dry.

Fluids generated during decontamination will be handled according to the procedures outlined in Section 9.

8 Investigation-Derived Waste (IDW)

The following waste stream types of IDW are expected to be generated: groundwater from purging, decontamination fluids, sampling supplies such as tubing, and PPE. Waste streams will be segregated and not mixed. Existing data indicates that there are no direct contact exposure concerns, so purge waters will be disposed of by discharging into the sump pit in the Mr. C’s treatment room that will then be pumped to the equalization tank for additional treatment. In the event that evidence of significant contamination is present (e.g. strong odors, sheen, product), the waste will be containerized in steel or plastic drums and stored in the Treatment building pending analysis and potential off-site disposal. All expendable materials generated during the investigation (including, but not limited to, gloves and plastic tubing) will be bagged and disposed of off-site as non-regulated solid waste.

9 Data Review and Report

A brief report summarizing all field activities and providing a summary of the analytical results will be provided to the NYSDEC Project Manager upon receipt and review of the analytical report from the laboratory. Analytical data review will be performed by a qualified chemist in accordance with NYSDEC Division of Environmental Remediation Guidance for Data Deliverables and the Development of Data Usability Summary Reports (in DER-10, May 2010) and appropriate USEPA Region 2 data validation standard operating procedures for the analytical methods performed (available at http://www.epa.gov/region2/qa/documents.htm). Final, validated groundwater sampling results must be submitted to the NYSDEC EIMS in accordance with the most recent version of the standardized EDD format. Further information on the EDD is available at the website http://www.dec.ny.gov/chemical/62440.html.

10 Schedule

Monitoring well evaluation and sampling is expected to be performed on an annual basis. Sampling is to be performed in approximately April or May of each year.

11 References

New York State Department of Environmental Conservation (NYSDEC), 2010, *Technical Guidance for Site Investigation and Remediation* (DER-10).

U.S. Environmental Protection Agency Region II, 1998, *Ground Water Sampling Procedure Low Stress (Low Flow) Purging and Sampling.*

Table 1 – Mr. C’s Site Sample Bottles, Volumes, and Preservatives

Analyte and Method	Bottle Type and Quantity[1]	Sample Holding Time[2]	Preservatives
Volatile organic compounds (VOCs) EPA SW-846 Method 8260;	Three 40-ml glass vials with septum-lined caps	7 days if unpreserved 14 days if preserved	HC1 to pH < 2 and ice to 4°C

Note:
[1] Certified pre-cleaned bottles and containers.
2 From date and time of sample collection.

Attachment A

Monitoring Well Inspection Checklist

Groundwater Monitoring Well Inspection Checklist, Mr. C's Dry Cleaners site - NYSDEC Site No. 915157

Well Number	Water Level (feet TOIC)	Current Depth (feet TOIC)	Well Paint (G/F/P)	Well Label (G/F/P)	Casing Lock (G/F/P)	Protective Cover (G/F/P)	Inner Well Cap (G/F/P)	Equipment in Well (B/U/H)	Obstructions in Well (Y/N)	Water in Annulus (Y/N)	Concrete Pad (G/F/P)	Inspection Date	Comments/Needs

Key at the end of table.

Groundwater Monitoring Well Inspection Checklist, Mr. C's Dry Cleaners site - NYSDEC Site No. 915157

Well Number	Water Level (feet TOIC)	Current Depth (feet TOIC)	Well Paint (G/F/P)	Well Label (G/F/P)	Casing Lock (G/F/P)	Protective Cover (G/F/P)	Inner Well Cap (G/F/P)	Equipment in Well (B/U/H)	Obstructions in Well (Y/N)	Water in Annulus (Y/N)	Concrete Pad (G/F/P)	Inspection Date	Comments/Needs

Key at the end of table.

Groundwater Monitoring Well Inspection Checklist, Mr. C's Dry Cleaners site - NYSDEC Site No. 915157

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Key:

B = Bailer.
F = Fair.
G = Good.
H = PDB Harness.
N = No.
P = Poor.
TOIC = Top of inner casing.
U = Bladder Pump.
Y = Yes.

Attachment B

Groundwater Well Purge and Sample Record Form

ATTACHMENT B

WELL PURGE & SAMPLE RECORD

Site Name/Location: ____________________ Well ID: ____________

EEEPC Project No.: ____________________ Date: ____________

Initial Depth to Water: ________ feet TOIC

Total Well Depth: ________ feet TOIC

Depth to Pump: ________ feet TOIC

Initial Pump Rate: ________ Lpm / gpm

adjusted to: ________ at ________

adjusted to: ________ at ________

Start Time: ____________

End Time: ____________

☐ Bailer ☐ Pump

Pump Type: ____________

Well Diameter: ________ inches

1x Well Volume: ________ gallons

Time	Purge Volume (gallons/liters)	pH (s.u.)	Temp. (ºC/ºF)	ORP (mV)	Conductivity (µS/cm mS/cm)	DO (mg/L)	Turbidity (NTU)	Water Level (feet)
Final Sample Data:								

Sample ID: ____________

Sample Time: ____________

Duplicate? ☐

MS/MSD? ☐

Dupe Samp ID: ____________

No. of Bottles: ____________

Analyses:
- ☐ VOCs
- ☐ SVOCs
- ☐ PCBs
- ☐ Pest.
- ☐ Metals/CN
- ☐ Dioxin

Methods:
- ☐ CLP
- ☐ SW846
- ☐ EPA/CWA
- ☐ ________

Comments: ____________________

Sampler(s): ____________________

J

Indoor Air and Sub-Slab Sampling Procedures

Sampling Plan for Soil Vapor Intrusion Investigations (SVII)

Mr. C's Dry Cleaners Site and Surrounding Properties

NYSDEC site No. 915157

January 2015

TABLE OF CONTENTS

1. Introduction

This Standard Operating Procedure (SOP) describes procedures for sample collection and evaluation for a soil vapor intrusion investigation (SVII) in the State of New York, specifically for the Mr. C’s Dry Cleaners site, East Aurora (V), Erie (C), Site #915157.

The proposed scope of SVII work is to be performed is the subslab, indoor and ambient air sampling at locations to be determined by the New York State Department of Health (NYSDOH).

The SOP for the proposed SVII work incorporates guidance provided by the New York State Department of Health on the general steps and strategies that should be applied when conducting SVII.

Therefore, this SOP must be confirmed and discussed with the appropriate regulatory agencies, even in New York State, prior to the investigation start date, to verify that it has been accepted by the reviewing agency. This SOP must be used in combination with an appropriate analytical method (e.g., USEPA TO-15).

2. Scope

Included in this SOP are the sample collection procedures for the following sample media:

1. Subsurface Soil Vapor Samples (collected outdoors, typically at foundation level directly from the soil);

2. Sub-slab Vapor Samples (collected beneath a structure’s slab);

3. Indoor Air Samples (collected from ambient air within a structure); and

4. Outdoor Air Samples (collected from ambient air outside of a structure).

The purpose of this investigation is to identify soil vapor intrusion pathways and determine if any migrating contaminant vapors have the potential to adversely impact humans that are exposed to these vapors. It is recommended that this investigation be conducted during the heating season because it is the period where the greatest impact is anticipated - when a building’s heating system is in operation typically causing a pressure gradient into the building and vapors may be drawn into the building. Heating season dates will vary with locale, but is generally defined by NYSDOH as November 15 through March 31.

3. Equipment

The survey will be performed using the equipment listed below.

- Hammer drill;
- Hand auger or post digger;
- Vacuum with high efficiency particulate air (HEPA) filtration for dust and debris cleanup;
- Dustpan and brush;
- ½-inch bottle brush;
- Drill bits, 1-inch diameter x 6 inches long (typical, minimum usable length);
- Drill bits, ½-inch diameter x 12 inches long (typical, minimum usable length);
- Building power source, generator, or batteries for hammer drill;
- Bentonite (fine granular or powder);
- Glass beads or coarse sand;
- Water;
- Inert laboratory- or food-grade-quality tubing (e.g., polyethylene, Teflon-lined polyethylene, or stainless steel), typically ¼- to ⅜-inch ID;
- Organic vapor monitor that reads in the parts per billion range (e.g., ppbRAE) <*to be used only when product inventories or indoor air sampling are conducted*>;
- Enclosure such as a small bucket (5-gallon, typical) and three, ⅜-inch holes with rubber grommets (typical) <*for leak detection testing during soil vapor sampling only*>;
- Helium (ultra-pure, when possible) gas tank < *for leak detection testing during soil vapor sampling only*>
- Portable helium detector < *for leak detection testing during soil vapor sampling only* >
- Syringe without needle (100-cc volume, typical);

- Tedlar bag for vapor purge collection <*for use only during sub-slab vapor sampling when indoor air sampling will be conducted concurrently*>;
- Adjustable wrench and screwdriver/nutdriver;
- Hydraulic cement and mixing tools; and
- Digital camera.

Samples are collected using canisters with vacuum gauges and flow controllers. The sampling equipment is provided by a laboratory certified to perform EPA Method TO-15 by New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP). NYSDOH ELAP will certify the sampling canister preparation procedure and equipment. Canisters may be 1-liter (L) or 1.4-L "Mini-Cans" or 6-L Summa canisters. The choice of canister depends on the sampling conditions and laboratory availability. Canisters must be certified clean (in accordance with EPA Method TO-15) and under a vacuum pressure of no more than -25 inches of mercury (in Hg). Batch cleaning is acceptable as long as the cleaning process is certified by NYSDOH. Flow controllers must be set for the appropriate collection period (1- or 24-hour, typical) (flow rate dependent upon size of canister). Flow controllers must maintain a constant flow over the sampling period. Note the method description below:

> "With a critical orifice flow restrictor, there will be a decrease in the flow rate as the pressure approaches atmospheric. However, with a mass flow controller, the subatmospheric sampling system can maintain a constant flow rate from full vacuum to within about 7 kPa [kilopascals] (1.0 psi [pound per square inch) or less below ambient pressure."

The laboratory must be notified at least two weeks in advance of sampling to ensure the canisters are available. The laboratory should provide enough canisters for one week of sampling with an extra 10% to account for added samples (e.g. multiple sub-slab samples in one structure) and regulator/canister failures (e.g., sampling rate incorrect, initial canister pressure too high).

Specifically for the Mr. C's SVII work; all samples are to be performed over a 24 hour period.

4. Multimedia Sampling Procedures

4.1 Soil Vapor Samples

4.1.1 Selection of Sampling Locations

1. **To evaluate the potential for current on-site or off-site exposures, collect soil vapor samples:**

   - In the vicinity of a building's foundation at a point located between the building and the contaminant source or along the site's perimeter. <*For buildings with no surrounding surface confining layer (e.g., pavement or sidewalk), samples should be located in native or undisturbed soils away from fill material surrounding the building (approximately 10 feet away from the building) to avoid sampling in an area that may be influenced by the building's operations. For example, operation of HVAC systems, fireplaces, or mechanical equipment (e.g., clothes dryers or exhaust fans/vents) in a building may exacerbate the infiltration of outdoor air into the vadose zone adjacent to the building. As a result, soil vapor samples collected in uncovered areas adjacent to the building may not be representative*>; and

   - At a depth of approximately 8 feet below grade or comparable to the depth of foundation footings (determined on a building-specific or site-specific basis). <*In areas where the groundwater table is less than 6 feet below grade, collect soil vapor samples at least 1 foot above the water table but no shallower than 4 feet below grade*>.

2. **To evaluate the potential for future exposures if development on a known or suspected contaminated area on-site or off-site is possible, collect soil vapor samples:**

   - In areas with either known or suspected subsurface sources of volatile chemicals, where elevated readings were obtained with field equipment during previous investigations, or where volatile organic compound contamination is reported to be present in the upper groundwater. <*If information is limited for the area, collect soil vapor samples in a grid pattern across the area at an appropriate spacing interval relative to the size of the area*>; and

   - At multiple depths from the suspected subsurface source (no deeper than 1 foot above the water table), or former source, to a depth comparable to the expected depth of foundation footings.

3. **To evaluate the potential for off-site vapor contamination, collect soil vapor samples:**

    - Along the site's perimeter or in areas of potential subsurface sources of vapor contamination (e.g., a groundwater source that has migrated off-site); and

    - At a depth comparable to the depth of foundation footings (determined on a site-specific basis). <*In areas where the groundwater table is less than 6 feet below grade, collect soil vapor samples at least one foot above the water table but no shallower than 4 feet below grade* >.

4. **To evaluate on-site and off-site preferential migration pathways in areas with low permeability soils, collect soil vapor samples:**

    - Along preferential soil vapor flow paths, such as sewer lines, utility corridors, trenches, pipelines, and other subsurface structures that are likely to be bedded with higher permeability materials; and

    - At depths corresponding to these subsurface features (depends on site-specific conditions).

5. **To characterize on-site or off-site contamination in the vadose zone**, **collect soil vapor samples:**

    - In areas with either known or suspected subsurface sources of volatile chemicals, where elevated readings were obtained with field equipment (eg; PID) during previous investigations, or where volatile chemical contamination is reported to be present in the upper groundwater; and

    - At appropriate depths associated with these areas (depends on site-specific conditions).

6. **To investigate the influence of contaminated groundwater or soil on soil vapor and to characterize the vertical profile of contamination, collect soil vapor samples:**

    - From clusters of soil vapor probes at varying depths in the vadose zone (no deeper than 1 foot above the water table) and preferably in conjunction with the collection of groundwater or soil samples.

4.1.2 Preparation

For permanent soil vapor sampling probes, the following sampling preparation procedure is to be followed:

- Create a hole in the soil of at least 1-inch diameter using direct push or an auger to the desired sampling depth (typically 8 feet below grade).

- Insert rigid tubing (e.g., stainless steel) of the appropriate size (typically ⅛- to ¼-inch inner diameter) into the constructed soil probe hole, keeping the bottom of the tubing at least 6 inches off the bottom of the hole and extend it to the surface. Alternatively, install a soil gas implant such as that manufactured by Geoprobe Systems. The Geoprobe Soil Gas Implant consists of double-woven stainless steel screen available in 6-, 14-, and 21-inch lengths. The implant is installed through the bore after the Geoprobe rods have been driven to depth. Flexible tubing (e.g., polyethylene or Teflon-lined polyethylene) is connected to the top of the implant and extended to the surface. Cap the tubing at the surface.

- Place porous backfill material (e.g., glass beads or coarse sand) into soil probe hole around the tubing/implant to create a sampling zone of 1 to 2 feet in length.

- Place a minimum of 6 to 12 linear inches of granular bentonite above the glass beads/sand pack and hydrate with potable water.

- Mix and install at least 3 linear feet of grout (Portland cement with 5% bentonite by weight or a premixed non-shrinking grout) in the annular space around the tubing to prevent direct infiltration of air from the surface. Backfill the remainder of the hole with clean material. For multiple probe depths in one borehole, the annular space should be grouted with bentonite between the probes to create discrete sampling zones.

- Install a protective casing around the top of the probe tubing and grout (e.g., concrete) in place.

For temporary soil vapor sampling probes, the installation procedures are identical to those described above with the following exceptions:

- A system such as the Geoprobe Post-Run Tubing (PRT) System may be used to eliminate the need for soil vapor implants, porous backfill, bentonite, and grout. Instead, soil vapor samples are collected using flexible tubing connected directly to a fitting at the bottom of the direct push rods after they have been advanced to depth and withdrawn approximately 6 inches. Soil vapor is drawn in from the open space beneath the rods.

- The interface between the rods and the soil must be sealed at the surface by excavating a small (1 to 3 inches deep) hole around the rods and packing it with hydrated bentonite, forming a slight mound at the surface.

- Direct-push rods and associated tooling must be decontaminated between locations.

4.1.3 Purging and Pre-Sample Testing

Prior to completing probe construction or attempting sample collection, the sample probe should be tested to determine if it will yield vapor for sampling (this is particularly important at sites with low permeability soils). Connect a syringe to the sample tubing and attempt to draw vapor into the syringe several times, sealing the sample tubing between draws. If a vacuum pressure is generated, the syringe plunger will be drawn back in when released and vapor sample collection will not proceed. Alternatively, the pump of an organic vapor or helium detector may be used by connecting the inlet of the operating device to the sample tubing and observing the ability of the pump to operate without creating a vacuum and stopping.

To purge ambient air from the sample tubing and to ensure that representative samples are being collected that are not affected by ambient air, the following steps should be followed:

- Connect the helium detector to the sample tubing to obtain “background” helium concentrations (helium is unlikely to be present in the subsurface at a detectable concentration; however, water vapor and certain organic vapors can interfere with the helium detector yielding a false detection).

- Place the bucket over the sample tube, gasket side down, and slip the sample tube through one of the predrilled holes. Insert a tube from the helium tank through another of the predrilled holes with the tubing outlet just above the ground surface (bottom of the inverted bucket). If a good seal cannot be obtained between the bucket gasket and the ground surface, place a hydrated bentonite seal around the bucket.

- Connect the helium detector to a test port installed near the base of the bucket and release helium into the bucket. The target concentration within the bucket is at least 25% helium.

- Disconnect the helium detector and plug the sample port. Connect the helium detector to the sample tube and measure the helium concentration in the soil vapor. Purge approximately 3 volumes of the tubing using the helium detector (approximately 10 milliliters [ml] per foot for ¼-inch inner diameter tubing).

- If the purge vapor is greater than 1% helium above background, reseal the probe hole with bentonite and repeat the purge/helium test process again. If after two successive attempts, the sample tube penetration cannot be thoroughly sealed, move to a new location or eliminate the soil vapor sample.

- Disconnect the helium detector from the sample tubing and reconnect to the test port in the bucket to ensure that helium was maintained with the test chamber throughout the duration of the test.

- Remove the bucket and helium supply when purging is complete.

- Begin sample collection.

4.1.4 Sample Collection

Soil vapor samples will be collected in specially prepared canisters equipped with a flow controller pre-set for a 24-hour sampling duration. For preparation of the canister and collection of the sample, the following procedure is to be followed:

- Place canister on a stable surface (ground) adjacent to the sample tube.

- Record the canister's serial number on the chain of custody (COC) and field notebook/sample form.

- Assign sample identification on canister ID tag and record on COC and field notebook/sample form.

- Samples should be assigned an ID according to the following convention:

  SID-###-SC/Q

    - SID - Three letter code identifying the site (note that private property information such as street address must not be used in the sample identifier);
    - ### - Sequential location number (note that all samples from a single structure should have the same location ID for grouping of sample types by location ID);
    - SC – Sub-code identifying type of sample (note that additional numeric characters may be added for multiple samples of one type in a single structure);
    - Q - Quality control sample code such as D for duplicate.

        - The matrix codes are as follows:
            - BA - Indoor Air from Basement or Crawlspace
            - FA - Indoor Air, First Floor (not basement)
            - OA - Outdoor Air
            - SS - Sub-slab Vapor
            - SV - Soil vapor
            - TB - Trip Blank

- Remove plug from canister fitting, if equipped.

- Connect the sample tubing to the pressure gauge/flow controller.

- Install pressure gauge/metering valve on canister valve fitting if not already installed. <*For compression fittings [e.g., Swagelok], ensure the ferrule is properly seated, tighten the nut by hand, and complete tightening the nut ¼-turn with a wrench.*>

- Open and close the canister valve, if so equipped. <*Some flow controllers do not include valves and sample collection is initiated immediately when the controller is connected to the canister. In this case, it is important to ensure that the sample tubing is properly connected to the flow controller prior to connecting the flow controller to the sample canister.*>

- Record gauge pressure; vacuum gauge pressure must read -25 in Hg or less or the canister cannot be used without verification from the laboratory that the canister did not leak during transport (i.e., the laboratory should supply the vacuum pressure for the canister when it was measured prior to shipment).

- Open canister valve to initiate sample collection. Observe the gauge pressure after approximately 1 to 2 minutes. The pressures should increase by approximately 1 in Hg per 2 minutes. If the pressure increases too rapidly, there may be a leak in the system and sample collection should be terminated. Identify the leak and recollect the sample using a new cylinder and flow controller.

- Take digital photograph of canister setup and surrounding area.

- Record the start time on COC and in the field notebook/sample form.

Procedure for termination of sample collection:

- Close the canister valve.

- Record the stop time on COC and in the field notebook/sample form. The date of the stop time will be considered the date of sampling for QC purposes.

- Record the final gauge pressure; vacuum gauge pressure should read between approximately -5 and 0 in Hg.

- Disconnect the sample tubing and pressure gauge/flow controller from canister, if applicable.

- Install plug on canister inlet fitting <*and on sample tubing for permanent probes*>.

- Place the sample container in the original box.

- For temporary sampling locations, remove the sample tubing and rods and backfill the hole with clean material.

- Fill in the sample collection log with the appropriate information; including, sample identification, date and time of sample collection, sampling depth, identity of samplers, sampling methods and devices, purge volumes, volume of soil vapor extracted, canisters used, the vacuum before and after samples collected, apparent moisture content (dry, moist, saturated, etc.) of the sampling zone, and log each sample on the COC form.

- All canisters will be returned at the completion of the field sampling to the laboratory by overnight shipment or courier. No work or shipment of samples will be expected on weekends or holidays, without prior notice.

4.2 Sub-slab Vapor Samples

4.2.1 Selection of Sampling Locations

To evaluate the potential for current human exposure within a building, collect sub-slab vapor samples:

- In structures with a concrete slab or other flooring from a central location away from foundation footings and within the soil or aggregate immediately below the basement slab or slab-on-grade. <*The number of sub-slab vapor samples required in a building depends upon the number of slabs (e.g., multiple slabs-on-grade in a large warehouse) and foundation types (e.g., combined basement and slab-on-grade in a residence). At least one sub-slab sample should be collected from each representative area. In structures within partial slabs or utility pads, collect the sub-slab vapor sample from beneath the pad*>.

- In structures with dirt floors (basement or crawlspaces), sub-slab samples are not collected but indoor air samples in the basement or crawlspace will be collected.

4.2.2 Preparation

For the sub-slab vapor sampling, the following sampling preparation procedure is to be followed for concrete basement/floor slabs:

- Drill a ½-inch diameter hole (or appropriate size for the sample tubing to be used) completely through the concrete floor slab using an electric rotary hammer drill and masonry bit; brush the concrete dust away from the hole. Record the approximate thickness of the slab.

- Drill a 1-inch diameter hole (nominal diameter) 1 to 2 inches into the concrete floor centered on the ½-inch hole. <*The 1-inch diameter hole may be drilled first at the discretion of the field team leader*>.

- Sweep excess concrete dust away from the drill hole and clean the hole with a ½-inch bottle brush.

- Insert flexible tubing through the hole with the bottom no more than 2 inches below the bottom of the slab.

- Mix a paste of bentonite and water. Place the bentonite paste at the bottom of the 1-inch diameter drill hole around the tubing and form a small mound over the area to seal the interface between the tubing and the concrete.

- Concrete dust can be cleaned up with a vacuum equipped with a HEPA filter only after the sample tubing is properly sealed and sample collection has begun.

4.2.3 Purging and Pre-Sample Testing

To purge ambient air from the sample tubing and to ensure that representative samples are being collected from beneath the slab, the following steps should be followed:

- Attach the syringe to the sample tubing and withdraw approximately 3 volumes of the sample tubing (approximately 10-ml per foot for ¼-inch inner diameter tubing). <*Note the difficulty with which the air is withdrawn; if it is very difficult to withdraw the purge volume, then the sample tube may be plugged at the bottom and should be reinstalled and repurged. If indoor air sampling is to be conducted, then the purged vapor should be discharged outside to prevent cross-contamination (either cap the syringe or discharge to a Tedlar bag and empty the Tedlar bag outside). Prior to discharge, measure the organic vapor concentration of the purged air using a photoionization detector (PID) and record the reading. A PID may be used to purged the sample tubing; however, the exhaust must be captured for discharge outside if indoor air sampling is planned*>.

- Begin sample collection.

4.2.4 Sample Collection

For preparation of the canister and collection of the sub-slab vapor sample, the procedure described in Section 4.1.4 is to be followed with the following exceptions:

- Flow controllers must be set for a **24-hour** collection period.

- Upon initiation of sample collection, the pressure should not appear to change in a short period. If the pressure increases too rapidly, there may be a leak in the system and sample collection should be terminated. Identify the leak and recollect the sample using a new cylinder and flow controller.

- When possible, return to the sample location after approximately 1 hour to verify that sample collection is progressing (the gauge pressure should increase by approximately 1 in Hg per hour).

4.3 Indoor Air Samples

4.3.1 Selection of Sampling Locations

To characterize contaminant concentration trends and potential exposures within a building, collect indoor air samples

- From the crawlspace area;

- From the basement (where vapor infiltration is suspected or in a central location) at a height approximately 3 feet above the floor to represent a height at which occupants normally are seated and/or sleep;

- From the lowest level living space (in centrally-located, high-use areas) at a height approximately 3 feet above the floor to represent a height at which occupants normally are seated and/or sleep; and

- If in a commercial setting (e.g., a strip mall), from multiple tenant spaces at a height approximately 3 feet above the floor to represent a height at which occupants normally are seated.

4.3.2 Preparation

- Conduct a pre-sampling inspection prior to each sampling event to identify conditions that may affect or interfere with the proposed testing including the type of structure, floor layout, physical conditions, and airflows of the building(s) being studied. *For example, in New York State use the NYS Department of Health Indoor Air Quality Questionnaire and Building Inventory forms. These forms are attached as* ***Attachment A.***

- Conduct a product inventory to identify potential air sampling interference by characterizing the occurrence and use of chemicals and products throughout the building, keeping in mind the goal of the investigation and site-specific contaminants of concern. <*For example, it is not necessary to provide detailed information for each individual container of like items. However it is* *necessary to indicate that "20 bottles of perfume" or "12 cans of latex paint" were present with containers in good condition*>.

- Take inventory of each room on the floor of the building being tested and on lower floors, if possible. <*This is important because even products stored in another area of a building can affect the air of the room being tested. For example, when testing for a petroleum spill, all indoor sources of petroleum hydrocarbons should be scrutinized. These can include household and commercial products containing volatile organic compounds (VOCs), petroleum products including fuel from gasoline-operated equipment, unvented space heaters and heating oil tanks, storage and/or recent use of petroleum-based finishes and paints or products containing petroleum distillates. This information should be detailed on the Product Inventory Form*>.

- Draw plot sketches of the building interior (crawlspace, basement, and/or first floor) that includes sample locations, possible indoor air pollution sources, floor types, footings that create separate foundation sections, and vapor intrusion pathways into the building (cracks, utility penetrations, sumps, etc.).

- If the inventory identifies indoor sources of air contamination that may interfere with the objectives of the investigation, the following measures should be implemented:

    - Remove products or eliminate activities that may result in the release of volatile chemicals from the indoor environment prior to testing.

    - Make sure all containers storing volatile chemicals are tightly sealed.

    - Ventilate building by operating the building’s heating ventilation and air conditioning (HVAC) system to maximize outside air intake or open windows/doors and operate exhaust fans if the building has no HVAC system.

    - Note any measures taken to control indoor air interferences on the building inspection form.

    - Do not begin sample collection for at least 24 hours after implementing these measures.

FOR 24 HOURS PRIOR TO SAMPLING, ALL REASONABLE MEASURES SHOULD BE TAKEN TO AVOID:

- Opening any windows, fireplace dampers, openings, or vents;

- Operating ventilation fans unless special arrangements are made;

- Smoking in the house;
- Painting;
- Using wood stoves, fireplaces or other auxiliary heating equipment (e.g., kerosene heaters);
- Operating or storing automobiles in an attached garage;
- Allowing containers of gasoline or oil to remain within the house, except for fuel oil tanks;
- Cleaning, waxing, or polishing furniture or floors with petroleum- or oil-based products;
- Using air fresheners or odor eliminators;
- Engaging in any hobbies that use materials containing volatile organic chemicals;
- Using cosmetics, including hairspray, nail polish, nail polish removers, perfume/cologne, etc.;
- Applying pesticides; and
- Storing recently dry-cleaned clothing and materials.

4.3.3 Purging and Pre-Sample Testing

- Use portable vapor monitoring equipment readings (e.g., PIDs for VOCs, Mercury Vapor Analyzer for mercury) to evaluate potential sources of chemical products stored in the building. Due to the low detection limits typically achieved for air sampling, a PID capable of measuring VOCs in the parts-per-billion (ppb) range is recommended. However, the ionization potential of the chemicals of interest must be considered when selecting a PID.
- Take inventory of products stored in buildings every time air is tested. <*If available, chemical ingredients of interest should be recorded for each product. If the ingredients are not listed on the label, record the product's exact and full name, and the manufacturer's name, address and phone number, if available. In some cases, Material Safety Data Sheets may be useful for identifying confounding sources.*>

4.3.4 Sample Collection

For preparation of the canister and collection of the indoor air sample, the procedure described in Section 4.2.4 is to be followed with the following exceptions:

- The canister may be placed on a stable surface approximately 3 feet above the floor or it may be placed on the floor with flexible sample tubing extended from the canister to a collection height of approximately 3 feet.

4.4 Outdoor Air Samples

4.4.1 Selection of Sampling Locations

To characterize “background” contaminant concentrations in ambient air, collect outdoor air samples from a representative upwind location:

- Whenever indoor air sampling is being conducted;
- Away from wind obstructions (e.g., trees or bushes); and
- At a height above the ground to represent breathing zones (3 to 5 feet).

A representative sample is one that is not biased toward obvious sources of volatile chemicals (e.g., automobiles, lawn mowers, oil storage tanks, gasoline stations, industrial facilities, etc.). Outdoor ambient air samples should be collected at the rate of one per day in the vicinity of indoor air sample locations.

4.4.2 Preparation

The following actions should be taken to document conditions during outdoor air sampling and ultimately to aid in the interpretation of the sampling results:

- Draw a plot sketch of the sampling area that includes sample locations, buildings and other nearby structures, possible sources of outdoor air pollution (industries, gas stations, repair shops, etc.), and wind direction.
- Record weather (e.g., precipitation, temperature, and barometric pressure); and
- Record any pertinent observations, such as odors, readings from field instrumentation, and significant activities in the vicinity (e.g., operation of heavy equipment or dry cleaners).

4.4.3 Purging and Pre-Sample Testing

None.

4.4.4 Sample Collection

For preparation of the canister and collection of the outdoor air sample, the procedure described in Section 4.3.4 is to be followed.

5. Quality Assurance

5.1 Quality Assurance/Quality Control Samples

Field quality control (QC) samples may include duplicates and trip blanks, as determined on a site-specific basis. Duplicate samples provide insight as to the homogeneity of the sample matrix and establish a degree of confidence that the sample represents site conditions. The relative percent difference between the concentrations in the original and duplicate samples measure the overall precision of the field sampling and analytical method. Field duplicates must be collected at a rate that satisfies the data quality objectives of the program and can be project specific. In the absence of project-specific requirements, collect duplicates at the rate of one duplicate per 20 original samples (5%).

Trip blanks are collected to establish that the transport of sample canisters to and from the field does not result in the contamination of the sample from external sources. Trip blanks consist of an unopened, pre-cleaned, certified canister shipped from the laboratory with the sample collection canisters, stored on site with the sample collection canisters, and returned to the laboratory unopened. Typically, trip blanks are submitted for analysis with each sample shipment. However, the applicability of trip blanks must be determined on a site-specific basis since they are not required by the analytical method (typically TO-15). It is not possible to mimic round-trip shipping conditions with a single trip blank since sample canisters are shipped from the lab under vacuum pressure and are returned to the lab at or close to ambient pressure.

Field QC sample results must be assessed during data review.

5.2 Sample Analysis

All air and vapor samples will be analyzed using USEPA Method TO-15 or another approved method suitable to meet the data quality objectives of the project. Analyses must be performed by a laboratory certified for the particular analysis in the State or Federal program in which the project is being conducted. In New York State, laboratories must be certified by the NYSDOH ELAP. The analyte list must be selected to comply with the data quality objectives of the project. For example, chlorinated solvents may be selected for drycleaner sites and aromatic/petroleum hydrocarbons may be selected for fuel spill sites. Reporting limits should be approximately 1 microgram per cubic meter ($\mu g/m^3$) for all compounds, unless otherwise specified to meet data quality objectives. For example, in New York State, a reporting limit of 0.25 $\mu g/m^3$ must be met for Trichloroethene in indoor and outdoor air samples.

6. Health and Safety

The type of personnel protective equipment (PPE) to be used during sampling is outlined in the site-specific Health and Safety Plan (HASP) and is contaminant specific. The HASP should be reviewed with specific emphasis placed on the safety procedures to be followed. Standard safe operating practices should be followed, such as minimizing contact with potential contaminants in both the vapor phase and liquid matrix through the use of respirators and protective clothing during soil vapor sampling. Typically, exposure to contaminants is minimal during sub-slab vapor, indoor air, and outdoor air sampling and PPE is not required; however, this must be determined on a site- and location-specific basis.

7. References

New York State Department of Health, February 2005, *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*, Public Comment Draft.

United States Environmental Protection Agency, November 2002, *OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)*, EPA530-D-02-004.

Attachment A

Air Quality Questionnaire and Building Inventory forms (NYSDEC)

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

Site Name: ______ Site Code: ______ Operable Unit: ______

Building Code: ______ Building Name: ______

Address: ______ Apt/Suite No: ______

City: ______ State: ______ Zip: ______ County: ______

Contact Information

Preparer's Name: ______ Phone No: ______

Preparer's Affiliation: ______ Company Code: ______

Purpose of Investigation: ______ Date of Inspection: ______

Contact Name: ______ Affiliation: ______

Phone No: ______ Alt. Phone No: ______ Email: ______

Number of Occupants (total): ______ Number of Children: ______

☐ Occupant Interviewed? ☐ Owner Occupied? ☐ Owner Interviewed?

Owner Name (if different): ______ Owner Phone: ______

Owner Mailing Address: ______

Building Details

Bldg Type (Res/Com/Ind/Mixed): ______ Bldg Size (S/M/L): ______

If Commercial or Industrial Facility, Select Operations: ______

If Residential Select Structure Type: ______

Number of Floors: ______ Approx. Year Construction: ______ ☐ Building Insulated? ☐ Attached Garage?

Describe Overall Building 'Tightness' and Airflows(e.g., results of smoke tests): ______

Foundation Description

Foundation Type: ______ Foundation Depth (bgs): ______ Unit: FEET

Foundation Floor Material: ______ Foundation Floor Thickness: ______

Foundation Wall Material: ______ Foundation Wall Thickness: ______ Unit: INCHES

☐ Floor penetrations? Describe Floor Penetrations: ______

☐ Wall penetrations? Describe Wall Penetrations: ______

Basement is: ______ Basement is: ______ ☐ Sumps/Drains? Water In Sump?: ______

Describe Foundation Condition (cracks, seepage, etc.) : ______

☐ Radon Mitigation System Installed? ☐ VOC Mitigation System Installed? ☐ Mitigation System On?

Heating/Cooling/Ventilation Systems

Heating System: ______ Heat Fuel Type: ______ ☐ Central A/C Present?

Vented Appliances

Water Heater Fuel Type: ______ Clothes Dryer Fuel Type: ______

Water Htr Vent Location: ______ Dryer Vent Location: ______

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

PRODUCT INVENTORY

Building Name: __________ Bldg Code: __________ Date: __________

Bldg Address: __________ Apt/Suite No: __________

Bldg City/State/Zip: __________

Make and Model of PID: __________ Date of Calibration: __________

Location	Product Name/Description	Size (oz)	Condition *	Chemical Ingredients	PID Reading	COC Y/N?
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐

* Describe the condition of the product containers as **Unopened (UO)**, **Used (U)**, or **Deteriorated (D)**

** Photographs of the **front and back** of product containers can replace the handwritten list of chemical ingredients. However, the photographs must be of good quality and ingredient labels must be legible.

Product Inventory Complete? ☐ Were there any elevated PID readings taken on site? ☐ ☐ Products with COC?

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

Site Name: ______ Site Code: ______ Operable Unit: ______

Building Code: ______ Building Name: ______

Address: ______ Apt/Suite No: ______

City: ______ State: ______ Zip: ______ County: ______

Factors Affecting Indoor Air Quailty

Frequency Basement/Lowest Level is Occupied?: ______ Floor Material: ______

☐ Inhabited? ☐ HVAC System On? ☐ Bathroom Exhaust Fan? ☐ Kitchen Exhaust Fan?

Alternate Heat Source: ______ ☐ Is there smoking in the building?

☐ Air Fresheners? Description/Location of Air Freshener: ______

☐ Cleaning Products Used Recently?: Description of Cleaning Products: ______

☐ Cosmetic Products Used Recently?: Description of Cosmetic Products: ______

☐ New Carpet or Furniture? Location of New Carpet/Furniture: ______

☐ Recent Dry Cleaning? Location of Recently Dry Cleaned Fabrics: ______

☐ Recent Painting/Staining? Location of New Painting: ______

☐ Solvent or Chemical Odors? Describe Odors (if any): ______

☐ Do Any Occupants Use Solvents At Work? If So, List Solvents Used: ______

☐ Recent Pesticide/Rodenticide? Description of Last Use: ______

Describe Any Household Activities (chemical use,/storage, unvented appliances, hobbies, etc.) That May Affect Indoor Air Quality:

☐ Any Prior Testing For Radon? If So, When?: ______

☐ Any Prior Testing For VOCs? If So, When?: ______

Sampling Conditions

Weather Conditions: ______ Outdoor Temperature: ______ °F

Current Building Use: ______ Barometric Pressure: ______ in(hg)

Product Inventory Complete? ______ ☐ Building Questionnaire Completed?

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

Building Code: ______________ Address: ______________

Sampling Information

Sampler Name(s): ______________

Sampler Company Code: ______________

Sample Collection Date: ______________

Date Samples Sent To Lab: ______________

Sample Chain of Custody Number: ______________

Outdoor Air Sample Location ID: ______________

SUMMA Canister Information

Sample ID:					
Location Code:					
Location Type:					
Canister ID:					
Regulator ID:					
Matrix:					
Sampling Method:					

Sampling Area Info

Slab Thickness (inches):					
Sub-Slab Material:					
Sub-Slab Moisture:					
Seal Type:					
Seal Adequate?:	☐	☐	☐	☐	☐

Sample Times and Vacuum Readings

Sample Start Date/Time:					
Vacuum Gauge Start:					
Sample End Date/Time:					
Vacuum Gauge End:					
Sample Duration (hrs):					
Vacuum Gauge Unit:					

Sample QA/QC Readings

Vapor Port Purge:	☐	☐	☐	☐	☐
Purge PID Reading:					
Purge PID Unit:					
Tracer Test Pass:	☐	☐	☐	☐	☐

Sample start and end times should be entered using the following format: MM/DD/YYYY HH:MM

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

LOWEST BUILDING LEVEL LAYOUT SKETCH

Please click the box with the blue border below to upload a sketch of the lowest building level .
The sketch should be in a standard image format (.jpg, .png, .tiff)

Clear Image

Design Sketch

Design Sketch Guidelines and Recommended Symbology

- Identify and label the locations of all sub-slab, indoor air, and outdoor air samples on the layout sketch.
- Measure the distance of all sample locations from identifiable features, and include on the layout sketch.
- Identify room use (bedroom, living room, den, kitchen, etc.) on the layout sket
- Identify the locations of the following features on the layout sketch, using the appropriate symbols:

B or F	Boiler or Furnace	o	Other floor or wall penetrations (label appropriately)
HW	Hot Water Heater	**xxxxxxx**	Perimeter Drains (draw inside or outside outer walls as appropriate)
FP	Fireplaces	**######**	Areas of broken-up concrete
WS	Wood Stoves	● SS-1	Location & label of sub-slab samples
W/D	Washer / Dryer	● IA-1	Location & label of indoor air samples
S	Sumps	● OA-1	Location & label of outdoor air samples
@	Floor Drains	● PFET-1	Location and label of any pressure field test holes.

FIRST FLOOR BUILDING LAYOUT SKETCH

Please click the box with the blue border below to upload a sketch of the first floor of the building. The sketch should be in a standard image format (.jpg, .png, .tiff)

Clear Image

Design Sketch

Design Sketch Guidelines and Recommended Symbology

- Identify and label the locations of all sub-slab, indoor air, and outdoor air samples on the layout sketch.
- Measure the distance of all sample locations from identifiable features, and include on the layout sketch.
- Identify room use (bedroom, living room, den, kitchen, etc.) on the layout sket
- Identify the locations of the following features on the layout sketch, using the appropriate symbols:

B or **F**	Boiler or Furnace	o	Other floor or wall penetrations (label appropriately)
HW	Hot Water Heater	**xxxxxxx**	Perimeter Drains (draw inside or outside outer walls as appropriate)
FP	Fireplaces	**######**	Areas of broken-up concrete
WS	Wood Stoves	● SS-1	Location & label of sub-slab samples
W/D	Washer / Dryer	● IA-1	Location & label of indoor air samples
S	Sumps	● OA-1	Location & label of outdoor air samples
@	Floor Drains	● PFET-1	Location and label of any pressure field test holes.

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

OUTDOOR PLOT LAYOUT SKETCH

Please click the box with the blue border below to upload a sketch of the outdoor plot of the building as well as the surrounding area. The sketch should be in a standard image format (.jpg, .png, .tiff)

Clear Image

Design Sketch

Design Sketch Guidelines and Recommended Symbology

- Identify and label the locations of all sub-slab, indoor air, and outdoor air samples on the layout sketch.
- Measure the distance of all sample locations from identifiable features, and include on the layout sketch.
- Identify room use (bedroom, living room, den, kitchen, etc.) on the layout sket
- Identify the locations of the following features on the layout sketch, using the appropriate symbols:

B or F	Boiler or Furnace	o	Other floor or wall penetrations (label appropriately)
HW	Hot Water Heater	**xxxxxxx**	Perimeter Drains (draw inside or outside outer walls as appropriate)
FP	Fireplaces	**######**	Areas of broken-up concrete
WS	Wood Stoves	● SS-1	Location & label of sub-slab samples
W/D	Washer / Dryer	● IA-1	Location & label of indoor air samples
S	Sumps	● OA-1	Location & label of outdoor air samples
@	Floor Drains	● PFET-1	Location and label of any pressure field test holes.

K

Generic Quality Assurance Project Plan

Generic Quality Assurance Project Plan (GQAPP) for the Mr. C's Dry Cleaners Site NYSDEC Site No. 9-15-157

November 2012

Prepared for:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
625 Broadway
Albany, New York 12233

Program QA Officer ____________________ Date ____________

Table of Contents

Section **Page**

Table of Contents (Cont.)

Section **Page**

Appendix

List of Tables

Table **Page**

List of Figures

Figure **Page**

List of Abbreviations and Acronyms

AAS	atomic absorption spectroscopy
ASP	Analytical Services Protocol
ASTM	American Society for Testing and Materials
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CLP	Contract Laboratory Program
CM	construction management
COC	chain-of-custody
CPR	cardiopulmonary resuscitation
DOT	United States Department of Transportation
DUSR	Data Usability Summary Report
ECL	Environmental Conservation Law
EDD	electronic data deliverable
ELAP	Environmental Laboratory Accreditation Program
EPA	United States Environmental Protection Agency
FS	Feasibility Study
FSP	field sampling plan
GC/MS	gas chromatography/mass spectrometry
IATA	International Air Transport Association
ICP	inductively coupled plasma
ICS	interference check sample

List of Acronyms (Cont.)

IDW	investigation-derived waste
IIWA	immediate investigation work assignment
IRM	interim remedial measure
LCS	laboratory control sample
MDL	method detection limit
MEDD	multimedia electronic data deliverable
mL/min	milliliters per minute
MS/MSD	matrix spike/matrix spike duplicate
MSB	matrix spike blank
NELAP	National Environmental Laboratory Accreditation Program
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OVA	organic vapor analyzer
PARCC	precision, accuracy, representativeness, completeness, and comparability
PE	performance evaluation
PID	photoionization detector
PPE	personal protection equipment
PSA	preliminary site assessment
QA/QC	quality assurance/quality control
QAM	Quality Assurance Manual
QAPP	Quality Assurance Project Plan
QMP	Quality Management Plan
RA	remedial action
RD	remedial design
RI	Remedial Investigation

List of Acronyms (Cont.)

RPD	relative percent difference
SARA	Superfund Amendments and Reauthorization Act of 1986
SDG	sample delivery group
SI	site inspection
SOP	Standard Operating Procedure
SOW	scope of work
SVOC	semi-volatile organic compound
TCLP	toxicity characteristic leaching procedure
TRPH	total recoverable petroleum hydrocarbon
VOA	volatile organic analysis
VOC	volatile organic compound
VTSR	verified time of sample receipt

Distribution List

Party	Affiliation and Title	Revision	Date Sent
QAPP Original Distribution			
	QA Director		
	Project Manager(s)		
	NYSDEC Contracts		
	NYSDEC QA Officer		

Revision List

Revision	Modifications	Distributed

Laboratory Distribution and Approval

All site specific contract or subcontract laboratories working on project must perform analytical services and work in compliance with this QAPP.

Party	Affiliation and Title	Revision	Date Sent
QAPP Original Distribution			

This page must be completed and returned to NYSDEC with each revision of the QAPP.

Laboratory certifies that it will conduct analytical services in compliance with QAPP unless modified by any project-specific requirements listed in the site-specific QAPP or approved laboratories exceptions or clarifications.

Executed this day of , 20

Contractor or Subcontractor Laboratory

Signature

Name

Title

1

Project Management

This generic Quality Assurance Project Plan (GQAPP) has been prepared in support of projects performed for the New York State Department of Environmental Conservation (NYSDEC).

The GQAPP is applicable to the Mr. C's project and needs to be implemented by site monitoring personnel and is subject to regulatory oversight by NYSDEC or that must be conducted in accordance with NYSDEC regulations.

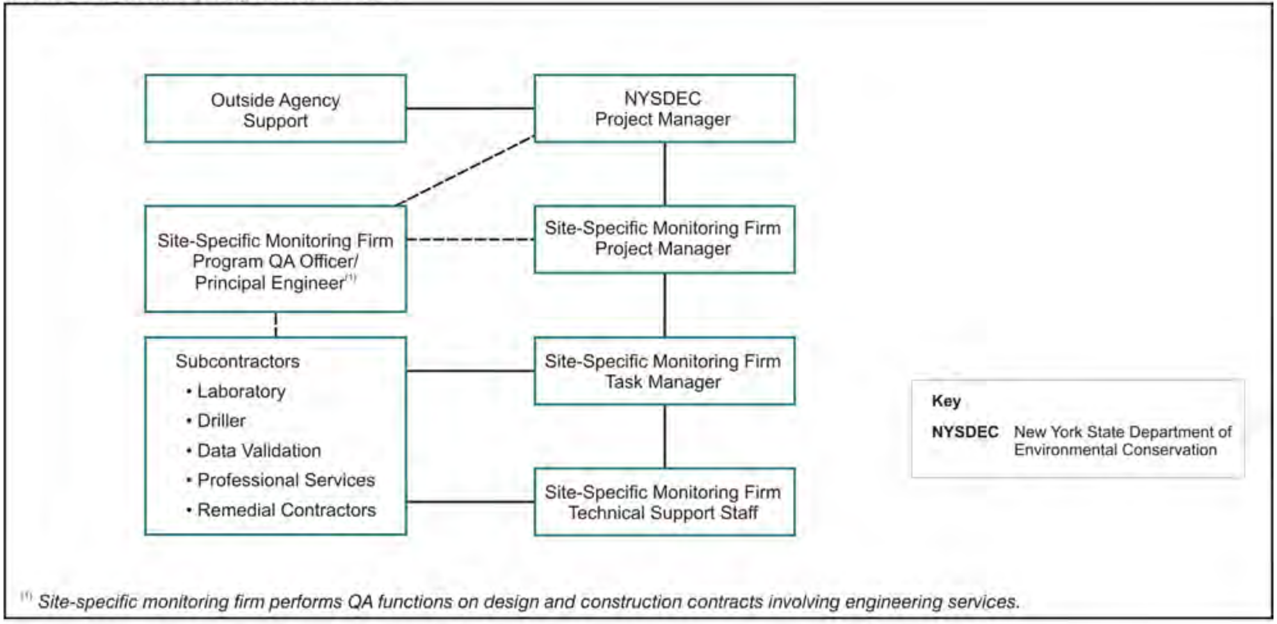
This GQAPP has been prepared in accordance with "United States Environmental Protection Agency (EPA) Requirements for Quality Assurance Project Plans," final, EPA QA/R-5 (March 2001) and incorporates NYSDEC requirements. This GQAPP presents the policies, organization, objectives, functional activities, and specific quality assurance/quality control (QA/QC) procedures that will be employed by site monitoring personnel to ensure that all technical data generated are accurate, representative, and ultimately capable of withstanding judicial scrutiny. These activities will be implemented under the requirements of site monitoring personnel's comprehensive QA program as documented in the corporate Quality Management Plan (QMP).

The GQAPP is formatted to address the four major sections listed in the EPA QAPP guidance document: Project Management, Data Generation and Acquisition, Assessment and Oversight, and Data Validation and Usability.

1.1 Project Organization

The organizational chart for the site specific environmental investigation, design, or construction project work in New York is presented as Figure 1-1. The owner and project team members are primarily responsible for implementation of the QA program on NYSDEC related projects. All project communications are directed through the site specific project manager. The site specific project manager is the primary point of contact for the NYSDEC Project Manager and technical staff. The QA Officer for the site specific work provides independent review functions to verify that the projects are implemented in accordance with applicable QA documents. The site specific project manager is responsible for independent oversight of projects involving engineering services for design and construction. The roles and specific QA responsibilities of key project personnel are described below.

02:002700_DC13_03-B2757 Fig1-1 Org Chart.CDR-12/11/09 GRA



[1] *Site-specific monitoring firm performs QA functions on design and construction contracts involving engineering services.*

Figure 1-1 Organizational Chart

Project Manager

The site specific Project Manager is responsible for QA/QC functions for all task-specific operations on NYSDEC projects, and will coordinate with the owner on issues that impact the overall quality of performance on the site specific work.

The Project Manager will also be responsible for the overall quality of work performed under project activities as it relates to the following specific roles:

- Overseeing day-to-day performance including all technical and administrative operations;
- Interfacing frequently with the NYSDEC Project Manager and technical staff;
- Tracking schedules and budgets and managing of mobilization and contract closeout activities;
- Selecting and monitoring field staff;
- Managing the development of detailed work plans; and
- Reviewing and approving all final reports and other work products.

Corporate or Program QA Officer

The site specific monitoring firm's Corporate QA Director is responsible for ensuring compliance with the site specific QA program. The Program QA Officer is responsible for oversight of all QA/QC activities for NYSDEC projects. The QA Officer will remain independent of day-to-day, direct project involvement but will have the responsibility for ensuring that all project and task-specific QA/QC requirements are met. The QA Officer will have direct access to corporate executive staff, as necessary, to resolve any QA/QC problems, disputes, or deficiencies. The QA Officer's specific duties include:

- Reviewing and approving the QAPP;
- Conducting field and laboratory audits in conjunction and keeping written records of the audits;
- Coordinating with the NYSDEC technical staff, Project Manager, Task Managers, and laboratory management to ensure that QA objectives appropriate to the project are set and that laboratory and field personnel are aware of these objectives; and
- Recommending, implementing, and/or reviewing actions taken in the event of QA/QC failures in the laboratory or field.

Project Chemist

The Project Chemist is responsible for data validation and verification, generation of Data Usability Summary Reports (DUSRs), and independent assessment of the hard copy and electronic analytical data. The Project Chemist will report nonconformance with QC criteria (including an assessment of the impact on data quality objectives) to the appropriate managers.

Technical Support Staff

The technical support staff for this program will be drawn from the site specific pool of resources. The technical support staff will implement project and site tasks, analyze data, and prepare reports/support materials. All support personnel assigned will be experienced professionals who possess the degree of specialization and technical competence necessary to perform the required work effectively and efficiently.

Laboratories

Laboratories providing analytical services will be chosen as appropriate for the project requirements. All laboratories will be certified by the New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP) for the methods that they are contracted to perform. Laboratories performing for Superfund sites with full data packages must be certified by NYSDOH for Contract Laboratory Program (CLP) analysis.

The laboratory QA programs are reviewed and approved by the QA Officer or the Project Chemist, and will be submitted to NYSDEC for approval. Copies of the laboratory QA manuals are available on request. The laboratory must provide an experienced Project Manager and a QA Officer that is independent of the day-to-day operations of the laboratory. The specific duties of the laboratory Project Manager and QA Officer for NYSDEC activities include:

- Reviewing the GQAPP to verify that analytical operations will meet project requirements;
- Documenting review and approval of GQAPP on distribution page;
- Reviewing receipt of all sample shipments and notifying the Project Manager and Project Chemist of any discrepancies within one day of receipt;
- Rapidly notifying the site specific Project Manager and Project Chemist regarding laboratory nonconformance with the GQAPP or analytical QA/QC problems affecting project samples; and
- Coordinating with the site specific Project Manager and Project Chemist, and laboratory management to implement corrective actions approved by NYSDEC or others as applicable.

1.2 Problem Definition/Background

All work is to be carried out consistent with NYSDEC and EPA requirements, protocols, and guidance.

1.3 Project Description

The work covered by this QAPP is defined under the site specific Site Management Plan (SMP). If necessary, site-specific QAPP information will be provided as an appendix to the field sampling plan (FSP).

1.4 Quality Objectives and Criteria

Quality objectives are qualitative or quantitative statements derived from the systematic planning process. Quality objectives are used to clarify the goals of the project and define the appropriate type of data to collect to support project decisions. General quality objectives for NYSDEC projects are summarized in Table 1-1.

Table 1-1 General Data Quality Objectives, NYSDEC Projects

Data Collection Activity	Quality Objectives	Standards[a]	Acceptability/ Performance Criteria[b]
Sampling and Analysis	To have samples and analytical results that accurately represents the nature and extent of contamination at the site. Data must be of sufficient quality to meet all regulatory requirements and allow assessment of impacts on human health by comparison to New York State criteria or background values. Data also may be used for long-term monitoring or to meet regulatory permit requirements. In these cases, data must meet the requirements of the permit.	■ NYSDEC Ambient Water Quality Standards ■ NYSDOH Soil Vapor Intrusion Guidance Values ■ NYSDEC Remedial Program Soil Cleanup Objectives	■ Data must be collected under an approved FSP using approved SOPs. Data must meet the acceptance and performance criteria documented in Section 2 of this QAPP. ■ Reporting limits should be below risk-based screening values for 90% of target analytes and 100% of critical analytes of concern. ■ Data must be compared to standards.
Field Screening Analysis	To have samples and analytical results that effectively indicate the nature and extent of contamination at the site. Technical personnel use data to determine the best locations to collect samples for laboratory analysis.	■ None	■ Data must be collected under an approved FSP using approved SOPs. Data must meet the acceptance and performance criteria for the screening method. ■ Reporting limits should be below anticipated concentrations of critical analytes of concern.
Subsurface Logging	To provide a description of the subsurface soils that is consistent and accurate, and to record drilling and sampling procedures and well construction details.	■ Site Specific SOPs (including Geologic Logging and Monitoring Well Installation)	■ Accurate, consistent, signed, and legible documentation as described in SOPs. ■ Unconsolidated materials described according to the Unified Soil Classification System. ■ Rock/soil material described using standard geologic nomenclature.
Surveying	To relate project work locations (including sample, monitoring well, and test pit locations) to existing local benchmarks.	■ Surveying subcontract ■ Differential correction for GPS data	■ Relation of all survey points to existing/known benchmarks. ■ Accurate horizontal coordinates (∀0.5 foot for wells; ∀3 feet for GPS locations). ■ Accurate vertical elevations (∀0.01 foot) for permanent monitoring well locations.
Field Records	To document all field activities and to allow accurate representation field events in the final report. Records must be capable of withstanding legal scrutiny.	■ Section 2 of the QAPP ■ Site Specific SOPs (Field Activities Logbooks)	■ Consistency between field and laboratory data. ■ Clear and legible documentation for sample collection and equipment decontamination for final report.

Table 1-1 General Data Quality Objectives, NYSDEC Projects

Data Collection Activity	Quality Objectives	Standards[a]	Acceptability/ Performance Criteria[b]
Outside Records	To use the most current reference values, reports, or data from outside sources in data assessments and recommendations for the site.	None	■ All versions of data or standards must be the most current values available. ■ Data or standards must be accurately incorporated into the final report.
Data Review and Assessment	To review and verify data are generated according to the QAPP, and assign data qualifiers as necessary to indicate limitations on data usability.	■ NYSDEC DUSR Guidance ■ EPA Region 2 Data Validation SOPs ■ EPA National Functional Guidelines	■ Data must be reviewed by Project Chemist meeting minimum NYSDEC qualifications. ■ Data qualifiers or changes to data must be documented in a DUSR.

Notes:

[a] Major standards.
[b] Major or noteworthy acceptability criteria. All performance criteria must be verified using procedures listed in the QAPP.

Key:

GPS = Global Positioning System.
NYSDEC = New York State Department of Environmental Conservation.
NYSDOH = New York State Department of Health.
QAPP = Quality Assurance Project Plan.
SOP = Standard Operating Procedure.

Acceptance and performance criteria establish the quality and quantity of data needed to meet the project quality objectives. General acceptance or performance criteria for the collection, evaluation, or use of environmental data for NYSDEC projects are outlined in Section 2.5, Analytical Methods. Quality objectives or acceptance and performance criteria applicable to a project are specified in the site-specific QAPP or work plan.

1.4.1 Data Assessment Definitions

Acceptance and performance criteria are often specified in terms of precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters. Numerical acceptance criteria cannot be assigned to all PARCC parameters, but general performance goals are established for most data collection activities. Numerical goals for analytical methods are presented in Section 2.4. Data assessment procedures throughout the QAPP clearly outline the steps to be taken, responsible individuals, and implications if QA objectives are not met. PARCC parameters are briefly defined below.

Precision

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average value, usually stated in terms of standard deviation or coefficient of variation. It also may be measured as the relative percent difference (RPD) between two values. Precision includes the interrelated concepts of instrument or method detection limits and multiple field sample variance. Sources of this variance are sample heterogeneity, sampling error, and analytical error.

Accuracy

Accuracy measures the bias of the measurement system. Sources of this error are the sampling process, field contamination, preservation, handling, sample matrix, sample preparation, and analysis. Data interpretation and reporting may also be significant sources of error. Typically, analytical accuracy is assessed through the analysis of spiked samples and may be stated in terms of percent recovery or the average (arithmetic mean) of the percent recovery. Blank samples are also analyzed to assess sampling and analytical bias (i.e., sample contamination). Background measurements similarly assess measurement bias.

Representativeness

Representativeness expresses the degree to which data represent a characteristic of a population, a parameter variation at a sampling point, or an environmental condition. Representativeness is a qualitative parameter, which is most concerned with proper design of the measurement program. Sample/measurement locations may be biased (judgmental) or unbiased (random or systematic). For unbiased schemes, sampling must be designed not only to collect samples that represent conditions at a sample location, but also to select sample locations, which represent the total area to be sampled.

Completeness

Completeness is defined as the percentage of measurements performed that are judged to be valid. Although a quantitative goal must be specified, the completeness goal is the same for all data uses—that a sufficient amount of *valid* data be generated. It is important that critical samples are identified and plans are made to ensure that valid data are collected for them.

Comparability

Comparability is a qualitative parameter expressing the confidence with which one dataset may be compared to another. Sample data should be comparable with other measurement data for similar samples and sample conditions. This goal is achieved through the use of standard techniques to collect and analyze samples.

1.5 Special Training/Certification

The site specific monitoring firm is committed to providing vigorous training in health and safety procedures, the proper use of protective equipment, and overall policy objectives. General training requirements for NYSDEC activities are as follows:

- Site monitoring employees that participate in on-site activities must have completed the 40-hour health and safety training program and the cardiopulmonary resuscitation (CPR)/first aid certification course. To continue such participation, each employee must successfully complete a minimum of eight hours of refresher training, annually; and

- All personnel shipping samples must complete the United States Department of Transportation (DOT) hazardous materials transportation training and certification, including training in specific International Air Transport Association (IATA) regulations (air shipments).

1.6 Documentation and Records

The site monitoring firm's QA Officer will approve the site specific QAPP and maintain the most current approved version of the document. The site specific Project Manager is responsible for providing the most current copy of the site specific QAPP and other planning documents to the project team members.

In addition to the QAPP and other planning documents, the primary documentation for the project is field records and analytical data packages. Requirements for field records are documented in site monitoring firm's Standard Operating Procedures (SOPs) for Field Activities Logbooks and Geotechnical Logbooks and are described briefly below. Requirements for analytical data packages for NYSDEC activities are also described below. The remainder of the QAPP describes additional project documentation and record requirements for QA/QC assessments, data validation, data management, and other areas.

1.6.1 Field Documentation

Sample Identification

Samples will be identified using the format described below. Each sample will be labeled, chemically preserved (if required), and sealed immediately after collection. To minimize handling of sample containers, labels will be completed prior to sample collection as practicable. The sample label will be completed using waterproof ink and will be firmly affixed to sample containers and protected with clear tape. The sample label will give the following information:

- Date of collection;
- Unique sample number;
- Analyses requested; and
- Preservation.

Each sample will be referenced by sample number in the logbook and on the chain-of-custody (COC) record.

Individual samples will be identified by a unique alphanumeric code. Normal field samples (non-quality-control) will be numbered according to the following convention:

SSS-MC-###-Q

SSS - Three letter code for site name

MC - Matrix code as designated below
- Sequential sample number
Q - Quality control sample code such as D for duplicate, F for filtered, S for split, etc.

The matrix codes are as follows:

AS - Bulk Asbestos
BA - Indoor Air from Basement or Crawlspace
DW - Drinking Water
EB - Equipment Blank
FA - Indoor Air, First Floor (not basement)

GW - Groundwater
OA - Outdoor Air
SD - Sediment
SB - Subsurface Soil
SF - Surface Soil
SS - Sub-slab Vapor
SV - Soil Vapor
SW - Surface Water
TB - Trip Blank
WS - Waste

Samples collected with an additional volume for matrix spike/matrix spike duplicates (MS/MSD) will be designated on the COC.

Field Logs and Data Forms

Field logs and data forms are necessary to provide sufficient data to enable participants to reconstruct events that occurred during the project and to refresh the memory of field personnel should they be called upon to give testimony during legal proceedings. Field logs also should document any deviations from the work plan, QAPP, or other applicable planning document. Procedures for recording information are specified in the Field Activities Logbook SOP. All field logs will be kept in a bound notebook containing numbered pages unless a specific field form is completed. All entries will be made in waterproof ink and the time of the entry will be recorded. The top of each page of the logbook or field form will contain the site specific project number, project name, and date that the entries on that page were recorded. No pages will be removed for any reason. Corrections will be made according to the procedures given later in this section. The field logs will include both site- and task-specific information.

Recording of information related to site activities is the responsibility of the site specific monitoring staff and will include a complete summary of the day's activities at the site and any communications outside the project team. Site information includes:

- Name of the person making the entry (signature);
- Names of team members, subcontractors, and visitors on site;
- Levels of personal protection equipment (PPE):
  - Level of protection originally used,
  - Changes in protection, if required, and
  - Reasons for changes; and
- Time spent on site.

Task-specific information may be recorded in multiple field logbooks. The task-specific information will include:

- Drilling information, including:
  - Method employed,
  - Diameter of borehole and well casing,
  - Materials used,
  - Depth of borehole, and
  - Well construction (if appropriate);

- Documentation on samples collected, including:
  - Construction of existing wells (if appropriate),
  - Sampling location and sample identification number,
  - Sampling depth for subsurface soil and surface water (if depth-specific surface water samples are collected) samples,
  - Flow rate of water from in-place plumbing (500 milliliters per minute [mL/min]) for samples of existing water supplies,
  - Sampling date, time, and personnel,
  - Sample sequence (order in which samples were collected),
  - Equipment used (including the use of fuel-powered units/motors during surface water sampling),
  - Type of sample (e.g., grab, composite, QC) and matrix,
  - Amount of each subsample or aliquot (if sample is a composite), and
  - Sample preservation and verification of preservation;

- Types of field QC samples, including when and where they were collected. The description of rinsate sample collection should include the equipment rinsed and the actual field samples collected with that equipment prior to collection of the rinsate;

- Information regarding well purging including:
  - Depth to water and total well depth,
  - Calculations used for volume purged,
  - Volume purged,
  - Equipment used,
  - Field measurements,
  - Length of purge time, and
  - Date and time well was purged;

- Drum inventory:
  - Type of drum and description of contents, and
  - Description of material in the drum and which ayers were sampled (if performed);

- Field equipment used, equipment identification numbers, and calibration information;
- On-site measurement data;
- Field observations and remarks;
- Weather conditions;
- Decontamination procedures;
- Unusual circumstances or difficulties; and
- Initials of person recording information.

Corrections to Documentation Notebook

As with any data logbooks, no pages will be removed for any reason. If corrections are necessary, they must be made by drawing a single line through the original entry (so that the original entry can still be read) and writing the corrected entry alongside. The correction must be initialed and dated. Most corrected errors will require a footnote explaining the correction.

Photographs

Photographs will be taken as directed by the site specific Team Leader. Documentation of a photograph is crucial to its validity as a representation of an existing situation. The following information will be noted in the task log concerning photographs:

- Date, time, location, and direction photograph was taken;
- Description of the photograph taken;
- Reasons why the photograph was taken;
- Sequential number of the digital photo; and
- Camera system used.

1.6.2 Laboratory Data Reporting

The data packages for all CLP and similar Superfund analytical services are consistent with NYSDEC Analytical Services Protocol (ASP) Category B (July 2005) and, therefore, must include a full data package with all associated sample and QC results, calibrations, and raw data. The data packages for long-term monitoring events are consistent with NYSDEC ASP Category A, and therefore must consist of a case narrative, COC, summary table of sample identifications and sample tracking information, a summary of analytical results, and a summary of QC results. The laboratory will provide a summary package of results for all data packages. The laboratory will provide a summary of the sample analyzed, methods used, and date and time of analysis. The laboratory will provide an electronic data deliverable that matches all data reported on the hard copy analytical report. Electronic data report requirements are described in Section 2.10.

Within 48 hours of sample receipt, the laboratory will provide a sample receipt file and copy of the completed COC.

The analytical summary report will include the sample aliquot analyzed, final extract volume, and dilution factor. The analytical summary data report also will include the laboratory reporting limit and method detection limit (MDL) for all target compounds. These limits will be corrected for percent moisture and all dilution factors. Any compounds found less than the reporting limit, but greater than the MDL will be reported and qualified with a “J” flag as estimated.

QC reports must provide a summary report or batch identifier clearly linking all QC results to actual field sample results. QC summary reports must include the laboratory control limits and flag any result reported outside control limits. The case narrative must include an explanation of all QC results reported outside control limits. The laboratory must provide copies of any nonconformance or corrective action forms associated with data in the laboratory report.

For Category A, the laboratory should provide copies of chromatograms for any samples for which elevated reporting limits are used because of sample matrix, but no target compounds are found above the reporting limit.

For organic analytes reported in both Category A and Category B deliverables, the laboratory must report results of the most concentrated extract analysis in order to achieve required quantitation limits.

1.6.3 Record Retention

All records related to the project must be stored in secure areas consistent with requirements in site specific QMP. All records related to the analytical effort must be maintained at the laboratory or in the office (for field screening data) in lockable filing cabinets for at least one year, except those stored in the computer (i.e., cost information, scheduling, custody transfers, and management records). All records must be maintained in a secure area for a period of six years after the end of the calendar year in which the final report is issued.

Types of records to be maintained in addition to the final technical reports for NYSDEC include the following:

- Field logbooks, sampling documents, photographs, QA/QC records, and any other supporting documentation for collection of field samples;

- Administrative records including time cards, costing, and scheduling information; and

- Client correspondence, subcontractor records, minutes of meetings, and any related project management records.

Types of records to be maintained by the laboratory in addition to the analytical report for the NYSDEC include the following:

- Complete COC records from sample receipt to destruction. Sample destruction records must contain information on the manner of final disposal;

- Supporting documentation for any nonconformance or corrective action forms supplied in the analytical report or related to the analysis of project samples;

- Computer records on disk with magnetic tape backup of cost information, scheduling, laboratory COC transfers, and laboratory management records;

- All laboratory notebooks including raw data such as readings, calibration details, and QC results; and

- Hard copies of data system printouts (i.e., chromatograms, mass spectra, and inductively coupled plasma [ICP] data files).

2

Data Generation and Acquisition

This section of the QAPP contains descriptions of all aspects of the implementation of field, laboratory and data handling procedures to meet the requirements of NYSDEC activities. The QAPP provides the basis for ensuring that appropriate methods are used and thoroughly documented. These procedures will be adapted, as appropriate, to meet the objectives of each NYSDEC project as described in the appropriate work plan.

2.1 Sampling Process Design

The sampling process design is documented in the work plan or in the FSP for each site. The FSP will include a project schedule and a summary table listing the type of samples collected, the sampling location, the rationale for selecting the location, sample handling procedures, analytical methods, and the number and type of QA/QC samples.

2.2 Sampling Methods

The sampling methods are documented in the work plan or in the FSP. The site specific monitoring firm’s sampling SOPs serve as the basis for sampling procedures.

In general, sampling at a site will progress from clean areas to contaminated areas. This minimizes the potential for cross contamination of samples and, subsequently, eliminates data anomalies or misinterpretation of the extent of contamination. The order of sample collection at a specific location normally proceeds as follows:

1. Volatile organic compounds (VOCs) or other volatile parameters;
2. Extractable organics (including total recoverable petroleum hydrocarbons [TRPH]);
3. Oil and grease;
4. Total metals;
5. Dissolved metals;

6. Microbiological samples;

7. Other inorganics; and

8. Physical parameters (including ignitability, corrosivity, and reactivity).

This sequence helps maintain the representativeness of samples and analytical results.

The remainder of this section describes typical procedures for equipment decontamination and the handling of investigation-derived waste (IDW), and sample containers, preservatives, holding times, packing, and shipping. Specific procedures for each site are provided in the work plan or in the FSP.

2.2.1 Equipment Decontamination

Sampling methods and equipment are chosen to minimize decontamination requirements and the possibility of cross-contamination. Equipment or supplies that cannot be effectively decontaminated (e.g., sample tubing or rope) will be disposed of after sampling. Investigation/sampling equipment will be cleaned at the site prior to use, between sampling locations, and prior to transport off-site. Decontamination of field equipment will be noted in the field logbook. If it is necessary to make decontamination procedure changes in the field, the changes will be noted in the logbook. Otherwise, a notation will be made each day that decontamination was conducted as specified in the work plan or in the FSP. Rinsate blanks will be collected to verify the effectiveness of decontamination procedures. If field blanks indicate poor techniques, the QA Officer and Project Manager will ensure techniques are modified and samplers trained appropriately.

All decontamination will be performed in accordance with NYSDEC-approved procedures. Decontamination of large equipment will consist of the following:

- Removal of foreign matter; and

- High-pressure steam cleaning.

Decontamination of heavy equipment will be performed by the subcontractor and will be performed in a decontamination pad as described in the contract.

The following alternative procedures will be used for smaller equipment and may also be employed for downhole tooling such as split spoons and Geoprobe rods or routine sampling equipment:

- Initially remove all foreign matter;

- Scrub with brushes in a laboratory-grade detergent solution (e.g., Alconox);

- Rinse with potable water with a final deionized or distilled water rinse; and

- Allow to air dry.

If sampling for metals is conducted, then an additional rinse with a 10% nitric acid solution will be added between the potable and deionized water rinses.

Sensitive down-hole devices that only contact water (e.g., water level indicator and miniTROLL pressure transducer) may be decontaminated by triple rinsing with deionized or distilled water. A temporary decontamination area will be established in each work area using heavy plastic sheeting as a pad. The decontamination will be performed by the field team.

Fluids generated during decontamination will be handled according to procedures described in Section 2.2.2.

2.2.2 Investigation-Derived Waste (IDW)

Unless otherwise directed by NYSDEC staff, all IDW will be handled in a manner consistent with requirements in the work plan and applicable federal and state regulations. IDW includes disposable equipment and PPE, purge and development waters, drilling fluids, soil cuttings, and decontamination fluids. Waste streams will not be mixed and will be segregated to the maximum extent possible.

Investigation-derived soils and water will be field-screened for organic vapors with an organic vapor analyzer (OVA) or photoionization detector (PID) and visual inspected to initially determine whether these wastes are potentially contaminated. In order to minimize the generation of drummed wastes and the costs associated with storage, testing, transportation, and disposal of drums, IDW will be handled in the following manner:

- **Soil cuttings from boreholes:** as much of the soil cuttings as possible will be used as backfill. Remaining cuttings that are not significantly contaminated (OVA or PID readings of 5 parts per million [ppm] or less and lack of staining, sheen, etc.) will be spread on the ground near the site of generation if the location is in a suitably undeveloped area. If this is not possible or if contamination is suspected, the excess soil cuttings will be drummed;

- **Soil cuttings from monitoring well boreholes:** cuttings that are not significantly contaminated (OVA or PID readings of 5 ppm or less and lack of staining, sheen, etc.) will be spread on the ground near the site of generation if the location is in a suitably undeveloped area. If this is not possible or if contamination is suspected, the excess soil cuttings will be drummed;

- **Development and purge waters from monitoring wells and decontamination water:** water that is not significantly contaminated (OVA or PID readings of 5 ppm or less, lack of sheen, etc.) will be discharged to the surface in the area where it was generated only if the area is suitably undeveloped (e.g., not paved and not on residential property). If the water cannot be discharged to the surface, then it may be discharged to the municipal sanitary sewer system pending receipt of a temporary discharge permit from the local sewer department. Alternatively, significantly contaminated waters or waters that cannot be discharged will be drummed; and

- **Used sampling equipment and PPE:** unless field screening indicates that PPE and other solid wastes are contaminated to the level that they can not be disposed of as non-hazardous waste, this material will be double-bagged and disposed of off-site as non-regulated solid waste.

Wastes that need to be drummed will be placed in United States Department of Transportation (DOT) approved 55-gallon drums and stored at a central storage location selected by NYSDEC, pending analysis and disposal. Drums will be staged within secondary containment units and covered with a plastic tarp if stored outside. All drums containing IDW will be labeled as to their contents, the site name, location where the material was generated, and date the waste was generated. Composite samples of like wastes will be collected for toxicity characteristic leaching procedure (TCLP) VOCs, TCLP semivolatile organic compounds (SVOCs), TCLP pesticides/herbicides, TCLP metals, PCBs, and pH. A waste disposal firm will then be subcontracted to haul the waste off-site to an appropriate disposal facility as either solid or hazardous waste. The site specific monitoring firm will coordinate drum hauling with the NYSDEC project manager to ensure that NYSDEC or its representative or the site owner or responsible party is available to sign the waste shipping manifest(s), as legal waste generator.

2.3 Sample Handling and Custody

2.3.1 Sample Containers

The volumes and containers required for sampling activities are indicated in Table 2-1. Prewashed sample containers will be provided by the laboratory and will be wide-mouth jars with Teflon-lined caps unless otherwise indicated. The laboratory must use an approved specialty container supplier, which prepares containers in accordance with EPA bottle-washing procedures. The laboratory must maintain a record of all sample bottle lot numbers shipped in the event of a contamination problem. Trip blanks will be transported to the site inside the same box as volatile organic analysis (VOA) vials or as the air sampling canisters.

Table 2-1 Summary of Analytical Methods, Preservatives, and Holding Times, NYSDEC Projects

Parameter	Method	Containers/Preservative for Solid Samples[a]	Containers/Preservative for Aqueous Samples[a]	Holding Time for Solid Samples[a]	Holding Time for Aqueous or Air Samples[a]
Contract Laboratory Program Analysis					
TCL VOCs	OLM04.2/SOM01.0	Two pre-weighed 40-mL plus one pre-weighed 40-mL vial with stir bar and methanol and one 4-oz. glass vial with septum (if no other containers are shipped)	Three 40-mL glass vials with septa, preserved HCl < pH 2	48 hours for analysis or freezing to <7˚C and 12 days for analysis following freezing	12 days for waters with chemical preservative, and 5 days for unpreserved sample
TCL SVOCs	OLM04.2/SOM01.0	One 8-oz. glass jar	Two 1-L amber glass bottles	12 days/40 days[d]	5 days/40 days[d]
TCL Pest/PCB	OLM04.2/SOM01.0	One 8-oz. glass jar	Two 1-L amber glass bottles	12 days/40 days[d]	5 days/40 days[d]
TAL Metals/ Mercury	ILM05.3	One 8-oz. glass jar	One 1-L HDPE bottle, preserved HNO_3 to pH <2	180 days/26 days for mercury	180 days/26 days for mercury
TAL Cyanide	ILM05.3	One 8-oz. glass jar	One 1-L HDPE bottle, preserved NaOH to pH >12	180 days/12 days for cyanide	180 days/12 days for cyanide
Air/Vapor Samples					
Target VOCs	TO-15[g]	1.0, 1.4, or 6.0 L Minican (depending on lab availability	NA		30 Days
Solid Waste					
Ignitability	SW-846 Chapter 8 (8.1)	One 8-oz. glass jar	One 1-L HDPE bottle for both tests	40 days	40 days
Corrosivity (as pH)	SW-846 Chapter 8 (8.2)	One 8-oz. glass jar		28 days	28 days
Reactivity	SW-846 Chapter 8 (8.3)	One 8-oz. glass jar	Two 1-L HDPE bottles	28 days	28 days

Table 2-1 Summary of Analytical Methods, Preservatives, and Holding Times, NYSDEC Projects

Parameter	Method	Containers/Preservative for Solid Samples[a]	Containers/Preservative for Aqueous Samples[a]	Holding Time for Solid Samples[a]	Holding Time for Aqueous or Air Samples[a]
TCLP Extraction	1311	Two 8-oz. glass jars	Various (see below)	5 days for SVOCs and mercury, 7 days for VOCs, 180 days for metals	5 days for SVOCs and mercury, 7 days for VOCs, 180 days for metals
TCLP Metals/ Mercury	6010B/7471	One 8-oz. glass jar	One 1-L HDPE bottle[c]	26 days[b] for mercury, 180 days for metals	26 days[b] for mercury, 180 days for metals
TCLP Volatile Organics	8260B	One 125-mL VOA jar	Two 40-ml glass vials with septa	7 days	7 days
TCLP Base/ Neutral Acid Extractables	8270C	One 8-oz. glass jar	Two 1-L amber glass bottles	7 days, 40 days for analysis[b]	7 days, 40 days for analysis[b]
TCLP Pesticides	8081A	One 8-oz. glass jar	Two 1-L amber glass bottles	7 days, 40 days for analysis[b]	7 days, 40 days for analysis[b]
TCLP Herbicides	8151A	One 8-oz. glass jar	Two 1-L amber glass bottles	7 days, 40 days for analysis[b]	7 days, 40 days for analysis[b]
TCLP STARS Base/Neutral Extractables	8270C	One 8-oz. glass jar	Two 1-L amber glass bottles	7 days, 40 days for analysis[b]	7 days, 40 days for analysis[b]
TCLP STARS Volatile Organics	8021B or 8260B	One 125 mL VOA jar	Two 40-mL glass vials with septa	7 days[b]	7 days[b]
Additional Methods					
Hardness	130.1,130.2	NA	One 1-L HDPE bottle (can combine with metals) preserved HNO_3 to pH <2	NA	180 days
pH	150.1	NA	To be performed in the field	NA	ASAP
TDS	160.1	NA	One 1-L HDPE bottle	NA	24 hours
TSS	160.2	NA	One 1-L HDPE bottle	NA	5 days

Table 2-1 Summary of Analytical Methods, Preservatives, and Holding Times, NYSDEC Projects

Parameter	Method	Containers/Preservative for Solid Samples[a]	Containers/Preservative for Aqueous Samples[a]	Holding Time for Solid Samples[a]	Holding Time for Aqueous or Air Samples[a]
Priority Pollutant Metals	200.7	One 4-oz. glass jar	One 1-L HDPE bottle preserved HNO_3 to pH <2	180 days, 26 days for mercury	180 days, 26 days for mercury
Alkalinity	310.1, 310.2	NA	One 1-L HDPE bottle	NA	12 days
Nitrate or Nitrite	353.2/300,/9056	One 4-oz. glass jar	One 1-L HDPE bottle (can combine with pH and BOD_5)	24 hours	24 hours
Nitrate-Nitrite	353.2	One 4-oz. glass jar	One 1-L HDPE bottle preserved H_2SO_4 to pH <2	26 days	26 days
Orthophosphorus	365.2/300,/9056	NA	One 1-L HDPE bottle (can combine with pH and BOD_5)	NA	24 hours
Total Phosphorus	365.2	One 4-oz. glass jar	One 1-L HDPE bottle preserved H_2SO_4 to pH <2	26 days	26 days
Chloride, Bromide, Sulfate, Fluoride	300, 9056 or individual methods	One 4-oz. glass jar	One 1-L HDPE bottle	26 days	26 days
COD	410.1	NA	One 1-L HDPE bottle (can combine with ammonia and TKN) preserved H_2SO_4 to pH <2	NA	26 days
Oil/Grease	1664	One 4-oz. glass jar	One 1-L amber glass bottle preserved HNO_3 to pH <2	26 days	26 days
TRPH	1664	One 4-oz. glass jar	One 1-L amber glass bottle preserved H_2SO_4 to pH <2	26 days	26 days
Metals/Mercury	6010B	One 4-oz. glass jar	One 125-mL HDPE bottle preserved HNO_3 to pH <2	180 days/26 days for mercury	180 days/26 days for mercury
Chromium, Hexavalent	7196A	One 4-oz. glass jar	One 1-L HDPE bottle unpreserved or preserved pH of 9.3 to 9.7 with an ammonia sulfate buffer solution	24 hours from collection for unpreserved soils and 28 days for preserved soils	24 hours from collection for unpreserved water and 28 days for preserved water
PCBs	8082	One 4-oz. glass jar	Two 1-L amber glass bottles	12 days/40 days[d]	5 days/40 days[d]

Table 2-1 Summary of Analytical Methods, Preservatives, and Holding Times, NYSDEC Projects

Parameter	Method	Containers/Preservative for Solid Samples[a]	Containers/Preservative for Aqueous Samples[a]	Holding Time for Solid Samples[a]	Holding Time for Aqueous or Air Samples[a]
VOCs and related tests	8260B/8021B/8015B	Two pre-weighed 40-mL with deionized water and one pre-weighed 40-mL vial with stir bar and methanol and one 4-oz. glass vial with septum(if no other containers are shipped)	Three 40-mL glass vials with septa preserved HCl < pH 2	48 hours for analysis or freezing to <7˚C and 12 days for analysis following freezing	12 days for waters with chemical preservative, and 5 days for unpreserved sample
SVOCs and related tests	8270C	One 8-oz. glass jar	Two 1-L amber glass bottles	12 days/40 days[d]	5 days/40 days[d]
Chlorinated Dioxins and Furans	8280A or 8290	One 8-oz. glass jar	Two 1-L amber glass bottles	30 days/45 days[d]	30 days/45 days[d]
Cyanide	9010C/9012B	One 4-oz. glass jar	One 1-L HDPE bottle preserved NaOH to pH >12	12 days	12 days
TOX	9020B	One 4-oz. glass jar	One 1-L amber glass preserved H_2SO_4 to pH <2	7 days	7 days
pH	9045C/9040B	One 4-oz. glass jar	One 125-mL HDPE bottle	ASAP	ASAP
Total Phenols	420.1	One 4-oz. glass jar	One 1-L amber glass preserved H_2SO_4 to pH <2	26 days	26 days
Total Organic Carbon	Lloyd Kahn; 415.1; 9060	One 4-oz. glass jar	NA	26 days	26 days
Total Glycol	DEC 89-9	One 4-oz. glass jar	One 1-L glass	26 days	14 days
Specific Gravity	SM 22710 F	NA	Can combine with other analyses (requires 500 mL)	NA	40 days
TKN	351.3	One 4-oz. glass jar	One 1-L HDPE bottle (can combine with COD and ammonia) preserved H_2SO_4 to pH <2	26 days	26 days

Table 2-1 Summary of Analytical Methods, Preservatives, and Holding Times, NYSDEC Projects

Parameter	Method	Containers/Preservative for Solid Samples[a]	Containers/Preservative for Aqueous Samples[a]	Holding Time for Solid Samples[a]	Holding Time for Aqueous or Air Samples[a]
Ammonia	350.2	One 4-oz. glass jar	One 1-L HDPE bottle (can combine with COD and TKN) preserved H_2SO_4 to pH <2	26 days	26 days
BOD_5	405.1	NA	One 1-L HDPE bottle (can combine with pH and nitrates)	NA	24 hours

[a] All samples to be cooled to 4°C except for metals analysis samples shipped alone. Sample containers must have Teflon-lined lids. Holding times are based on verified times of sample receipt and are consistent with NYSDEC requirements. 0.008% Na2S2O3 to be added to water samples in the presence of residual chlorine.

[b] Time listed is from TCLP extraction.

[c] TCLP analysis of water samples assumes less than 0.5% solids.

[d] Holding time is 5 days from collection to extraction and 40 days from extraction to analysis.

Key:

ASAP = As soon as possible.
BOD_5 = Biochemical oxygen demand-5.
BTX = Benzene, toluene, xylene.
COD = Chemical oxygen demand.
EPA = U.S. Environmental Protection Agency.
HDPE = High-density polyethylene.
HNO_3 = Nitric acid.
H_2SO_4 = Sulfuric acid.
L = Liter.
mL = Milliliter.
NA = Not applicable.
NaOH = Sodium hydroxide.
oz. = Ounce.
PCBs = Polychlorinated biphenyls.
SM = Standard Methods of Analysis for Water and Wastewater.
STARS = NYSDEC Spill Technology and Remediation Series (Memorandum No. 1 [1992]).
SVOCs = Semivolatile organic compounds.
TAL = Target Analyze List.
TCL = Target Compound List.
TCLP = Toxicity characteristic leaching procedure.
TDS = Total dissolved solids.
TKN = Total Kjeldahl nitrogen.
TOX = Total Organic Halides.
TRPH = total recoverable petroleum hydrocarbon.
TSS = Total suspended solids.
VOC = Volatile organic compounds.

For air samples, laboratories will follow cleaning procedures and checking for canisters as outlined in Method TO-15 and the NYSDOH Guidance for Soil Vapor Instrusion. Laboratories are required to certify that containers are clean and provide copies of the certification in the data package.

2.3.2 Samples Preservation and Holding Times

All samples requiring preservation will be collected in containers pre-preserved by the laboratory supplier. If field preservation is necessary, preservation will be immediately after collection and transportation to the site office. A clean, disposable pipette or a premeasured, single-use, glass ampule will be used to transfer liquid preservatives to the sample container. Care will be taken to avoid contact between the pipette or ampule and the sample or sample container. Solid preservatives will be transferred to the sample container using a clean, stainless-steel spoon. The sample preservation will be checked on representative samples by pouring the sample into a clean cup and testing with pH paper to determine if a sufficient amount of preservative has been used. Preserved samples for VOA will be tested on an extra vial at a rate of approximately 10%. Use of additional preservative also will be recorded in the logbook. Field blanks, which require preservation, will be preserved with a volume of reagent equal to the volume of reagent used in the samples that the blanks represent. A list of preservatives and holding times for each type of analysis are indicated in Table 2-1. Additional preservation requirements and holding times for non-target analyses are listed in the NYSDEC ASP.

Samples for soil VOCs will be collected in accordance with Method 5035. The laboratory must supply two pre-tarred VOA vials with 5 mL of deionized water, one pre-tarred vial with methanol, and one 2-ounce container for dry weight analysis (only if no other tests are required). The laboratory also must provide one coring device per sample for collection of a 5-gram plug. Soil samples for VOCs must arrive at the laboratory within 48 hours to be frozen at -7^{o}C.

Reagents used for preservation are reagent-grade and are supplied by the laboratory or approved chemical supplier. The laboratory must maintain traceability records on preservatives in the event of potential field contamination of samples. Each bottle is received from the laboratory and must be clearly labeled with laboratory name, type of chemical, lot number, and expiration date. Field personnel should record the date used in the field, site name, and site specific project number on the label or in the site logbook. Fresh sample containers and preservatives will be obtained from laboratory stocks prior to mobilization for each sampling event. Preservatives stored on site will be disposed of after use unless containers are sealed and stored under COC in a secure area. No preservatives will be used passed the expiration date.

Sample preservation will be verified at the laboratory at receipt or prior to analysis for VOCs. The preservation or pH will be recorded in the logbook. If samples are improperly preserved, a corrective action form will be submitted to the laboratory project manager for follow-up action. The laboratory will notify the Field Leader or Project Manager to implement corrective action in the field.

Methods for the analysis of soils, sediments, or solid matrices for VOCs will be used in conjunction with Method 5035A: Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples. The recommended collection technique for Method 5035A calls for the transfer of a 5-gram aliquot of sample to a tarred empty 40-mL VOA vial. The sample is iced at 4°C for transport to the lab. The laboratory will refrigerate VOA vials at 4°C ± 2°C for 48 hours or less or preserve by freezing at < -7°C within 48 hours of receipt to extend holding time to 14 days.

2.3.3 Sample Handling

The transportation and handling of samples must be accomplished in a manner that not only protects the integrity of samples but also prevents any detrimental effects due to the possible hazardous nature of the samples. Regulations for packaging, marking, labeling, and shipping of hazardous materials are promulgated by the DOT in 49 CFR 171 through 177. The site specific monitoring firm needs to trains all staff responsible for the shipment of samples in these regulations. Procedures for sample packing and shipping are documented in the site specific monitoring firm’s SOP.

Sample Packaging

Samples must be packaged carefully to avoid breakage or contamination and must be shipped to the laboratory at proper temperatures. The following sample packaging requirements will be followed:

- Sample bottle lids must never be mixed. All sample lids must stay with their original containers;
- Shipping coolers must be partially filled with packing materials and ice (when required) to prevent bottles from moving and breaking during shipping;
- Environmental samples are to be cooled. Wet ice packaged in sealable, plastic bags will be used to cool samples during shipping. Ice is not to be used as a substitute for packing materials;
- Any remaining space in the cooler should be filled with inert packing material such as bubble wrap. Under no circumstances should material such as sawdust or sand be used;

- A duplicate custody record must be placed in a plastic bag and taped to the inside of the cooler lid. Custody seals are affixed to the sample cooler; and

- All containers for a given sample will be shipped in the same cooler when possible. In cases where samples for volatile analysis would be shipped in several coolers on a single day, VOA vials will be consolidated into a single cooler to minimize the number of required trip blanks.

Shipping Containers

Environmental samples will be properly packaged and labeled for transport and dispatched to the laboratory facility. The SOP procedure will be followed to mark and label sample shipments. A separate COC record must be prepared for each shipping container. The following requirements for shipping containers will be followed.

Sample shipping containers will generally be commercially purchased coolers (e.g., Coleman coolers) or boxes provided from the laboratory for air canisters. Each container will be custody-sealed for shipment, as appropriate. The container custody seal will consist of filament tape wrapped around the package at least twice and custody seals affixed in such a way that access to the container can be gained only by cutting the filament tape and breaking a seal.

Field personnel will make arrangements for transportation of samples to the laboratory. In most cases, samples will be shipped using an overnight express carrier (e.g., Federal Express). Field monitoring personnel will provide the laboratory with a shipment schedule and notify them of deviations from planned activities. The field monitoring personnel will notify the laboratory of all of samples intended for Saturday delivery, no later than 3 p.m. (Eastern Standard Time) on Thursday.

2.3.4 Sample Custody

Formal sample custody procedures begin when the precleaned sample containers leave the laboratory or upon receipt from the container vendor. The laboratory must follow written and approved SOPs for shipping, receiving, logging, and internally transferring samples. Sample identification documents must be carefully prepared so that sample identification and COC can be maintained and sample disposition controlled. Sample identification documents include:

- Field notebooks;

- Sample labels;

- Custody seals; and

- COC records.

The primary objective of COC procedures is to provide an accurate written or computerized record that can be used to trace the possession and handling of a sample from sampling through completion of all required analyses. A sample is in custody if it is:

- In a team member's physical possession;
- In a team member's view;
- Locked up; or
- Kept in a secured area that is restricted to authorized personnel.

Field Custody Procedures

Precleaned sample containers will be relinquished by the laboratory to the Field monitoring personnel. The Field monitoring personnel will record receipt of the sample containers in the project logbook. The following field custody procedure will be used for collection of samples:

- As few persons as possible should handle samples;
- Coolers or boxes containing cleaned bottles should be sealed with a custody tape seal during transport to the field or while in storage prior to use;
- The sample collector is personally responsible for the care and custody of samples collected until they are transferred to another person or dispatched properly under COC rules;
- The sample collector will record sample data in the field logbook; and
- The Field monitoring personnel will determine whether proper custody procedures were followed during the fieldwork and decide if additional samples are required.

Chain-of-Custody Record

The COC form must be fully completed in duplicate by the field technician designated by the site specific monitoring firm’s Project Manager as responsible for sample shipment to the appropriate laboratory for analysis. In addition, if samples are known to require rapid turnaround in the laboratory because of project time constraints or analytical concerns (e.g., extraction time or sample retention period limitations), the person completing the COC record should note these constraints. The custody record also should indicate any special preservation techniques necessary or whether samples need to be filtered. Copies of COC records are maintained with the project file.

Custody Seals

Custody seals are preprinted, adhesive-backed seals with security slots designed to break if the seals are disturbed. DOT-approved sample shipping containers are sealed in as many places as necessary to ensure security. Seals must be signed and dated before use. Upon receipt at the laboratory, the custodian must check and document on a cooler receipt form that seals on boxes are intact.

2.3.5 Laboratory Custody Procedures

All laboratory custody procedures must maintain a system that provides for sample log-in, sign-out and sign-in of samples to and from individual analysts, data storage and reporting, and sample disposal. These procedures must ensure continuous documentation of sample custody from receipt to disposal. Procedures used by the laboratory must meet all NYSDEC requirements. Laboratories must complete a cooler receipt form documenting the temperature and condition of samples on receipt. The form must be provided in the laboratory data package.

The laboratory must submit sample receipt documents for each set of samples received. A sample delivery group (SDG) is defined as a batch of up to 20 samples collected during one calendar week. Samples shipped on Friday will normally conclude an SDG. The sample receipt documents consist of the Sample Receipt file, a pdf of the COC, and a pdf of the laboratory log report showing the tests selected.

The laboratory must implement, practice, and maintain programs for managing waste disposal. The site specific monitoring firm’s and NYSDEC markings must be removed from all sample containers prior to disposal. Waste disposal procedures must include use of a certified hauler and meet Federal and State regulations.

2.4 Analytical Method Requirements

Analytical method requirements will be documented in the appropriate work plan or FSP. The specific implementation of analytical methods will be documented in laboratory SOPs. Laboratory SOPs and the QA program will be reviewed and approved as part of the procurement process.

2.4.1 Standard Laboratory Analytical Procedures

Analytical methods in support of NYSDEC activities are referenced in NYSDEC’s ASP. The protocol is based on the following methods:

1. 40 CFR Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants under the Clean Water Act;

2. "Standard Methods for the Examination of Water and Wastewater," APHA/AWWA/WEF, 21st ed, 1992;
3. Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, Revised March 1983;
4. "Test Methods for Evaluating Solid Waste, Physical Chemical Methods," 3rd ed, SW-846, 1998, latest update;
5. "Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air," 2nd ed, EPA/625/R-96/010b, January 1999;
6. "USEPA Contract Laboratory Program Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration, OLM04.3, 2003or SOM01.2, 2007";
7. "EPA Contract Laboratory Program, Statement of Work for Inorganic Analysis, Multi-Media, Multi-Concentration ILM05.4, 2007; and
8. American Society for Testing and Materials (ASTM).

The laboratory must be certified by the NYSDOH ELAP for all analytical methods for which the NYSDOH provides an approval program. Laboratories also must be National Environmental Laboratory Accreditation Program (NELAP) approved by NYSDOH or related accrediting authority.

Table 2-1 lists all analyses that may be performed for NYSDEC projects. Reporting limits for any additional methods will be included in the site-specific QAPP.

The site specific monitoring firm's anticipates that laboratories will use the most current method available and/or recommended by EPA. For example, EPA has promulgated the use of Standard Methods references instead of the water method reference listed above. The actual methods for the project will be reviewed and approved as part of the project planning process.

2.5 Quality Control

QC data are necessary to determine precision and accuracy and to demonstrate the absence of interferences and/or contamination of glassware and reagents. Field QC will include duplicates, trip blanks, field equipment blanks, and miscellaneous field QC samples. Field QC samples will be preserved, documented, and transported in the same manner as the samples they represent. Laboratory-based QC will consist of standards, replicates, spikes, and blanks. Method QC limits for analyses need to be provided by the site specific monitoring firm's laboratory or are included in NYSDEC ASP 2005. Quality control limits for any additional methods will be included in the site-specific work plan or FSP.

2.5.1 Field Quality Control Samples

The collection of field QC samples and the conditions, under which the samples were collected, will be documented in the field logbook. Unless otherwise directed by NYSDEC, the field QC samples listed below will be collected and analyzed at the frequency listed in Table 2-2.

Table 2-2 Field Quality Control Guidelines, NYSDEC Projects

QC Sample	Description
Field Duplicate	One per matrix per 20 samples for each analysis.
Field Equipment Blank	One per equipment per 20 samples for each analysis. Only equipment sets that are subject to decontamination require equipment blanks. Dedicated or disposal equipment does not require equipment blanks.
Field Background Samples	Per sampling day for indoor air samples as specified in the guidance for soil vapor intrusion.
Trip Blank	One per shipment for each cooler in which aqueous samples for VOC analysis are shipped or one per shipment batch for air samples. Trip blanks are analyzed for all VOC methods designated for samples. Trip blanks are shipped only for aqueous matrix.

Duplicate Samples

Duplicate samples will be collected at the rate one duplicate per 20 project samples of the same matrix. Duplicate soil samples will be prepared by collecting equal aliquots from the same sample source and placing them in separate sample bottles. Duplicate water samples will be prepared by collecting successive volumes of water and placing them in separate bottles. Duplicate air samples will collected with a tubing splitter. Duplicate samples will be shipped with the samples they represent and will be analyzed in the same manner.

The RPD between the concentration in the original and duplicate sample measures the overall precision of the field sampling and analytical method. Field duplicates are evaluated by using two times the laboratory QC criteria for duplicates (i.e., RPDs of 40% for water and air and 70% for soils). If all other laboratory QC criteria are met, RPD results outside control limits indicate potential matrix effects. Significant deviations in RPD results of field duplicates are assessed to evaluate whether data met all quality objectives for the project.

Trip Blanks

Trip blanks are collected to establish that the transport of sample bottles to and from the field does not result in contamination of the sample from external sources. Trip blanks will be collected for, and in conjunction with, only VOA for aqueous samples. If the 40-mililiter (mL) VOA vials are shipped to the field team by the laboratory sample custodian, a representative number of vials filled with analyte-free water (preserved, capped, and labeled) will accompany the shipment to and from the laboratory. Trip blanks will be treated in the same manner as the VOA samples they represent and will be taken to representative field sample sites, but remain unopened. Trip blanks will be sent with each sample-shipping container that contains aqueous samples for VOA.

Field Equipment Blanks

Field equipment blanks are blank samples (also called rinsate blanks) designed to demonstrate that sampling equipment has been properly prepared and cleaned before field use and that cleaning procedures between samples are sufficient to minimize cross-contamination. Field equipment blanks will be prepared in the field using an approved water source. Sampling of the water source may also be required if analyte-free water is not obtained from the lab. The field equipment blank will be preserved, documented, shipped, and analyzed in the same manner as the samples it represents. Equipment blanks will be collected at the rate of one sample per day, per equipment set.

An equipment set is all sampling equipment required to collect one sample. For example, one soil sample equipment set may include a stainless-steel bowl, a stainless-steel trowel, and a bucket auger. Samples collected with dedicated or disposable equipment do not require equipment blank samples.

Field equipment and trip blanks serve to demonstrate contamination-free procedures in the field and during sample transport. The goal is for field blanks to be free of contamination. Low-level contamination may be present, but must be less than five times the level found in associated samples. If contamination is greater, the sample results are qualified as non-detect at an elevated-reporting limit. If field blank contaminants are also present in the method blank, or are typical laboratory contaminants, or are not present in project samples, then no further action is required. All other sources of contamination must be investigated as part of the corrective action process. Sample results that do not meet quality objectives after qualification, re-sampling may be required. The QA Officer, Project Chemist, and Project Manager must determine potential changes in field procedures to eliminate contamination sources prior to re-sampling.

Miscellaneous Field QC Samples

This type of QC sampling involves analysis of investigation water sources and monitoring well drilling fluids (if used). Because the water supply source is used in decontamination and well drilling activities, it may be necessary to determine the possibility for the introduction of outside contaminants. Drilling fluids (muds) that are used during well installation may also be analyzed in order to assess the possibility of such constituents affecting groundwater samples.

Field background samples are required for air sampling events. Results of the background sample are used in the assessment process to determine whether contamination is site-related or significant.

2.5.2 Laboratory Quality Control Analyses

Analytical performance is monitored through QC samples and spikes, such as laboratory method blanks, surrogate spikes, QC check samples, matrix spikes, matrix spike duplicates, duplicate samples, and duplicate injections (see Table 2-3). All QC samples are applied on the basis of a laboratory batch. Batches do not exceed 20 samples excluding associated field and laboratory QC samples. The QC samples associated with sample preparation include method blanks, laboratory control samples (LCSs) (also called matrix spike blanks [MSB] by NYSDEC), matrix spikes, and duplicates. The run batch represents all samples analyzed together in the run sequence. The run sequence is typically limited to 24 hours unless defined differently for the analytical method. For some analyses, such as volatile organics, the run batch is equivalent to the preparation batch. The QC samples associated with the run sequence include calibration standards, instrument blanks, and reference standards. Unless otherwise directed by NYSDEC staff, the laboratory QC samples listed below will be collected and analyzed at the frequency listed in Table 2-3.

Instances may arise where high sample concentrations, nonhomogeneity of samples, or matrix interferences preclude achieving detection limits or associated QC target criteria. In such instances, data will not be rejected *a priori* but will be examined on a case-by-case basis. The laboratory will report the reason for deviations from these detection limits or noncompliance with QC criteria in the case narrative.

Table 2-3 Laboratory Quality Control Sample Guidelines, NYSDEC Projects

QC Sample	Description
MB	One per matrix per preparation batch for each analysis.
LCS/MSB	One per matrix per preparation batch for each analysis. The LCS/MSB must contain all target analytes of concern at the site.
Surrogate Spikes	All samples analyzed for organic methods.
Internal Standards	All samples analyzed by GC/MS methods.
MS/MSD	One per matrix per SDG for each analysis. The spike solution must contain a broad range of the analytes of concern at the site. The overall frequency of MS/MSD on project samples must be at least one set per 20 samples.
MS/MD	One per matrix per SDG for metals and general chemistry methods. The spike solution must contain a broad range of analytes of concern at the site. The overall frequency of MS/MD on the project samples must be at least one set per 20 samples.
Serial Dilution/Post Digestion Spike	All samples analyzed for metals.

Table 2-3 Laboratory Quality Control Sample Guidelines, NYSDEC Projects

QC Sample	Description

Key:
SDG = Sample Delivery Group.
LCS = Laboratory Control Samples.
MSB = Matrix Spike Blank.
MS/MD = Matrix Spike/Matrix Duplicate.
MS/MSD = Matrix Spike/Matrix Spike Duplicate.
MB = Method Blank.
TAL = Target Analyte List.

Laboratory Method Blank

Laboratory method blanks serve to demonstrate a contamination-free environment in the laboratory. The goal is for method blanks to be free of contamination. Low-level contamination may be present, but must be less than the reporting limit. If contamination is greater, samples are reanalyzed. If contaminants are present in the method blank but not in project samples, no further action is required. All sources of contamination that are not common laboratory contaminants as defined in the method SOPs must be investigated as part of the corrective action process. Sample results must not be blank subtracted unless specifically required by the analytical method.

Surrogate Standards

Surrogate recoveries must be within QC criteria for method blanks and LCSs to demonstrate acceptable method performance. If surrogate recoveries are outside QC criteria for method blanks or LCSs, corrective action is required and the Project Chemist should be notified. Surrogate recoveries in the samples indicate the method performance on the particular sample matrix. Surrogate recoveries that are outside QC criteria for a sample indicate a potential matrix effect. Matrix effects must be verified based on review of recoveries in the method blank or LCS, sample reanalysis, or evaluation of interfering compounds. Sample clean-up procedures are required by the NYSDEC ASP must be implemented to alleviate potential matrix problems.

Laboratory Control Sample

LCS recoveries must be monitored on control charts for all non-CLP methods. Laboratory QC criteria must be established for each method and matrix using a minimum of 30 points. QC criteria should be updated annually for all non-CLP methods. The LCS recovery must be within the control limits to demonstrate acceptable method performance. Sporadic marginal failures of a few target analytes reported when greater than five target analytes are required are allowed as part of the data review guidance. If LCS recoveries are outside QC criteria for more than a few target analytes, recoveries are significantly low, or the compounds were detected in the samples, then corrective action is required. After corrective action is complete, sample re-analysis is required for failed parameters. If LCS recoveries exceed the QC criteria, and that parameter is not found in any samples, re-analysis is not necessary. For any other deviations from LCS control limits that can not be resolved by sample re-analysis within holding times, the Project Chemist must be notified immediately. If critical samples are affected, the Project Manager may determine that re-sampling is required.

Matrix Spike Sample

MS recoveries are a measure of the performance of the method on the sample being analyzed. Field and trip blanks must not be chosen for spiking. MS recoveries outside the control limits applied to the LCS indicate matrix effects. Sample clean-up procedures may be warranted for samples with severe matrix effects. The laboratory should notify the Project Chemist of these instances to determine an appropriate corrective action.

Matrix Spike Duplicate Sample

The MSD sample is commonly prepared in conjunction with the MS sample. The MSD is prepared from a separate portion of the sample and processed with the same additions as the MS. The MSD is prepared for methods that do not typically show concentrations of target analytes above MDLs, such as organic methods. The RPD between the recoveries in the MS and MSD measures the precision of the analytical method on actual project samples. QC criteria for RPDs are 20% for waters and 35% for soils unless the laboratory provides additional statistical criteria.

Duplicate Sample

The duplicate is prepared for methods that typically show concentrations of target analytes above MDLs, such as metals and wet chemistry methods. The RPDs between recoveries in the original and duplicate measures the precision of the analytical method on the actual project samples. QC criteria for RPDs are 20% for waters and 35% for soils unless the laboratory provides additional statistical criteria.

If all other QC criteria are met, RPD results outside control limits indicate potential matrix effects. The laboratory should investigate significant deviations in the RPD results by observing the sample to determine any visual heterogeneity or reviewing sample chromatograms for matrix interference. If visual observation does not indicate a potential problem, the sample may be reanalyzed. Potential matrix effects are reported in the case narrative.

Instrument Blanks

Instrument or reagent blanks are analyzed in the laboratory to assess laboratory instrument procedures as possible sources of sample contamination. Instrument blanks are part of the laboratory corrective action if method blanks show contamination or the analyst suspects carryover from a high concentration sample. Instrument blank results are reported on a laboratory corrective action form.

QC Check Standards

A QC check standard is obtained from a different source or at a minimum a lot different from that of the calibration standard. A check standard result is used to validate an existing concentration calibration standard file or calibration curve. The check standard provides information on the accuracy of the instrumental analytical method, independent of various sample matrices. Check standards are analyzed with each new calibration curve.

Internal standard area counts for water and solid sample analysis for all samples must be in the inclusive range of 50% to 200%, and retention time must not marry more than +/- 30 seconds of its associated 12-hour calibration standard (i.e., opening Continuing Calibration Verification or mid-point standard from Initial Calibration).

The serial dilution analysis (a five-fold dilution) must agree within a 10% difference of the original determination after correction for the dilution if the analyte concentration is sufficiently high (concentration in the original sample is >50 times [50x] the MDL).

The post-digestion spike (%R) must be within the acceptance limits of 75% to 125%. However, spike recovery limits do not apply when the sample concentration is greater than 4x the spike added.

Other Laboratory QC Samples

The laboratory performs analysis of other QC samples or standards, depending on the analytical method. Method-specific QC samples or standards include internal standard spikes for gas chromatography/mass spectrometry (GC/MS) methods; post-digestion spikes and serial dilutions for metals analysis; and interference check samples (ICSs) for ICP analysis.

Blind QC Check Samples

Types of blind QC check samples include external performance evaluation (PE) samples provided by an outside certifying agency and internal QC samples submitted for routine analysis by the laboratory QA officer. The laboratory must pass NYSDOH samples as part of the approval process. If methods are used that are not included in NYSDOH approval process, blind QC samples may be submitted to the laboratory to evaluate method performance.

2.6 Instrument/Equipment Testing, Inspection, and Maintenance

All laboratory and field instruments and equipment used for sample analysis must be serviced and maintained only by qualified personnel. Laboratory instrument maintenance procedures will be evaluated to verify that there will be no impacts on analysis of project samples due to instrument malfunction. For example, the laboratory must have duplicate instrumentation and/or major laboratory instruments (e.g., GC/MS, ICP, atomic absorption spectroscopy [AAS]) maintained under service agreements with the manufacturer that require rapid respond by manufacturer-approved service agents.

Field instruments will be rented through approved suppliers that have manufacturer-approved maintenance programs.

2.6.1 Field Equipment Maintenance

Field equipment will be checked upon receipt to verify that instruments are in working condition and that the rental company provided appropriate calibration records or certifications. On-site operation will be performed in accordance with manufacturer manuals. If any problems occur, the instrument will be replaced immediately. Equipment purchased for the contract will be maintained in accordance with manufacturer guidance.

2.6.2 Laboratory Equipment Maintenance

The laboratory must maintain a stock of spare parts and consumables for all analytical equipment. Routine preventive maintenance procedures should be documented in site specific monitoring firm’s SOPs. Maintenance performed on each piece of equipment must be documented in a maintenance logbook. Daily checks of the laboratory deionized water and other support systems are required. The laboratory must operate backup instrumentation for most of its analytical equipment in the event of major instrument failure or have an alternative approached to ensure analytical work proceeds within holding times with no adverse impacts on data quality.

2.7 Instrument/Equipment Calibration and Frequency

All instruments and equipment used during sampling and analysis will be operated and calibrated according to the manufacturer's guidelines and recommendations, as well as criteria set forth in applicable analytical methodology references. Personnel properly trained in these procedures will perform operation and calibration of all instruments. Documentation of all field maintenance and calibration information will be maintained in the field logbook. Table 2-4 lists typical monitoring equipment used during fieldwork. This equipment is representative of instruments typically required for NYSDEC projects. All equipment used for the NYSDEC projects will be NYSDEC-owned or rented. All field personnel receive annual refresher training on the field operation of all health and safety related

Table 2-4 General Field Equipment and Calibration Procedures

Instrument or Equipment	Description[a]	Field Calibration Procedure	Acceptability/ Performance Criteria	Responsible Personnel
Organic Vapor Analyzer (OVA)	Flame Ionization Detector to provide continuous data on organic vapor concentrations. Unit must be Class I, Division 1, Grade A,B,C,D. Unit must have rechargeable battery, range of 0 to 1,000 ppm, and ultra-high purity hydrogen as fuel source.	Units are factory calibrated to remain with performance specification for an excess of 6 months. During field use, a carbon filter is used with the OVA to distinguish methane from other organics. The unit is checked daily with calibration gas to ensure the response is consistent. If needed, the unit will be re-calibrated to manufacturer specifications. When the OVA is used to screen samples (except samples for headspace analysis), periodic ambient air readings will also be recorded in the logbook.	A carbon filter must remove sources of organic vapors other than methane (i.e., marker). Instrument must detect organic vapors without filter. Response should be checked daily with calibration gas. The accuracy will depend on the application.	Site Safety Officer, Project Geologist
O_2 Explosimeter	Gas monitor designed to simultaneously monitor areas for oxygen deficiency and dangerous levels of combustible gas. Units must be equipped with sample pumps and hoses to measure gases in a confined space. Range O_2 - 0 to 25%, LEL - 0 to 100%, H_2S - 0 to 200 ppm, and CO - 0 to 999 ppm. Not all units have the additional capability to detect hydrogen sulfide or H_2S or carbon dioxide.	Procedures for field calibration of the O_2/explosimeter are as follows: ■ Inspect instrument to ensure entry and exit ports are clear; ■ Turn the switch to ON position; ■ Allow the meters to stabilize and then press the reset button; ■ Check the battery level; ■ Calibrate the oxygen meter to 20.8% by using the calibrate knob; ■ Adjust the explosimeter to zero by using the zero knob; and ■ Check alarm levels by adjusting the calibrate knob for oxygen levels and the zero knob for explosimeter levels and note the readings when the alarm sounds. Return readings to normal and depress the reset button.	Alarm must sound during calibration procedure. Battery must have sufficient charge for operation. Blocking the sample line probe and observing the drop of the flow indicator float checks flow system. If flow system is not functioning, return unit for repairs.	Site Safety Officer, Project Geologist

Table 2-4 General Field Equipment and Calibration Procedures

Instrument or Equipment	Description[a]	Field Calibration Procedure	Acceptability/ Performance Criteria	Responsible Personnel
pH/Conductivity, Temperature, Dissolved Oxygen (DO), Oxidation Reduction (REDOX) Meter	Meter designed for field use with battery operation. The unit must contain separate pH, temperature, conductivity, DO, and ORP probes in one unit.	Before use, pH, specific conductance, DO, and ORP probes need to be calibrated or tested for responsiveness. The pH probe will be calibrated first. This is done by placing the probe in pH 7, then pH 4, standard solutions and adjusting the pH calibration knobs until the correct measurement is obtained. The ORP probe is then calibrated with the ORP standard solution (Zobell), and the DO probe is checked in accordance with manufacturer guidelines. The probes should be rinsed with deionized water between each calibration solution and following calibration. Used calibration solution is to be discarded. Finally, the conductivity probe is checked with a solution of known conductivity.	Turbidity and DO ∀ 10% pH ∀ 0.01 pH Conductivity at ∀ 2% FSD The instrument will be checked with a pH standard every 4 hours and at the end of the sampling day. If the response is greater than 0.2 units more or less than the standard, complete calibration will be conducted.	Project Geologist, Sampler
Turbidity Meter	Nephelometer designed for field use with battery operation. Range 0.01 to 1,000 NTU.	The unit is factory calibrated. Field procedures involve checking the unit's responsiveness at least once a day using factory supplied standards. The responsiveness should be checked on the 0 to 10 range, 0 to 100 range, and 0 to 1,000 range.	∀ 10%	Sampler

Table 2-4 General Field Equipment and Calibration Procedures

Instrument or Equipment	Description[a]	Field Calibration Procedure	Acceptability/ Performance Criteria	Responsible Personnel
PID Meter	The PID is a portable, non-destructive trace gas analyzer. Units for site characterization must have a range of 0 to >2,000 ppm and a 10.6 or 11.7 eV lamp (e.g., MiniRAE 2000). Units for indoor air monitoring must have a range of 1 ppb to 2,000 ppm and a 10.6 eV lamp (e.g., ppb RAE Plus).Calibration check gas (e.g., isobutylene) must be provided with unit.	In the field, PIDs will be calibrated at the start of each field event by the manufacturer. Initial calibration must be verified by a certificate of calibration from the rental company or field calibration is required. There is no field calibration for a Mini-Rae 2000. If a significant change in weather occurs during the day (i.e., change in humidity or temperature) or if the unit is turned off for an extended period, then there is a field test, called a Bump Test. It consists of having the unit sniff 100ppm cal gas and determine the reading. If the unit is reading 100 ppm or close to it, then it is OK. If not, depending on how far off it is, either dry out the unit on a heater (due to potential fogging of the lamp), or send the unit back to the rental company for in-house calibration.	Meter must give consistent background readings.	Site Safety Officer, Project Geologist

[a] Description is for typical equipment; equivalent units may be used.

equipment, which includes calibration procedures. Brief descriptions of calibration procedures for major field instruments are listed on Table 2-4.

The site specific monitoring firm requires laboratories to use the most current method available for calibration criteria. For example, EPA no longer allows the use of the grand mean to evaluate calibration linerity for organic methods. The site specific monitoring firm requires that the most stringent method criteria be met for all compounds of concern at site. Unless modified by the method, the site specific monitoring firm requires at least a five point curve for all calibrations for organics and a minimum of three calibration points for inorganics; exclusion of points is not allowed to meet criteria without technical justification. Any manual integration performed for calibrations needs to be documented with the rationale and included in the data package. Manual integrations of internal standards or surrogates in calibrations are not allowed.

2.8 Inspection/Acceptance of Supplies and Consumables

Measures are established by the site specific monitoring firm's QMP to assure that purchased material, equipment, and services whether purchased directly or through contractors or subcontractors conform to procurement documents.

2.9 Non-Direct Measurements

For data acquired from non-direct measurement sources include the following:

- Physical information such as descriptions of sampling activities and geologic logs;
- State and local environmental agency files;
- Reference computer databases and literature files; and
- Historical reports on a site and subjective information gathered through interviews.

Data from non-direct measurements will be reviewed and used as indicated in the work plan. Data from all non-direct measurement sources are stored as indicated in Section 1.6.

2.10 Data Management

Data management procedures track samples and results from work plan generation to the final report. The field data include approved work planning tables, labels, field sampling forms, COC forms, and logbooks. The surveyor will provide coordinates for all sample locations. The field team leader of the monitoring firm will review all field data for accuracy. Any field data not provided by the laboratory will be entered into a database or spreadsheet.

Electronic data will be provided in accordance with the most recent version of EPA Region 2's standardized electronic data deliverable (EDD) format. The format is based on the Multimedia Electronic Data Deliverable, or MEDD format. Further information on MEDD is available at the Web site http://www.epa.gov/region02/superfund/medd.htm. Currently this is the EPA Region 2 EDD dated December 2003. If required for the project, the laboratory also may provide an alternative EDD consistent with the Corporate EDD or other approved format.

The site specific monitoring firm will process the EDD to verify that criteria established in this QAPP are met. The Project Chemist will review all laboratory and field data to verify the results against the hard copy and check for transcription errors. The Project Chemist will verify qualifiers added by data processing and add any data qualifiers. The individual SDG EDD files will be processed to a centralized data management system to store all reviewed and approved data. Data that will appear on data tables for the report will be generated from the centralized database, which will serve as the central, protected data source for all data handling operations.

The central database will be stored in a secure area on site specific monitoring firm's network with access limited to data management specialists designated by the Project Manager. Data users may enter additional electronic data such as risk-based criteria for comparison of results. This data will be stored in separate tables in the database and linked to the actual results. Any data from outside sources will include a description of the data, a reference to the source, and the date updated. Outside data will be checked prior to use verify that current values are used. The central database will be used to create tables for the final report.

3

Assessment and Oversight

The site specific monitoring firm's assessment and oversight procedures will be implemented in accordance with the QMP. The QMP outlines general roles and responsibilities for the project team.

3.1 Assessment and Response Actions

The site specific monitoring firm's overall assessment activities include management assessments, development of SOPs, and performance evaluations. Management assessments include weekly meetings and conference calls to evaluate project readiness and staff utilization. Assignment of qualified personnel, maintenance of schedules and budgets, and quality of project deliverables are verified as part of these assessments. The development of SOPs and performance evaluations are used to provide trained and qualified personnel for the project.

The site specific monitoring firm's technical assessment activities include peer review, data quality reviews, and technical system audits (i.e., laboratory and field). Procedures for assessment and audit of data quality are described in Section 4 of this QAPP. Procedures for peer review and technical assessments are summarized briefly below.

Both overall and direct technical assessment activities may result in the need for corrective action. The site specific monitoring firm's approach to implementing a corrective action response program for both field and laboratory situations is summarized briefly below. The NYSDEC QA Officer has stop work authority on all NYSDEC projects that may have negative quality impacts prior to completion of corrective actions.

3.1.1 Peer Review

The site specific monitoring firm's implements peer review for all project deliverables including work plans, QAPPs, draft and final reports, and technical memoranda. The peer review process provides for a critical evaluation of the deliverable by an individual or team to determine if the deliverable will meet established criteria, quality objectives, technical standards, and contractual obligations. The Project Manager will assign peer reviewers, when the publications schedule is established. The publications staff will be responsible for ensuring all peer reviewers participate in the review process and approve all final deliverables. For technical memoranda and other project documents, the Project Manager will be responsible for obtaining principal review and approval.

3.1.2 Technical Systems Assessments

The entire project team is responsible for ongoing assessment of the technical work performed by the team, identification of nonconformance with the project objectives, and initiation, implementation and documentation of corrective action. Independent performance and systems audits are technical assessments that are a possible part of the QA/QC program. The following describes types of audits conducted, frequency of these audits, and personnel responsible for conducting audits.

Field Audits

Field audits are performed under the direction of the QA Officer. The need for field audits will be determined during project planning and indicated in the work plan. Field audits will be documented on the site specific monitoring firm's field audit checklists. Field audits will be typically performed during the early field programs.

Field Inspections

The Project Manager will be responsible for inspecting all field activities to verify compliance of activities with project plans.

Laboratory Audits

The laboratory must implement a comprehensive program of internal audits to verify compliance of their systems with SOPs and QA manuals.

NYSDOH must certify the laboratory and will perform external systems audits at an approximate frequency of once a year. External audits include reviews of analytical capabilities and procedures, COC procedures, documentation, QA/QC, and laboratory organization. These audits also include analysis of blind PE samples.

The QA Officer or designee may also audit laboratories. These audits are typically performed to verify laboratory capabilities and implementation of any complex project requirements or in response to a QC nonconformance identified as part of the data review process.

3.1.3 Corrective Action

Corrective actions will be implemented as needed. In conjunction with the QA Officer and Laboratory QA Coordinator, the Project Manager is responsible for initiating corrective action and implementing it in the field and office, and the laboratory project manager is responsible for implementing it in the laboratory. It is their combined responsibility to see that all sampling and analytical procedures are followed as specified and that the data generated meet the prescribed acceptance criteria. Specific corrective actions necessary will be clearly documented in the logbooks or analytical reports.

Field Situations

The need for corrective action in the field may be determined by technical assessments or by more direct means such as equipment malfunction. Once a problem has been identified, it may be addressed immediately or an audit report may serve as notification to project management staff that corrective action is necessary. Immediate corrective actions taken in the field will be documented in the project logbook. Corrective actions may include, but are not limited to:

- Correcting equipment decontamination or sample handling procedures if field blanks indicated contamination;
- Recalibrating field instruments and checking battery charge;
- Training field laboratory personnel in correct sample handling or collection procedures; and
- Accepting data with an acknowledged level of uncertainty.

After a corrective action has been implemented, its effectiveness will be verified. If the action does not resolve the problem, appropriate personnel will be assigned to investigate and effectively remediate the problem. Corrective actions recommended by NYSDEC personnel will be addressed in a timely manner.

Laboratory Situations

Out-of-control QC data, laboratory audits, or outside data review may determine the need for corrective action in the laboratory. Corrective actions may include, but are not limited to:

- Reanalyzing samples, if holding times permit;
- Correcting laboratory procedures;
- Recalibrating instruments using freshly prepared standards;
- Replacing solvents or other reagents that give unacceptable blank values;
- Training additional laboratory personnel in correct sample preparation and analysis procedures; and
- Accepting data with an acknowledged level of uncertainty.

The laboratory corrective actions must be defined in analytical SOPs. Any deviations from approved corrective actions must be documented and approved by the Project Chemist.

Whenever corrective action is deemed necessary by the Project Chemist or NYSDEC technical staff, the laboratory project manager will ensure that the following steps are taken:

- The cause of the problem is investigated and determined;
- Appropriate corrective action is determined;
- Corrective action is implemented and its effectiveness verified by the laboratory QA officer; and
- Documentation of the corrective action verification is provided to the Project Chemist and NYSDEC staff in a timely manner.

3.2 Reports to Management

For reports to management include the following:

- **Audit Reports** - Audit reports are prepared by the audit team leader immediately after completion of the audit. The report will list findings and recommendations and will be provided to the Project Manager and QA Officer.
- **Data Usability Summary Report** - A DUSR will be completed by the Project Chemist and provided to the NYSDEC technical staff in the appendix of the report. Impacts on the usability of data will be tracked by adding qualifiers to individual data points as described in Section 4.

Upon completion of a project sampling effort, analytical and QC data will be included in a comprehensive technical report that summarizes field activities and provides a data evaluation. A discussion of the validity of results in the context of QA/QC procedures will be made and the DUSR will be provided.

Serious analytical problems will be reported immediately to NYSDEC personnel. Time and type of corrective action (if needed) will depend on the severity of the problem and relative overall project importance. Corrective actions may include altering procedures in the field, conducting an audit, or modifying laboratory protocol.

4

Data Validation and Usability

The site specific monitoring firm will implement procedures for data validation and usability described below. These procedures will be adapted, if necessary, to meet project-specific requirements as determined in the work plan or FSP. A generic data usability validation checklist report form is provided in Appendix A.

4.1 Data Review, Validation, and Verification Requirements

All data generated will be reviewed by comparing accuracy and precision results for the QC samples to QC criteria listed in NYSDEC ASP 2005. The following types of data will be reviewed:

- Analytical reporting limits and target compounds will be compared to limits listed in the site-specific QAPP;
- Holding times will be verified against Table 2-1;
- QC summary data for surrogates, method blanks, LCS, and MS/MSD samples will be compared to criteria listed in the site-specific QAPP;
- Field QC results for duplicates and blanks will be compared to criteria listed in Section 2.5.1;
- Calibration summary data will be checked by the laboratory to verify that all positive results for target compounds were generated under an acceptable calibration as defined by the analytical method. Any deviations will be noted in the case narrative and reviewed by the Project Chemist;
- Field data such as sample identifications and sample dates will be checked against the laboratory report; and
- Any raw data files from the field and laboratory will not be reviewed unless there is a significant problem noted with the summary information.

4.2 Validation and Verification Methods

The data review scheme for analytical results from the receipt of the analytical data through the validated report is described below. The laboratory is responsible for performing internal data review. The laboratory data review must include 100% analyst review, 100% peer review, and 100% review by the laboratory project manager or designated QC reviewer to verify that all project-specific requirements are met. All levels of laboratory review must be fully documented and available for review if requested or if a laboratory audit is performed.

After receipt from the laboratory, project data will be validated using the following steps:

Evaluation of Completeness

The Project Chemist checks the electronic files for compliance with required format and the project target compounds and units. If errors in loading are found, the EDD files will be returned to the laboratory and the Project Chemist will request resubmission via SubLab. The Project Chemist also verifies that the laboratory information matches the field information and that the following items are included in the data package:

- COC forms and laboratory sample summary forms;
- Case narrative describing any out-of-control events and summarizing analytical procedures;
- Data report forms (i.e., Form I);
- QA/QC summary forms; and
- Chromatograms documenting any QC problems.

If the data package is incomplete, the Project Chemist will request resubmission. The laboratory must provide all missing information within one day.

Evaluation of Compliance

The Project Chemist will review all processed files and add data qualifiers for outliers. If QC data are provided in the EDD, the results will be used to verify compliance electronically. If no QC data are provided in the EDD, the reports will checked manually. Additional compliance checks on representative portions of the data are briefly outlined below:

- Review chromatograms, mass spectra, and other raw data if provided as backup information for any apparent QC anomalies;

- Review of calibration summaries or any other QC samples not provided in the EDD by the laboratory;

- Ensure that all analytical problems and corrections are reported in the case narrative and that appropriate laboratory qualifiers are added;

- For any problems identified, review concerns with the laboratory, obtain additional information if necessary, and check all related data to determine the extent of the error;

- Project chemists will follow qualification guidelines in EPA Region 2 data validation SOPs or *EPA CLP National Functional Guidelines for Organic Data Review, EPA 540/R-99-008* (October 1999) or *EPA CLP National Functional Guidelines for Inorganic Data Review*, EPA 540-R-04-004 (October 2004), but will use the specific method criteria for evaluation. The DUSR will be completed as specified in NYSDEC *Guidance of the Development of DUSRs* (July 1999); and

Data Review Reporting

The Project Chemist will perform the following reporting functions:

- Alert the Project Manager to any QC problems, obvious anomalous values, or discrepancies between the field and laboratory data, that may impact data usability; and

- Discuss QC problems in a DUSR for each laboratory report. DUSR will include a short narrative and print out of qualified data;

- Prepare analytical data summary tables of qualified data that summarize those samples and analytes for which detectable concentrations were exhibited including field QC samples; and

- At the completion of all field and laboratory efforts, summarize planned versus actual field and laboratory activities and data usability concerns in the technical report.

4.3 Reconciliation with User Requirements

For routine assessments of data quality, The site specific monitoring firm’s will implement the data validation procedures described in Section 4.2 and assign appropriate data qualifiers to indicate limitations on the data. The Data Validation Chemist will be responsible for evaluating precision, accuracy, representativeness, comparability, and completeness of data using procedures described in Section 2.5 of this QAPP. Any deviations from analytical performance criteria or quality objectives for the project will be documented in the DUSR provided to the data users for the project.

The QA Officer or Project Chemist will work with the final users of the data in performing data quality assessments. The data quality assessment may include some or all of the following steps:

- Data that are determined to be incomplete or not usable for the project will be discussed with the project team. If critical data points are involved which impact the ability to complete project objectives, data users will report immediately to the Project Manager. The Project Manager will discuss resolution of the issue with NYSDEC technical staff and implement necessary corrective actions (for example re-sampling);

- Data that are non-detect but have elevated reporting limits due to blank contamination or matrix interference will be compared to screening values. If reporting limits exceed the screening values, then results will be handled as incomplete data as described above; and

- Data that are qualified as estimated will be used for all project decision making. If an estimated result is close to a screening value, then there is uncertainty in any conclusions as to whether the result exceeds the screening value. The data user must evaluate the potential uncertainty in developing recommendations for the site. If estimated results become critical data points in making final decisions on the site, the Project Manager and NYSDEC technical staff should evaluate the use of the results and may consider the data point incomplete.

The assessment process involves comparing analytical results to screening values and background concentrations to determine if the contamination present is site-related (i.e., above background levels) or significant (i.e., above screening values). Additional data assessment may be performed on a site-by-site basis.

A

Data Usability Summary Report Model

Attachment A – Sample Data Usability Summary Report

The analytical data provided by the laboratory were reviewed for precision, accuracy, and completeness per NYSDEC Division of Environmental Remediation Guidance for the Development of DUSRs (March 2010). Specific criteria for QC limits were obtained from the project QAPP. Compliance with the project QA program is indicated on the in the checklist and tables. Any major or minor concerns affected data usability are summarized listed below. The checklist and tables also indicate whether data qualification is required and/or the type of qualifier assigned.

Reference:

ProjectID	Lab Work Order
Mr. C's Cleaners	L1227

Table 1 Sample Summary Tables from Electronic Data Deliverable

Work Order	Matrix	Sample ID	Lab ID	ID Corrections
L1227	GW	TB1-060112	L1227-01	
L1227	GW	ES1-5-R-060112	L1227-02	
L1227	GW	MP1-8S-R-060112	L1227-03	
L1227	GW	RB1-060112	L1227-04	
L1227	GW	MP1-9S-R-060112	L1227-05	
L1227	GW	MP1-13B-R-060112	L1227-06	
L1227	GW	MP1-13B-R-060112/Q	L1227-07	

General Sample Information	
Do Samples and Analyses on COC check against Lab Sample Tracking Form?	Yes
Did coolers arrive at lab between 2 and 6°C and in good condition as indicated on COC and Cooler Receipt Form?	Yes
Frequency of Field QC Samples Correct? Field Duplicate - 1/20 samples Trip Blank - Every cooler with VOCs waters only Equipment Blank - 1/ set of samples per day?	Yes – Project QC goals have been met.
All ASP Forms complete?	Yes
Case narrative present and complete?	Yes
Any holding time violations (See table below)?	No

The following tables are presented at the end of this DUSR and provided summaries of results outside QC criteria.

- Method Blanks Results (Table 2)
- Surrogates Outside Limits (Table 3)
- MS/MSD Outside Limits (Table 4)
- LCS Outside Limits (Table 5)

- Re-analysis Results (Table 6)
- Field Duplicate Results (Table 7)

Go to Tables List

Volatile Organics by GCMS	
Description	**Notes and Qualifiers**
Any compounds present in method, trip and field blanks (see Table 2)?	Yes. One organic compound was detected in the trip blank for this SDG.
For samples, if results are <5 times the blank or < 10 times blank for common laboratory contaminants then "U" flag data. Qualification also applies to TICs.	Results qualified as shown in Table 2B.
Surrogate for method blanks and LCS within limits?	Yes
Surrogate for samples and MS/MSD within limits? (See Table 3). All samples should be re-analyzed for VOCs? Samples should re-analyzed if >1 BN and/or > AP for BNAs is out. Matrix effects should be established.	Yes
Laboratory QC frequency one blank and LCS with each batch and one set of MS/MSD per 20 samples?	Yes
MS/MSD within QC criteria (see Table 4)? If out and LCS is compliant, then J flag positive data in original sample due to matrix?	Yes
LCS within QC criteria (see Table 5)? If out, and the recovery high with no positive values, then no data qualification is required.	Yes
Were any samples re-analyzed or diluted (see Table 6)? For any sample re-analysis and dilutions is only one reportable result by flagged?	No.
For TICs are there any system related compounds that should not be reported?	No.
Do field duplicate results show good precision for all compounds except TICs (see Table 7)?	Yes. Samples MP1-13B-R-060112 and MP1-13B-R-060112/Q are a field duplicate sample pair – see Table 7.

Summary of Potential Impacts on Data Usability
Major Concerns
None
Minor Concerns
Result qualified due to trip blank contamination.

Table 2 - List of Positive Results for Blank Samples

Method	Sample ID	Samp Type	Analyte	Result	Qual	Anal Type	Units	MDL	PQL
SW8260	TB1-060112	BLK	Methylene chloride	1.3	J	W	µg/L	0.41	5.0

Table 2A - List of Samples Qualified for Method Blank Contamination

None

Table 2B - List of Samples Qualified for Field Blank Contamination

Method	Trip Blank	Matrix	Analyte	Blank Result	Sample Result	Lab Qual	PQL	Affected Samples	Sample Flag
SW8260	TB1-060112	GW	Methylene chloride	1.3	2.1	J	5.0	RB1-060112	U Qualified

Table 3 - List of Samples with Surrogates outside Control Limits

None

Table 4 - List MS/MSD Recoveries and RPDs outside Control Limits

None.

Table 5 - List LCS Recoveries outside Control Limits

None.

Table 6 –Samples that were Reanalyzed

None.

Table 7 – Summary of Field Duplicate Results

Method	Analyte	MP1-13B-R-060112	MP1-13B-R-060112/Q	RPD	Rating	Sample Qualifier
SW8260	Tetrachloroethene	3.6 J	3.6 J	0	Good	None

SW8260	Trichloroethene	0.80 J	0.81 J	1.24	Good	None

Key:
A = Analyte
NC = Not Calculated
ND = Not Detected
PQL = Practical Quantitation Limit
RPD = Relative Percent Difference
T = Tentatively Identified Compound

L

Mr. C’s Dry Cleaners Site Operations and Maintenance (O&M) Plan

Mr. C's Dry Cleaner Site
NYSDEC
O&M Manual

Contract # D004180
Site # 9-15-157
GROUNDWATER RECOVERY SYSTEM

586 Main Street
East Aurora, NY

Mr. C's Dry Cleaners Site
NYSDEC Site # 9-15-157
Contract D004180
Operation & Maintenance Manual Revisions
Revision 1
March 21, 2005

The following modifications have been made to the components and configuration of the groundwater treatment system. The changes are reflected in this Operation and Maintenance Manual:

Products

2.1 Equipment Summary

- Section 2.1.14 The Vapor Carbon Units were taken off line, and removed from the site on January 14, 2005. This paragraph is no longer relevant in the O&M Manual. The Groundwater Treatment System Plan drawing has been modified to reflect the current treatment system configuration.
- Section 2.1.1.5 Sequestering Agent. Although the sequestering agent remains on site it is currently not being used to treat the raw inlet water. The unit will remain onsite and be activated as need in the future. The Material Safety Data Sheet for the sequestering remains as (form 3).

Operations

3.2 System Startup

- Section 3.3.4 Disposal of exhausted carbon This paragraph is no longer relevant.
- Section 3.4.2 Sampling – Vapor Phase / Air This paragraph is no longer relevant.

Section # 6

Flow Meters

- A new Industrial Turbine Flow Meter and Totalizer has been added to the effluent discharge, located on the north effluent pipe. The old effluent meter is still inline on the effluent discharge.

Section # 8

Bag Filters

- 150 *u*m filters are being used in the Model 8 Bag Filter Unit.

Section # 14

Granulated Activated Carbon

- This section is no longer relevant to the O&M Manual.

These changes are now reflected in the updates of the O&M manual.

Signed: ______________________ **Dated:** 3/23/05

Mr. C's Dry Cleaner Site
NYSDEC
O&M Table of Contents

1.0 General

1.1 Description

1.1.1 Site Background

The Mr. C's Dry Cleaners Site is listed on the New York State Registry of Inactive Hazardous Waste Disposal Sites (Site No. 9-15-157). The site is located in an area occupied, in part, by Mr. C Cleaners, Inc. at 586 Main Street in the Village of East Aurora, Erie County, New York. The properties surrounding Mr. C Cleaners is a mix of light commercial, municipal, and residential development.

The 0.5-acre property includes a one floor building on a concrete slab foundation and an adjacent paved parking lot. Mr. C Cleaners has operated as a dry cleaner consistently since 1970 and was used for other businesses (laundry, auto repair/spray painting, and a hotel) since 1912. Mt. C Cleaners' dry cleaning operations occupy the front portion of the building along Main Street. The remaining portion of the "L" shaped building consists of storage space adjacent to the dry cleaning operations and various types of active commercial businesses. The parking lot services all of the businesses within this building.

In December 1991, the New York State Department of Environmental Conservation (NYSDEC) investigated chemical-like odors in the basement of the First Presbyterian Church, southwest of the site. The NYSDEC and NYSDOH collected air samples on several occasions and detected the presence of tetrachloroethylene (PCE). Subsequent investigations found PCE contamination in the sanitary sewers, groundwater, and soil vapor. The site was designated as a Class 2 site, meaning that the site is believed to pose a significant threat to the public health and the environment.

The 1994 Remedial Investigation found contamination in the groundwater and in soil with the highest concentrations beneath Mr. C's Dry Cleaners building. The primary contaminant is tetrachloroethlyene (PCE), other contaminants are PCE degradation compounds, petroleum hydrocarbons, and other volatile organic compounds (VOCs). The investigation delineated the vertical and horizontal extent of the contaminated groundwater plume. Pre-design investigation in December 1998 and April 1999 were conducted to confirm the vertical and horizontal extent of the groundwater plume.

1.1.2 Scope of Work

The work at the site consists of furnishing all labor, materials, supervision, equipment and services necessary to complete the work detailed in the specifications and Contract Drawings. The work included, but was not limited to the following: Installation of eight groundwater pumping wells and approximately 1,100 linear feet of double-wall groundwater collection pipe ranging in size from 1.0-inch I.D. to 4.0-inch I.D. Demolition of utilities and furnishings within the existing storage space of the Mr. C's Dry Cleaners building. Construction of a 150 gallons-per-minute (GPM) groundwater treatment system consisting of a sequestering agent feed system, bag filters, a 3,000-gallon holding tank, low-profile air stripper, and vapor-phase granular activated carbon. Installation of approximately 1,300 linear feet of 4-inch diameter discharge force main along Whaley Avenue and an outfall structure to Tannery Brook off Ridge Road. Operation and maintenance of the groundwater collection and treatment systems for a period of one year, following start-up.

2.0 Products

2.1 Equipment Summary

2.1.1 Equipment Layout

An Auto Cad Lt. Drawing of the remediation building and the location of the system components can be found as **Figure 1**. The drawing is not to scale, the dimensions of the system components are shown as well as the distances between all of the system components.

2.1.2 Process and Instrumentation Diagram

The Process and Instrumentation Diagrams can be found in the **Appendix** section of the O&M Manual. In the NES O&M System Manual Book 1 of 2, Section 2.

2.1.3 Control Panel Drawings and Programs

The Control Panel Drawings and Programs can be found in the **Appendix** section of the O&M Manual. In the NES O&M System Manual Book 1 of 2, Section 3.

2.1.4 Groundwater Pumps

A six inch, single phase, three horsepower Grundfos pump was installed in RW-1, and a 4 inch, single phase, 1.5 horsepower Grundfos pump was installed in PW-2 through PW-8. The Grundfos SQ/SQE groundwater pump installation and operating instructions including a trouble shooting guide can be found in the **Appendix** section of the O&M Manual. In the NES O&M System Manual Book 1 of 2, Section 4.

2.1.5 Level Transducers

Level Transducers were placed in all pumping wells two feet above the pump intake and were programmed to turn the pump on and off at varying water levels. This is done in order to keep a cone of depression in the water table and to pull up as much of the contamination as possible. The KPSI Level and Pressure Transducer Installation and Maintenance guide can be found in the **Appendix** section of the O&M Manual. In the NES O&M System Manual Book 1 of 2, Section 5.

2.1.6 Flow Meter

A Krohne Electromagnetic Flow meter was installed in the influent ground water pumping line to record influent flow rate and to record the amount of groundwater pumped into the system. The Krohne Electromagnetic Flow Meter installation and programming instructions can be found in the **Appendix** section of the O&M Manual. In the NES O&M System Manual Book 1 of 2, Section 6.

2.1.7 Sump Pump

The Goulds sump pump was installed inside of a 2 foot wide by 2 foot long by 4 inches deep sump in the back of the remediation building. The sump pump will automatically turn on once the high level float switch is triggered pumping the water directly into the holding tank. Once the water in the sump reaches a low level the sump pump will turn off automatically. The Goulds Sump Pump maintenance and operation guide can be found in the **Appendix** section of the O&M Manual. In the NES O&M System Manual Book 1 of 2, Section 7.

2.1.8 Bag Filter

The Rosedale Product, Inc. bag filter unit was installed to filter the groundwater before it reaches the air stripper. Two bag filters were installed so that the system would not have to be turned off when it was time for a bag filter change. The groundwater can be redirected to the other bag filter through a series of ball valves so that the system is continuously operational. The Rosedale Product, Inc. bag filter unit installation, operation and maintenance manual can be found in the **Appendix** section of the O&M Manual. In the NES O&M System Manual Book 1 of 2, Section 8.

2.1.9 Feed Pumps

The G&L Feed Pumps were installed to pump groundwater from the holding tank into the air stripper (Influent Feed Pumps). The G&L Pumps installation, operation and maintenance instructions can be found in the **Appendix** section of the O&M Manual. In the NES O&M System Manual Book 1 of 2, Section 9.

2.1.10 Air Stripper

The purpose of the air stripper is to treat contaminated ground water for the removal of certain dissolved volatile organic compounds (VOC). The shallow Tray low profile air stripper is a compact, low-maintenance solution to groundwater treatment. The Shallow Tray low profile air stripper unit installation, operation and maintenance instructions can be found in the **Appendix** section of the O&M Manual. In the NES O&M System Manual Book 1 of 2, Section 10.

2.1.11 Effluent Pumps

The G&L Pumps were installed to pump treated groundwater from the air stripper into the discharge force main (Effluent Feed Pumps) which empties into Tannery Brook. The G&L Pumps installation, operation and maintenance instructions can be found in the **Appendix** section of the O&M Manual. In the NES O&M System Manual Book 1 of 2, Section 11.

2.1.12 Effluent Flow Meter

The Great Plains Industries industrial grade Flow meter was installed in the effluent treated water, pumping line to record effluent flow rate and to record the amount of treated water pumped into the force main and eventually into Tannery Brook. The Great Plains Industries industrial grade Flow Meter installation and operating instructions can be found in the **Appendix** section of the O&M Manual. In the NES O&M System Manual Book 1 of 2, Section 12.

2.1.13 Holding Tank

The Holding Tank P&ID diagrams can be found in the **Appendix** section of the O&M Manual. In the NES O&M System Manual Book 1 of 2, Section 13.

2.1.14 Vapor Carbon

The function of the Vapor Carbon is to treat the air from the air stripper. The treated air is discharged into the atmosphere through a vent in the roof after it has gone through a series of two vapor carbon vessels. The vapor carbon operating parameters and the P&ID diagrams can be found in the **Appendix** section of the O&M manual. In the NES O&M System Manual Book 1 of 2, Section 14.

2.1.15 Sequestering Agent

The sequestering agent that is used is called Carus Quest 101 and it will be stored in drums within the remedial compound, with feed lines piped and connected into the process stream before the bag filter units. The feed rate will be calibrated to 0.03 gallons per hour. The Material Safety Data Sheet for Carus Quest 101 is located as **Form 3**.

2.1.16 Telemetry System

The Verbatim Auto Dialer system and all associated components were installed per the manufacturer's instructions as included in the **Appendix** section of the O&M manual. In the NES O&M System Manual Book 2 of 2. The auto dialer functions as a remote alarm monitor, which monitors the Mr. C's Dry Cleaners remediation system 24 hours a day.

2.1.17 Overview

All system components for the Mr. C's Dry Cleaners remediation project were installed per the manufacturer's instructions, as included in the NES System Manual, Books 1 and 2.

3.0 Operation

3.1 Warranties / Guarantees

All warranties / guarantees provided for site remedial equipment is outlined in the **Appendix** in the NES System Manual, Books 1 and 2.

3.2 System Startup

Before power is applied to any equipment, the component manufacturer's operation and start-up manual (compressor, blower, pump, etc.) should be reviewed. Some equipment cannot be operated in the wrong rotation even momentarily without damage. Verifying proper rotation should only be done after review of the associated equipment manual.

As a general rule, all fluid levels, drive components, plumbing attachments, etc. should be inspected. The equipment should be initially started in a no-load condition with non-contaminated process fluid (i.e. SVE vacuum blower started with all recovery wells shut off, and the ambient air dilution valve open fully). **Do not store equipment for more then one month without running it.** Idle blowers, pumps or other items may rust or seize if not run once a month.

Once proper operation of all equipment has been verified, the system can be started. The following procedures shall be followed during the startup of all remedial equipment at the site.

AIR STRIPPER CONTROL PANEL

1. Turn power control switch on

2. Turn air stripper blower #1 switch on

3. Turn effluent pump #1 switch on

4. Turn influent pump #1 switch on

5. Push reset button

6. Check for alarm lights

MAIN CONTROL PANEL

7. Turn control power switch on and wait 30 seconds

8. Turn well pumps switch 1-8 on

9. Turn metering pump switch on

10. Push reset button

11. Check for alarm lights

System shut down is followed by reversing the system start up procedures, but before you turn the power off to the air stripper blower let the blower run for at least 10 minutes to fully treat any water that is still in the air stripper.

3.3 Operating Parameters

The Holding Tank and the Bag Filters need to be checked to make sure they are operating in the following ranges.

1. Bag filters inlet pressure 0-15 psi maximum (change filters above 15 psi)
2. Bag filters outlet pressure 0-10 psi maximum
3. Water flow rate 0-150 gpm maximum

The Influent Pumps, Effluent Pumps and the Air Stripper need to be checked to make sure they are operating in the following ranges.

1. Influent pumps 0-60 psi maximum
2. Air stripper vacuum 13-16 In H20
3. Air stripper airflow 0-2100 cfm
4. Effluent pumps pressure 0-60 psi maximum
5. Water flow rate 0-150 gpm maximum

The Carbon Vessels need to be checked to make sure they are operating in the following ranges.

1. Inlet pressure 0-15 psi maximum (check carbon above 15 psi)
2. Outlet pressure 0-10 psi maximum

3.3.1 Flow totalizer readings

Total flows, for groundwater process streams, shall be measured and recorded as part of the operation and maintenance period. There are totalizers located where the untreated ground water enters the remediation building and where the treated ground water leaves the building. These flows are recorded once per week and submitted in the Monthly Operation and Maintenance report.

3.3.2 Monthly groundwater elevation measurements

Monthly groundwater measurements will be collected from all of the site peizometers and will be submitted as part of the Monthly Reports. The elevations shall be used to construct groundwater flow nets showing a plan view of the flow net, and cross-sections horizontal to the flow of groundwater perpendicular to the flow of groundwater. The form used to collect peizometer groundwater measurements is included in the O&M manual as **Form 2**.

3.3.3 Discharge of treated water

All treated effluent water generated during the operation and maintenance period will be discharged according to the discharge permit currently held for this site, and according to the procedures outlined in the contract documents. The treated water will be directed through the Force Main, which empties directly into Tannery Brook. **Table 1** of the O&M manual shows the discharge requirements to Tannery Brook for Volatile Organic Compounds, BTEX, Metals and Water Quality.

3.3.4 Disposal of exhausted carbon

All exhausted carbon generated during the operation and maintenance period will be discharged according to the procedures outlined in the contract documents. Waste characterization analysis samples will have to be taken to determine if the carbon is considered Non-hazardous or hazardous. If the carbon is determined to be non-hazardous it can be disposed of at the Town of Tonawanda land fill, and if the carbon is determined to be hazardous the carbon can be disposed of at CWM Model Waste City.

3.3.5 Performance monitoring

The performance of the remedial system will be monitored and a system check form filled out once per week according to the procedures outlined in the contract documents, the Operations and Maintenance Manual, and the Sampling and Analysis Plan. The system check form is included in the O&M manual as **Form 1**.

3.4 Sampling

3.4.1 Sampling – water

Groundwater samples will be collected once per month according to the contract documents, Section 01650, part 3, section 3.5. Samples will also be collected according to the guidelines and procedures outlined in the Sampling and Analysis Plan developed for this site.

3.4.1.1 Locations

Groundwater samples will be collected from the process streams detailed below.

3.4.1.1.1 Air Stripper Influent and Effluent

Groundwater samples will be collected from the air stripper influent (untreated groundwater before it goes through the air stripper) and effluent streams (treated ground water after it goes through the air stripper), as detailed in the contract documents and the Sampling and Analysis Plan.

3.4.1.2 Record keeping

All site records will be compiled according to the contract documents, and the following will be noted: Sampling Location, Date of Collection, Date of Analysis, Unit Process, Sample Number, Matrix, Type of Analysis, results, and Detection Limits, Flow Rate if Applicable and Sampling Personnel.

3.4.2 Sampling - vapor phase / air

Vapor phase / air samples will be collected according to the contract documents, Section 01650, part 3, section 3.6. Samples will also be collected according to the guidelines and procedures outlined in the Sampling and Analysis Plan developed for this site.

3.4.2.1 Locations

Vapor phase / air samples will be collected from the process streams detailed below.

3.4.2.1.1 Air discharge from the air stripper

Vapor phase / air samples will be collected from the air discharge stream from the air stripper (Pre Carbon), as detailed in the contract documents and the Sampling and Analysis Plan.

3.4.2.1.2 Air discharge from the vapor-phase GAC unit

Vapor phase / air samples will be collected from the air discharge stream from the vapor-phase GAC unit (Post Carbon), as detailed in the contract documents and the Sampling and Analysis Plan.

3.4.3 Sample analytical requirements/ Expedited TAT's for samples

Air stripper influent and air stripper effluent water samples shall be analyzed for the following: ASP 95-1 + MTBE, TSS/ TDS, Cyanide and TCL Metals.
Pre carbon and post carbon air samples shall be analyzed for the following: TO-2.

All samples shall be analyzed and reported with in 2 weeks upon arrival to the lab.

3.5 Records and Reports

All site records will be compiled according to the contract documents, and the following will be noted: Sampling Location, Date of Collection, Date of Analysis, Unit Process, Sample Number, Matrix, Type of Analysis, results, and Detection Limits, Flow Rate if Applicable and Sampling Personnel.

3.5.1 General

3.5.1.1 Monitoring logs and data sheets

All monitoring logs and data sheets will be compiled and kept in accordance with the contract documents, as outlined in Section 01650, part 3, section 3.8, sub-part A, item 1. The system check form is included as **Form 1**. The peizometer groundwater measurement form is included as **Form 2**.

3.5.1.2 Data and monitoring sheet retained on site

All data and monitoring sheets will be compiled and kept on site in accordance with the contract documents, as outlined in Section 01650, part 3, section 3.8, sub-part A, item 2.

3.5.1.3 QC of all data and information

All data generated at the site will be compiled and kept in accordance with the contract documents, as outlined in Section 01650, part 3, section 3.8, sub-part A, item 3.

3.5.1.4 Maintenance of all records for equipment, processes and systems

All records are to be maintained and kept in accordance with the contract documents, as outlined in Section 01650, part 3, section 3.8, sub-part A, item 4.

3.5.1.5 Problem reporting and corrective action

All problems and proposed corrective actions will be compiled and kept in accordance with the contract documents, as outlined in Section 01650, part 3, section 3.8, sub-part A, item 5.

3.5.1.6 Report and data submittal

All reports and data will be submitted in accordance with the contract documents, as outlined in Section 01650, part 3, section 3.8, sub-part A, item 6.

3.5.2 12-Month O&M

Operation and Maintenance of the remedial system shall occur for a twelve-month period, as described below.

3.5.2.1 Monthly Status Report

A monthly status report will be compiled as per the contract documents. Information contained in each monthly status report will consist of the following items, as detailed in the contract documents:
O&M activities and status, Updated O&M logs (**Form 1**), Technical support activities, Health and Safety activities, status, problems, etc, Planned activities and schedules, Total flows treated (source and concentration data), Groundwater elevation measurements (**Form 2**), Groundwater flow nets (plan view, horizontal &perpendicular cross-sections), Material list, including quantities and cost, Actual performance vs. design criteria analysis, Recommended SOPs to enhance performance, Estimate of long-term material equipment requirements.

3.6 Maintenance Requirements

3.6.1 General

3.6.1.1 Problem notification and resolution

The Verbatim Auto Dialer will call the pre-programmed personnel when an alarm condition is reached. When this occurs, the person that receives the call will send a technician immediately to the site to correct the problem. This insures that the treatment system runs as efficiently and consistently as possible. The list of Names and Phone Numbers programmed into the Auto Dialer is below.

Phil Holloway, pager: 518-446-4153 (Tyree)
Steve Phelps, pager: 800-366-2337 (Tyree)
Dragan Mitrovich, cell: 203-948-5051 (Tyree)
General Number: 716-684-8060 (E&E)

The Auto Dialer Channel Designations are Below:
Channel 1- Well pump overload (any of 8)
Channel 2- EQ tank alarm
Channel 3- Air stripper alarm
Channel 4- A/S influent pump 1 overload
Channel 5- A/S influent pump 2 overload
Channel 6- A/S blower 1 overload
Channel 7- A/S blower 2 overload
Channel 8- A/S effluent pump 1 overload
Channel 9- A/S effluent pump 2 overload
Channel 10- Building sump high level
Channel 11-16- Reserved for future use

3.6.1.2 Maintenance requirements

The following is a list of Alarm Descriptions and Troubleshooting Guides.

AIR STRIPPER CONTROL PANEL ALARMS

1. Air stripper high sump level:

- Check water level in the air stripper
- Check effluent pump
- Push reset button

2. Air stripper low air pressure

- Check air stripper blower
- Check air stripper effluent air flow
- Check carbon vessel pressure
- Push reset button

MAIN CONTROL PANEL ALARMS

These alarms will be display on PLC unit

1. Overload relay on pumps 1-8

- Check pumps overload relay inside control panel
- Check voltage on motor starters
- Check amperage on motor starters
- Push reset button

2. Equalization tank high level

- Check water level inside EQ tank
- Check influent pump
- Push reset button

3. Air stripper high sump level

- Check water level in the air stripper
- Check air stripper effluent air flow
- Push reset button

4. Air stripper low air flow

- Check air stripper blower

- Check air stripper effluent air flow
- Check carbon vessel pressure
- Push reset button

3.6.1.3 Maintenance and upkeep for calibration of equipment

The sequestering agent needs to be calibrated and there is a calibration chamber located next to the metering pump in the remediation building. Maintenance and upkeep for calibration of equipment shall occur as defined in the contract documents, Section 01650, part 3, section 3.9, sub-part A, subsection 4.

3.6.1.4 Tool and equipment storage and handling

All spare parts, equipment and tools will be stored at an offsite facility. They will be turned over to the department at the end of the operation and maintenance period.

3.6.1.5 Preventative maintenance schedule

Change out the bag filters when the inlet pressure is above 15 psi, or the outlet pressure is above 10 psi.
Check the carbon in the carbon vessels when the inlet pressure is above 15 psi.
Grease the bearings in the influent and effluent pumps and the sump pump annually.
Clean the air stripper trays with a pressure washer biannually.

3.6.1.6 Self-performance of maintenance items

Tyree shall maintain the facilities in a fully operational condition at all times and shall perform maintenance and repairs to the remediation system as needed.

3.6.2 Equipment and materials

3.6.2.1 Maintenance tools and equipment

Tyree shall provide any maintenance tools and equipment that will be needed for the upkeep of the remediation equipment during the operation and maintenance period.

3.6.2.2 Spare parts and materials inventory list

Spare pumps for pumping wells RW-1 and PW-2 through PW-8.
An activated carbon vessel with granular activated carbon, inlet and outlet plugs and ID tags.
Felt bag filters.
Goulds sump pump and float switch.
Metering pump.

3.6.3 Reports and records

3.6.3.1 Record keeping system

A three ring binder composed of copies of the Operation and Maintenance system check forms will be kept on site inside of the remediation building. All readings and any problems occurred during the O&M period will also be noted on the forms. The original copies of the O&M system check forms will be kept at the Latham office. These forms will be included in the Monthly O&M report.

3.6.3.2 Maintenance Procedures

The Krohne electromagnetic flow meter maintenance procedures as found in the Appendix in the NES System Manual Section 6 page 8/1. Always switch off power source before opening the housing to the flow meter.

- Clean the signal converter housing with a solventless detergent.
- Replace the power fuses.
- Changeover the operating voltage.
- Replace the electronics unit of the signal converter.
- Turn the display PCB.
- Retrofit the display unit.

The Goulds sump pump maintenance procedures as found in the Appendix in the NES System Manual Section 7 page 4. Always disconnect and lockout electrical power before attempting any maintenance.

- Check for even operating times monthly.
- Make sure that there is unimpeded float operation monthly.

The Rosedale bag filter unit maintenance procedures as found in the Appendix in the NES System Manual Section 8 page 3.

- Clean or replace the filter media.
- Clean the basket and housing.

The Goulds Influent and Effluent pump maintenance procedures as found in the Appendix in the System Manual Section 9 page 4. Always disconnect and lockout electrical power before attempting any maintenance.

- Re-grease bearings located in the motor at 2,000 hours or after 3 months with #2 Sodium or Lithium grease.

The Shallow Tray Low Profile Air Stripper maintenance procedures as found in the Appendix in the System Manual Section 10 page 4-1.

- Always let the blower run an additional 5 minutes after the feed pumps have been shut of.
- Clean the air stripper trays using a pressure washer.

The Industrial Grade effluent flow meter maintenance procedures as found in the Appendix in the System Manual Section 12 page 7.

The Industrial Grade effluent flow meter maintenance procedures as found in the Appendix in the System Manual Section 12 page 7.

- Check the batteries (provide 4,000 hours of actual use).
- Clean the battery terminals annually.

3.7 Permanent Utilities

Tyree shall provide all site utility services for system operation and monitoring during the operation and maintenance period according to the contract documents, Section 01650, part 3, section 3.10, sub-part A, subsection 1.

3.7.1 General

3.7.1.1 Maintenance of electrical supply

Tyree shall maintain all electricity necessary for use at the site during the operation and maintenance period. Tyree shall coordinate with the local electrical utility to provide all supply connections and facilities. At the end of the operation and maintenance period Tyree shall turn over the connections and facilities installed by Tyree to the department according to the contract documents, Section 01650, part 3, section 3.10, sub-part A, subsection 2.

3.7.1.2 Telephone service provision

A Verbatim Auto Dialer is installed inside of the remediation building and it functions as a remote alarm monitor because this facility is not staffed 24 hours a day. When an alarm occurs the auto dialer accesses the standard phone line to which it is connected, dials the appropriate phone numbers and delivers the users own pre-recorded voice message corresponding to those particular alarm conditions that are currently active. Maintenance, Testing and battery guidelines are found in the Appendix in the NES System Manual book 2 of 2.

3.8 Miscellaneous Items

3.8.1 Name, address and phone number of equipment manufacturer

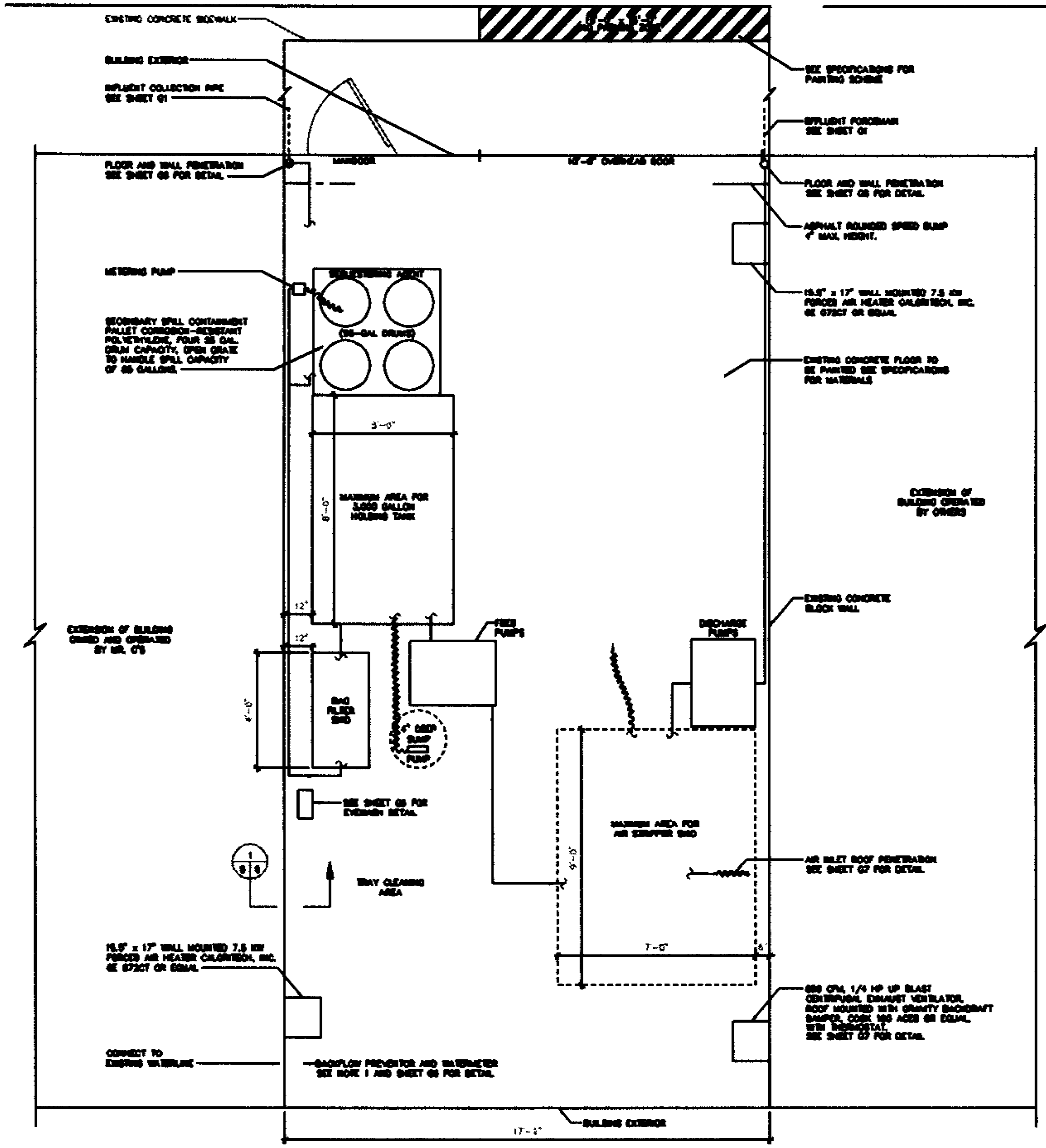
National Environmental Systems, INC.
36 Maple Avenue
Seekonk, Massachusetts 02771
Telephone (508) 761-6611
Fax (508) 761-6898

3.8.2 Copy of all approved Shop Drawings, warranty bond and service contract

Copies of all approved shop drawings, warranty bond and service contracts are located in the O&M manual in the **Appendix** titled, As-built drawings.

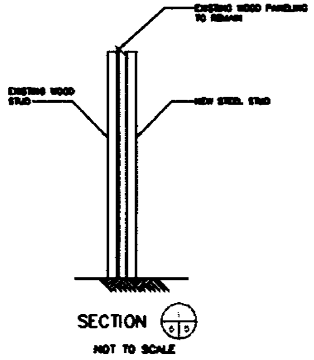
Figures

Remediation Building Layout



FLOOR PLAN

SCALE: 1/2" = 1'-0"



SECTION

NOT TO SCALE

ROOM FINISH SCHEDULE		
LOCATION	SUBSTRATE	PROPOSED FINISH
EAST WALL	EXISTING CONC. BLOCK	PAINT
SOUTH WALL	NEW STEEL STUDS	NUDO PRODUCTS INC. FIBER-LITE FRP LINER PANELS, OR EQUAL
NORTH WALL	EXISTING CONC. BLOCK	PAINT
WEST WALL	EXISTING CONC. BLOCK	PAINT
CEILING	WOOD JOISTS	GYPROC INC. FIRE GUARD C GYPSUM BOARD OR EQUAL
EXISTING FLOOR	CONCRETE	NON-SLIP PAINT FINISH

NOTES:
1. INSTALL BACK FLOW PREVENTOR WITH 3' IN FRONT FOR ACCESS.
2. ALL PROCESS PIPING TO BE 4" DIA. PVC UNLESS

MALCOLM PIRNIE

GROUNDWATER TREATMENT
SYSTEM PLAN
SCALE: AS NOTED

G 5 7
02880005

Forms

O&M System Check Form

O&M Piezometer Gauging Form

Carus Quest 101 Material Safety Data Sheet

The Tyree Organization

SYSTEM CHECK

DATE:

CONTRACT NUMBER: D004180
SITE NUMBER: 9-15-157
SITE NAME: Mr Cs Dry Cleaners
LOCATION: East Aurora, NY

Monthly System CHECK

Influent Flow Rate: ____________

Influent totalizer Reading: ____________

Metering Pump Pressure: ____________

Bag Filter Pressure -TOP: ____________

Bag Filter Pressure -BOTTOM: ____________

Influent Pump (Feed Pump to Air Stripper) Pressure: ____________

Air Stripper Differential Pressure: ____________

Air Stripper Air Velocity (anemometer): ____________

Air Stripper Vacuum: ____________

Effluent Pump Pressure: ____________

Effluent Flow Rate: ____________

Effluent Totalizer Reading: ____________

Holding Tank Level: ____________

Sequestering Agent Drum Level: ____________

Sampling:

- Collected water sample from Air Stripper Influent	Yes or No
- Collected water sample from Air Stripper Effluent	Yes or No
- Collected air sample from Carbon Influent	Yes or No
- Collected air sample from Carbon Effluent	Yes or No

System check performed by:

Notes:

Piezometer Gauging Data

Date: ____________________

Tech ____________________

Piezometer	Depth of Recovery Well as is gauged
PZ-1A	
PZ-1B	
PZ-1C	
PZ-1D	
PZ-2A	
PZ-2B	
PZ-2C	
PZ-2D	
PZ-3A	
PZ-3B	
PZ-3C	
PZ-3D	
PZ-4A	
PZ-4B	
PZ-4C	
PZ-4D	

PZ-5A	
PZ-5B	
PZ-5C	
PZ-5D	
PZ-6A	
PZ-6B	
PZ-6C	
PZ-6D	
PZ-7A	
PZ-7B	
PZ-7C	
PZ-7D	
PZ-8A	
PZ-8B	
PZ-8C	
PZ-8D	

CarusQuest™ 101

MATERIAL SAFETY DATA SHEET

Information Telephone: 815-223-1500 Emergency Telephone: 800-435-6856 CHEMTREC Telephone: 800-424-9300

I. IDENTIFICATION

PRODUCT NAME:	CarusQuest™ 101	REVISION DATE:	6/10/99
CHEMICAL NAME:	1-Hydroxyethyledene-1, 1-Diphosphonic Acid	FORMULA:	Proprietary
SYNONYMS:	Phosphonic Acid	EPA REG.#:	Not Applicable
D.O.T. HAZARD CLASS:	Corrosive, Class 8, PG II	UN NO.: 3265	CAS NO.: 2809-21-4
D.O.T. SHIPPING NAME:	Corrosive Liquid, Acidic, Organic, N.O.S.	CAS NAME:	Not Applicable

II. PHYSICAL DATA

PHYSICAL STATE:	Clear liquid, distinct odor	SPECIFIC GRAVITY: (H_2O=1)	1.23	PH: <2
BOILING POINT: (°C at 760 mm Hg)	>100° C (212° F)	SOLUBILITY: (in water weight %)	Soluble in all proportions	
FREEZING POINT, °C:	< 20° C (4° F)	VOLATILES VOLUME %:	Not Applicable	
VAPOR PRESSURE (at 20°C mm Hg)	12 mm	EVAPORATION RATE: (Butyl Acetate = 1)	Not Applicable	

III. HAZARDOUS COMPONENTS GREATER THAN 1%

MATERIAL	PEL	TLV	CAS. NO.	%
1-Hydroxyethyledene-1, 1-Diphosphonic Acid	Not established	Not established	2809-21-4	30%

This product does not contain any ingredients subject to the reporting requirements of Section 313 - Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

CARCINOGENICITY: Not listed by IARC, NTP, or OSHA.

IV FIRE AND EXPLOSIVE HAZARD DATA

FLAMMABILITY:	Non-flammable liquid
NORMAL EXTINGUISHING AGENT:	Use media suitable to extinguish source of fire.
SPECIAL FIRE FIGHTING PROCEDURES:	Self-contained breathing apparatus should be worn.
UNUSUAL FIRE AND EXPLOSION HAZARDS:	Decomposition could produce phosphine gas.

V. REACTIVITY DATA

STABILITY: Stable	CONDITIONS TO AVOID: None known
INCOMPATIBILITY (Materials to avoid):	Strong alkalies and strong oxidizers
HAZARDOUS COMBUSTION/ DECOMPOSITION PRODUCTS:	Phosphine gas, oxides of carbon

Responsible Care®
A Public Commitment

(over)

CARUS CHEMICAL MUNICIPAL
DIVISION OF CARUS CORPORATION

continued

PRODUCT NAME: CarusQuest® 101

VI. HEALTH HAZARD DATA

ACUTE EFFECTS OF EXPOSURE:		

INGESTION:	Corrosive to mucous membranes
SKIN CONTACT:	Irritating to the skin, producing redness and burning sensation
INHALATION:	Inhalation of mist may cause irritation to respiratory tract, producing sneezing and sore throat.
EYE CONTACT:	Corrosive to eye tissue
CHRONIC EFFECTS OF EXPOSURE:	
HEALTH DATA:	Chronic ingestion may alter calcium metabolism.

	EMERGENCY AND FIRST AID PROCEDURES
INGESTION:	Drink large amounts of water or milk. Consult a physician
SKIN:	Wash with soap and water. If irritation occurs, consult a physician.
INHALATION:	Remove to fresh air. Consult a physician.
EYES:	Flush eyes with water for 15 minutes. Consult a physician.

VII. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:	Clean up spills with inert absorbent material and place into container for disposal Flush spill area with large amounts of water.
WASTE DISPOSAL METHOD:	Dispose in a landfill in accordance with federal, state, and local regulations.

VIII. SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION:	Use approved NIOSH/MSHA mist respirator.		
PROTECTIVE GLOVES:	Rubber or plastic	EYE PROTECTION:	Chemical splash goggles
VENTILATION:	Local mechanical exhaust at point of use as needed to control misting	SPECIAL EQUIPMENT:	Emergency eyewash fountain and safety shower

IX. SPECIAL PRECAUTIONS

HANDLING AND STORING:	Do not get on hands or clothing. Avoid breathing mist. Wash thoroughly after handling. Store in cool, dry place. Protect container from external damage.
OTHER:	NIOSH (RTECS) number: SZ8562100

CARUS

Division of Carus Corporation
315 Fifth Street
P.O. Box 599
Peru, IL 61354
Tel (815) 223-1500
Fax (815) 224-6697

Tables

Discharge Requirements to Tannery Brook

SPDES Permit

TABLE 01650-2

DISCHARGE REQUIREMENTS
TO TANNERY BROOK

Parameter	Concentrations
Volatile Organic Compounds (μg/L)	
Chloroform	7.0
1,1-Dichloroethene	5.0
1,2-Dichloroethene	5.0
1,2-Dichloropropane	5.0
Methylene Chloride	5.0
Tetrachloroethene	0.7
1,1,1-Trichloroethane	5.0
Trichloroethene	5.0
Vinyl Chloride	0.7
Petroleum Hydrocarbons (μg/L)	
Benzene	0.8
Ethylbenzene	5.0
Toluene	5.0
Xylene (total)	5.0
Chlorobenzene	5.0
Metals	
Aluminum	TBD
Calcium	TBD
Cobalt	TBD
Copper	TBD
Cyanide	TBD
Iron	TBD
Lead	TBD
Magnesium	TBD
Manganese	TBD
Mercury	TBD
Nickel	TBD
Potassium	TBD
Silver	TBD
Sodium	TBD
Vanadium	TBD
Zinc	TBD
Water Quality	
Total dissolved solids	TBD
Total suspended solids	TBD
Hardness	TBD
PH	TBD
Turbidity	TBD

Notes:

TBD = To be determined.

++ END OF SECTION ++

Attachment E - Addendum #1
Mr. C's Dry Cleaners
Contract D004180

91-20-2a (1/89)

Site No.:9-15-157
Part 1, Page 1 of 2

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning April 2001

and lasting until April 2006

the discharges from the treatment facility to Tannery Brook, water index number E-1-4-14-4 , Class C , RECEIVING WATER shall be limited and monitored by the operator as specified below:

Outfall Number and Parameter	Discharge Limitations		Units	Minimum Monitoring Requirements	
	Daily Avg.	Daily Max		Measurement Frequency	Sample Type
Outfall 001 - Treated Groundwater Remediation Discharge:					
Flow	Monitor	216,000	GPD	Continuous	Meter
pH (range)	6.0 to	9.0	SU	Weekly	Grab
1,1 Dichloroethene	Monitor	10	µg/l	Weekly	Grab
1,2 Dichloroethene	Monitor	10	µg/l	Weekly	Grab
Tetrachloroethene	2	10	µg/l	Weekly	Grab
Trichloroethene	Monitor	10	µg/l	Weekly	Grab
Vinyl Chloride	Monitor	10	µg/l	Weekly	Grab
Benzene	Monitor	5	µg/l	Weekly	Grab
Ethyl benzene	Monitor	5	µg/l	Weekly	Grab
Methylene Chloride	Monitor	10	µg/l	Weekly	Grab
1,1,1 Trichloroethane	Monitor	10	µg/l	Weekly	Grab
Toluene	Monitor	5	µg/l	Weekly	Grab
o-Xylene	Monitor	5	µg/l	Weekly	Grab
m & p Xylene	Monitor	10	µg/l	Weekly	Grab
Iron, Total	Monitor	600	µg/l	Weekly	Grab
Aluminum	Monitor	4000	µg/l	Weekly	Grab
Copper	Monitor	48	µg/l	Weekly	Grab
Lead	Monitor	11	µg/l	Weekly	Grab
Manganese	Monitor	2000	µg/l	Weekly	Grab
Silver	Monitor	100	µg/l	Weekly	Grab
Vanadium	Monitor	28	µg/l	Weekly	Grab
Zinc	Monitor	230	µg/l	Weekly	Grab
Total Dissolved Solids	Monitor	850	mg/l	Weekly	Grab

EPA 160.1

EPA 160.2

Total Suspended Solids	Monitor	20	mg/l	Weekly	Grab
Cyanide, Free 9012	Monitor	10	µg/l	Weekly	Grab

Additional Conditions:

(1) Discharge is not authorized until such time as an engineering submission showing the method of treatment is approved by the Department. The discharge rate may not exceed the effective or design treatment system capacity. All monitoring data, engineering submissions and modification requests must be submitted to:

Chief - Operation Maintenance and Support Section
Bureau of Hazardous Site Control
Division of Environmental Remediation
NYSDEC
50 Wolf Road
Albany, N.Y. 12233-7010

With a copy sent to:

John McMahon ,RWE, R-9
NYSDEC
270 Michigan Avenue
Buffalo, NY 14203-2999

(2) Only site generated wastewater is authorized for treatment and discharge.

(3) Authorization to discharge is valid only for the period noted above but may be renewed if appropriate. A request for renewal must be received 6 months prior to the expiration date to allow for a review of monitoring data and reassessment of monitoring requirements.

(4) Both concentration (mg/l or µg/l) and mass loadings (lbs/day) must be reported to the Department for all parameters except flow and pH.

(5) Any use of corrosion/scale inhibitors or biocidal-type compounds used in the treatment process must be approved by the department prior to use.

(6) This discharge and adminstration of this discharge must comply with the attached General Conditions.

(7) The Water Treatment Chemical - **Carus Quest 101** from Carus Chemical Co. is permitted ' the dosage rate of 1.5 lbs/day, seven days a week (if required) ,24 hours per day. The cor are listed on the form WTCFX(9/99) attached.

Metals
Nitric Acid 500
1K unpresvd S.HG
F

Attachment E - Addendum #1
Mr. C's Dry Cleaners
Contract D004180

Form WTCFX (9/99)

NYSDEC - Division of Water
WTC Usage Notification Requirements for SPDES Permittees
Page 3 of 3

1.a. Date Signed by Permittee : 7/25/00	1.b. Date Signed by WTC Manufacturer : 7/21/00
2.b. SPDES No. : Site # 9-15-157	2.c. Contact Name : DAVID CHIUSANO
3.a. WTC Name : CarusQuest 101	6.a. Avg./Max Daily Dosage: 1.5 lbs/d

Mr. C's Dry Cleaner's Site

Generic WTC Usage Requirements

A. WTC usage shall not exceed the usage rate reported by the permittee or authorized below, whichever is less.

B. The discharge shall not cause or contribute to a violation of water quality or an exceedance of AWQC.

C. The permittee must maintain a logbook of all WTC use, noting for each WTC the date, time, exact location, and amount of each dosage, and, the name of the individual applying or measuring the chemical. The logbook must also document that adequate process controls are in place to ensure that excessive levels of WTCs are not used and subsequently discharged through outfalls. The permittee shall retain the logbook data for a period of at least 3 years. This period may be extended by request of the DEC.

D. The permittee shall provide an annual report, attached to the December DMR, containing the following information for each outfall: the current list of WTCs authorized for use and discharge by the DEC, for each WTC the amount in pounds used during the year, identification of authorized WTCs the permittee no longer uses, and any other pertinent information.

Items 15 - 16 must be completed by NYSDEC permit writer.

15. Review Decision (check the appropriate box).

☒ The proposed WTC usage may proceed as proposed without permit modification subject to the conditions noted above.

☐ The proposed WTC usage may not proceed for one of the following three reasons:

- ☐ As noted below, the information provided is insufficient to complete our review.
- ☐ As noted below, the SPDES permit must first be modified to add new requirements.
- ☐ As noted below, the proposed use is prohibited.

16. Permit Writer Information:

PRINT NAME SUDHIR MAHATMA SIGNATURE
TITLE Env. Engr. II DATE
ADDRESS 50 WOLF RD. Rm 314, ALBANY, NY 12233-3505
TELEPHONE 518·457·9602 FAX 518·485·7786

Appendix

NES System Manual Book 1 of 2

NES System Manual Book 2 of 2

As-Builts

NES

NATIONAL ENVIRONMENTAL SYSTEMS, INC
36 Maple Avenue, Seekonk, Massachusetts 02771
TEL (508) 761 6611 FAX (508) 761 6898

System Manual

NES PROJECT NUMBER: 01-A-083
PROJECT NAME: Mr. C's Dry Cleaners
Book 1 of 2

Prepared for:

Tyree Organization
4 Northway Lane
Latham, NY 12110

Prepared by:

National Environmental Systems

36 Maple Avenue Seekonk, MA 02771

Phone (508) 761-6611 Fax (508) 761-6898

National Environmental Systems, Inc., is a Woman-Owned Small Business

Table of Contents

NATIONAL ENVIRONMENTAL SYSTEMS, INC.
36 Maple Avenue, Seekonk, Massachusetts 02771
TEL (508) 761 6611 FAX (508) 761 6898

INSTALLATION GUIDELINES

1. Inspect exterior and interior of control panel for damage that may have occurred during shipment. Check all interior components within panel for tightness. Vibration during transport may loosen screw terminals, din rail mounted components, hardware, etc. Check motor starter overloads and reset if tripped.

2. Panel and associated wiring should be installed by a qualified, licensed, electrician familiar with remediation/water treatment equipment. All information required for proper installation is contained on the drawings or other documents within this manual. Drawings containing information on panel interior and exterior layout, line diagrams, and process and instrumentation are also included in this section for reference only.

Many remediation systems are installed in "hazardous locations" and therefore the installer must follow the National Electric Code requirement for these areas. The control panel and associated equipment should only be installed in the area for which it was designed.

Many systems utilize a combination of intrinsically safe and non-intrinsically safe circuits. Proper separation and demarkation is required. Please refer to the National Electric Code Article 504 "Intrinsically Safe Systems" and any local codes.

3. Before applying power to any equipment, the component manufacturers operation and start-up manual (compressor, blower, pump, etc.) should be reviewed. Some equipment cannot be operated in the wrong rotation even momentarily without damage. Verifying proper rotation should only be done after review of the associated equipment manual.

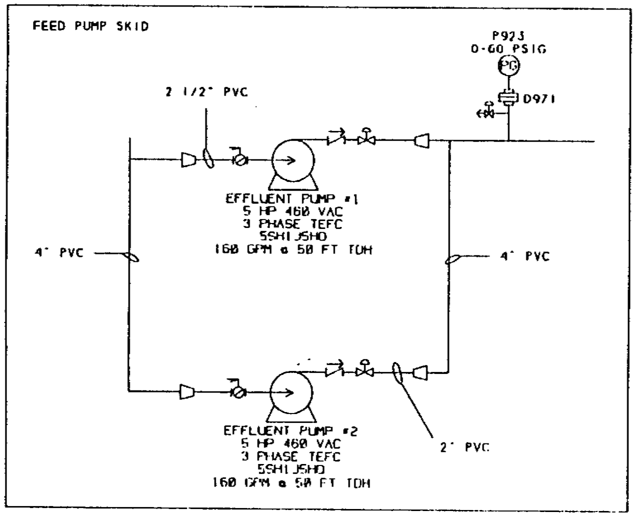
4. As a general rule, all fluid levels, drive components, plumbing attachments, etc. should be inspected. The equipment should be initially started in a no-load condition with non-contaminated process fluid (i.e. SVE vacuum blower started with all recovery wells shut off, and the ambient air dilution valve open fully). **Do not store equipment for more than one month without running it.** Idle blowers, pumps or other items may rust or sieze if not run once a month.

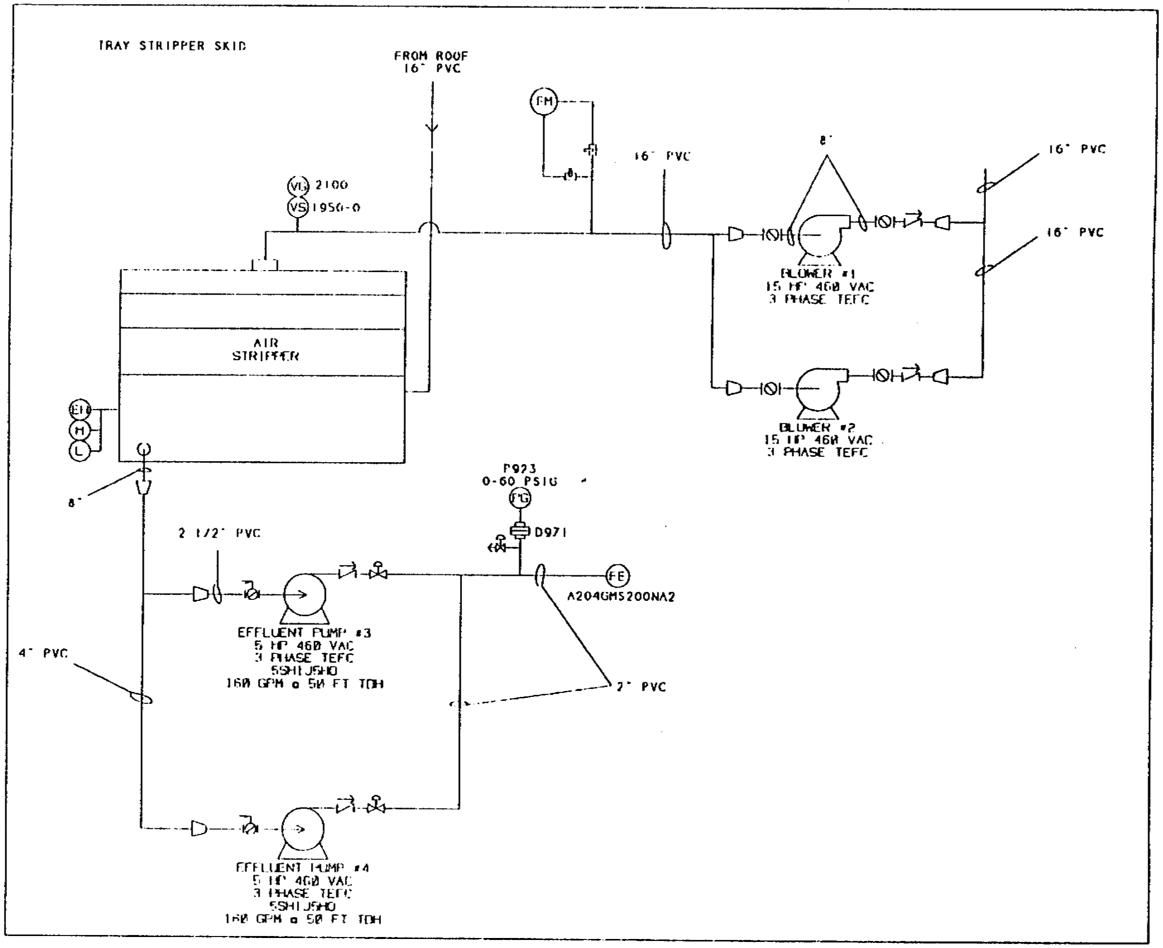
5. Once proper operation of all equipment has been verified the system can be started. Turn the selector switches to "auto" or "on", and press reset if necessary. The system should run automatically.

6. If it is possible, any alarm conditions (i.e. SVE moisture separator high level) should be manually actuated to ensure proper system response.

7. The system can now be adjusted to design flow rates, pressures, etc. All adjustments should be made gradually.

P&ID





LEGEND

- CHECK VALVE
- BALL VALVE
- SAMPLE PORT
- RELIEF VALVE
- BUTTERFLY VALVE

EH EMERGENCY HIGH SWITCH
H HIGH LEVEL FOR PUMP TURN ON
L LOW LEVEL FOR PUMP TURN OFF
PS PRESSURE SWITCH
PG PRESSURE GAUGE
VS VACUUM SWITCH
TG TEMPERATURE GAUGE
VG VACUUM GAUGE
FM FLOW METER
PT PRESSURE TRANSMITTER

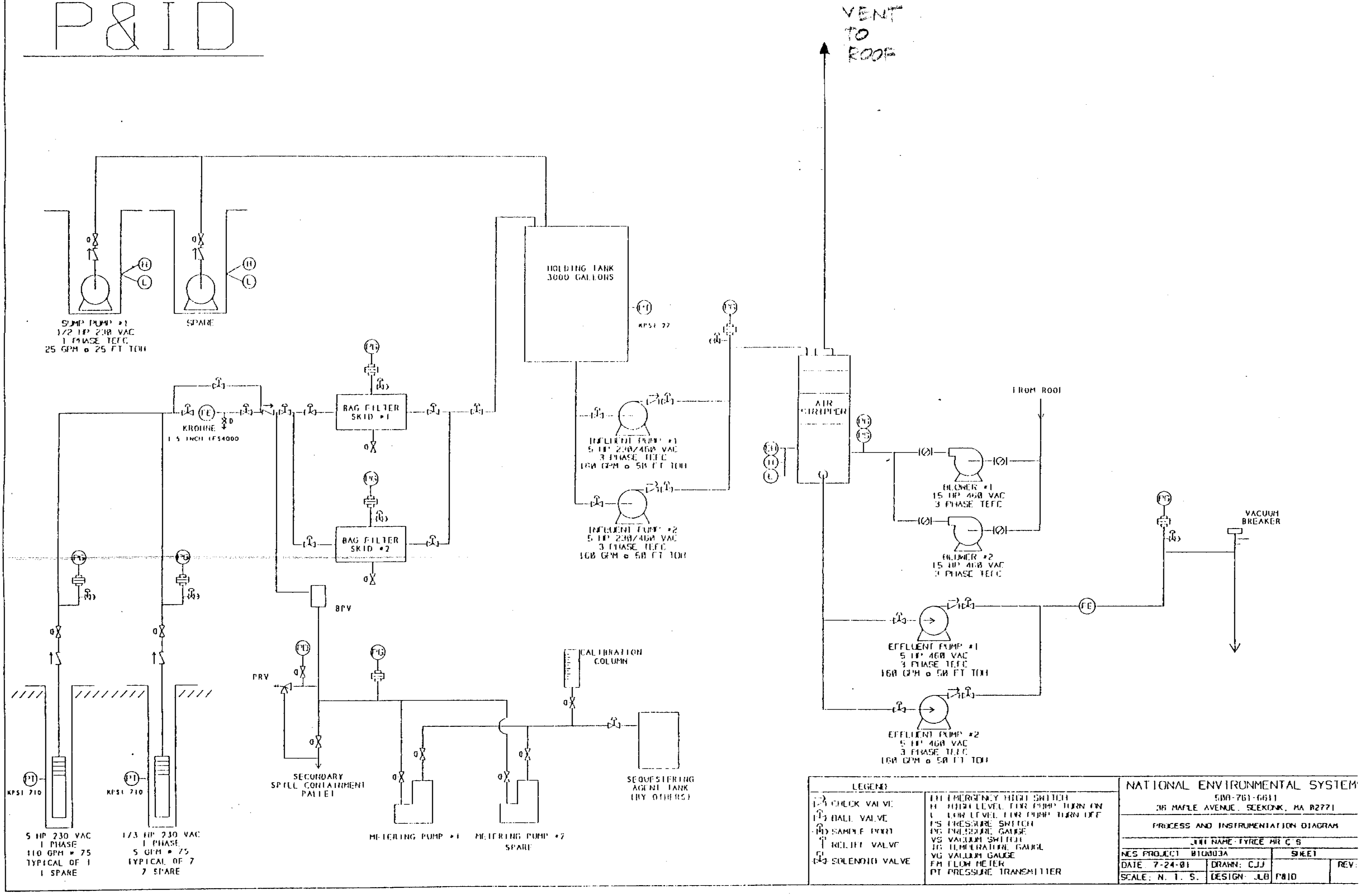
NATIONAL ENVIRONMENTAL SYSTEMS
508-761-0811
36 MAPLE AVENUE, SEEKONK, MA 02771

PROCESS AND INSTRUMENTATION DIAGRAM

JOB NAME: TYREE MR C'S

NES PROJECT: 010083A	SHEET	
DATE: 3-07-02	DRAWN: CJJ	REV:
SCALE: N. T. S.	DESIGN: JLB	P&ID

P&ID



EH EMERGENCY HIGH SWITCH
H HIGH LEVEL FOR PUMP TURN ON
L LOW LEVEL FOR PUMP TURN OFF
PS PRESSURE SWITCH
PG PRESSURE GAUGE
VS VACUUM SWITCH
TG TEMPERATURE GAUGE
VG VACUUM GAUGE
FM FLOW METER
PT PRESSURE TRANSMITTER

NATIONAL ENVIRONMENTAL SYSTEM
508-761-6611
36 MAPLE AVENUE, SEEKONK, MA 02771

PROCESS AND INSTRUMENTATION DIAGRAM

JOB NAME: TYRCE MR C'S

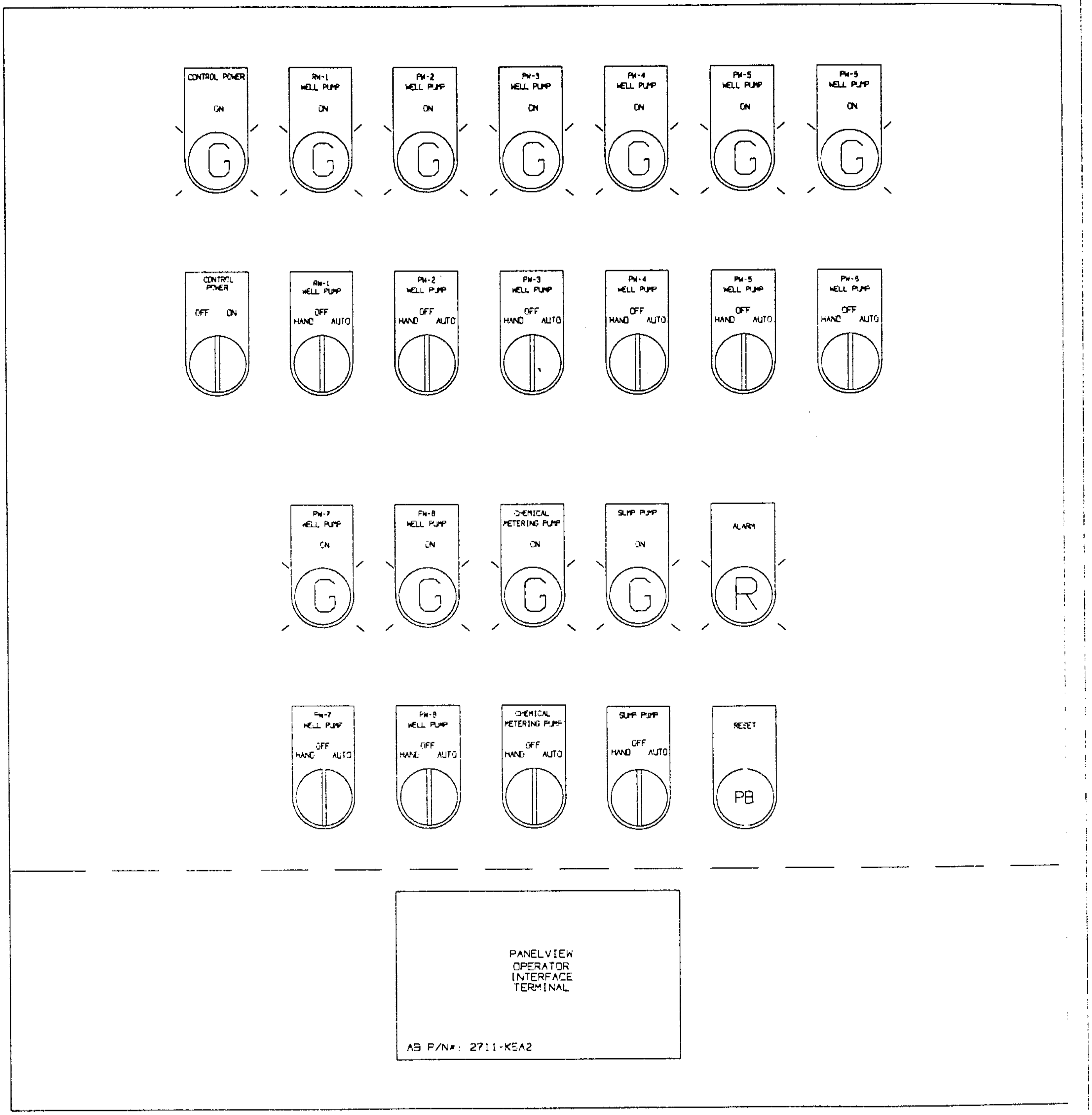
NES PROJECT 010003A		SHEET	
DATE 7-24-01	DRAWN: CJJ		REV:
SCALE: N. T. S.	DESIGN: JLB	P&ID	

MAIN CONTROL PANEL DRAWINGS

CONTROL PANEL DRAWINGS

SHEET	DESCRIPTION
E-1 TO E-7B	MAIN CONTROL PANEL DRAWINGS
E-8A,B	KHRONE FLOW METER DRAWING
E-9	AUTODIALER DRAWING
----------------	LADDER LOGIC PROGRAM
----------------	DEVELOPED SCREENS
1, 2, 3 OF 3	AIR STRIPPER CONTROL PANEL DRAWINGS

PANEL EXTERIOR : 48" X 36" X 12"



NOTE : ALL OPERATORS ARE ALLEN BRADLEY 800 T SERIES.

NATIONAL ENVIRONMENTAL SYSTEMS
508-761-6611
36 MAPLE AVENUE, SEEKONK, MA 02771

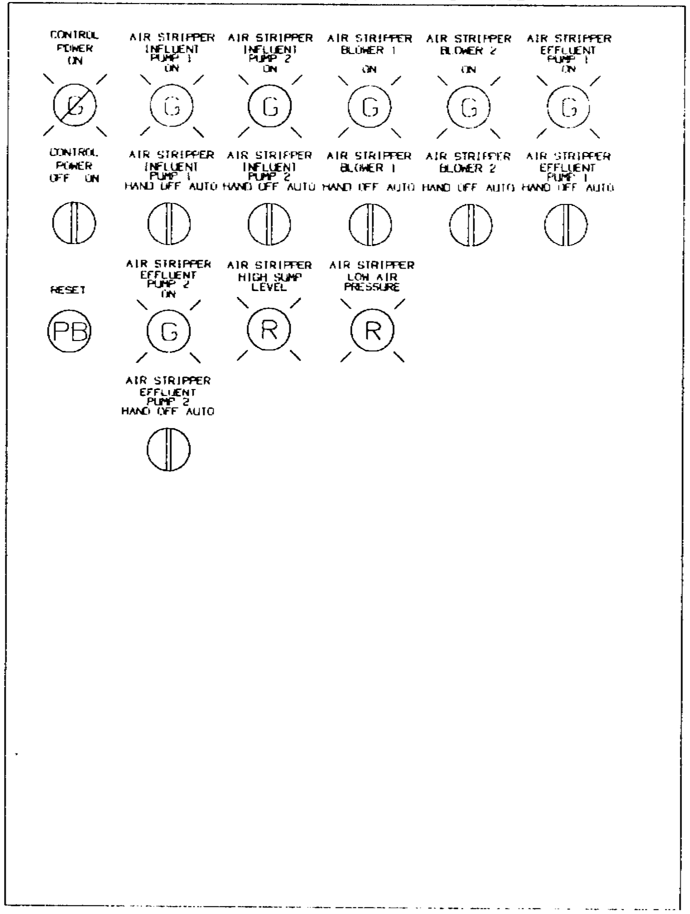
MAIN PANEL EXTERIOR

JOB NAME : MR C'S CLEANERS

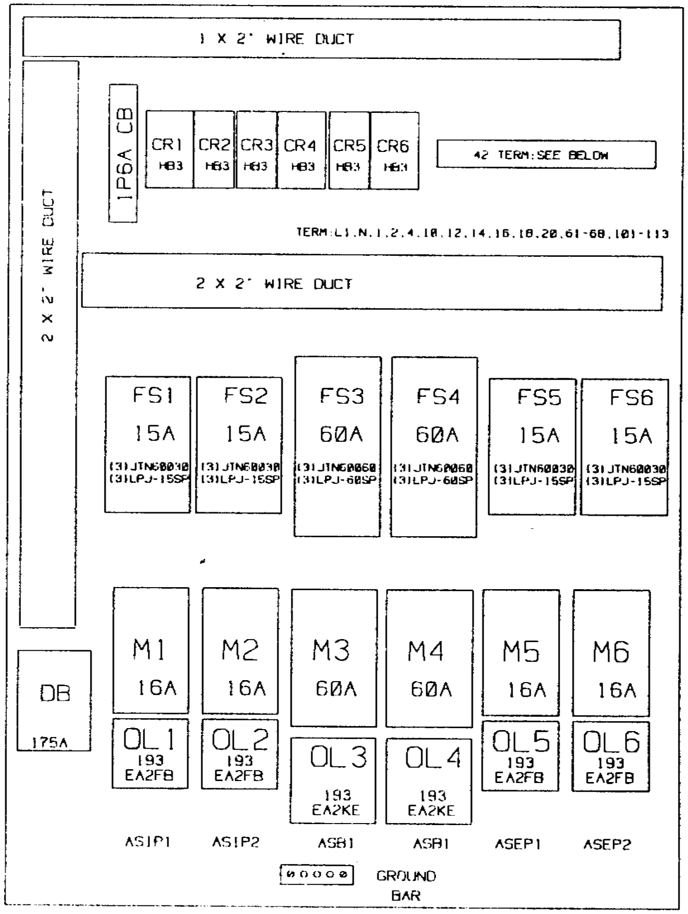
NES PROJECT 010033		SHEET E-1
DATE. 7/24/01	DRAWN: RJD	REV
SCALE: N. T. S.	DESIGN: RJD	

PANEL EXTERIOR

ENCLOSURE DIMENSIONS: 36" X 30" X 12"



PANEL INTERIOR



NOTES:
1.) ALL OPERATORS ARE ALLEN BRADLEY 800T SERIES
2.) ALL RELAYS ARE ALLEN BRADLEY 700-HB33A1.

LEGEND

CR = CONTROL RELAY
DB = DISTRIBUTION BLOCK
FS = FUSE SET
M = MOTOR STARTER
OL = OVERLOAD (UNIT)

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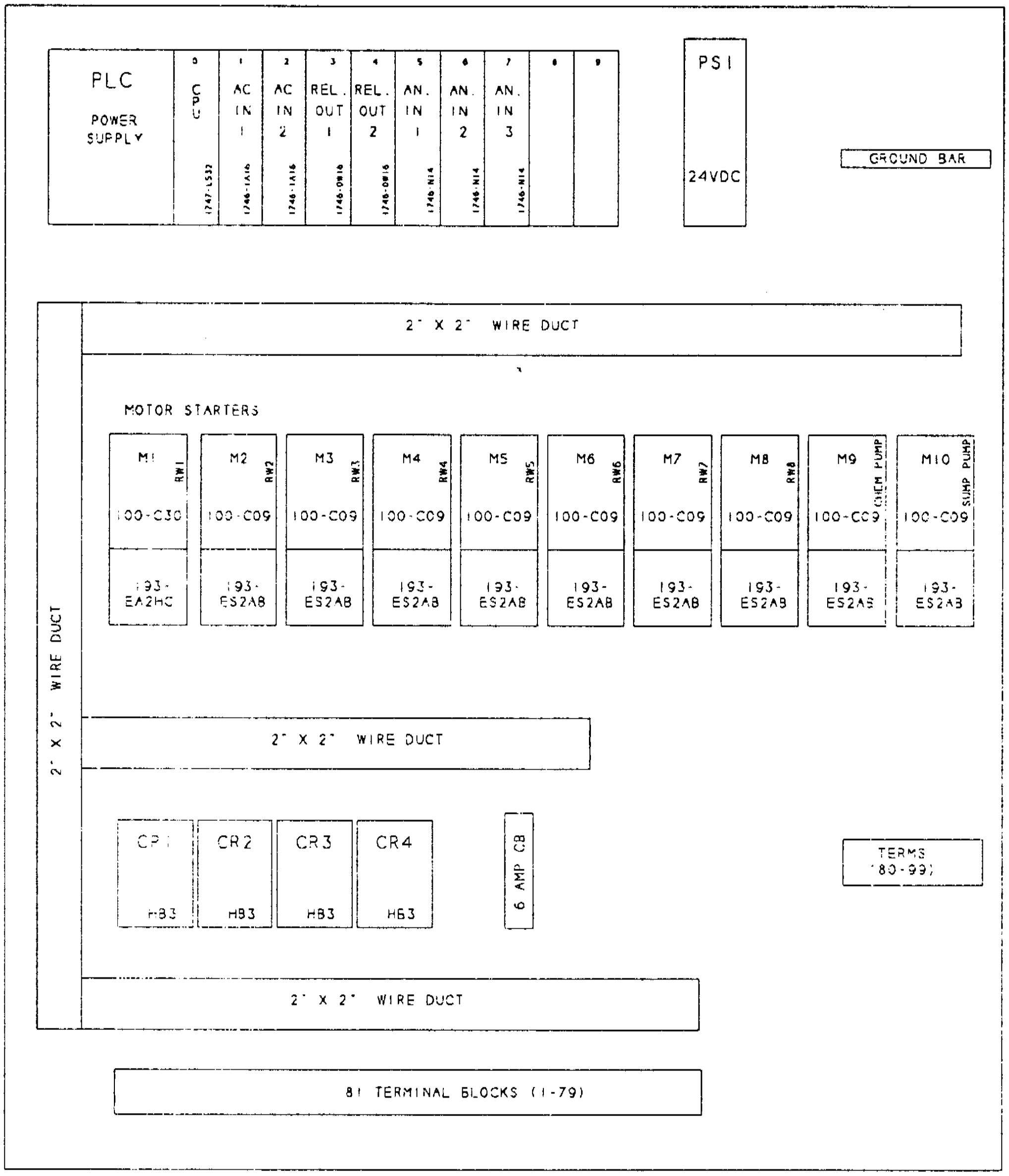
36 MAPLE AVENUE, SEEKONK, MA 02771

AIR STRIPPER CONTROL PANEL

JOB NAME : TYREE / MR C'S CLEANERS

NES PROJECT # 01A003		SHEET 1 OF 3	
DATE: 3/5/02	DRAWN: RJO	\S09	REV: -
SCALE: N. T. S.	DESIGN: RJD	SVMLTY	

PANEL INTERIOR



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36 MAPLE AVENUE, SEEKONK, MA 02771

MAIN PANEL INTERIOR

JOB NAME : MR C'S CLEANERS

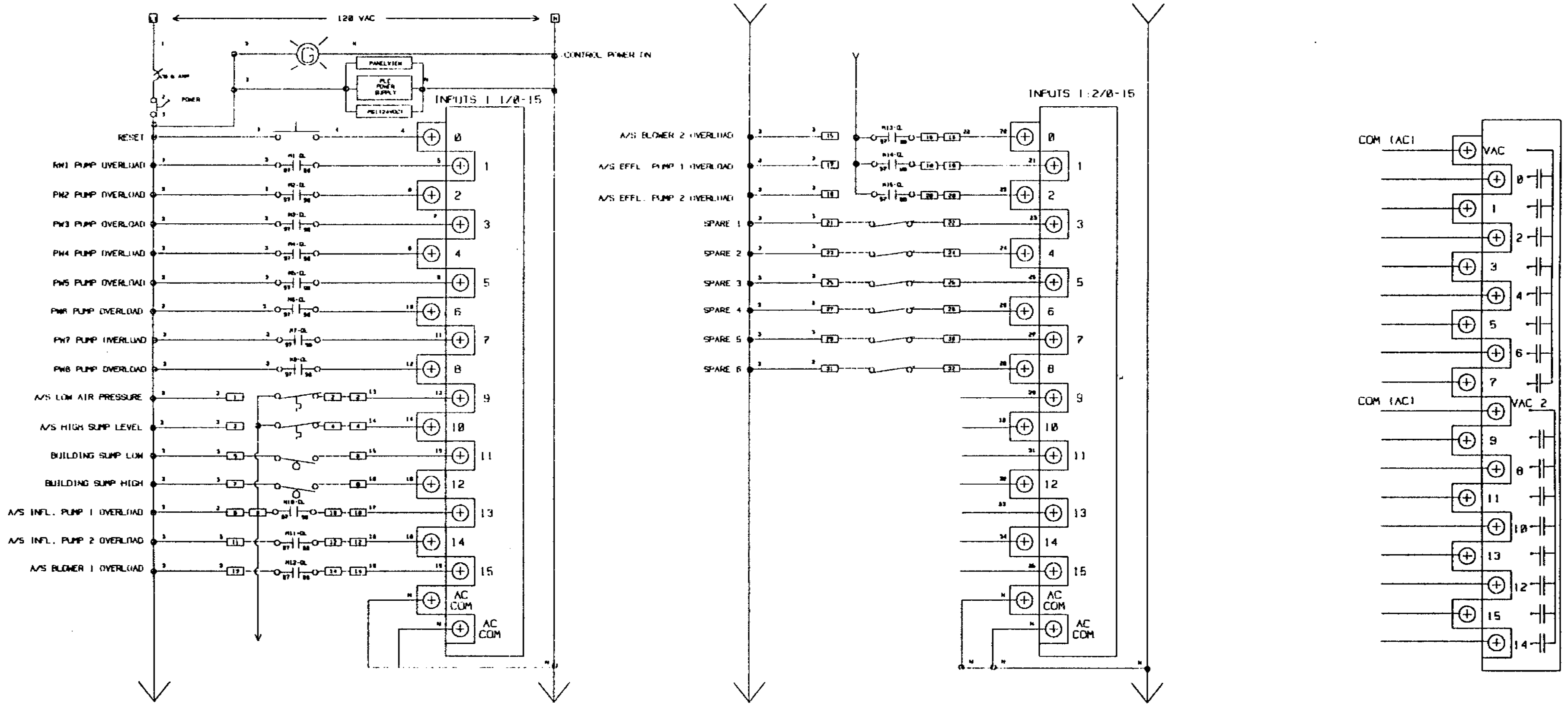
NES PROJECT 010083		SHEET E-2	
DATE 7/23/01	DRAWN: RJD		REV:
SCALE: N.T.S.	DESIGN: RJD		

AC INPUT CARD #1

AC INPUT CARD #2

RELAY OUTPUT CARD

TYPICAL OUTPUT CARD SHOWN. REFER TO LADDER LOGIC DIAGRAM (SHEET E-4) FOR WIRING.
(OUTPUTS ARE REFERRED TO BY PLC ADDRESS (I.E. PLC O: 3/0
INDICATES FIRST OUTPUT CARD FIRST OUPUT)



NOTES

1. RED #18 MTW USED FOR ALL 120V CONNECTIONS.
2. WHITE #18 MTW USED FOR ALL NEUTRAL CONNECTIONS
3. BLUE #18 MTW USED FOR ALL INTRINSICALLY SAFE CONNECTIONS
4. TERMINAL AND WIRE NUMBERS TO BE REVISED PRIOR TO BUILDING.

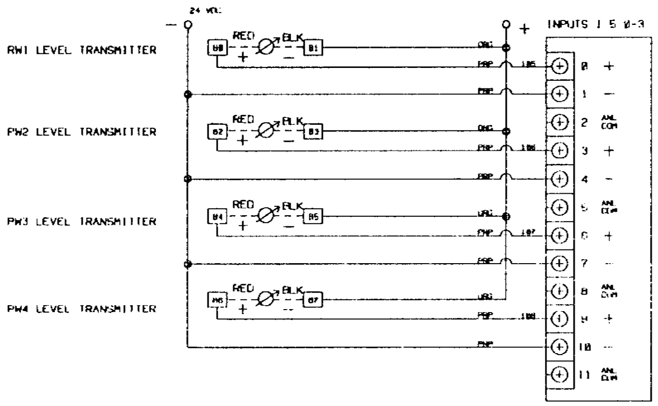
NATIONAL ENVIRONMENTAL SYSTEMS
508-761-6611
36 MAPLE AVENUE, SEEKONK, MA 02771

AC INPUT CARDS 1 AND 2 WIRING DIAGRAM

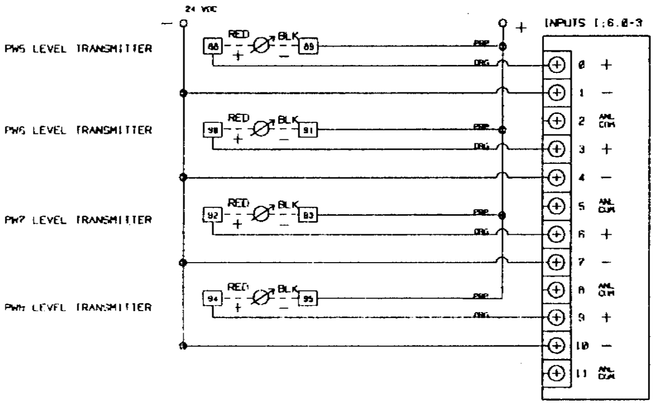
JOB NAME : MR C'S CLEANERS

NES PROJECT 010083		SHEET E-3	
DATE: 07/24/01	DRAWN: RJD	\097020\	REV:
SCALE: N. T. S.	DESIGN: RJD	ACIN123	

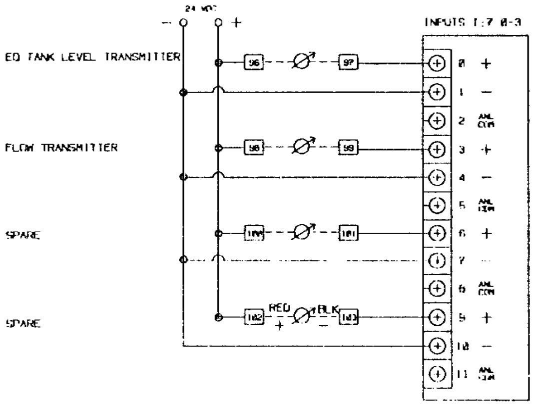
ANALOG INPUT CARD #1



ANALOG INPUT CARD #2



ANALOG INPUT CARD #3



NATIONAL ENVIRONMENTAL SYSTEMS
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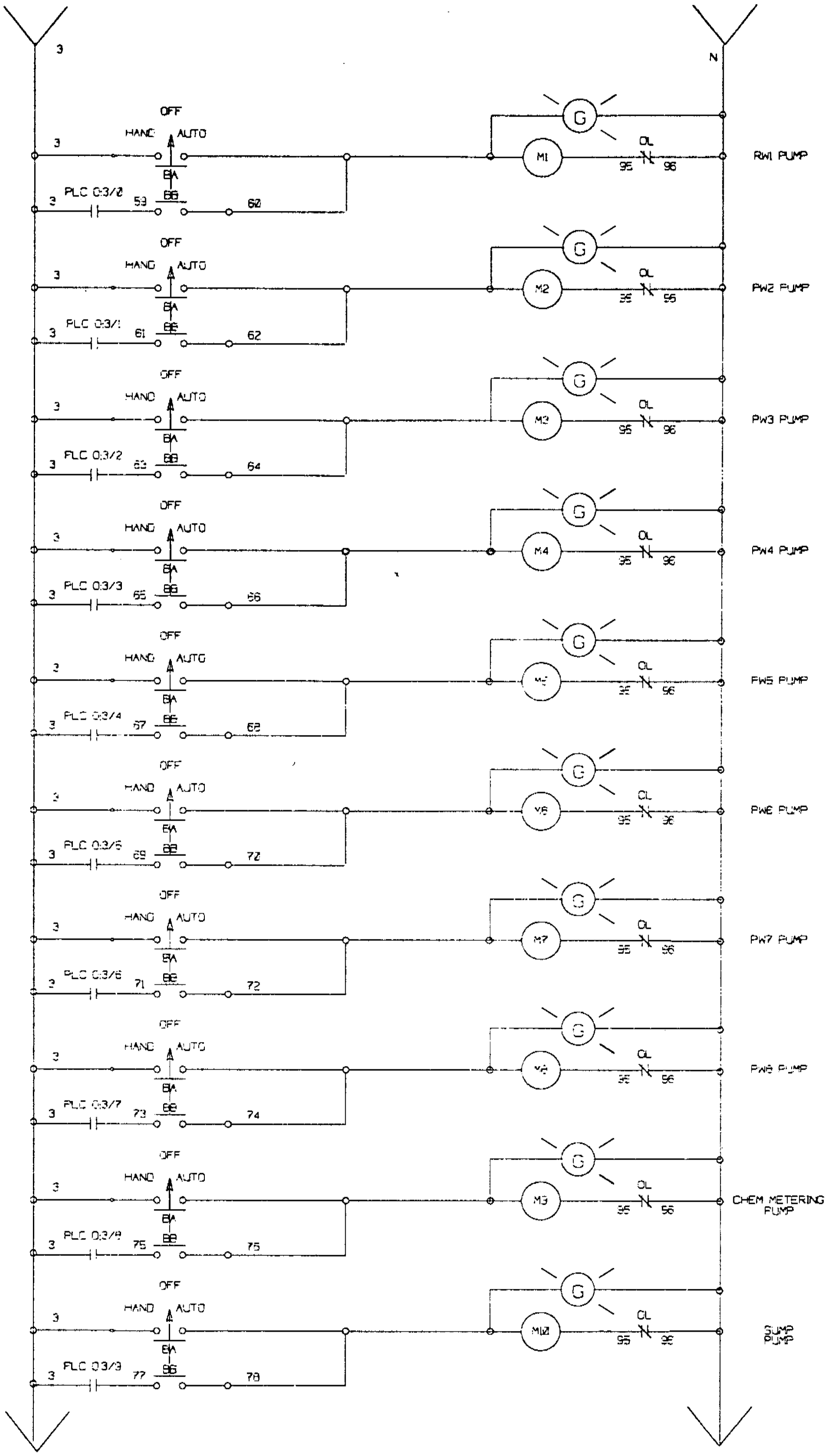
36 MAPLE AVENUE SEEKONK, MA 02771

ANALOG INPUT CARDS 1 TO 3 WIRING DIAGRAMS

JOB NAME : MR C S CLEANERS

NES PROJECT 810003		SHEET E-4	
DATE: 7/24/81	DRAWN: RJD		REV:
SCALE: N. T. S.	DESIGN: RJD	ANLIN	A



1. SEE RELAY OUTPUT CARD DRAWING AND NOTES (SHEET E-3B) FOR EXPLANATION OF PLC OUTPUT CONTACT LABELLING.
2. [1] INDICATES FIELD WIRING TERMINAL.
3. PLC OUTPUTS SHOWN AS INDEPENDENT CONTACTS FOR CLARITY.

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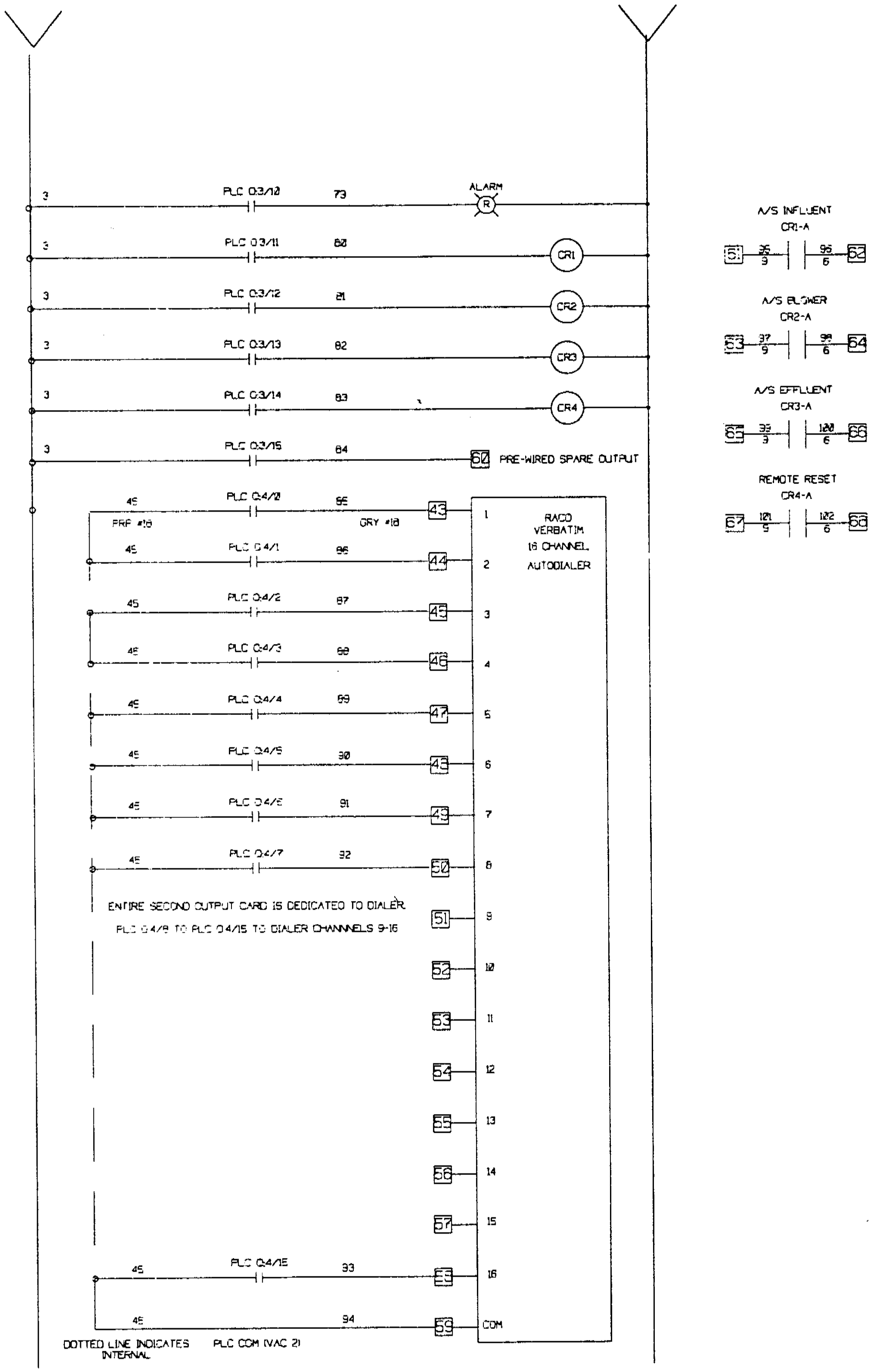
LADDER DIAGRAM 1

JOB NAME: MR C'S CLEANERS

NES PROJECT 010083		SHEET E-5	
DATE 7/24/01	DRAWN: RJD	\SO LADDER	REV:
SCALE: N. T. S.	DESIGN: RJD		



NOTES:

1. SEE RELAY OUTPUT CARD DRAWING AND NOTES (SHEET E-38) FOR EXPLANATION OF PLC OUTPUT CONTACT LABELLING.
2. $\boxed{1}$ INDICATES FIELD WIRING TERMINAL.
3. PLC OUTPUTS SHOWN AS INDEPENDENT CONTACTS FOR CLARITY.

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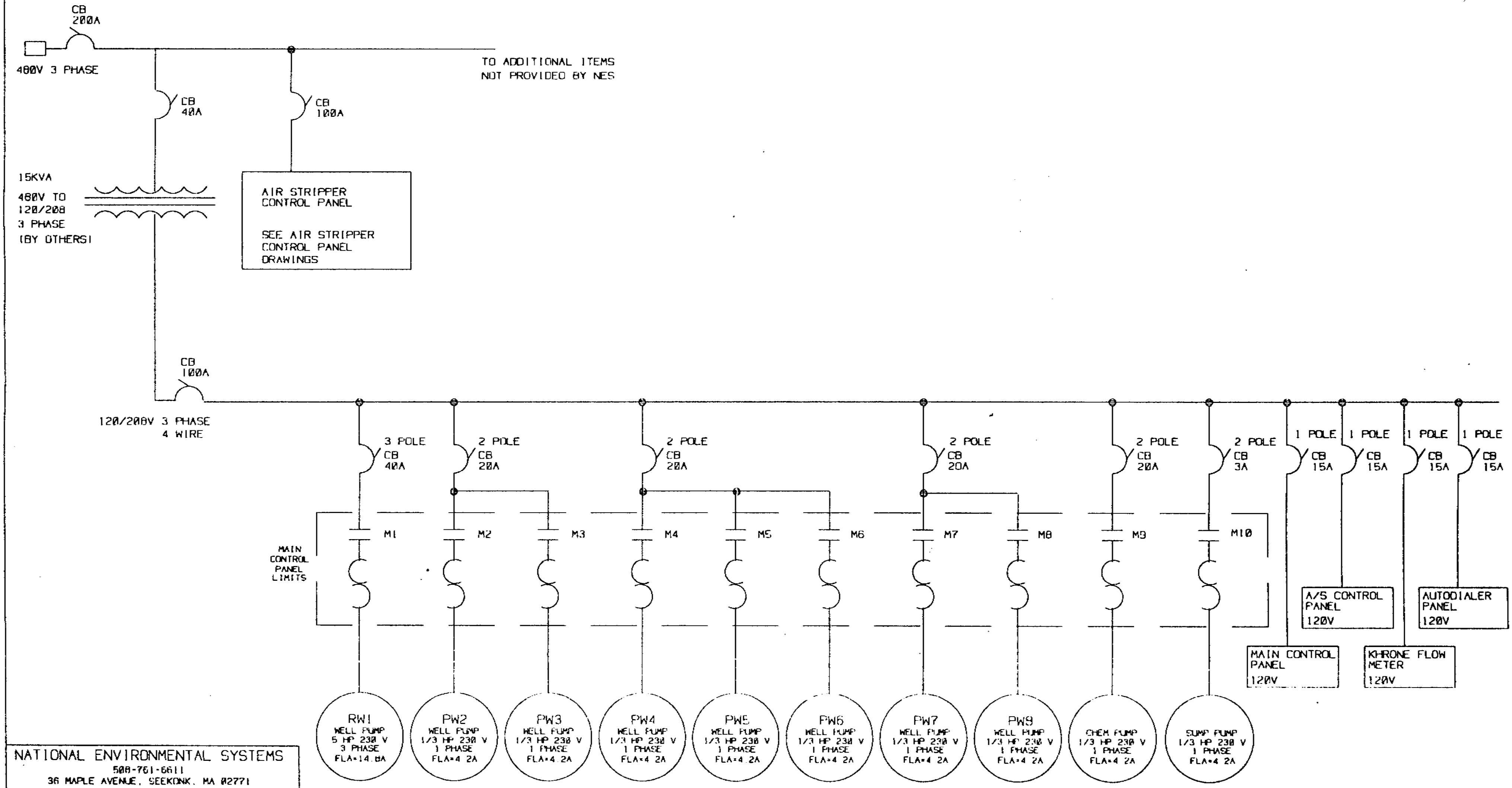
LADDER DIAGRAM 2

JOB NAME :MR C'S CLEANERS

NES PROJECT 010093A		SHEET E-6	
DATE: 7/24/01	DRAWN: RJD	\SO	REV:
SCALE: N. T. S.	DESIGN: RJD	LADDER	

NOTE: DISTRIBUTION PANELS BY OTHERS.



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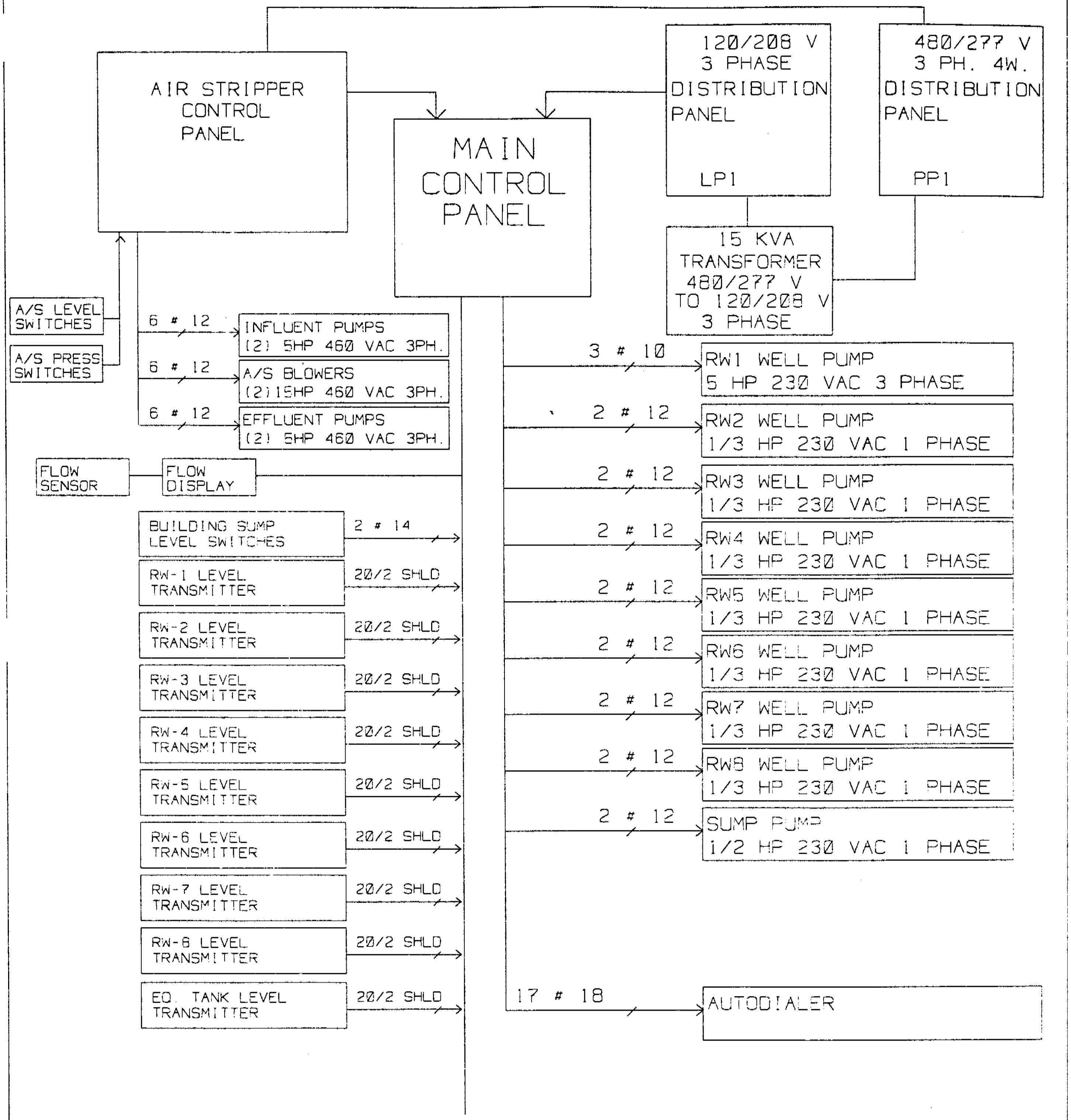
508-761-6611
36 MAPLE AVENUE, SEEKONK, MA 02771

LINE DIAGRAM

JOB NAME : TYREE MR C'S CLEANERS

NES PROJECT 01A003		SHEET E-7A	
DATE: 4/22/02	DRAWN: RJD	\SO9601S\ LINEDIAG	REV: B
SCALE: N. T. S.	DESIGN: RJD		

ELECTRICAL BLOCK DIAGRAM



NOTES:
1 - ALL CONDUITS MUST BE PROPERLY SEALED.
2 - USE SEPARATE CONDUITS AND JUNCTION BOXES FOR CONTROL AND MOTOR WIRING.
3 - WIRE SIZES INDICATED ARE MINIMUM.
✱ - SIZE MOTOR CONDUCTORS ACCORDING TO MOTOR MANUFACTURERS TABLE FOR VOLTAGE DROP BASED ON DISTANCE.

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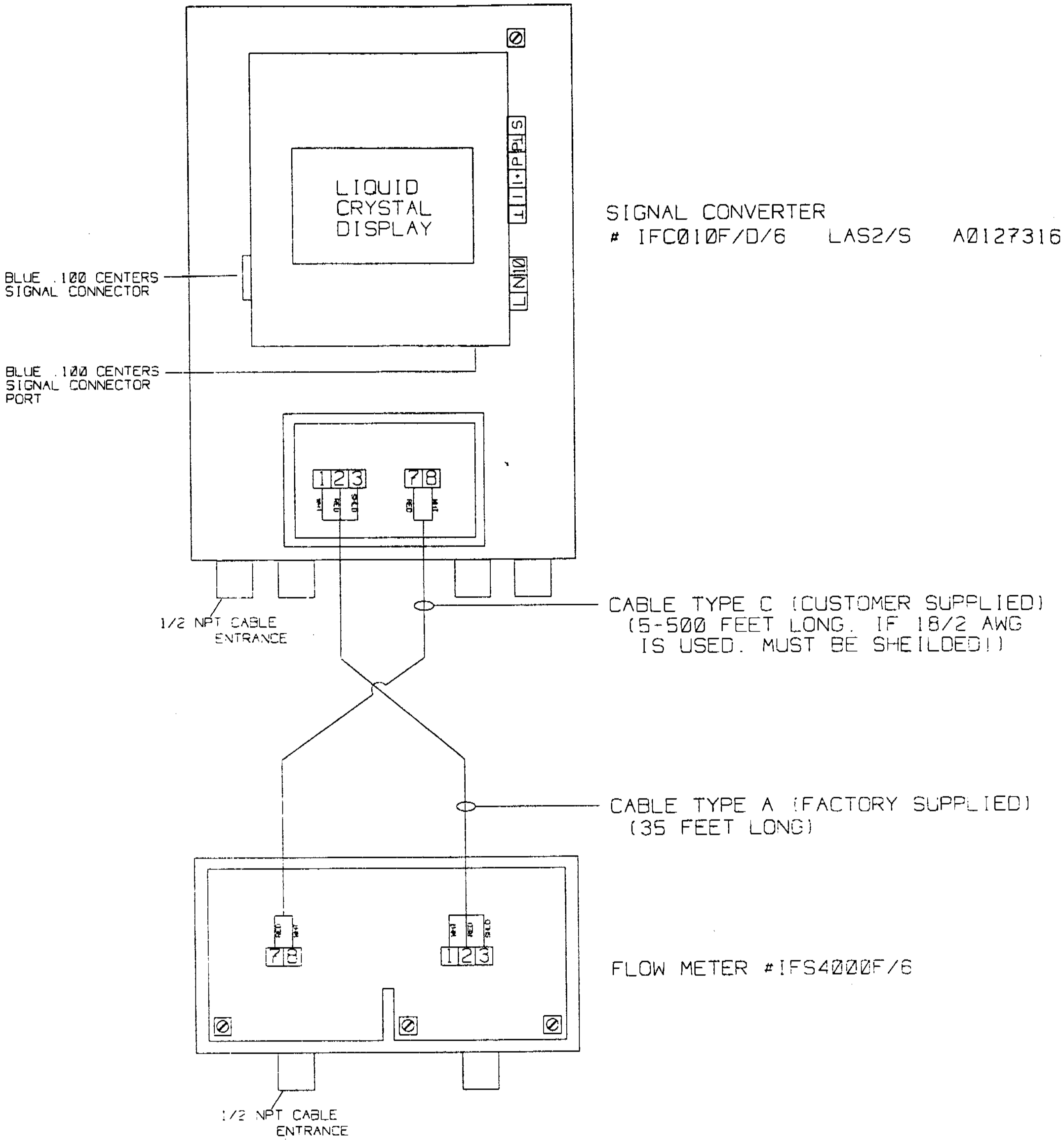
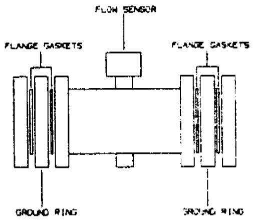
36 MAPLE AVENUE. SEEKONK. MA 02771

BLOCK DIAGRAM

JOB NAME : MR C'S CLEANERS

NES PROJECT 010063		SHEET E-7B	
DATE: 07-24-01	DRAWN: RJD	\S095016\	REV:
SCALE: N. T. S.	DESIGN: RJD	BLOCK	-





SIDE VEIW OF THE KROHNE IFS4020F/6
FLOW METER

NATIONAL ENVIRONMENTAL SYSTEMS
508-761-6611
36 MAPLE AVENUE, SEEKONK, MA 02771

KROHNE SIGNAL CONVERTER & FLOW METER

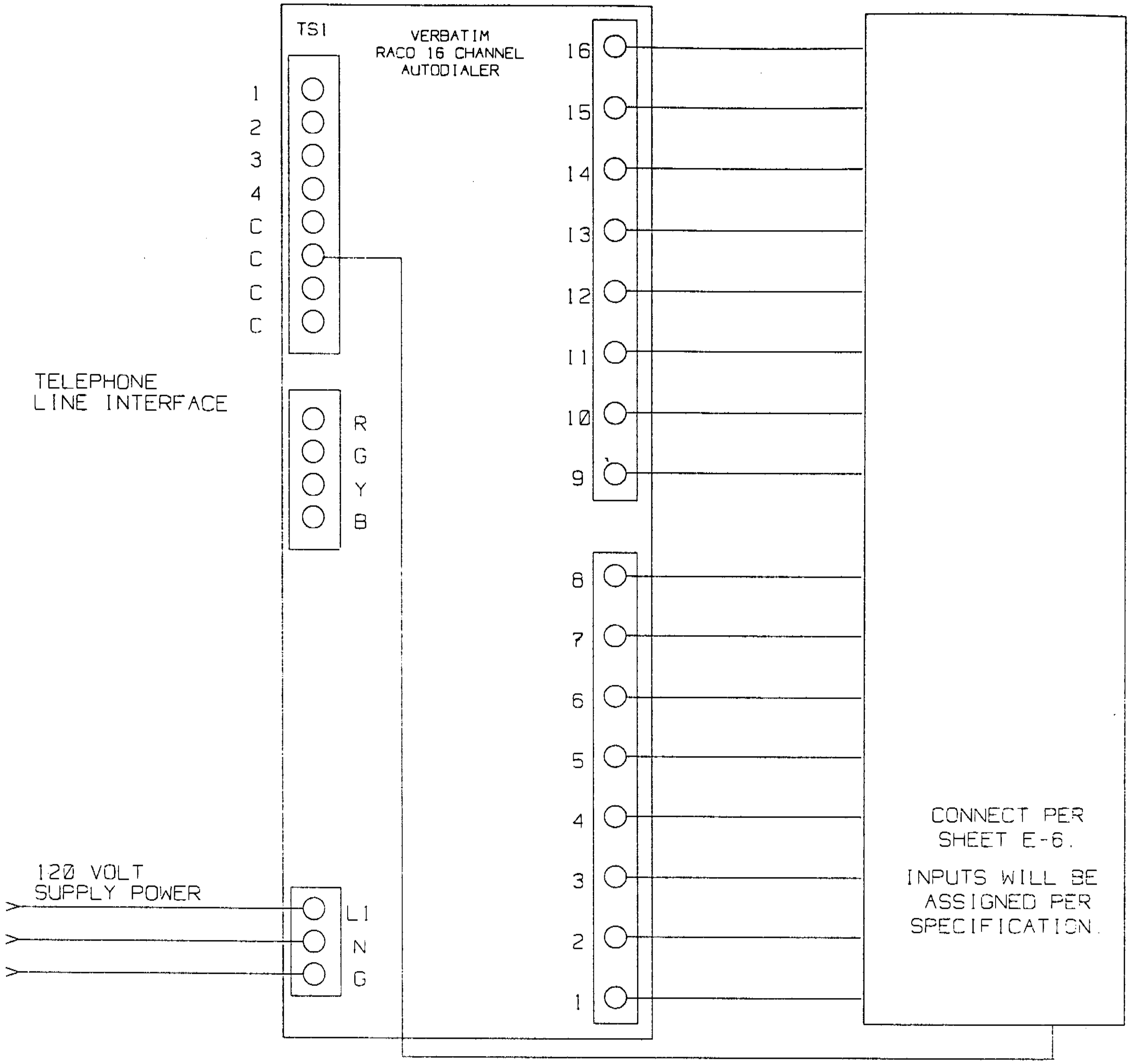
JOB NAME : MR. C's CLEANERS

NES PROJECT 01A083
SHEET E-8A
DATE: 3/18/02
DRAWN: MJS
REV:
SCALE: N.T.S.
DESIGN:

FUNCTION	TEXT	DESCRIPTION	SETTINGS
1	OPERATION	operations menu	
1.1	FULL SCALE		100.00 Gal/Min
1.2	TIMECONST.		FACTORY DEFAULT
1.3	L.F.CUTOFF		OFF
1.4	DISPLAY	DISP FLOW	US Gal/Min
		DISP TOTAL	"+"TOTAL
		DISP MSG	FACTORY DEFAULT(NO)
1.5	CUR.OUTP.I	FUNCT.1	1 DIR
		RANGE1	4-20Ma
		I ERROR	22Ma
1.6	PULSOUTP.P	FUNCTION P	1 DIR
		SELECT P	1000HZ
3	INSTALL		
3.1	LANGUAGE		GB/ENGLISH
3.2	FLOWMETER	DIAMETER	40mm 1.5"
		FULL SCALE	100.00 Gal/Min
		GKL VALUE	5.859
		FIELD FREQ	6-Jan
		FLOW DIR	"+" DIR
3.3	ZERO SET		CALIB NO
3.4	ENTRY CODE		NO
3.5	USER UNIT	TEXT VOL	MGAL
		FACT VOL	FACTORY DEFAULT "2.64172E-4
		TEXT TIME	HR
		FACT TIME	8.64000E"+"4

DATA FOR KHRONE FLOWMETER
FOR MR C'S CLEANERS - 01A083

SHEET E-8B



AUTODIALER CHANNEL ASSIGNMENT

1 WELL PUMP OVERLOAD (ANY OF 8)
2. EQ TANK ALARM
3. AIR STRIPPER ALARM
4. A/S INFL. PUMP 1 OVERLOAD
5. A/S INFL. PUMP 2 OVERLOAD
6. A/S BLOWER 1 OVERLOAD
7. A/S BLOWER 2 OVERLOAD
8. A/S EFFL. PUMP 1 OVERLOAD
9. A/S EFFL. PUMP 2 OVERLOAD
10. BUILDING SUMP HIGH LEVEL
11-16. RESERVED FOR FUTURE USE

NATIONAL ENVIRONMENTAL SYSTEMS
508-761-6611
36 MAPLE AVENUE, SEEKONK, MA 02771

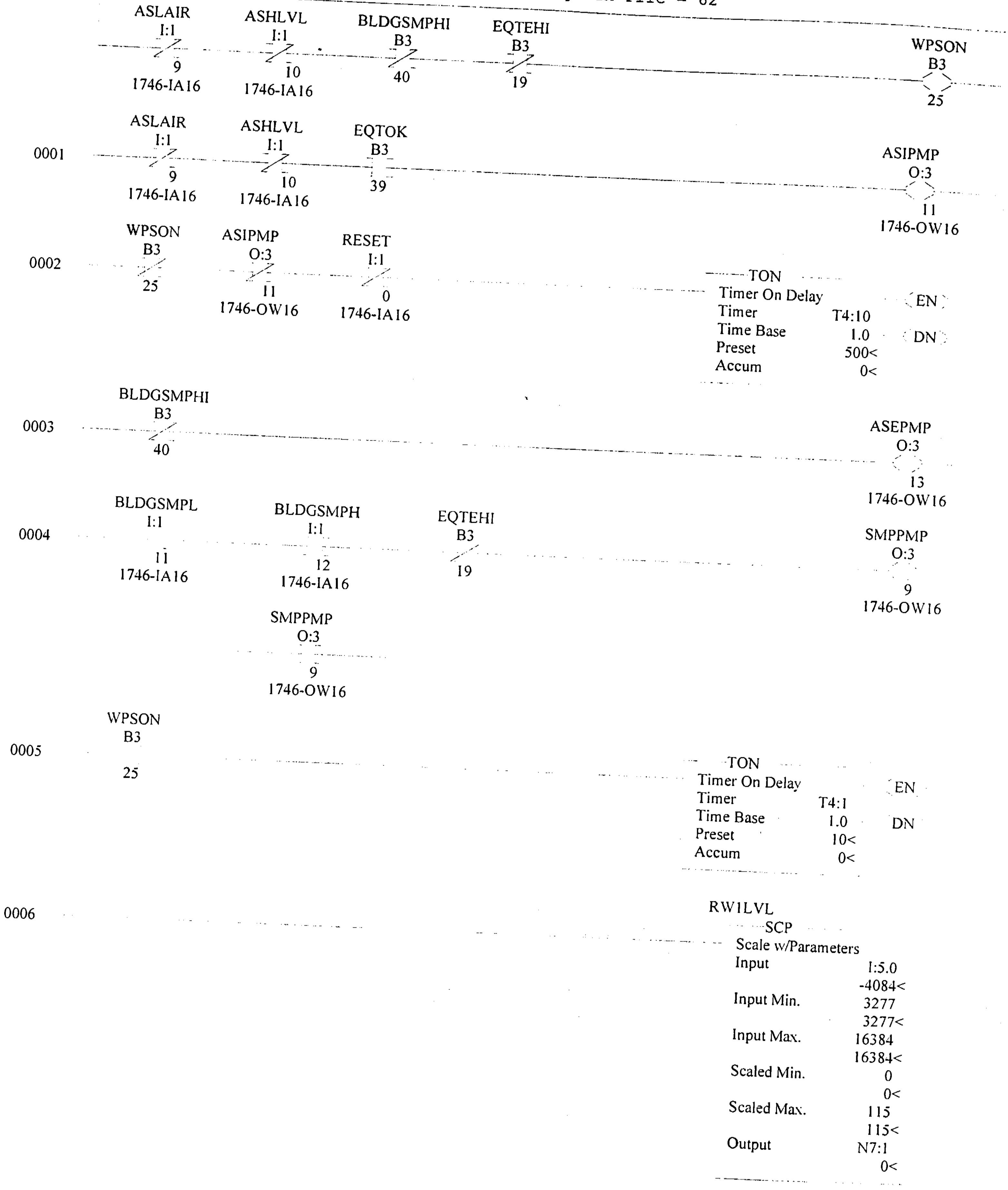
RACO 16 CHANNEL AUTODIALER INPUT WIRING

JOB NAME : MR. C's CLEANERS

NES PROJECT 01A083		SHEET E-9	
DATE: 3/4/02	DRAWN: MJS		REV:
SCALE: N.T.S.	DESIGN: WWS		

LADDER LOGIC PROGRAM (RSLOGIX)

LAD 2 - --- Total Rungs in File = 62



LAD 2 - --- Total Rungs in File = 62

```
       RW1LVL                                                                    RW1LO
       +--GRT ------------+                                                        B3
-------| Greater Than (A>B)|--------------------------------------------------------( )----
       | Source A     N7:1 |                                                        1
       |                0< |
       | Source B    N7:11 |
       |                0< |
       +-------------------+

       RW1LVL                                                                    RW1HI
       +--GEQ --------------------+                                                B3
0008 --| Grtr Than or Eql (A>=B)  |-------------------------------------------------( )----
       | Source A           N7:1  |                                                 2
       |                      0<  |
       | Source B          N7:12  |
       |                      0<  |
       +--------------------------+

       RW1LO          RW1HI                                                      RW1OK
        B3             B3                                                          B3
0009 ---] [------+-----]/[--------------------------------------------------------( )----
         1       |      2                                                          31
                 |    RW1OK
                 |     B3
                 +-----] [
                        31

       WPSON     RW1OK      RW1OL       T4:1                                     RW1PMP
        B3        B3         I:1                                                   O:3
0010 ---] [-------] [--------]/[---------]/[---------------------------------------( )----
        25        31          1          DN                                         0
                          1746-IA16                                             1746-OW16

       T4:1                                             PW2DLY
                                                        +--TON ----------------+
0011 ---]/[---------------------------------------------| Timer On Delay       |-(EN)-
        DN                                              | Timer          T4:2  |
                                                        | Time Base       1.0  |-(DN)
                                                        | Preset          10<  |
                                                        | Accum            0<  |
                                                        +----------------------+

                                                           PW2LVL
                                                           +--SCP ------------------+
0012 ------------------------------------------------------| Scale w/Parameters     |----
                                                           | Input            I:5.1 |
                                                           |                   616< |
                                                           | Input Min.        3277 |
                                                           |                  3277< |
                                                           | Input Max.       16384 |
                                                           |                 16384< |
                                                           | Scaled Min.          0 |
                                                           |                     0< |
                                                           | Scaled Max.        115 |
                                                           |                   115< |
                                                           | Output            N7:2 |
                                                           |                     0< |
                                                           +------------------------+
```

```
        RW1LVL                                                                   PW2LO
        ----GRT----------                                                          B3
 ~   ---Greater Than (A>B)  |---------------------------------------------------( )---
        Source A      N7:1                                                          3
                        0<
        Source B     N7:13
                        0<
        -----------------

        RW1LVL                                                                   PW2HI
        ----GEQ----------                                                          B3
0014 ---Grtr Than or Eql (A>=B) ------------------------------------------------( )---
        Source A        N7:1                                                        4
                          0<
        Source B       N7:14
                          0<
        -----------------

        PW2LO        PW2HI                                                       PW2OK
         B3           B3                                                           B3
0015 ----] [------+----]/[-------------------------------------------------------( )---
          3       |    4                                                           32
                  |
                  |  PW2OK
                  |   B3
                  +---] [----
                       32

        WPSON     PW2OK     PW2OL        PW2DLY/DN                              PW2PMP
         B3        B3        I:1            T4:2                                  O:3
0016 ----] [-------] [-------]/[-------------] [---------------------------------( )---
          25        32        2             DN                                     1
                          1746-IA16                                           1746-OW16

        PW2DLY/DN                                                PW3DLY
          T4:2                                                   ----TON--------
0017 ----] [---------------------------------------------------- Timer On Delay   (EN)---
           DN                                                    Timer       T4:3
                                                                 Time Base    1.0  (DN)---
                                                                 Preset       10<
                                                                 Accum         0<
                                                                 ---------------

                                                                   PW3LVL
                                                                   ----SCP------------
0018 --------------------------------------------------------------Scale w/Parameters
                                                                   Input          I:5.2
                                                                                  1992<
                                                                   Input Min.     3277
                                                                                  3277<
                                                                   Input Max.    16384
                                                                                 16384<
                                                                   Scaled Min.       0
                                                                                    0<
                                                                   Scaled Max.     115
                                                                                  115<
                                                                   Output         N7:3
                                                                                    0<
                                                                   -------------------
```

```
         PW3LVL                                                                        PW3LO
       ----GRT ---------                                                                 B3
nc   --- Greater Than (A>B) ------------------------------------------------------------( )---
         Source A       N7:3                                                             5
                          0<
         Source B      N7:15
                          0<
       -----------------

         PW3LVL                                                                        PW3HI
       ----GRT ---------                                                                 B3
0020 --- Grtr Than or Eql (A>=B) -------------------------------------------------------( )---
         Source A       N7:3                                                             6
                          0<
         Source B      N7:16
                          0<
       -----------------

         PW3LO          PW3HI                                                          PW3OK
          B3             B3                                                              B3
0021 ----] [----+-------]/[---+---------------------------------------------------------( )---
          5     |         6   |                                                          33
                |       PW3OK |
                |        B3   |
                +-------] [---+
                          33

         WPSON     PW3OK     PW30L        PW3DLY/DN                                  PW3PMP
          B3        B3        I:1           T4:3                                       O:3
0022 ----] [-------] [-------]/[-----------] [-----------------------------------------( )---
          25        33         3            DN                                          2
                           1746-IA16                                                1746-OW16

         PW3DLY/DN                                                  PW4DLY
           T4:3                                                   ------TON -----------
0023 -----] [------------------------------------------------------ Timer On Delay     -(EN)-
            DN                                                      Timer        T4:4
                                                                    Time Base     1.0  -(DN)-
                                                                    Preset        10<
                                                                    Accum          0<
                                                                  ---------------------

                                                                        PW4LVL
                                                                     ----SCP -----------
0024 --------------------------------------------------------------- Scale w/Parameters  ---
                                                                        Input            I:5.3
                                                                                          598<
                                                                        Input Min.        3277
                                                                                          3277<
                                                                        Input Max.       16384
                                                                                         16384<
                                                                        Scaled Min.          0
                                                                                             0<
                                                                        Scaled Max.        115
                                                                                           115<
                                                                        Output            N7:4
                                                                                             0<
                                                                     ----------------------
```

```
          PW4LVL                                                                PW4LO
         ----GRT ----------                                                      B3
0025  ---Greater Than (A>B) ------------------------------------------------------( )
          Source A      N7:4                                                      7
                          0<
          Source B      N7:17
                          0<
         ------------------

          PW4LVL                                                                PW4HI
         ----GEQ ----------                                                      B3
0026  ---Grtr Than or Eql (A>=B) -------------------------------------------------( )
          Source A         N7:4                                                   8
                             0<
          Source B         N7:18
                             0<
         ------------------

          PW4LO        PW4HI                                                    PW4OK
           B3           B3                                                       B3
0027  ----] [----+-----]/[----+------------------------------------------------( )
           7     |      8     |                                                  34
                 |    PW4OK   |
                 |     B3     |
                 +-----] [----+
                        34

        WPSON     PW4OK     PW40L      PW4DLY/DN                               PW4PMP
         B3        B3        I:1          T4:4                                   O:3
0028  ---] [-------] [-------]/[----------]/[--------------------------------------( )
         25        34         4            DN                                     3
                           1746-IA16                                          1746-OW16

        PW4DLY/DN                                              PW5DLY
          T4:4                                                 ----TON ------
0029  ----] [--------------------------------------------------Timer On Delay      (EN)
           DN                                                  Timer        T4:5
                                                               Time Base     1.0   (DN)
                                                               Preset        10<
                                                               Accum          0<
                                                               --------------

                                                                  PW5LVL
                                                                 ----SCP ------
0030  -----------------------------------------------------------Scale w/Parameters
                                                                  Input          I:6.0
                                                                                -4084<
                                                                  Input Min.      3277
                                                                                 3277<
                                                                  Input Max.     16384
                                                                                16384<
                                                                  Scaled Min.        0
                                                                                    0<
                                                                  Scaled Max.      115
                                                                                  115<
                                                                  Output          N7:5
                                                                                    0<
                                                                 --------------
```

LAD 2 - --- Total Rungs in File = 62

```
        PW5LVL                                                                 PW5LO
        GRT                                                                     B3
      --Greater Than (A>B) -------------------------------------------------( )---
        Source A          N7:5                                                  9
                            0<
        Source B          N7:19
                            0<

        PW5LVL                                                                 PW5HI
        GEQ                                                                     B3
0032  --Grtr Than or Eql (A>=B) --------------------------------------------( )---
        Source A            N7:5                                                10
                              0<
        Source B            N7:20
                              0<

        PW5LO          PW5HI                                                   PW5OK
         B3             B3                                                      B3
0033  --] [-----------] [-----------------------------------------------------( )---
         9              10                                                      35

                       PW5OK
                        B3
                  -----] [-----
                        35

        WPSON    PW5OK    PW50L       PW5DLY/DN                              PW5PMP
         B3       B3       I:1          T4:5                                   O:3
0034  --] [------] [------]/[----------] [-------------------------------------( )---
         25       35        5            DN                                     4
                        1746-IA16                                         1746-OW16

        PW5DLY/DN                                         PW6DLY
          T4:5                                            TON
0035  ----] [---------------------------------------------Timer On Delay      EN
          DN                                              Timer       T4:6
                                                          Time Base    1.0    DN
                                                          Preset       10<
                                                          Accum         0<

                                                             PW6LVL
                                                             SCP
0036  -------------------------------------------------------Scale w/Parameters
                                                             Input            I:6.1
                                                                               616<
                                                             Input Min.        3277
                                                                               3277<
                                                             Input Max.       16384
                                                                              16384<
                                                             Scaled Min.          0
                                                                                  0<
                                                             Scaled Max.        115
                                                                                115<
                                                             Output            N7:6
                                                                                  0<
```

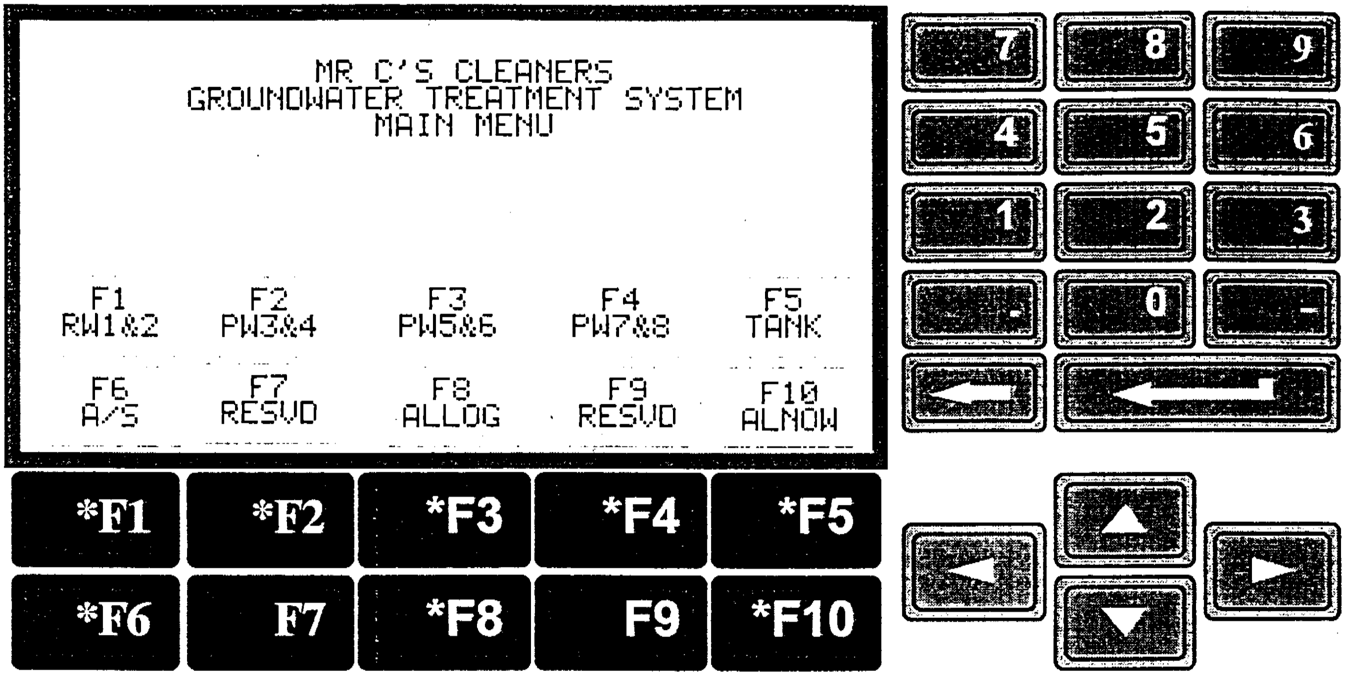
```
         PW6LVL                                                                PW6LO
        ----GRT ----------                                                       B3
     ---- Greater Than (A>B) -------------------------------------------------( )---
          Source A       N7:6                                                   11
                           0<
          Source B      N7:21
                           0<
        ------------------

         PW6LVL                                                                PW6HI
        ----GEQ ----------                                                       B3
0038 ---- Grtr Than or Eql (A>=B) ---------------------------------------------( )---
          Source A         N7:6                                                 12
                             0<
          Source B        N7:22
                             0<
        ------------------

         PW6LO          PW6HI                                                  PW6OK
          B3             B3                                                      B3
0039 ----] [------------]/[---------------------------------------------------( )---
          11             12                                                     36
                   |
                   |    PW6OK
                   |     B3
                   +----] [----
                         36

         WPSON   PW6OK    PW60L      PW6DLY/DN                              PW6PMP
          B3      B3       I:1         T4:6                                   O:3
0040 ----] [-----] [------]/[---------]/[-------------------------------------( )---
          25      36        6           DN                                     5
                         1746-IA16                                        1746-OW16

         PW6DLY/DN                                              PW7DLY
           T4:6                                                ---- TON ------------
0041 -----]/[------------------------------------------------- Timer On Delay    (EN)--
            DN                                                  Timer       T4:7
                                                                Time Base    1.0  (DN)--
                                                                Preset       10<
                                                                Accum         0<
                                                                --------------------

                                                                    PW7LVL
                                                                   --- SCP ----------
0042 ------------------------------------------------------------- Scale w/Parameters
                                                                     Input          1:6.2
                                                                                    1992<
                                                                     Input Min.      3277
                                                                                     3277<
                                                                     Input Max.     16384
                                                                                    16384<
                                                                     Scaled Min.        0
                                                                                        0<
                                                                     Scaled Max.      115
                                                                                      115<
                                                                     Output          N7:7
                                                                                        0<
                                                                   ------------------
```

```
        PW7LVL                                                                  PW7LO
        ----GRT ---------                                                        B3
    ----Greater Than (A>B) ---------------------------------------------------( )----
        Source A      N7:7                                                       13
                        0<
        Source B     N7:23
                        0<
        -----------------

        PW7LVL                                                                  PW7HI
        ----GEQ ---------                                                        B3
0044 ---Grtr Than or Eql (A>=B) -------------------------------------------------( )----
        Source A        N7:7                                                     14
                          0<
        Source B       N7:24
                          0<
        -----------------

        PW7LO       PW7HI                                                       PW7OK
         B3          B3                                                          B3
0045 ----] [----+----]/[----+-----------------------------------------------------( )----
         13     |    14     |                                                    37
                |   PW7OK   |
                |    B3     |
                +----] [----+
                     37

        WPSON     PW7OK     PW70L     PW7DLY/DN                                PW7PMP
         B3        B3        I:1        T4:7                                     O:3
0046 ----] [-------] [-------]/[--------] [---------------------------------------( )----
         25        37         7          DN                                       6
                         1746-IA16                                          1746-OW16

        PW7DLY/DN                                           PW8DLY
          T4:7                                              ----TON ----------
0047 -----] [-----------------------------------------------Timer On Delay    (EN)----
          DN                                                Timer        T4:8
                                                            Time Base     1.0  (DN)
                                                            Preset        10<
                                                            Accum          0<
                                                            ------------------

                                                               PW8LVL
                                                               ----SCP ---------
0048 ----------------------------------------------------------Scale w/Parameters ----
                                                               Input            I:6.3
                                                                                 598<
                                                               Input Min.        3277
                                                                                3277<
                                                               Input Max.       16384
                                                                               16384<
                                                               Scaled Min.          0
                                                                                   0<
                                                               Scaled Max.        115
                                                                                 115<
                                                               Output            N7:8
                                                                                   0<
                                                               ---------------------
```

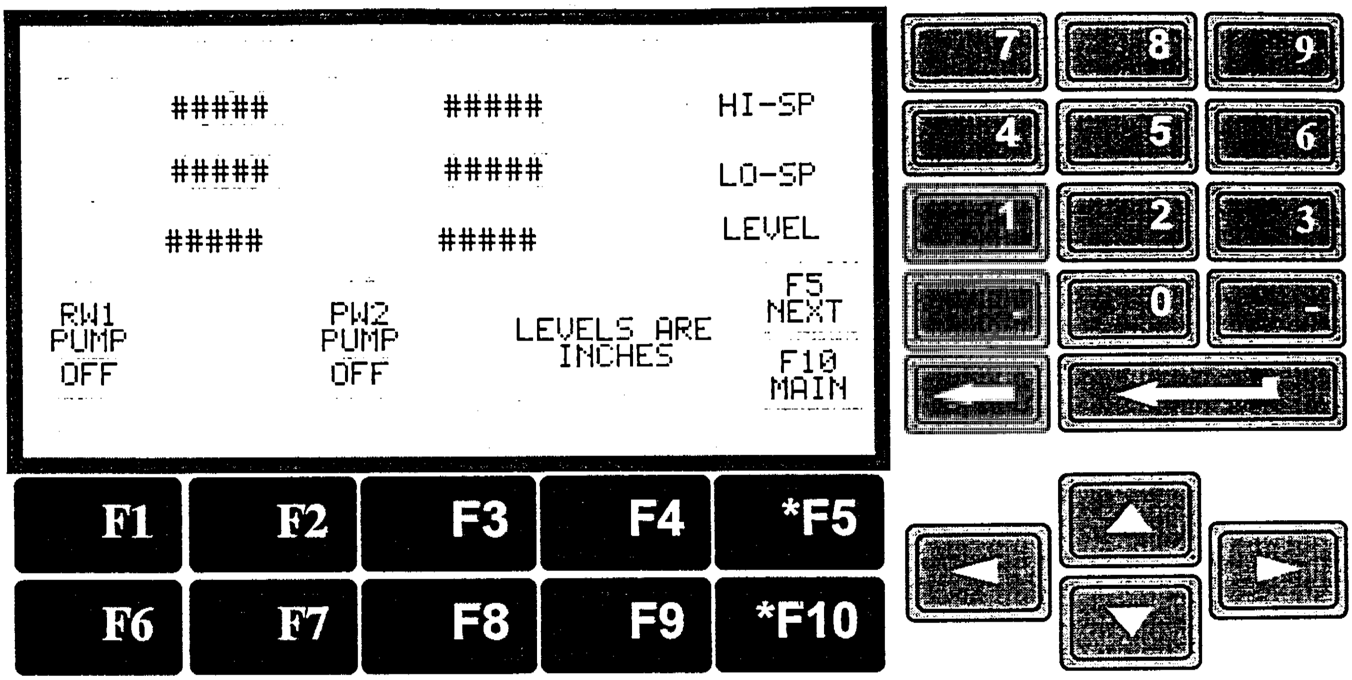
```
         PW8LVL                                                                    PW8LO
         ---GRT ------------                                                        B3
         Greater Than (A>B) -------------------------------------------------------( )--
         Source A       N7:8                                                        15
                          0<
         Source B      N7:25
                          0<
         ------------------

         PW8LVL                                                                    PW8HI
         ---GEQ ------------                                                        B3
0050     Grtr Than or Eql (A>=B) --------------------------------------------------( )--
         Source A         N7:8                                                      16
                            0<
         Source B        N7:26
                            0<
         ------------------

         PW8LO         PW8HI                                                       PW8OK
          B3            B3                                                          B3
0051  ---] [-------+----]/[------------------------------------------------------( )--
          15       |    16                                                          38
                   |
                   |   PW8OK
                   |    B3
                   +----] [----+
                        38

         WPSON     PW8OK     PW80L                                               PW8PMP
          B3        B3        I:1                                                 O:3
0052  ---] [-------] [-------]/[--------------------------------------------------( )--
          25        38         8                                                   7
                             1746-IA16                                         1746-OW16

                                                              EQTLVL
                                                                   SCP
0053  --------------------------------------------------------     Scale w/Parameters
                                                                   Input            I:7.0
                                                                                   -4084<
                                                                   Input Min.        3277
                                                                                     3277<
                                                                   Input Max.       16384
                                                                                    16384<
                                                                   Scaled Min.          0
                                                                                        0<
                                                                   Scaled Max.         23
                                                                                       23<
                                                                   Output            N7:9
                                                                                        0<
                                                                   ------------------

         EQTLVL                                                                    EQTLO
         ---GRT ------------                                                        B3
0054     Greater Than (A>B) -------------------------------------------------------( )--
         Source A       N7:9                                                        17
                          0<
         Source B      N7:27
                          0<
         ------------------
```

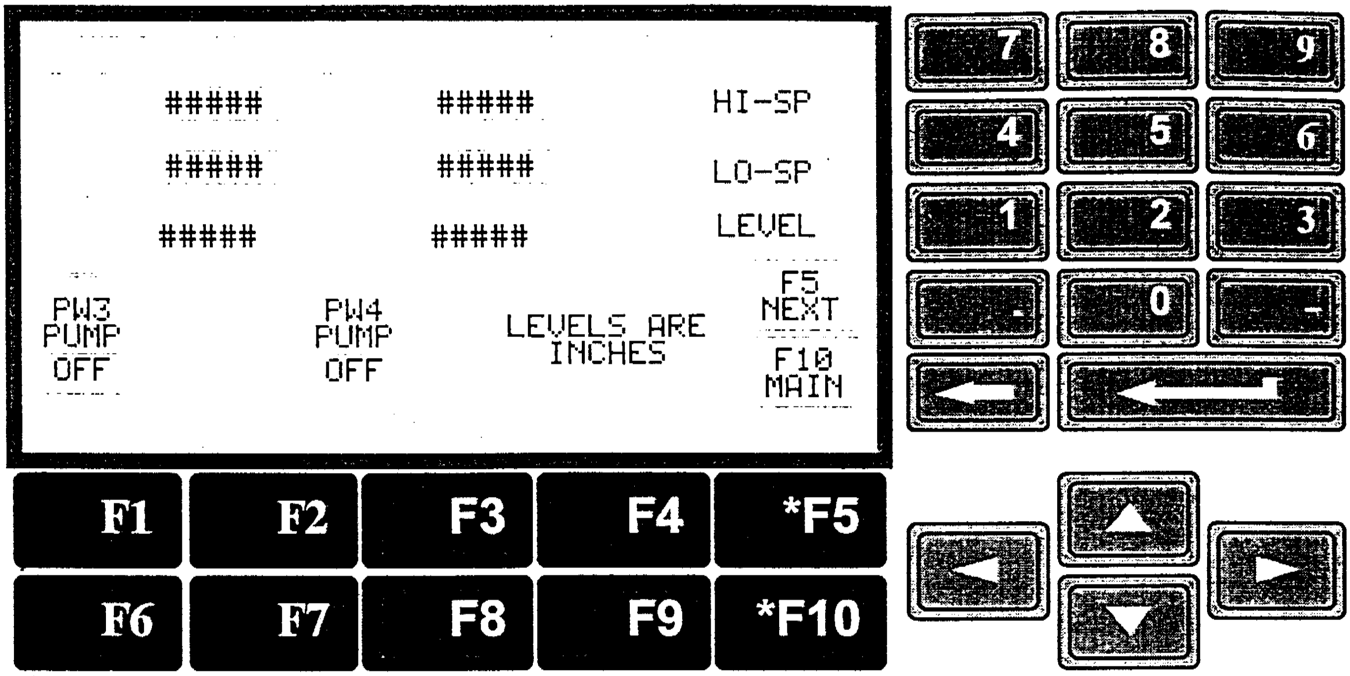
```
        EQTLVL                                                                EQTHI
        ---GEQ ------------                                                    B3
    ----Grtr Than or Eql (A>=B)-----------------------------------------------( )----
        Source A          N7:9                                                 18
                            0<
        Source B          N7:28
                            0<
        --------------------

        EQTLO         EQTHI                                                   EQTOK
         B3            B3                                                      B3
0056 ----] [-----------] [--------------------------------------------------( )----
         17            18                                                      39
                   |
                   |   EQTOK
                   |    B3
                   |---] [------
                        39

       WPSON     EQTOK     ASIP10L                                          ASIPMP
        B3        B3        I:1                                               O:3
0057 ---] [------] [-------]/[---------------------------------------------( )----
        25        39          13                                              11
                          1746-IA16                                      1746-OW16

                                                      APW2DLY
                                                     ---TON ----------
0058 -------------------------------------------------Timer On Delay    -(EN)-
                                                      Timer      T4:9
                                                      Time Base   1.0   -(DN)
                                                      Preset      10<
                                                      Accum        0<
                                                     -------------------

        EQTLVL                                                              EQTEHI
        ---GEQ -----------                                                    B3
0059 ----Grtr Than or Eql (A>=B)--------------------------------------------(L)----
         Source A          N7:9                                               19
                             0<
         Source B          N7:29
                             0<
             ---------------

           EQTEHI                                                              B3
            B3
0060 -------] [----------------------------------------------------------(U)----
            19                                                                 42
       |
       |                RESET
       |     B3          I:1
       |----] [---------]/[-----
             42           0
                      1746-IA16

0061 ------------------------------------------------------------------- END ----
```

DEVELOPED SCREENS (PANELBUILDER)



MR C'S CLEANERS
GROUNDWATER TREATMENT SYSTEM
MAIN MENU


HI-SP
LO-SP
LEVEL
RW1 PUMP OFF
PW2 PUMP OFF
LEVELS ARE INCHES
F5 NEXT
F10 MAIN
F1
F2
F3
F4
*F5
F6
F7
F8
F9
*F10
7
8
9
4
5
6
1
2
3
.
0
-



HI-SP

LO-SP

LEVEL

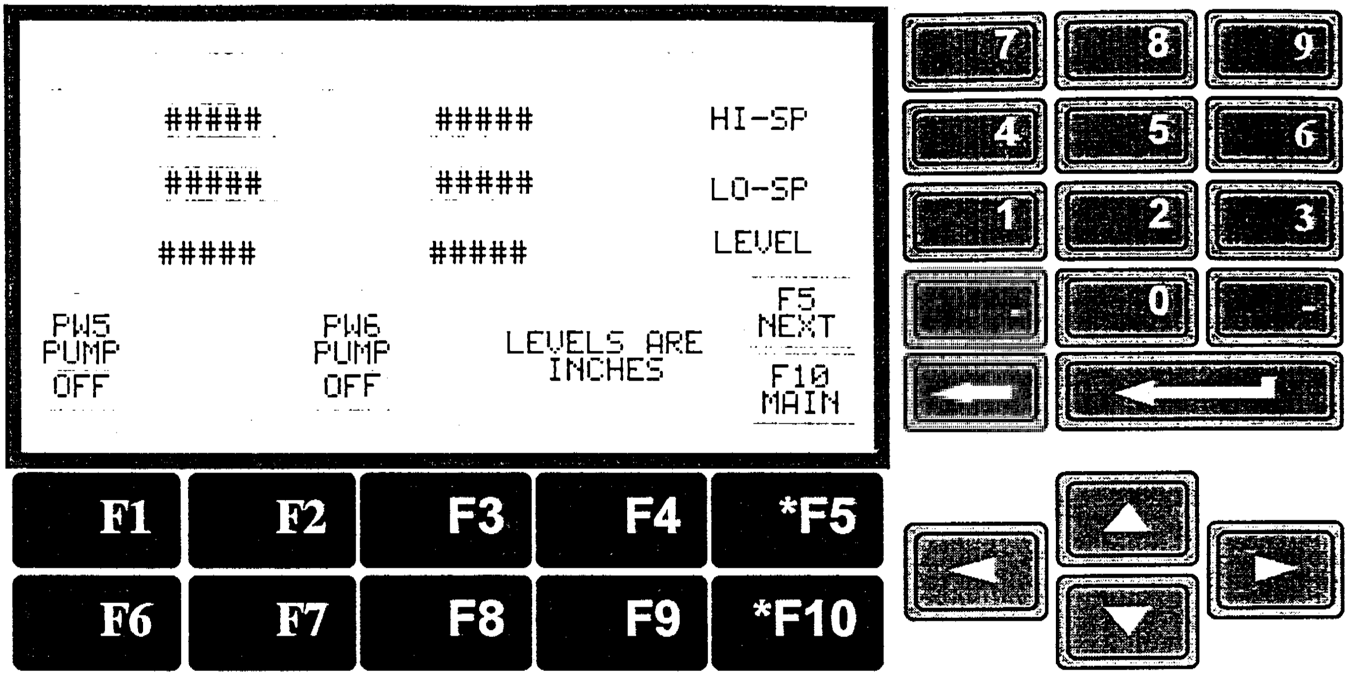
PW3 PUMP OFF

PW4 PUMP OFF

LEVELS ARE INCHES

F5 NEXT

F10 MAIN



HI-SP

LO-SP

LEVEL

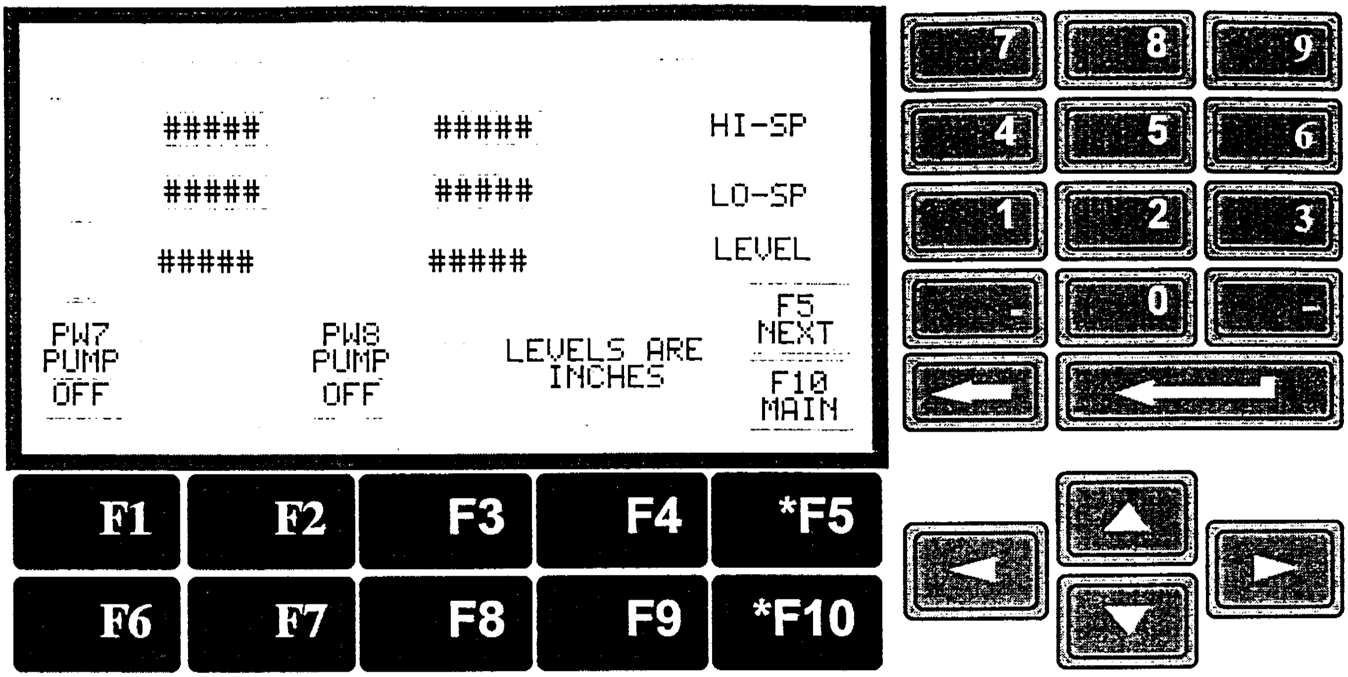
PW5 PUMP OFF

PW6 PUMP OFF

LEVELS ARE INCHES

F5 NEXT

F10 MAIN



HI-SP

LO-SP

LEVEL

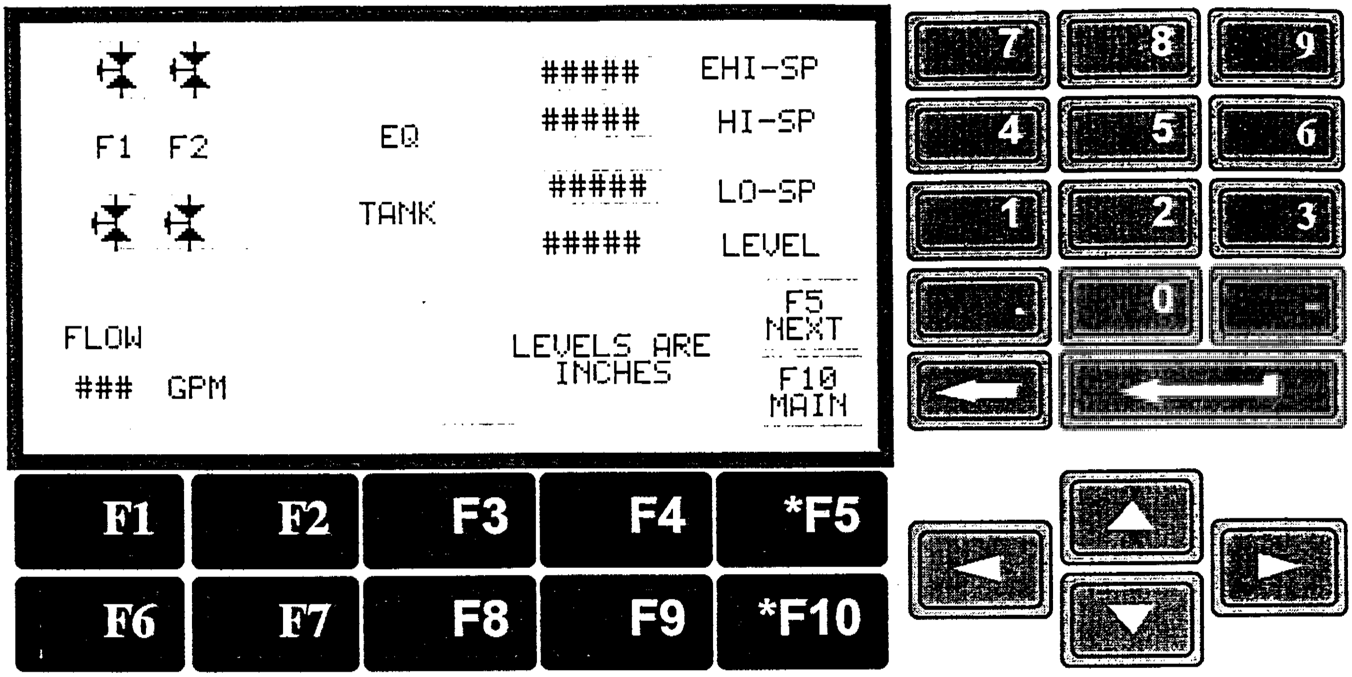
PW7 PUMP OFF

PW8 PUMP OFF

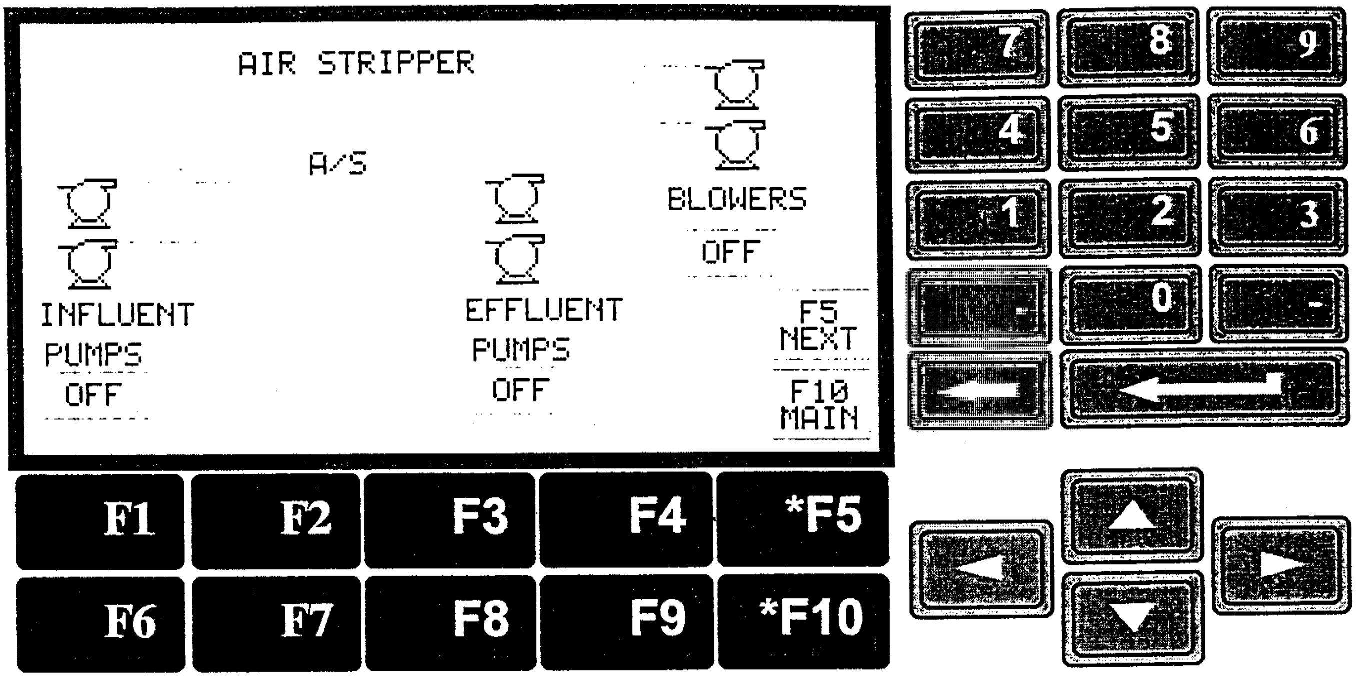
LEVELS ARE INCHES

F5 NEXT

F10 MAIN



LEVELS ARE INCHES



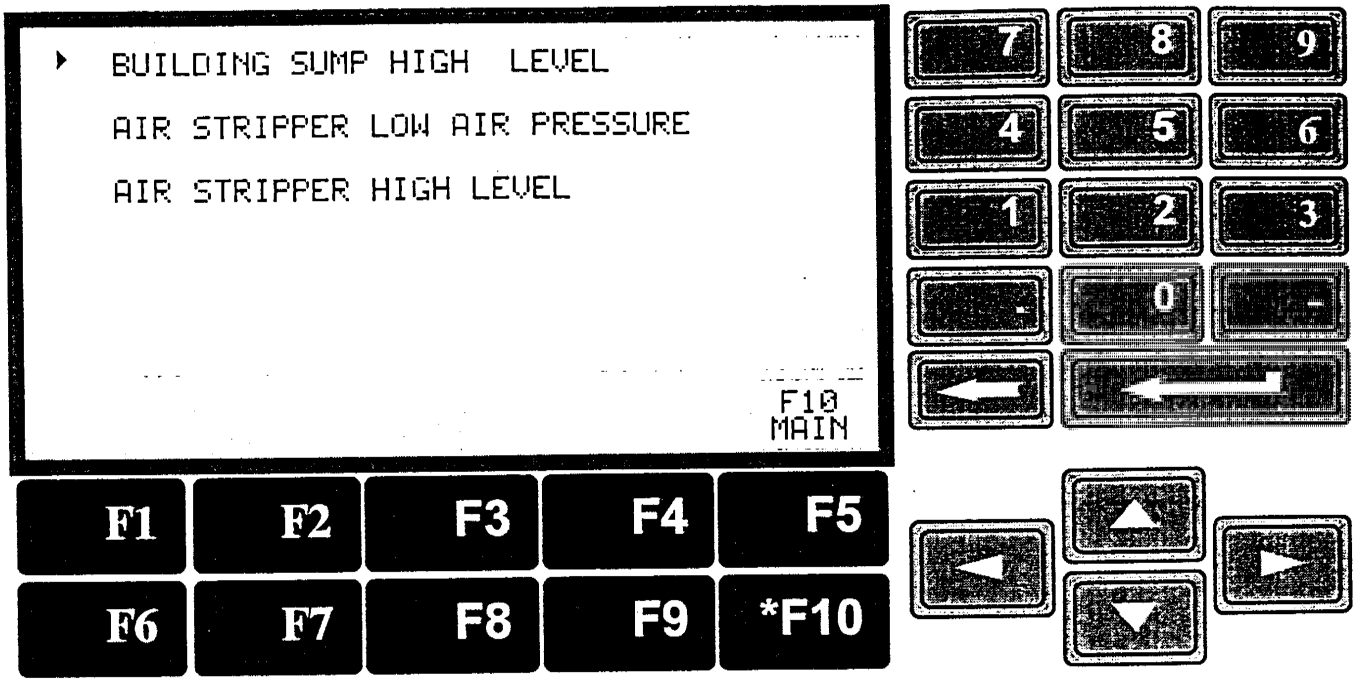
AIR STRIPPER

A/S

BLOWERS OFF

INFLUENT PUMPS OFF

EFFLUENT PUMPS OFF

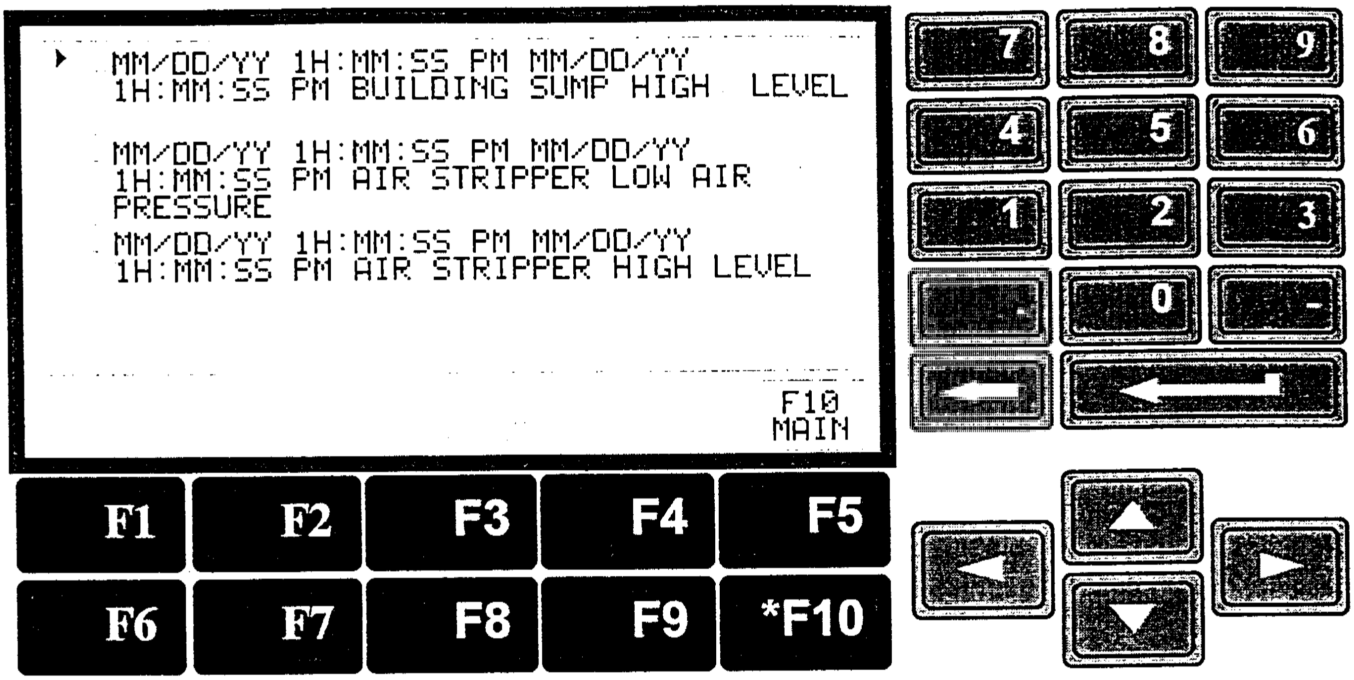


▶ BUILDING SUMP HIGH LEVEL

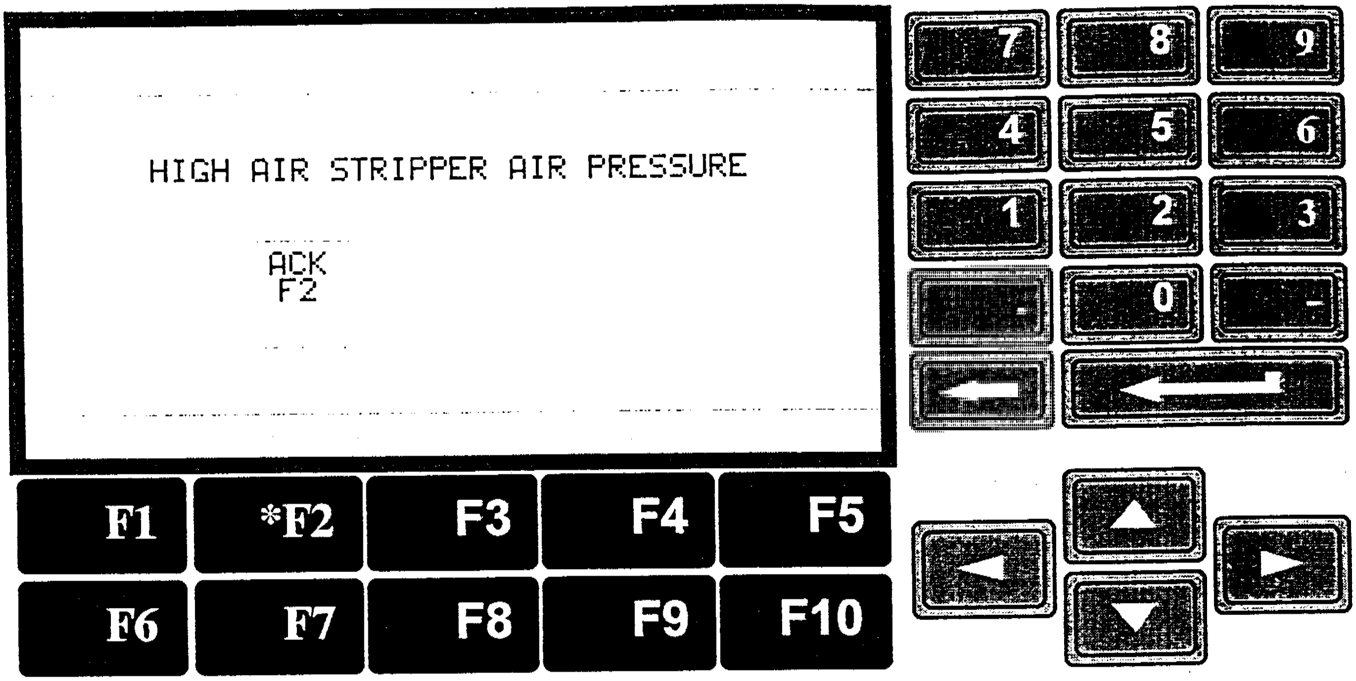
AIR STRIPPER LOW AIR PRESSURE

AIR STRIPPER HIGH LEVEL

F10
MAIN



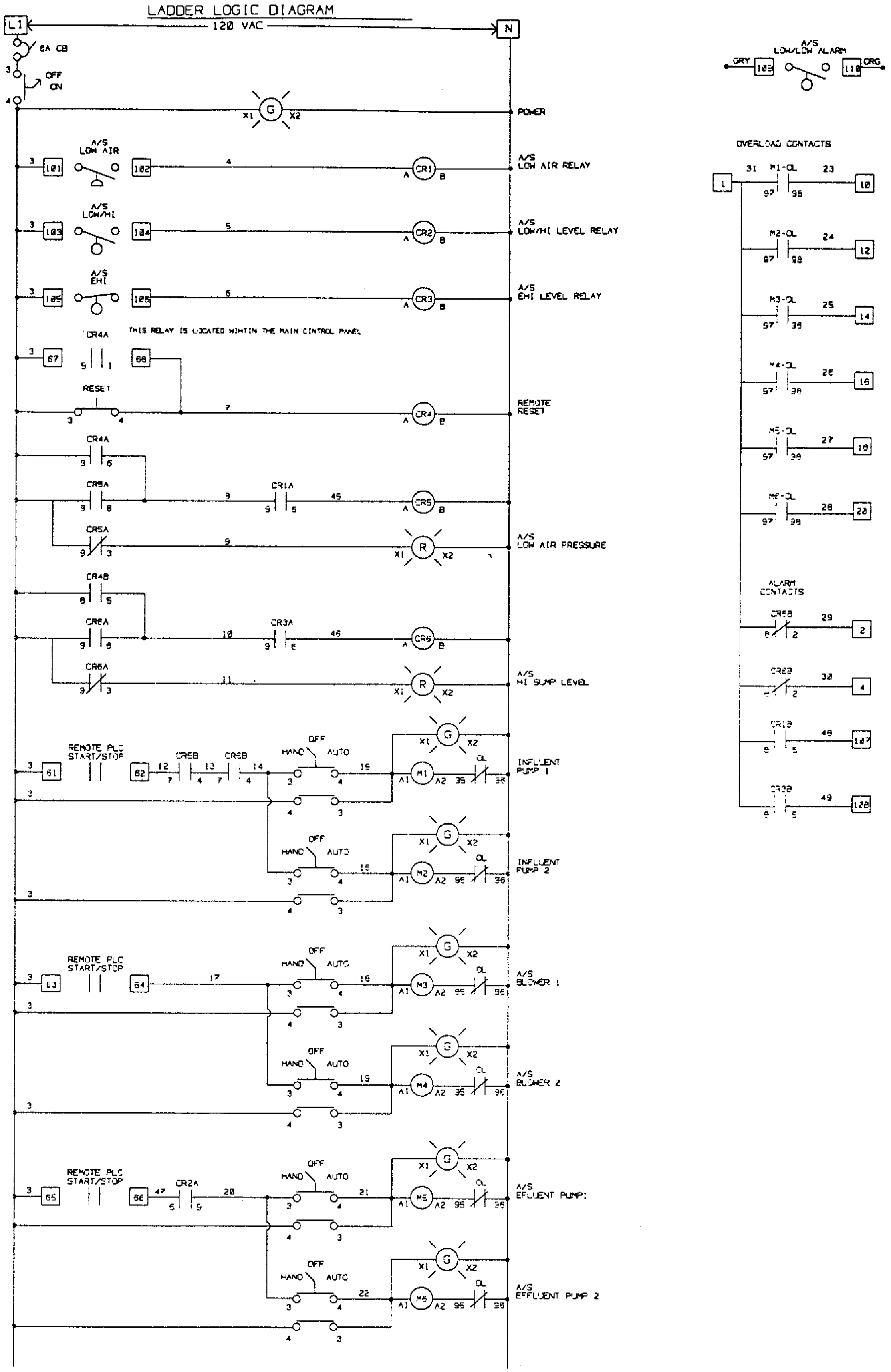
```
▸ MM/DD/YY 1H:MM:SS PM MM/DD/YY
  1H:MM:SS PM BUILDING SUMP HIGH  LEVEL

  MM/DD/YY 1H:MM:SS PM MM/DD/YY
  1H:MM:SS PM AIR STRIPPER LOW AIR
  PRESSURE
  MM/DD/YY 1H:MM:SS PM MM/DD/YY
  1H:MM:SS PM AIR STRIPPER HIGH LEVEL

                                        F10
                                       MAIN
```



HIGH AIR STRIPPER AIR PRESSURE

ACK
F2

AIR STRIPPER CONTROL PANEL DRAWINGS

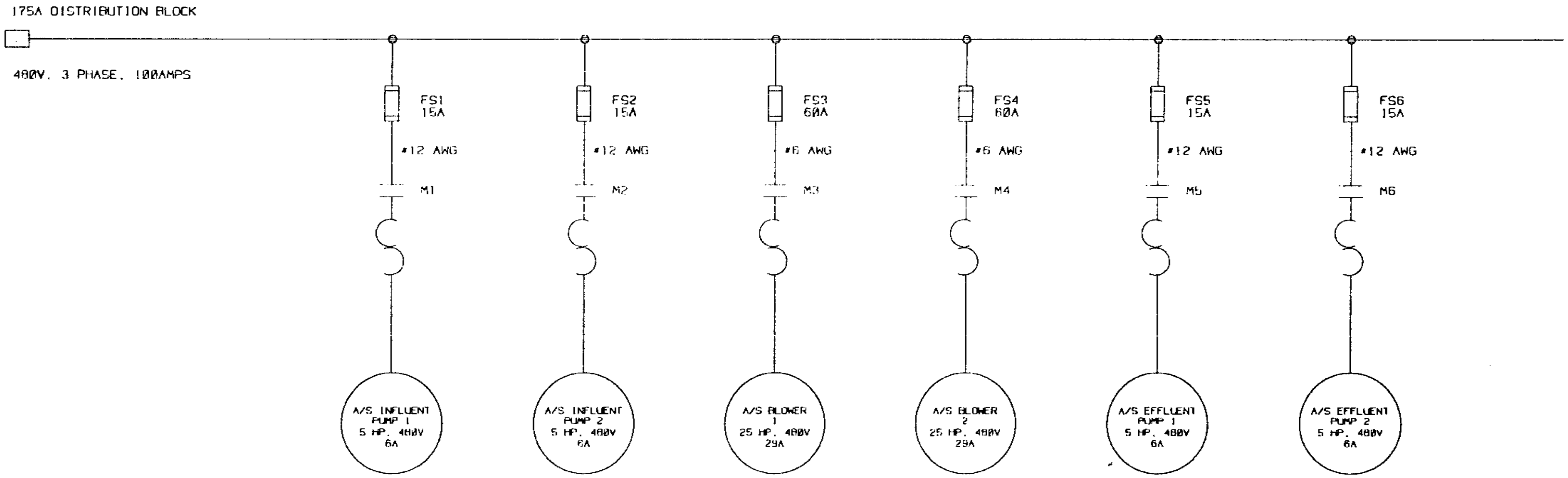


NATIONAL ENVIRONMENTAL SYSTEMS
508-761-6611
36 MAPLE AVENUE, SEEKONK, MA 02771

RELAY BASED CONTROL PANEL

JOB NAME : TYREE / MR. C's

NES PROJECT # 01A083		SHEET 2 OF 3	
DATE: 3/25/02	DRAWN: MJS	\S09	REV:
SCALE: N. T. S.	DESIGN: RJD	SVMLTY	–



NOTE: MOTOR FULL LOAD AMPS ARE FROM MOTOR NAMEPLATES (FOR 460V.).
LOAD FOR 1 SET: 41 AMPS
LOAD FOR BOTH SETS: 82 AMPS

NATIONAL ENVIRONMENTAL SYSTEMS
508-761-6611
36 MAPLE AVENUE. SEEKONK. MA 02771

LINE DIAGRAM

JOB NAME : TYREE / MR C's
NES PROJECT 010083
SHEET 3 OF 3
DATE: 3/6/02
DRAWN: MJS
\SO96015\
REV: B
SCALE: N. T. S.
DESIGN: RJO
LINEDIAG

TECHNICAL & PUMP SELECTION INFORMATION RW-1 Pump

SECTION 6

Part 1 – INTRODUCTION

Part 2 – CABLE SELECTION

Part 3 – MISC. TECHNICAL DATA, FORMULAS, AND CONVERSIONS

PART 1: INTRODUCTION

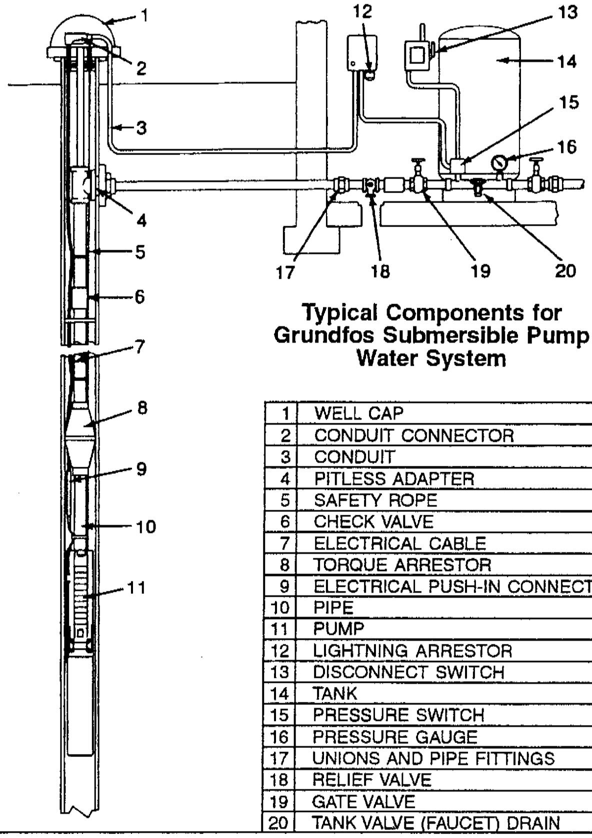
General

This section will provide the technical information needed to properly select GRUNDFOS groundwater products. The information applies primarily to domestic groundwater systems using 4-inch wells with submersible or jet pumps, pressure tanks, and accessories. It is important to be familiar with typical system components and their basic hydraulic principles to ensure a better understanding of the more technical information found later in this section.

Prior to selecting the pump, the basic system requirements must be determined. System capacity and system pressure must be calculated and friction losses determined to ensure proper system performance. These calculations are covered in detail in **Part 1**. In **Part 2**, information is provided on proper cable selection. Also provided in **Part 3** are miscellaneous technical data and formulas commonly used in the selection of domestic groundwater systems.

Typical System Components

Domestic groundwater systems are made up of a pump, storage tank, and accessories to operate the system automatically. Pumps are generally of the submersible or jet variety and include the pump and motor as a unit. Refer to Figure 8-A for the components found in a typical automatic groundwater pumping system.



Typical Components for Grundfos Submersible Pump Water System

1	WELL CAP
2	CONDUIT CONNECTOR
3	CONDUIT
4	PITLESS ADAPTER
5	SAFETY ROPE
6	CHECK VALVE
7	ELECTRICAL CABLE
8	TORQUE ARRESTOR
9	ELECTRICAL PUSH-IN CONNECTOR
10	PIPE
11	PUMP
12	LIGHTNING ARRESTOR
13	DISCONNECT SWITCH
14	TANK
15	PRESSURE SWITCH
16	PRESSURE GAUGE
17	UNIONS AND PIPE FITTINGS
18	RELIEF VALVE
19	GATE VALVE
20	TANK VALVE (FAUCET) DRAIN

FIGURE 8-A
Components found in a typical automatic groundwater pumping system including a submersible pump, pressure tank, and pressure control accessories.

In a ***closed, automatic water system*** a pressure tank is used to store water and maintain system pressure between specified limits (such as 30 to 50 psi). As the water level in the tank rises, tank air is compressed in the upper part of the tank until the upper pressure limit is reached (i.e., 50 psi). At this "cut-out" point a pressure switch opens the electrical circuit to the motor and the pump stops.

The compressed air in the tank acts like a spring pushing down on the water to create system pressure. When a valve is opened in the water system, the air pressure in the upper part of the tank forces the water to flow out of the tank and into the system. As the water is drawn from the tank, the air occupies a larger space and the pressure drops until the lower limit is reached (i.e., 30 psi). At this "cut-in" point the pressure switch closes the electrical circuit to the motor and the pump starts. A cycle is thereby completed.

In an ***open, automatic water system*** the pump is used to fill a large, elevated storage tank which utilizes gravity to maintain system pressure. Tank level controls are used to cycle the pump to maintain water levels within prescribed limits.

Refer to the following illustrations for schematic layouts of typical domestic groundwater systems and components: Figure 8-B (Submersible Pump - Closed System), Figure 8-C (Submersible Pump - Open System), Figure 8-D (Shallow Well Jet Pump), and Figure 8-E (Deep Well Jet Pump).

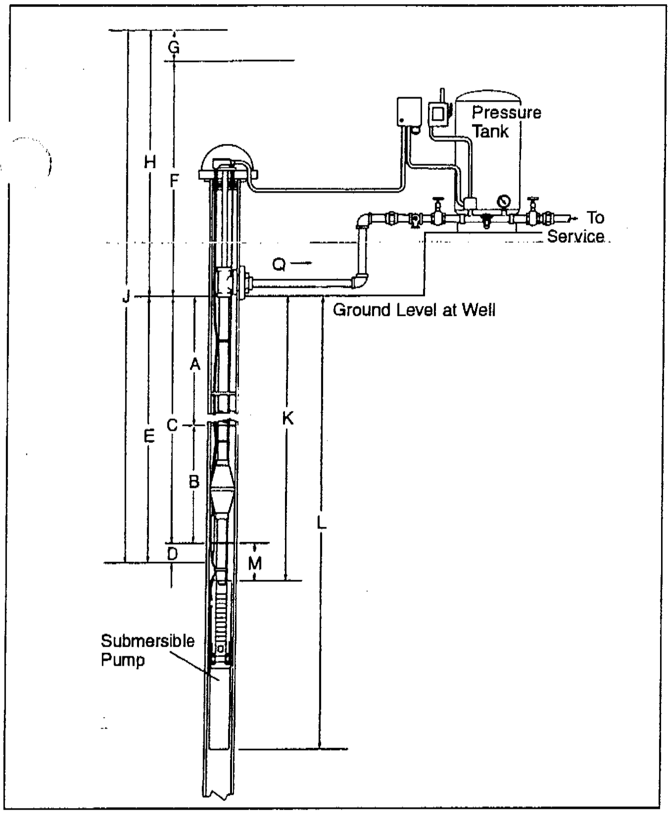
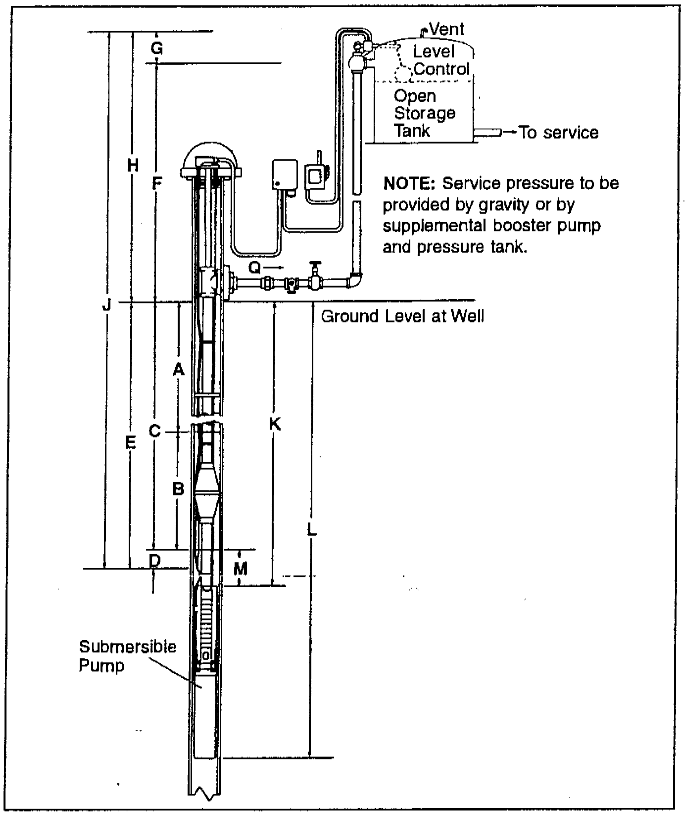


FIGURE 8-B
Figure 8-B illustrates a schematic layout of a CLOSED goundwater pumping system using a submersible pump and pressure tank set for automatic operation. A pressure switch controls the cycling of the pump.



NOTE: Service pressure to be provided by gravity or by supplemental booster pump and pressure tank.

FIGURE 8-C
Figure 8-C illustrates a schematic layout of an OPEN groundwater pumping system using a submersible pump and an elevated storage tank set for automatic operation. A level control on the storage tank controls the cycling of the pump.

sed Groundwater System with Submersible Pump

A. **STATIC WATER LEVEL (in feet):** vertical distance from the top of the well to the standing water level or water table.

B. **DRAWDOWN (in feet):** reduction in the water level during pumping (varies with well yield and pump capacity).

C. **PUMPING WATER LEVEL or LIFT (in feet):** C = A + B.

D. **FRICTION LOSSES in the WELL (in feet):** friction losses caused by the drop pipe and fittings between the pump and the top of the well.

E. **TOTAL LIFT in the WELL (in feet):** E = A + B + D.

F. **STATIC DISCHARGE HEAD (in feet):** for PRESSURE TANK SYSTEMS it is the elevation rise in feet of the pressure tank, discharge nozzles, etc., above the top of the well plus the pressure (in feet) required at that level.

G. **FRICTION LOSSES in the DISCHARGE SYSTEM (in feet):** friction losses caused by piping, valves, and fittings between the top of the well and the point of discharge.

H. **TOTAL DISCHARGE HEAD (in feet):** H = F + G.

J. **TOTAL PUMPING HEAD (in feet):** J = E + H.

K. **SETTING OF PUMP (in feet):** vertical distance from the top of the well to the top of the pump.

L. **OVERALL LENGTH (in feet):** vertical distance from the top of the well to the bottom of the pump.

M. **SUBMERGENCE (in feet):** M = K - C.

CAPACITY (in gpm or gph): rate of pumping.

Open Groundwater System with Submersible Pump

A. **STATIC WATER LEVEL (in feet):** vertical distance from the top of the well to the standing water level or water table.

B. **DRAWDOWN (in feet):** reduction in the water level during pumping (varies with well yield and pump capacity).

C. **PUMPING WATER LEVEL or LIFT (in feet):** C = A + B.

D. **FRICTION LOSSES in the WELL (in feet):** friction losses caused by the drop pipe and fittings between the pump and the top of the well.

E. **TOTAL LIFT in the WELL (in feet):** E = A + B + D.

F. **STATIC DISCHARGE HEAD (in feet):** for OPEN DISCHARGE SYSTEMS it is the elevation of the highest water level above the top of the well.

G. **FRICTION LOSSES in the DISCHARGE SYSTEM (in feet):** friction losses caused by piping, valves, and fittings between the top of the well and the point of discharge.

H. **TOTAL DISCHARGE HEAD (in feet):** H = F + G.

J. **TOTAL PUMPING HEAD (in feet):** J = E + H.

K. **SETTING OF PUMP (in feet):** vertical distance from the top of the well to the top of the pump.

L. **OVERALL LENGTH (in feet):** vertical distance from the top of the well to the bottom of the pump.

M. **SUBMERGENCE (in feet):** M = K - C.

Q. **CAPACITY (in gpm or gph):** rate of pumping.

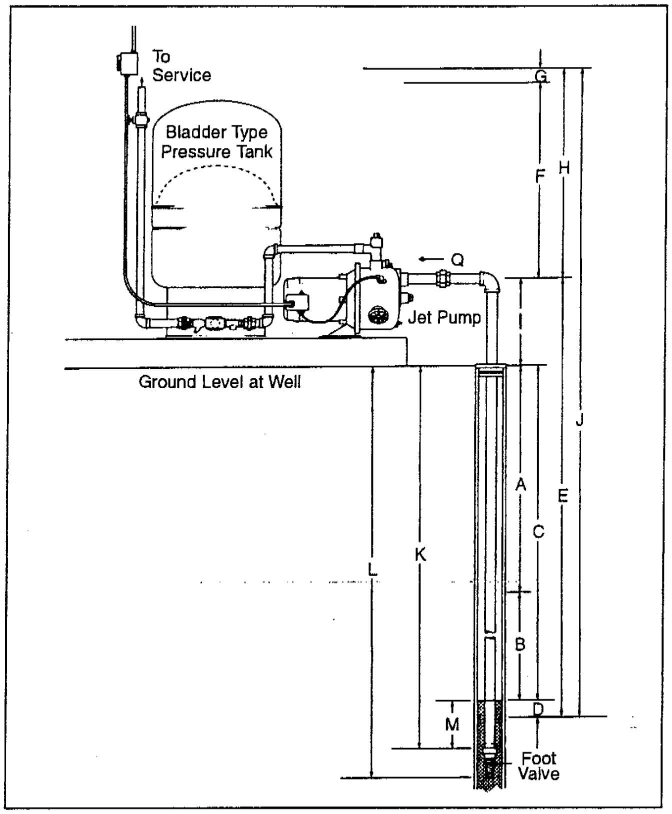


FIGURE 8-D
Figure 8-D illustrates a schematic layout of a SHALLOW WELL groundwater pumping system using a shallow well JET PUMP designed for setting to 25 feet. The pressure tank is set for automatic operation with a pressure switch controlling the cycling of the pump.

CLOSED GROUNDWATER SYSTEM WITH SHALLOW WELL JET PUMP

A. Statics Water Level (in feet): vertical distance from the top of the well to the standing water level or water table.

B. Drawdown (in feet): reduction in the water level during pumping (varies with well yield and pump capacity).

C. Pumping Water Level or Lift (in feet): C = A + B.

D. Friction Losses in the Suction System (in feet): friction losses caused by suction piping between the pump and foot valve.

E. Total Suction Lift (in feet): E = A + B + D + I.

F. Static Discharge Head (in feet): for *Pressure Tanks Systems* it is the elevation rise in feet of the pressure tank, discharge nozzles, etc., above the pump plus the pressure (in feet) discharge nozzles, etc., above the pump plus the pressure (in feet) required at that level. For *Open Discharge Systems* it is the elevation in feet of the highest water level above the pump.

G. Friction Losses in the Discharge System (in feet): friction losses caused by piping, valves, and fittings between the top of the well and the point of discharge.

H. Total Discharge Head (in feet): H = F + G.

I. Elevation of the Pump above the Top of the Well (in feet).

J. Total Pumping Head (in feet): J = E + H.

K. Setting of the Foot Valve or Strainer (in feet): vertical distance from the top of the well to the top of the foot valve or strainer.

L. Overall Length (in feet): vertical distance from the top of the well to the bottom of the foot valve or strainer.

M. Submergence (in feet): M = K - C.

Q. Capacity (in gpm or gph): rate of pumping.

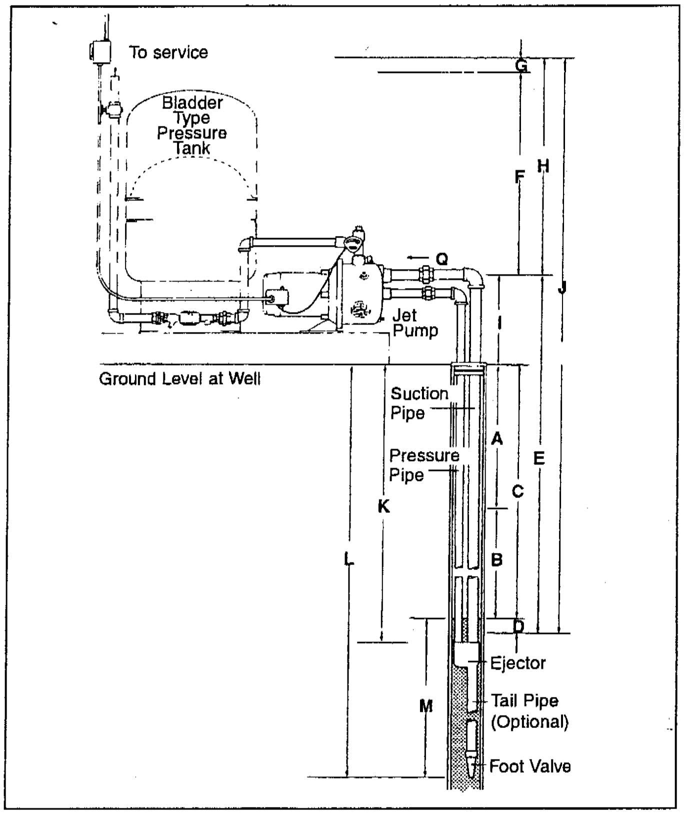


FIGURE 8-E
Figure 8-E illustrates a schematic layout of an DEEP WELL groundwater pumping system using a deep well JET PUMP designed for settings to 100 feet. The pressure tank is set for automatic operation with a pressure switch controlling the cycling of the pump.

CLOSED GROUNDWATER SYSTEM WITH SHALLOW WELL JET PUMP

A. Static Water Level (in feet): vertical distance from the top of the well to the standing water level or water table.

B. Drawdown (in feet): reduction in the water level during pumping (varies with well yield and pump capacity).

C. Pumping Water Level or Lift (in feet): C = A + B.

D. Friction Losses in the Suction System (in feet): friction losses caused by suction piping between the pump and foot valve.

E. Total Suction Lift (in feet): E = A + B + D + I.

F. Static Discharge Head (in feet): for PRESSURE TANK SYSTEMS it is the elevation rise in feet of the pressure tank, discharge nozzles, etc., above the pump plus the pressure (in feet) discharge nozzles, etc., above the pump plus the pressure (in feet) required at that level. For OPEN DISCHARGE SYSTEMS it is the elevation in feet of the highest water level above the pump.

G. Friction Losses in the Discharge System (in feet): friction losses caused by piping, valves, and fittings between the top of the well and the point of discharge.

H. Total Discharge Head (in feet): H = F + G.

I. Elevation of the Pump above the Top of the Well (in feet).

J. Total Pumping Head (in feet): J = E + H.

K. Setting of the Foot Valve or Strainer (in feet): vertical distance from the top of the well to the top of the foot valve or strainer.

L. Overall Length (in feet): vertical distance from the top of the well to the bottom of the foot valve or strainer.

M. Submergence (in feet): M=K–C. The ejector should be set as close to the bottom of its maximum depth rating as the well will permit.

Q. Capacity (in gpm or gph): rate of pumping.

Head and Pressure

Head and pressure are related in a very simple and direct manner. Since water has known weight, we know that a 231 foot long, one-inch square pipe holds 100 pounds of water. At the bottom of the one-inch square pipe we refer to the pressure as 100 pounds per square inch (psi). For any diameter pipe 231 feet high, the pressure will always be 100 psi at the bottom. Refer to Figure 8-F.

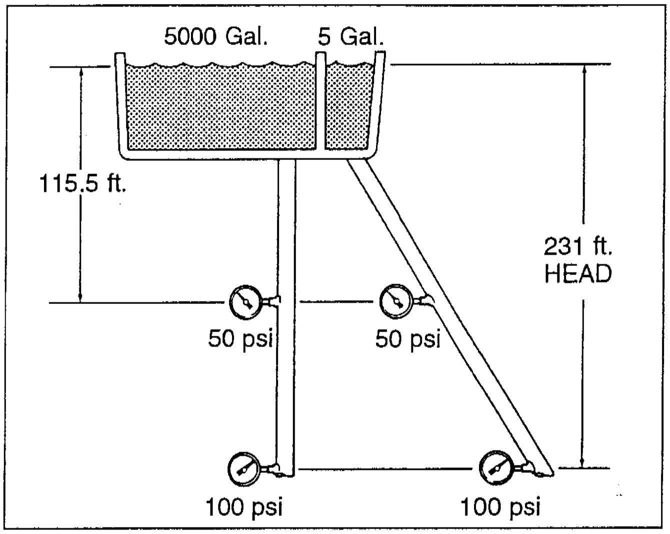


FIGURE 8-F
Figure 8-F illustrates the relationship between head and pressure.

Head is usually expressed in feet and refers to the height, or elevation, of the column of water. In Figure 8-F we see that a column of water 231 feet high creates a pressure reading of 100 psi. That same column of water is referred to as having 231 feet of **head.** Thus, for water, 231 feet of head is equivalent to 100 psi. Or, 2.31 feet of head equals 1 psi.

It should be noted that head and pressure readings for non-flowing water depend on the elevation of the water and not on the volume of water nor the size or length of piping.

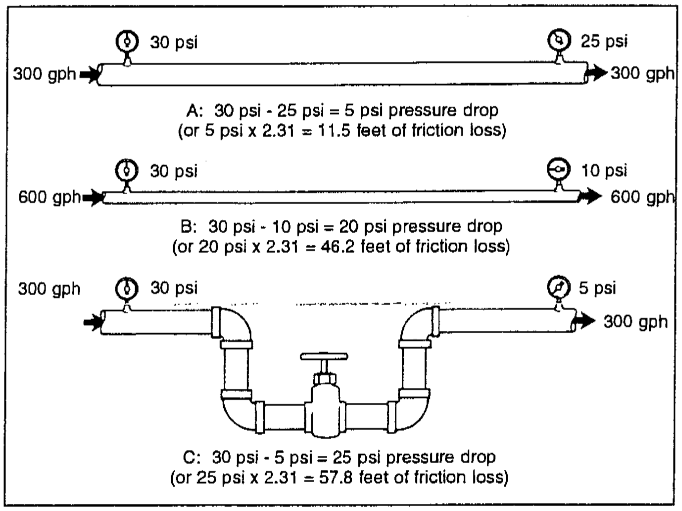
Flow and Friction Loss

Flow is measured as the volume of water moved over a given length of time. This is generally referred to as gallons per minute (gpm) for larger flows and gallons per hour (gph) for smaller flows. When water moves through a pipe, it must overcome resistance to flow caused by friction as it moves along the walls of the pipe as well as resistance caused by its own turbulence. Added together, these losses are referred to as **friction losses** and may significantly reduce system pressure.

Figure 8-G illustrates the relationship of flow and friction loss. For any flow through a level pipe the gauge pressure at the pipe inlet will be greater than the gauge pressure at the pipe outlet. The difference is attributed to friction losses caused by the pipe itself and by fittings.

In general, friction losses occur or are increased under the following conditions:

1. Friction losses result from flow through any size or length of pipe (Figure 8-G).
2. Friction losses increase as the flow rate increases or as the pipe size decreases (if the flow rate doubles for a given pipe size, friction losses quadruple, Figure 8-G).



A: 30 psi - 25 psi = 5 psi pressure drop
(or 5 psi x 2.31 = 11.5 feet of friction loss)

B: 30 psi - 10 psi = 20 psi pressure drop
(or 20 psi x 2.31 = 46.2 feet of friction loss)

C: 30 psi - 5 psi = 25 psi pressure drop
(or 25 psi x 2.31 = 57.8 feet of friction loss)

FIGURE 8-G
As shown in these illustrations friction losses increase with additional flow rates and the addition of valves and fittings.

Power is required to push water to a higher elevation, to increase outlet pressure, to increase flow rates, and to overcome friction losses. Good system design and common sense indicate that friction losses should be minimized whenever possible. The costs of larger pumps, bigger motors, and increased power consumption to overcome friction losses must be balanced against the increased cost of larger, but more efficient, system piping. In either case, unnecessary valves and fittings should be eliminated wherever possible.

Submersible Pumps vs. Jet Pumps

Submersible and jet pumps are both used in domestic groundwater systems. When high flow rates and pressure settings are required at high operating efficiencies, submersible pumps are generally preferred. Submersible pumps have the advantage of performing well both in shallow well applications as well as at depths to 2,000 feet. An extensive range of submersible pump models is also available allowing a precise match to exact system requirements.

Convertible jet pumps are sometimes an economical alternative to submersibles, especially in shallow well installations of 25 feet or less. The pumps are less expensive, installation is simplified, and they are easily converted for deep well installations down to 100 feet (Figure 8-H).

In "weak" well applications where the pump lowers the water level in the well faster than the well can replenish itself, a deep well jet pump with a tail pipe is particularly effective when flow requirements are relatively small. By adding 35 feet of tail pipe below the jet assembly with the foot valve attached to the bottom, it will not be possible to pull the well down and allow air to enter the system. Pump delivery remains at 100% of the rated capacity down to the level of the jet assembly. If the water level falls below that point, flow decreases in proportion to the drawdown as shown in Figure 8-I. When pump delivery equals well inflow, the water level remains constant until the pump shuts off. At 33.9 feet of drawdown the pump will no longer deliver water but the foot valve will remain fully submerged.

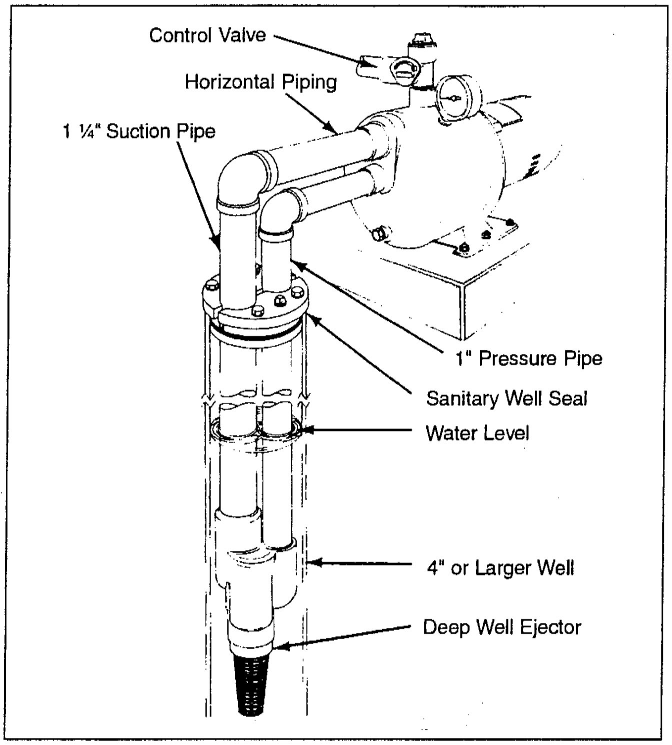


FIGURE 8-H
Figure 8-H illustrates a convertible jet pump set for deep well use (to 100 feet).

Final Pump Selection

Final pump selection will depend upon specific application requirements and cost considerations. Regardless of the pump type, system flow and head requirements (discussed in detail in Part 2) must be determined prior to actual pump selection.

Flow requirement will be determined by the size of the house or farm (including the number of bathrooms, outlets and appliances), the size of family, and the number of farm animals, if applicable.

Total Pumping Head must be calculated to ensure that the pump selected will meet all head or discharge pressure requirements. Total pumping head is the combination of the total suction lift (or lift in well), plus the pump discharge head (consisting of the elevation from the pumping water level to pressure tank plus pressure tank discharge pressure), plus all system friction losses.

Total Dynamic Head is equivalent to total pumping head plus velocity head. In most residential systems, velocity head is negligible. Because of this, the velocity head term has been left out of future examples and formulas. From the information gathered on flow and head requirements, a specific submersible or jet pump may be selected and an appropriately sized pressure tank ordered.

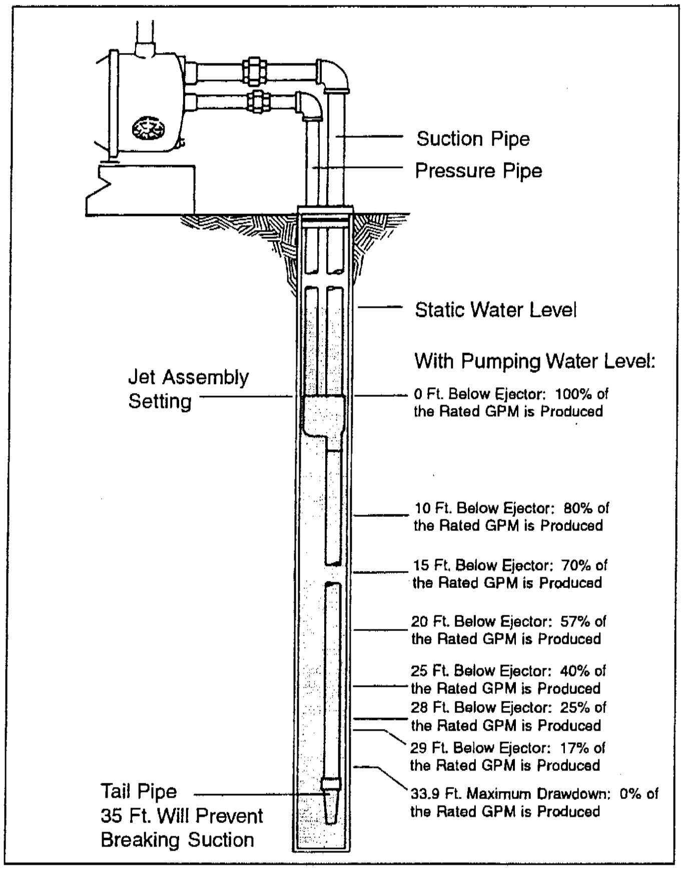


FIGURE 8-I
Figure 8-I illustrates the use of a tail pipe on a deep well convertible jet pump to compensate for weak well conditions.

Submersible Pump Cable Selection Charts (60 Hz)

CABLE LENGTH SELECTION TABLES

The following table (Table 8-Q(2)) lists the recommended copper cable sizes and various cable lengths for submersible pump motors. Proper wire size will ensure that adequate voltage will be supplied to the motor.

This table complies with the 1978 edition of the National Electric Table 310-16, Column 2 for 75°C wire. The ampacities (current carrying properties of a conductor) have been divided by 1.25 per the N.E.C., Article 430-22, for motor branch circuits based on motor amps at rated horsepower.

To assure adequate starting torque, the maximum cable lengths are calculated to maintain 95% of the service entrance voltage at the motor when the motor is running at maximum nameplate amps. Cable sizes larger than specified may always be used and will reduce power usage.

The use of cables smaller than the recommended sizes will void the warranty. Smaller cable sizes will cause reduced starting torque and poor motor operation.

CALCULATING MIXED CABLE SIZES

In a submersible pump installation any combination of cable sizes may be used as long as the total percentage length of the individual cables does not exceed 100%. Mixed cable sizes are most often encountered when a pump is being replaced with a larger horsepower model and part of the old cable will be left in place.

In the following example, a 2 HP, 230 volt, 1 phase pump is being installed to replace a smaller model. The 115 feet of buried #12 cable located between the service entrance and the well head will be used in the replacement installation. The well driller must be able to calculate the required size of cable in the well to connect the new motor at a setting of 270 feet.

Cable Size Calculation:
Step 1–Check Table 8-Q(2) to see if the 115 feet of existing #12 cable is large enough to provide current to the larger 2 HP replacement pump. The table tells us that #12 cable is adequate for a maximum length of 250 feet.

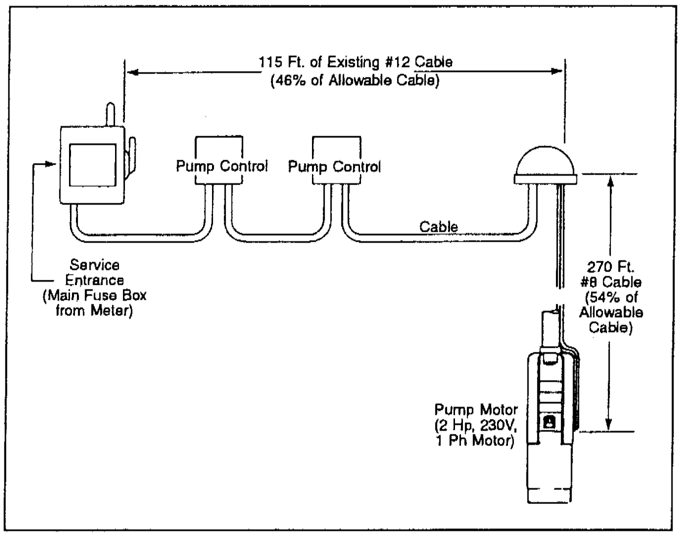


FIGURE 8-Q(1)
Example of Mixed Cable Installation

Step 2–Since 250 feet is the maximum allowable cable length for the #12 cable, calculate the percent used by the 115-foot run. (115 ft. ÷ 250 ft. = 46%)

Step 3–With 46% of the total allowable cable used between the service entrance and the well head, 54% remains for use in the well (100% - 46% = 54%). Therefore, the 270 feet of cable required in the well can utilize only 54% of the total feet allowed in the table.

Step 4–From Table 8-Q(2) determine the proper size cable required for the 2 HP pump set at 270 feet. (Remember, you are limited to 54% of the length listed in the table.) A check of #10 cable at 2 HP indicates that only 210 feet of this cable could be used (390 ft. x 54% = 210 ft.). Since this is less than the 270 required, the next larger size should be tried. For #8 cable, 54% of 620 feet = 335 feet. ***The #8 cable is suitable for use in the well at a pump setting of 270 feet.***

See Chart 8-Q(2) next page.

MAXIMUM MOTOR CABLE LENGTH

TABLE 8-Q(2)
Single Phase 60Hz

(Motor Service to Entrance)

Motor Rating		Copper Wire Size												
Volts	**HP**	**14**	**12**	**10**	**8**	**6**	**4**	**2**	**0**	**00**	**000**	**0000**	**250**	**300**
115	1/3	130	210	340	540	840	1300	1960	2910					
	1/2	100	160	250	390	620	960	1460	2160					
230	1/3	550	880	1390	2190	3400	5250	7960						
	1/2	400	650	1020	1610	2510	3880	5880						
	3/4	300	480	760	1200	1870	2890	4370	6470					
	1	250	400	630	990	1540	2380	3610	5360	6520				
	1½	190	310	480	770	1200	1870	2850	4280	5240				
	2	150	250	390	620	970	1530	2360	3620	4480				
	3	120	190	300	470	750	1190	1850	2890	3610				
	5			180	280	450	710	1110	1740	2170				
	7½				200	310	490	750	1140	1410				
	10					250	390	600	930	1160				

Three Phase 60Hz

Volts	HP	14	12	10	8	6	4	2	0	00	000	0000	250	300
208	1½	310	500	790	1260									
	2	240	390	610	970	1520								
	3	180	290	470	740	1160	1810							
	5		170	280	440	690	1080	1660						
	7½			200	310	490	770	1180	1770					
	10				230	370	570	880	1330	1640				
	15					250	390	600	910	1110	1340			
	20						300	460	700	860	1050	1270		
	25							370	570	700	840	1030	1170	
	30							310	470	580	700	850	970	1110
230	1½	360	580	920	1450									
	2	280	450	700	1110	1740								
	3	210	340	540	860	1340	2080							
	5		200	320	510	800	1240	1900						
	7½			230	360	570	890	1350	2030					
	10				270	420	660	1010	1520	1870				
	15					290	450	690	1040	1280	1540			
	20						350	530	810	990	1200	1450		
	25						280	430	650	800	970	1170	1340	
	30							350	540	660	800	970	1110	1270
460	1½	1700												
	2	1300	2070											
	3	1000	1600	2520										
	5	590	950	1500	2360									
	7½	420	680	1070	1690	2640								
	10	310	500	790	1250	1960	3050							
	15			540	850	1340	2090	3200						
	20			410	650	1030	1610	2470	3730					
	25				530	830	1300	1990	3010	3700				
	30				430	680	1070	1640	2490	3060	3700			
	40						790	1210	1830	2250	2710	3290		
	50						640	980	1480	1810	2190	2650	3010	
	60							830	1250	1540	1850	2240	2540	2890
	75								1030	1260	1520	1850	2100	2400
	100									940	1130	1380	1560	1790
	125											1080	1220	1390
	150												1050	1190
	200												1080	1300
	250													1080
575	1½	2620												
	2	2030												
	3	1580	2530											
	5	920	1480	2330										
	7½	660	1060	1680	2650									
	10	490	780	1240	1950									
	15		530	850	1340	2090								
	20			650	1030	1610	2520							
	25			520	830	1300	2030	3110						
	30				680	1070	1670	2560	3880					
	40					790	1240	1900	2860	3510				
	50						1000	1540	2310	2840	3420			
	60						850	1300	1960	2400	2890	3500		
	75							1060	1600	1970	2380	2890	3290	
	100								1190	1460	1770	2150		2790

CAUTION: Use of wire size smaller than listed will void warranty.

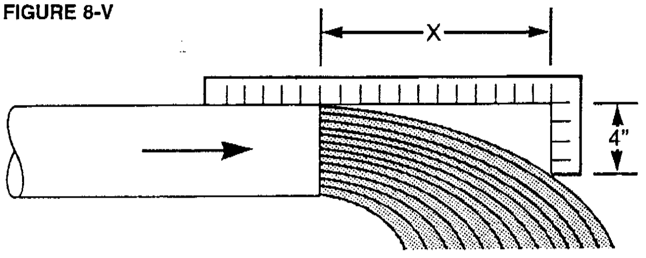
Notes:
1. If aluminum conductor is used, multiply lengths by 0.5 Maximum allowable length of aluminum is considerably shorter than copper wire of same size.
2. The portion of the total cable which is between the service entrance and a 3ø motor starter should not exceed 25% of the total maximum length to assure reliable starter operation. Single-phase control boxes may be connected at any point of the total cable length.
3. Cables #14 to #0000 are AWG sizes, and 250 to 300 are MCM sizes.

Calculating Discharge Rate by Using the Horizontal Open Discharge Method

The most reliable method of measuring flow is to use a flow meter. When a flow meter is not available, however, it is possible to estimate the discharge capacity by constructing an "L" shaped measuring stick similar to that shown in Figure 8-V. With the water flowing from the pipe, place the long end of the "L" on top of the pipe. Position the "L" so that the end of the short 4-inch side just touches the stream of water as the stream slants downward. Note the horizontal distance "X" from this point to the open end of the discharge pipe. With the value "X" and and the nominal inside diameter of the pipe, use Table 8-X to find the discharge rate in gallons per minute.

EXAMPLE: Horizontal distance "X" is measured to be 12 inches. The size of the pipe Is known to be 1½" (nominal diameter). Find 12 inches in the left hand column of the chart and move across to the 1½" pipe size column. Table 8-X indicates that the discharge rate is 40.0 gallons per minute.

FIGURE 8-V



Calculating Low Capacity Outlets: A simple procedure for measuring low capacity outlets such as small pump outlets, hose spigots, and faucets is to record the amount of time it takes to fill a container of known size.

EXAMPLE: Select a container of known size such as a 5-gallon paint bucket. With a watch, measure, in seconds, the amount of time it takes to fill the bucket. If it takes 30 seconds to fill a 5-gallon bucket, Table 8-W indicates that the flow is 10.0 gallons per minute. To obtain gallons per hour (gph) multiply 10.0 x 60 to obtain 600 gph.

TABLE 8-W

Discharge Rate in Gallons Per Minute (GPM) for Low Capacity Systems

Capacity of Container (Gallons)	Time (in seconds) to Fill Container							
	10	15	20	30	45	60	90	120
	Discharge Rate in Gallons Per Minute (GPM)							
1	6.0	4.0	3.0	2.0	1.3	1.0	.7	.5
3	18.0	12.0	9.0	6.0	4.0	3.0	2.0	1.5
5	30.0	20.0	15.0	10.0	6.7	5.0	3.3	2.5
10	60.0	40.0	30.0	20.0	13.3	10.0	6.7	5.0

NOTE: Multiply gallons per minute (GPM) by 60 to obtain gallons per hour (GPH).

Calculating Distance to Water Level

Install ⅛" or ¼" pipe or tubing into the well so that the end of the tubing extends 10 to 20 feet below the lowest possible pumping water level. Be sure that all joints in the tubing are airtight. As the tubing is lowered into the well measure its length. Record the measurement.

TABLE 8-X

Discharge Rate in Gallons Per Minute (GPM) for Large Capacity Systems

Horz. Dist.(X) Inches	Nominal Pipe Size (in Inches)									
	1	1 ¼"	1 ½"	2"	2 ½"	3"	4"	5"	6"	8"
	Discharge Rate in Gallons Per Minute (GPM)									
4	5.7	9.8	13.3	22.0	31	48	83			
5	7.1	12.2	16.6	27.5	39	61	104	163		
6	8.5	14.7	20.0	33.0	47	73	125	195	285	
7	10.0	17.1	23.2	38.5	55	85	146	228	334	380
8	11.3	19.6	26.5	44.0	62	97	166	260	380	665
9	12.8	22.0	29.8	49.5	70	110	187	293	430	750
10	14.2	24.5	33.2	55.5	78	122	208	326	476	830
11	15.6	27.0	36.5	60.5	86	134	229	360	525	915
12	17.0	29.0	40.0	66.0	94	146	250	390	570	1000
13	18.5	31.5	43.0	71.5	102	158	270	425	620	1080
14	20.0	34.0	46.5	77.0	109	170	292	456	670	1160
15	21.3	36.3	50.0	82.5	117	183	312	490	710	1250
16	22.7	39.0	53.0	88.0	125	196	334	520	760	1330
17		41.5	56.5	93.0	133	207	355	550	810	1410
18			60.0	99.0	144	220	375	590	860	1500
19				100.0	148	232	395	620	910	1580
20					156	244	415	650	950	1660
21						256	435	685	1000	1750

Once the tubing is fixed in a stationary position at the top of the well, connect an air line and pressure gauge. With a tire pump or other air supply, pump air into the line until the pressure gauge reaches a point where it doesn't read any higher. Record the pressure gauge reading at this point.

Figure 8-Y illustrates a typical method for measuring distance to water level:

X = Distance to water level (in feet). This figure to be determined.

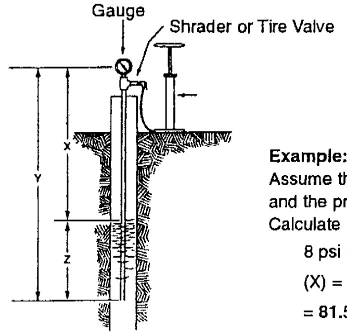
Y = Total length of air line (in feet).

Z = Length of submerged air line. This value is obtained from the pressure gauge reading which reads in pounds per square inch (psi). Multiply the pressure gauge reading by 2.31 to obtain the length of the submerged air line in feet.

Distance to water level (X) = (Y) - (Z)
= The total length of the air line (Y) minus the length of the submerged portion of the air line (Z).

Figure 8-Y

Calculating the distance to water level.



Example:
Assume that the air line is 100 feet long and the pressure gauge reads 8 psi.
Calculate the distance to water level (X).
8 psi x 2.31 = 18.5 feet
(X) = 100 feet (Y) - 18.5 feet (Z)
= 81.5 feet = distance to water level

FORMULAS

TEMPERATURE CONVERSIONS:

$$\text{Degrees } \mathbf{C} = \frac{5}{9} \times (\text{Degrees F} - 32)$$

$$\text{Degrees } \mathbf{F} = \left(\frac{9}{5} \times \text{Degrees C}\right) + 32$$

Area of a Circle:
$\text{Area} = \pi r^2$

Circumference of a Circle:
$\text{Circumference} = 2 \pi r$
$r = \text{radius}$
$\pi = 3.14$

Volume of a Tank or Cistern:
$3.14 \times (\text{radius of tank})^2 \times (\text{ht. of tank}) \times 7.48 = \text{Gallons}$
Radius and height of tank measured in feet
7.48 = number of gallons per cubic foot of water

WORK, POWER, AND EFFICIENCY:

The amount of work required to lift 1 pound to a height of 1 foot is defined as 1 ft.-lb. To lift 100 pounds to a height of 60 feet is 100 pounds x 60 feet = 6,000 ft-lbs. This amount of energy remains the same whether it takes one minute or one hour to lift the weight. The rate of working, however, is referred to as **power** and was 6,000 ft-lbs. per minute in the first case and 100 foot pounds per minute in the second case.

Power can be represented either mechanically or electrically. **Mechanical power** is measured in horsepower (HP). One HP is the theoretical power required to raise 33,000 pounds to a height of one foot in one minute, or:

1 HP = 33,000 ft.-lb./minute
= 550 ft.-lb./second

Electrical power is measured in watts(w) or kilowatts(kw), and:

1,000 w = 1 kw = 1.34 hp, or
1 HP = 745 w = 0.746 kw

WATER HORSEPOWER (WHP):

Water horsepower is the power required to raise water at a specified rate against a specified head, assuming 100% efficiency.

$$\text{WHP} = \frac{\text{GPM} \times \text{Total Pumping Head}}{3{,}960}$$

BRAKE HORSEPOWER (BHP):

Brake horsepower is based on test data and can be either the horsepower developed at the motor shaft (motor output) or that absorbed at the pump shaft (pump input).

$$\text{Pump BHP} = \frac{\text{WHP} \times 100}{\text{Pump Efficiency (\%)}}$$

$$= \frac{\text{GPM} \times \text{Total Pumping Head} \times 100}{3{,}960 \times \text{Pump Efficiency (\%)}}$$

$$\text{Motor BHP} = \frac{\text{Power input} \times \text{Motor Efficiency (\%)}}{100}$$

$$= \frac{1.34 \times \text{kw input} \times \text{Motor Efficiency (\%)}}{100}$$

PUMP EFFICIENCY:

Pumps and motors, like all machines, are not 100% efficient. Not all of the energy supplied to them is converted into useful work. Pump efficiency is the ratio of power output to power input, or:

$$\text{Efficiency (\%)} = \frac{\text{Power Output} \times 100}{\text{Power Input}}$$

$$\text{Pump Eff. (\%)} = \frac{\text{WHP} \times 100}{\text{Pump BHP (Input)}}$$

$$= \frac{\text{GPM} \times \text{Total Pumping Head} \times 100}{3960 \times \text{Pump BHP (Input)}}$$

$$\text{Motor Eff. (\%)} = \frac{\text{Motor BHP (Output)} \times 100}{1.34 \times \text{kw input}}$$

$$\text{Plant Eff. (\%)} = \frac{\text{GPM} \times \text{Total Pumping Head} \times 100}{5{,}300 \times \text{kw Input}}$$

ELECTRIC POWER (AC):

E = Electrical pressure (volts). Similar to hydraulic head.
I = Electrical current (amps). Similar to rate of flow.
W = Electrical power (watts) = E x I x PF
kw = Kilowatt (1,000 watts)
kw-hr. = Kilowatt-hour = 1,000 watts for one hour
Apparent Power = E x I = volt-amperes
PF = Power Factor = Useful Power ÷ Apparent Power

Power Calculations for Single-Phase Power
W (Watts) = E x I x PF
NOTE: When measuring single-phase power use a single-phase wattmeter.

Input HP to motor = W ÷ 746 = 1.34 x kw

Power Calculations for Three-Phase Power
W (Watts) = 1.73 x E x I x PF
Where: E = effective (RMS) voltage between phases
I = average current in each phase
NOTE: When measuring three-phase power use either (1) three-phase wattmeter, (2) single-phase wattmeters, or the power company's revolving disc wattmeter.

When calculating power with a revolving disc wattmeter use the following formulas:

$$\text{kw input} = \frac{K \times R \times 3.60}{t}$$

$$\text{Input HP (to motor)} = \frac{K \times R \times 3{,}600}{746 \times t}$$

$$= \frac{K \times R \times 4.83}{t}$$

FORMULAS

$$\text{Motor BHP (output)} = \frac{\text{Input HP x Motor Eff.(\%)}}{100}$$

Where K = Meter constant = watts per revolution of revolving disc (value of K is marked on the meter nameplate or on the revolving disc). Where current transformers are used, multiply meter constant by current transformer ratio.

R = Number of disc revolutions counted.
t = Time in seconds for R revolutions.

CALCULATING OPERATING COSTS OF PUMPS:
Costs in Cents per 1,000 Gallons:

$$\text{Cost (¢)} = \frac{\text{kw Input x r x 1,000}}{\text{GPH}}$$

Cost in Cents per Acre-Inch

$$\text{Cost (¢)} = \frac{\text{kw Input x r x 452.6}}{\text{GPM}}$$

Where: r = cost of power in cents per kw-hr.

FRICTION LOSS TABLES

Friction Loss Table – SCH 40 STEEL PIPE

(Friction Loss in Feet of Head Per 100 Feet of Pipe)

		1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"
GPM	GPH	ID 0.622"	ID 0.824"	ID 1.049"	ID 1.380"	ID 1.610"	ID 2.067"	ID 2.469"	ID 3.068"	ID 4.026"
2	120	4.8								
3	180	10	2.5							
4	240	17.1	4.2							
5	300	25.8	6.3	1.9						
6	360	36.5	8.9	2.7						
7	420	48.7	11.8	3.6						
8	480	62.7	15	4.5						
9	540	78.3	18.8	5.7						
10	600	95.9	23	6.9	1.8					
12	720		32.6	9.6	2.5	1.2				
14	840		43.5	12.8	3.3	1.5				
16	960		56.3	16.5	4.2	2				
20	1,200		86.1	25.1	6.3	2.9				
25	1,500			38.7	9.6	4.5	1.3			
[illegible]	1,800			54.6	13.6	6.3	1.8			
[illegible]	2,100			73.3	18.2	8.4	2.4			
40	2,400			95	23.5	10.8	3.1	1.3		
45	2,700				29.4	13.5	3.9	1.6		
50	3,000				36	16.4	4.7	1.9		
60	3,600				51	23.2	6.6	2.7		
70	4,200				68.8	31.3	8.9	3.6	1.2	
80	4,800				89.2	40.5	11.4	4.6	1.6	
90	5,400					51	14.2	5.8	2	
100	6,000					62.2	17.4	7.1	2.4	
120	7,200						24.7	10.1	3.4	
140	8,400						33.2	13.5	4.5	1.2
160	9,600						43	17.5	5.8	1.5
200	12,000						66.3	27	8.9	2.3
260	15,600							45	14.8	3.7
300	18,000							59.6	19.5	4.9

Friction Loss Table – SCH 40 PVC

(Friction Loss in Feet of Head Per 100 Feet of Pipe)

		1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"
GPM	GPH	ID 0.622"	ID 0.824"	ID 1.049"	ID 1.380"	ID 1.610"	ID 2.067"	ID 2.469"	ID 3.068"	ID 4.026"
2	120	4.1								
3	180	8.7	2.2							
4	240	14.8	3.7							
5	300	22.2	5.7	1.8						
6	360	31.2	8	2.5						
7	420	41.5	10.6	3.3						
8	480	53	13.5	4.2						
9	540	66	16.8	5.2						
10	600	80.5	20.4	6.3	1.7					
12	720		28.6	8.9	2.3	1.1				
14	840		38	11.8	3.1	1.4				
16	960		48.6	15.1	4	1.9				
20	1,200		60.5	22.8	6	2.8				
25	1,500			38.7	9.1	4.3	1.3			
30	1,800				12.7	6	1.8			
35	2,100				16.9	8	2.4			
40	2,400				21.6	10.2	3	1.1		
45	2,700				28	12.5	3.8	1.4		
50	3,000					15.4	4.6	1.7		
60	3,600					21.6	6.4	2.3		
70	4,200					28.7	8.5	3	1.2	
80	4,800					36.8	10.9	3.8	1.4	
90	5,400					45.7	13.6	4.8	1.8	
100	6,000					56.6	16.5	5.7	2.2	
120	7,200						23.1	8	3	
140	8,400						30.6	10.5	4	1.1
160	9,600						39.3	13.4	5	1.4
200	12,000						66.3	20.1	7.6	2.1
260	15,600							32.4	12.2	3.4
300	18,000							42.1	15.8	4.4

Friction Loss Table – VALVES and FITTINGS

(Friction Loss in Equivalent Number of Feet of Straight Pipe)

TYPE OF FITTING AND APPLICATION	PIPE AND FITTING	NOMINAL SIZE OF FITTING AND PIPE						
		1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"
		EQUIVALENT LENGTH OF PIPE(IN FEET)						
Insert Coupling	Plastic	3	3	3	3	3	3	3
Threaded Adapter (Plastic to Thread)	Plastic	3	3	3	3	3	3	3
90° Standard Elbow	Steel	2	2	3	4	4	5	6
	Plastic	2	2	3	4	4	5	6
Standard Tee (Flow Through Run)	Steel	1	2	2	3	3	4	4
	Plastic	1	2	2	3	3	4	4
Standard Tee (Flow Through Side)	Steel	4	5	6	7	8	11	13
	Plastic	4	5	6	7	8	11	13
Gate Valve[1]	Steel	1	1	1	1	2	2	2
Swing Check Valve[1]	Steel	5	7	9	12	13	17	21

NOTES:

Based on schedule 40 steel and plastic fittings.

Figures given are friction losses in terms of Equivalent Lenghts of straight pipe.

Friction loss figures are for screwed valves and are based equivalent lengths of steel pipe.

CONVERSION TABLES

UNITS OF FLOW

CONVERT TO ➧ CONVERT FROM ⬇	U.S. GALLONS PER MINUTE	MILLION U.S. GALLONS PER DAY	CUBIC FEET PER SECOND	CUBIC METERS PER HOUR	LITERS PER SECOND
	MULTIPLY BY:				
(1) U.S. GALLON PER MINUTE	1	0.001440	0.00223	0.2271	0.0631
(1) MILLION U.S. GALLONS PER DAY	694.5	1	1.547	157.7	43.8
(1) CUBIC FOOT PER SECOND	448.83	0.646	1	101.9	28.32
(1) CUBIC METER PER HOUR	4.403	0.00634	0.00982	1	0.2778
(1) LITER PER SECOND	15.85	0.0228	0.0353	3.60	1

UNITS OF PRESSURE AND HEAD

CONVERT TO ➧ CONVERT FROM ⬇	LBS. PER SQUARE INCH	FEET OF WATER ①	METERS OF WATER ①	INCHES OF MERCURY ②	ATMOSPHERES	KILOGRAMS PER SQUARE CM
	MULTIPLY BY:					
(1) LB. PER SQUARE INCH	1	2.31	0.704	2.04	0.0680	0.0703
(1) FOOT OF WATER ①	0.433	1	0.305	0.881	0.02945	0.0304
(1) METER OF WATER ①	1.42	3.28	1	2.89	0.0966	.1
(1) INCH OF MERCURY ②	0.491	1.135	0.346	1	0.0334	0.0345
(1) ATMOSPHERE (at Sea Level)	14.70	33.96	10.35	29.92	1	1.033
(1) KILOGRAM PER SQUARE CM	14.22	32.9	10	28.96	0.968	1

NOTES: ① Equivalent units are based on density of fresh water at 68°F.
② Equivalent units are based on density of mercury at 32°F.
Each 1,000 feet of ascent decreases pressure about ½ pound per square inch.

UNITS OF VOLUME AND WEIGHT

CONVERT TO ➧ CONVERT FROM ⬇	U.S. GALLONS	IMPERIAL GALLONS	CUBIC INCHES	CUBIC FEET	ACRE FEET	POUNDS ③	CUBIC METERS	LITERS
	MULTIPLY BY:							
(1) U.S. GALLON	1	0.833	231	0.1337	3.07×10^{-6}	8.34	0.003785	3.785
(1) IMPERIAL GALLON	1.201	1	277.4	0.1605	3.69×10^{-6}	10.01	0.004546	4.546
(1) CUBIC INCH	0.00433	0.00360	1	0.000579	—	0.0361	1.64×10^{-5}	0.0164
(1) CUBIC FOOT	7.48	6.23	1728	1	2.30×10^{-5}	62.4	0.02832	28.32
(1) ACRE FOOT	325,850	271,335	—	43,560	1	2.7×10^{6}	1233.5	1.23×10^{6}
(1) POUND ③	0.120	0.0998	27.7	0.0160	3.68×10^{-7}	1	4.54×10^{-4}	0.454
(1) CUBIC METER	264.2	220	61,024	35.315	8.11×10^{-4}	2202	1	1000
(1) LITER	0.2642	0.220	61.024	0.0353	8.11×10^{-7}	2.202	0.001	1

NOTES: ③ Weight equivalent basis water at 60°F.

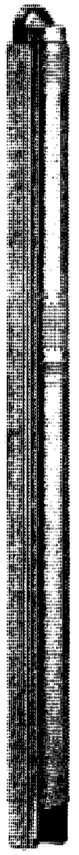
UNITS OF LENGTH

(1) Inch = 0.0833 Ft. = 0.0278 Yd. = 25.4 mm = 2.54 cm
(1) Ft. = 12 Inches = 0.333 Yd. = 30.48 cm = 0.3048 Meter
(1) Yard = 36 Inches = 3 Ft. = 91.44 cm = 0.9144 Meters

(1) Mile = 5280 Ft. = 1760 Yds. = 1.61 km = 1609 Meters
(1) Meter = 3.281 Ft. = 39.37 In. = 0.000621 Miles = 0.001 km
(1) Kilometer = 1000 m = 1093.61 Yds. = 0.62137 Miles = 3281 Ft.

SQ/SQE

Installation and Operating Instructions



- **High Starting Torque**
- **Soft Start**
  (2 seconds to reach maximum rpm, and maximum pressure)
- **Built-in "Smart" Motor Protection with automatic restart**
- **Simple Installation**
- **Communicate with SQE**
  (Through CU300 Status Box)

Please leave these instructions with the pump for future reference

GRUNDFOS®

Leaders in Pump Technology

SAFETY WARNING

Electrical Work

WARNING: Reduced risk of electric shock during operation of this pump requires the provision of acceptable grounding. If the means of connection to the supply connected box is other than grounded metal conduit, ground the pump back to the service by connecting a copper conductor (at least the size of the circuit supplying the pump) to the grounding screw provided within the wiring compartment.

Pre-Installation Checklist

1. Well Preparation

If the pump is to be installed in a new well then the well should be fully developed and bailed or blown free of cuttings and sand. The construction of the GRUNDFOS SQ/SQE submersibles makes it resistant to abrasion; however, no pump made of any material can forever withstand the destructive wear that occurs when constantly pumping sandy water.

If this pump is used to replace an oil-filled submersible or oil-lubricated line-shaft turbine in an existing well, the well must be blown or bailed clear of oil.

2. Make Sure You Have the Right Pump

Determine the maximum depth of the well, and the drawdown level at the pump's maximum capacity. Pump selection and setting depth should be made based on this data.

3. Pumped Fluid Requirements

Submersible well pumps are designed for pumping clear, cold water; free of air or gases. Decreased pump performance and life expectancy can occur if the water is not clear, cold or contains air or gases. Water temperature should not exceed 104°F.

A check should be made to ensure that the installation depth of the pump will always be at least three feet below the maximum drawdown level of the well. The bottom of the motor should never be installed lower than the top the screen or within five feet of the well bottom, as shown in fig.1.

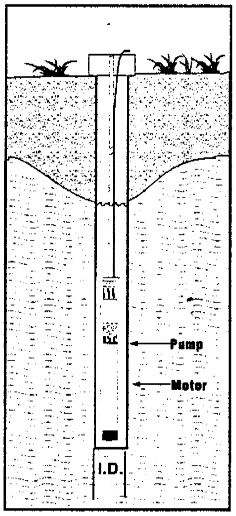


Fig. 1

4. Motor Cooling Requirements

To ensure proper motor cooling refer to the table below for minimum flow requirements:

Flow velocity past the motor	Maximum liquid temperature
0.0 f/s (free convection)	86° F(30°C)
Min. 0.5 f/s	104°F (40°C)

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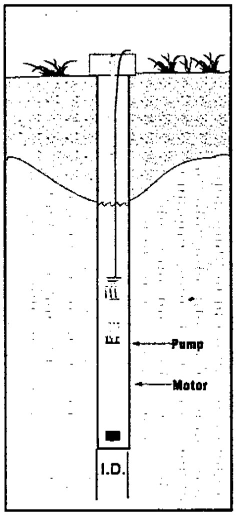

Fig. 1

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0.0 f/s (free convection)	86° F(30°C)
Min. 0.5 f/s	104°F (40°C)

Pre-Installation Checklist

To refill the motor, proceed as follows:

1. Remove the cable guard and separate the pump end from the motor.
2. Place the motor in vertical position with an inclination of approx. 10°.
3. Remove the filling plug using a screwdriver or a similar tool.
4. Inject motor liquid into the motor with a filling syringe or similar tool,see fig. 3.
5. To allow possible air to escape, move the motor from side to side. And turn the shaft.

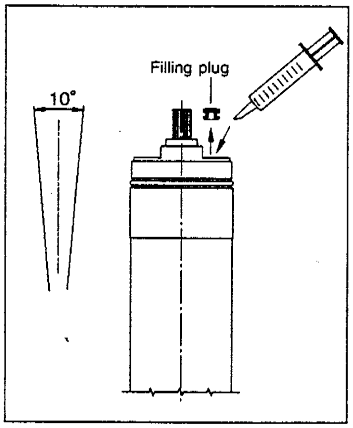


Fig. 3

6. Replace the filling plug and make sure it is tight.
7. Assemble pump end and motor.
8. Install the cable guard.

The pump is now ready for installation.

7. Installation Postions

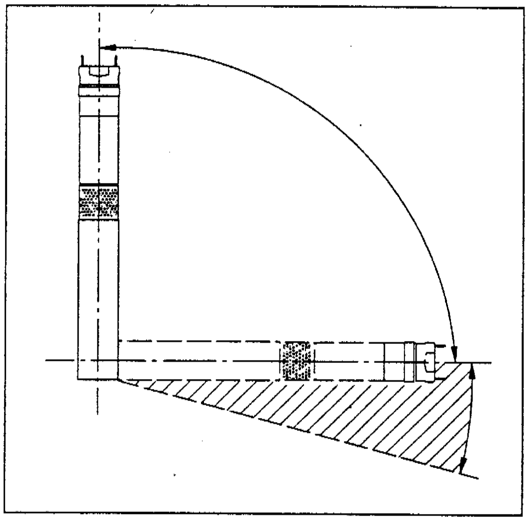


Fig. 4

Positional requirements
The pump is suitable for vertical as well as horizontal installation, however, the pump shaft must never fall below the horizontal plane, see fig. 4.

8. Electrical connection

General

The electrical connection should be carried out by an authorized electrician in accordance with local regulations.

⚠ **Before starting work on the pump, make sure the electricity supply has been switched off and that it cannot be accidentally switched on. The pump must be grounded. The pump must be connected to an external mains switch.**

The supply voltage, rated maximum current and power factor (PF) appear on the motor nameplate.

The required voltage for GRUNDFOS submersible MS3/MSE3 motors, measured at the motor terminals, is +6%/–10% of the nominal voltage during continuous operation (including variation in the supply voltage and losses in cables).

If the pump is connected to an installation where a Ground Fault circuit breaker (GFI) is used as additional protection, this circuit breaker must trip out when ground fault currents with DC content (pulsating DC) occur.

Supply voltage:1 x 100-115V or 1 x 200-240 V +6%/–10%, 50/60 Hz.

The current consumption can only accurately be measured by means of a true RMS instrument. If other instruments are used, the value measured will differ from the actual value.

The SQE pumps can be connected to a CU 300 status box.

Note: The pump must never be connected to a capacitor or to another type of control box other than a CU 300.

The pump must never be connected to an external frequency converter.

Motor protection

The motor has built-in automatic thermal overload protection and requires no additional motor protection.

Connection of motor

The motor can be connected directly to the main circuit breaker.

Start/stop of the pump will typically be done via a pressure switch, see fig. 5.

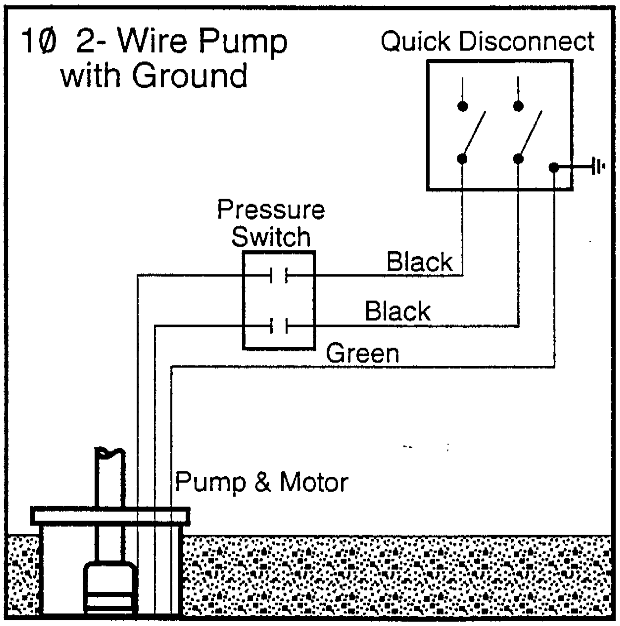
Note: The pressure switch must be rated for the maximum amps of the specific pump size.

9. Making the Wiring Connections

WARNING!

Reduced risk of electric shock during operation of this pump requires the provision of acceptable grounding. If the means of connection to the supply connected box is other than grounded metal conduit, ground the pump back to the service by connecting a copper conductor, at least the size of the circuit supplying the pump.

Single-Phase 2-wire Wiring Diagram for GRUNDFOS Motors



A capacitor or control box should NEVER be connected to a SQ/SQE submersible pump

Fig. 5

10. Cable Sizing

SINGLE-PHASE 60 HZ Maximum Cable Length Motor Service to Entrance

Motor Rating		Copper Wire Size								
VOLTS	HP	14	12	10	8	6	4	2	0	00
115	1/3	130	210	340	540	840	1300	1960	2910	
	1/2	100	160	250	390	620	960	1460	2160	
230	1/3	550	880	1390	2190	3400	5250	7960		
	1/2	400	650	1020	1610	2510	3880	5880		
	3/4	300	480	760	1200	1870	2890	4370	6470	
	1	250	400	630	990	1540	2380	3610	5360	6520
	1 1/2	190	310	480	770	1200	1870	2850	4280	5240

11. Splicing the Cable

Splice the drop cable with the motor cable. If the splice is carefully made, it will be as efficient as any other portion of the cable and will be completely watertight.

There are a number of cable splicing kits available today - epoxy filled, rubber-sealed, etc. Many perform well if the manufacturer's directions are followed carefully. If one of these kits is not used, we recommend the following method for splicing the motor cable to the drop cable:

Examine the motor cable and the drop cable carefully for damage.
Cut the motor leads off in a staggered manner. Cut the ends of the drop cable so that the ends match up with the motor leads. Be sure to match the colors.

Strip back and strip off one-inch of insulation from each lead, making sure to scrape the wire bare to obtain a good connection. Be careful not to damage the copper conductor when stripping off the insulation.

Insert a properly sized Sta-Kon-type connector on each pair of leads, again making sure that colors are matched. Using Sta-Kon crimping pliers, indent the lugs. Be sure to squeeze down hard on the pliers, particularly when using large cable.

Form a piece of electrical putty tightly around each Sta-Kon. The putty should overlap on the insulation of the wire.

Use a good quality tape such as #33 Scotch Waterproof or Plymouth Rubber Company Slipknot Grey.
Wrap each wire and joint tightly for a distance of about 2½ inches on each side of the joint.

Make a minimum of four passes over each joint and overlap each pass approximately one inch to assure a completely watertight seal.

Installation Procedures

General
Note: Do not lower or lift the pump by means of the motor cable.

The loose data plate supplied with the pump should be placed close to the installation site.

12. Installing the cable plug to the motor

The cable plug supplied with the motor is factory-greased. Check that the plug is greased correctly.

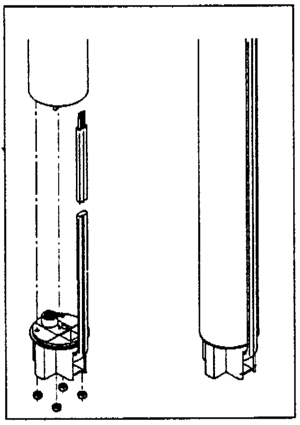


Fig. 6

To install the cable plug, proceed as follows:

1. Check that the cable is of the correct type, cross-section and length.
2. Check that the mains on the location has correct connection to ground.
3. Check that the motor socket is clean and dry.
4. Press the cable plug into the motor socket. The plug will only fit one way, see fig. 6.
5. Install and tighten the four nuts, see fig. 6. When the plug has been installed, there must not be a clearance between the motor and the cable plug.

13. Installing the cable guard

To fit the cable guard, proceed as follows:

1. Make sure that the motor lead lies flat in the cable guard.
2. The two flaps of the cable guard must engage with the upper edge of the pump sleeve, see fig. 7.

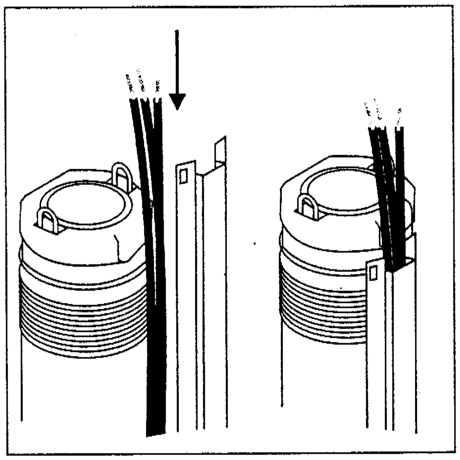


Fig. 7

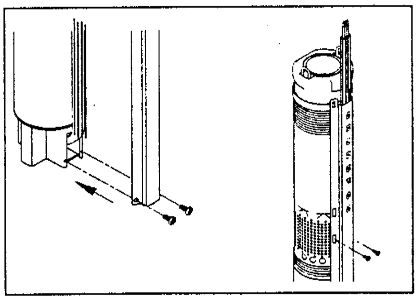


Fig. 8

3. Fasten the cable guard to the cable plug with the four screws supplied, see fig. 8.

14. Piping

- The pump should only be gripped by the two flats at the top of the pump, as shown in fig. 9.
- The pump can be installed vertically or horizontally. During operation, the pump must always be completely submerged in water.
- When plastic pipe is used, a stainless steel safety wire is recommended for lowering and lifting the pump. Fasten the wire to the eyelet on the pump, as shown in fig. 10.
- The threaded joints must be well cut and fit together tightly to ensure that they do not work loose.

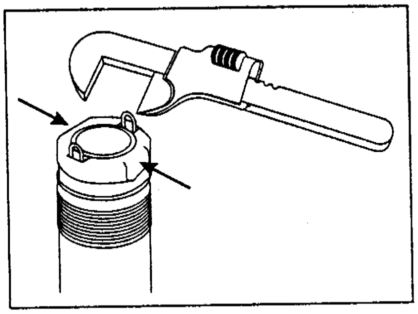


Fig. 9

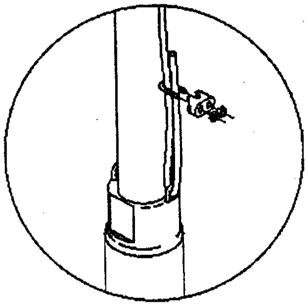


Fig. 10

15. Installing the Pump

Installation Depth

The dynamic water level should always be above the pump see fig. 11.

A = Dynamic water level
B = Static Water Level
C = Minimum 3" well diameter
D = Drawdown
E = Installation depth below static water level. Maximum 500 feet

Procedures

To install the pump, follow these steps:

1. Install the enclosed data plate sticker at the well head.
2. Check the well for proper clearance — the well must be at least 3" in diameter. It is a good idea to check the well for clearance using a plumb ring (2.95 ø x 10 in.).
3. Attach the first section of riser pipe to the pump.

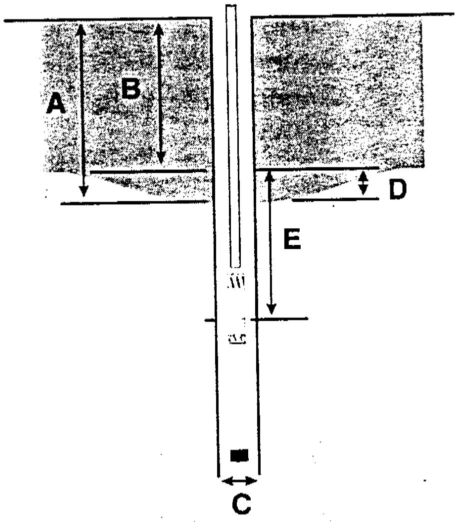


Fig. 11

16. Installing the Pump(cont.)

4. Lower the pump into the well. Make sure the motor cable is not damaged when the pump is lifted or lowered into the well — especially in 3" wells. ***NOTE*:** **Do not lower or lift the pump using the motor cable.**
5. When the pump has been installed to the required depth, the installation should be finished by means of a well seal. Note that the dynamic water level should always be above the pump.
6. Loosen the safety wire so that it becomes unloaded and lock it to the well seal using a cable clamp.
7. Attach the supplemental information label at the electrical installation site.
8. Complete the electrical connections. **Remember that a capacitor or a control box should NEVER be connected to a SQ/SQE submersible pump.**

Installation depths

Maximum installation depth: below the static water level: 500 feet,
Minimum installation depths: 1.75' below the dynamic water level:

Vertical installation:

During start-up and operation, the pump must always be completely submerged in water.

Horizontal installation:

The pump must be installed at least 1.75 ft. below the dynamic water level. If there is a risk that the pump might be covered by mud, the pump must always be placed in a flow sleeve.

Note: Do not lower or lift the pump with the motor cable.

17. Generator Operation

- It is OK to operate the SQ/SQE with a generator.

The generator must be sized 10% above the pumps P1 (Input Power) values.

Motor HP	Min. Generator Size (Watts)
1/3 - 1/2 A	1000
1/2 - 3/4 B	1700
1- 1½ C	2000

18. Starting the Pump for the First Time

When the pump has been connected correctly, the pump should be started with the discharge valve closed approximately one-third. Due to the soft start feature, the pump takes approximately 2 seconds to develop full pressure.

Motor Cooling and Other Considerations

- Make sure the well is capable of yielding a minimum quantity of water corresponding to the pump capacity.
- Do not start the pump until it is completely submerged in the liquid.
- As the valve is being opened, the drawdown should be checked to ensure that the pump always remains submerged.
- To ensure the necessary cooling of the motor, the pump should never be set so low that it gives no water. If the flow rate suddenly falls, the reason might be that the pump is pumping more water than the well can yield. The pump must immediately be stopped and the fault remedied.

Water Impurities

- If there are impurities in the water, the valve should be opened gradually as the water becomes clearer. The pump should not be stopped until the water is clean, otherwise the pump parts and the check valve may become clogged.
- When the water is clean the valve should be fully opened.

Minimum flow rate

- To ensure the necessary cooling of the motor, the pump flow rate should never be set to a value lower than .2 gpm. If the flow rate suddenly falls, the reason might be that the pump is pumping more water than the well can yield. The pump must be stopped and the fault corrected.

Note: **The pump's dry-running protection is effective only within the recommended duty range of the pump.**

Note: **Do not let the pump run against a closed discharge valve for more than 5 minutes. When the discharge valve is closed, there is no cooling flow and there is a risk of overheating in motor and pump.**

Operating the Pump

Built-in protection

The motor incorporates an electronic unit which protects the motor in various situations.

In case of overload, the built-in overload protection will stop the pump for 5 minutes. After that period, the pump will attempt to restart.

If the pump is started and the well has not recovered, the pump will stop after 30 seconds.

If the pump has been stopped as a result of dry running, it will start automatically after 5 minutes.

Resetting the pump:

Switch off the electricity supply for 1 minute.

The motor is protected against the following conditions:

- dry running,
- voltage surges (up to 5000 V),
- overvoltage,
- undervoltage,
- overload
- overtemperature.

MS 3 Motors:

Note: All MS 3 motors are factory set to detect dry running conditions. However, it is important to ensure that the configurations of both the SQ pump and motor are the same configuration. Configurations can be found on both SQ pump and motor nameplates as " Config."

EXAMPLE: Config. A-2, must match the other nameplate A-2. See Technical Data on page 17 for quick referencing on all configurations.

MSE 3 Motors:

Note: To set Dry-Run limit in the MSE/SQE pumps, you need to connect the pump to a CU 300. Refer to CU 300 I&O for proper connections.

To set Dry-Run protection, follow these steps:

1. Start the pump against closed discharge.
2. Rapidly read the power consumption value (W) in the R100 display 2.5.
3. Multiply this value by 0.9.
4. Within the R100, go to display 4.6 and enter the new value (minimum power limit).
5. Go to display 4.7 and change the setting to "Active".

For further information on dry-running, refer to CU 300 I&O.

Maintenance and service:

The pumps are normally maintenance-free.

Deposits and wear may occur. For that purpose, service kits and service tools are available from GRUNDFOS. The GRUNDFOS Service Manual is available on request.

The pumps can be serviced at a GRUNDFOS service center.

19. Assembly of Pump and Motor

To assemble pump end and motor, proceed as follows:

1. Place the motor horizontally in a vice and tighten it, see fig. 12.
2. Grease the motor shaft end with the grease supplied with the motor.
3. Screw the pump end on the motor. A spanner may be used on the clamping faces of the pump part, see fig.12.
4. Install cable guard as described on page 7.

When pump end and motor have been assembled correctly, there must not be a clearance between pump end and motor.

To disassemble reverse procedure.

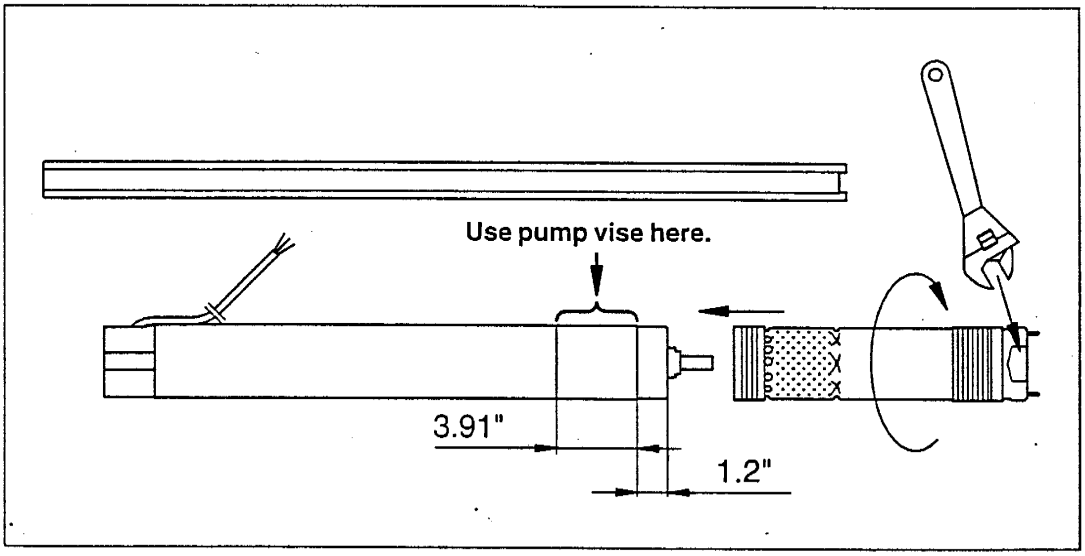


Fig. 12

Fault	Cause	Remedy
1. The pump does not run	a. The fuses are blown	Replace the blown fuses. If the new fuses blow too, check the electrical installation and the drop cable.
	b. The GFI circuit breaker has tripped.	Reset the circuit breaker.
	c. No electricity supply.	Contact the Electricity provider.
	d. The motor protection has cut off the electricity supply due to overload.	Check for motor/pump blockage.
	e. The drop cable is defective.	Repair/replace the pump/cable.
	f. Overvoltage has occured.	Check the electricity supply
2. The pump runs but gives no water.	a. The discharge is closed.	Open the valve
	b. No water or too low water level in well.	See item 3a.
	c. Check valve is stuck in it's closed position.	Pull the pump and clean or replace the valve.
	d. The suction strainer is closed.	Pull the pump and clean the strainer.
	e. The pump is defective.	Repair/replace the pump.
3. The pump runs at reduced capacity.	a. The drawdown is larger than anticipated.	Increase the installation depth of the pump, throttle the pump or replace it with a smaller capacity model.
	b. The valve s in the discharge pipe are partly closed/blocked.	Check and clean/replace the valves as necessary.
	c. The discharge pipe is partly chocked by impurities (Iron bacteria).	Clean/rplace the dischrge pipe.
	d. The non- return valve of the pump is blocked.	Pull the pump and check/replace the valve.
	e. The pump and the riser pipe are partly choked by impurities (Iron bacteria).	Pull out the pump. Check and clean or replace the pump, if necessary. Clean the pipes.
	f. The pump is defective.	Repair/replace the pump.
	g. Hole in discharge pipe.	Check and repair the piping.
	h. The riser pipe is defective.	Replace.
	i. Undervoltage has occurred.	Check the electricity supply.
4. Frequent starts and stops.	a. The differential of the pressure switch between the start and stop pressures is too small.	Increase the differential. However, the stop pressure must not exceed the operating pressure of the pressure tank, and the start pressure should be high enough to ensure sufficient water supply.
	b. The water level electrodes or level switches in the reservior have not been installed correctly	Adjust the intervals of the electrodes/level switches to ensure suitable time between the cutting-in and cutting-out of the pump. See installation and operating instructions for the automatic devices used. If the intervals between start/stop cannot be changed via the automatics, the pump capacity may be reduced by throttling the discharge valve.
	c. Checkvalve is leaking or stuck half-open.	Pull the pump and clean/replace the non-return valve.
	d. The supply voltage is unstable.	Check the electrical supply.
	e. The motor temperature is too high.	Check the water temperature.

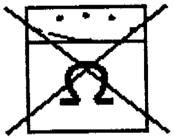
Troubleshooting

Instruments not allowed:

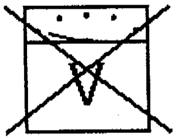
Note: The use of the following instruments is not allowed during fault finding:

Insulation Test

Resistance Test

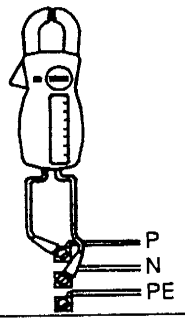


High-voltage Test



Note: When measuring, use RMS-instruments.

Checking the motor and cable:

1. Supply voltage 	Measure the voltage L1 (RMS) between phase and L2. Connect the voltmeter to the terminals at the connections.	The voltage should, when the motor is loaded, be within the range specified on Page 4, large variations in supply voltage indicate poor electricity supply, and the pump should be stopped until the problem has been corrected.
2. Current consumption 	Measure the current (RMS) while the pump is operating at a constant discharge head(if possible, at capacity where the motor is heavily loaded). For maximum current, see motor nameplate.	If the current exceeds the full load current, there are the following possible faults: Poor connection in the leads, possibly in the cable joint. Too low supply voltage, see item 1 on Page 13.

Environment

During handling, operation, storage and transport, all environment regulations dealing with the handling of hazardous materials must be observed.

⚠ **When the pump is taken out of operation, it must be ensured that no hazardous material is left in the pump and in the riser pipe, which can be injurous to persons and the environment.**

Disposal

Disposal of this product or parts of it must be carried out according to the following guidelines:

1. Use the local public or private waste collection service.
2. If such waste collection service does not exist or cannot handle the materials used in the product, please deliver the product or any hazardous materials from it to your nearest GRUNDFOS company or service center.

Technical Data

Supply Voltage:	1x200-240V +6%/-10%, 50/60 Hz, PE 1x100-115V +6%/-10%, 50/60 Hz, PE
Operation via Generator:	As a minimum, the generator output must be equal to the motor P1[KW] +10%
Starting Current:	The motor starting current is equal to the highest value stated on the motor nameplate
Starting:	Soft starting
Run-up Time:	Maximum : 2 seconds
Motor Protection:	The motor is protected against: Dry running, overvoltage, undervoltage, overload, overtemperature
Power Factor:	PF= 1
Service Factor:	0.33-0.50A[HP]-1.75 at 115V/230V 0.50-0.75A[HP]-1.4 at 230V 1.0 -1.5C[HP] -1.15 at 230V
Motor Cable: Length	3 Wire, 14 AWG XLPE 5 ft
Motor Liquid: **pH Values:**	Type SML 2 SQ and SQE: 5 to 9
Liquid Temperature:	The temperature of the pumped liquid must not exceed 104°F.
Note: if liquids with a viscosity higher than that of water are to be pumped, please contact GRUNDFOS	
Discharge Port:	5SQ/SQE- 1"NPT 10-15SQ/SQE- 1 1/4" NPT 22-30SQ/SQE- 1 1/2" NPT
STORAGE CONDITIONS	
Minimum Ambient Temperature: **Maximum Ambient Temperature:**	-4°F +140°F
Freeze Protection:	If the pump has to be stored after use, it must be stored on a frost-free location or it must be ensured that the motor liquid is frost-proof. (**The motor must be stored without being filled with motor liquid.**)
OPERATING CONDITIONS	
Minimum Ambient Fluid Temperature: **Maximum Ambient Fluid Temperature:**	34°F +104°F
APPROXIMATE DIMENSIONS AND WEIGHT	
Motor Dimensions (MS 3 & MSE 3):	
0.33-0.50A[hp]	20.9" length x 2.68" diameter
0.50-0.75B[hp]	20.9" length x 2.68" diameter
1.0-1.5C[hp]	22.3" length x 2.68" diameter
Motor Weights (MS 3 & MSE 3):	
0.33-0.50A[hp]	6.0 Lbs
0.50-0.75B[hp]	7.1 Lbs
1.0-1.5C[hp]	8.2 Lbs
Pump End Dimensions:	
Pump Diameter:	2.68"
Pump Diameter, incl. cable guard:	2.91"
Pump End Dimensions(min. and max.):	
5SQ/SQE	10.6" to 18.0"
10SQ/SQE	10.6" to 16.9"
15SQ/SQE	10.6" to 16.9"
22SQ/SQE	10.6" to 16.9"
30SQ/SQE	10.6" to 13.7"
Pump End Weights(min. and max.):	
All SQ/SQE Models	2.2 lbs to 3.5 lbs
Well Diameter (minimum):	3"
Installation Depth (Maximum):	500 feet, below static water level.

Technical Data

PUMP TYPE	HP	VOLTAGE	CONFIG.	MAX. AMPS
5SQ/SQE03A-90	1/3 A	230V/115V	A-2	3.9/7.8
5SQ/SQE03A-140	1/3 A	230V/115V	A-4	3.9/7.8
5SQ/SQE05A-180	1/2 A	230V/115V	A-5	4.9/9.8
5SQ/SQE05B-230	1/2 B	230V	B-8	4.9
5SQ/SQE05B-270	1/2 B	230V	B-9	4.9
5SQ/SQE07B-320	3/4 B	230V	B-6	7.6
5SQ/SQE10C-360	1 C	230V	C-2	7.6
5SQ/SQE10C-410	1 C	230V	C-10	7.6
5SQ/SQE10C-450	1 C	230V	C-7	7.6
10SQ/SQE03A-110	1/3 A	230V/115V	A-2	3.9/7.8
10SQ/SQE05A-160	1/2 A	230V/115V	A-4	4.9/9.8
10SQ/SQE05B-200	1/2 B	230V	B-3	4.9
10SQ/SQE07B-240	3/4 B	230V	B-4	7.6
10SQ/SQE10C-290	1 C	230V	C-2	7.6
10SQ/SQE10C-330	1 C	230V	C-9	7.6
10SQ/SQE15C-380	1 1/2 C	230V	C-5	11.1
15SQ/SQE03A-70	1/3 A	230V/115V	A-1	3.9/7.8
15SQ/SQE05A-110	1/2 A	230V/115V	A-3	4.9/9.8
15SQ/SQE05B-150	1/2 B	230V	B-1	4.9
15SQ/SQE07B-180	3/4 B	230V	B-5	7.6
15SQ/SQE10C-220	1 C	230V	C-1	7.6
15SQ/SQE10C-250	1 C	230V	C-3	7.6
15SQ/SQE15C-290	1 1/2 C	230V	C-9	11.1
22SQ/SQE03A-40	1/3 A	230V/115V	A-7	3.9/7.8
22SQ/SQE05A-80	1/2 A	230V/115V	A-6	4.9/9.8
22SQ/SQE05B-120	1/2 B	230V	B-2	4.9
22SQ/SQE07B-160	3/4 B	230V	B-5	7.6
22SQ/SQE10C-190	1 C	230V	C-4	7.6
22SQ/SQE15C-220	1 1/2 C	230V	C-6	11.1
30SQ/SQE05A-40	1/2 A	230V/115V	A-1	4.9/9.8
30SQ/SQE05B-90	1/2 B	230V	B-7	7.6
30SQ/SQE10C-130	1 C	230V	C-8	7.6
30SQ/SQE15C-170	1 1/2 C	230V	C-2	11.1

Technical Data

ACCESSORIES	
PRODUCT	**PART NUMBER**
CU 300	96422776
FLOW SLEEVE	96037505
GREASE	96037562
FLOW SWITCH .5 GPM 5-15SQE	96022967
FLOW SWITCH 1 GPM 22-30SQE	96022970
PRESSURE TRANSMITTER	96026030
CONSTANT PRESSURE KIT: 5-15SQE	96022968
(Includes CU300, Pressure Transducer & .5 GPM Flow Switch)	
CONSTANT PRESSURE KIT: 22-30SQE	96022971
(Includes CU300, Pressure Transducer & 1 GPM Flow Switch)	

Notes

LIMITED WARRANTY

Products manufactured by GRUNDFOS are warranted to the original user only to be free of defects in material and workmanship for a period of 18 months from date of installation, but not more than 24 months from date of manufacture. GRUNDFOS' liability under this warranty shall be limited to repairing or replacing at GRUNDFOS' option, without charge, F.O.B. GRUNDFOS factory or authorized service station, any product of GRUNDFOS manufacture. GRUNDFOS will not be liable for any costs of removal, installation, transportation, or any other charges which may arise in connection with a warranty claim. Products which are sold but not manufactured by GRUNDFOS are subject to the warranty provided by the manufacturer of said products and not by GRUNDFOS' warranty. GRUNDFOS will not be liable for damage or wear to products caused by abnormal operating conditions, accident, abuse, misuse, unauthorized alteration or repair, or if the product was not installed in accordance with GRUNDFOS printed installation and operating instructions.

To obtain service under this warranty, the defective product must be returned to the distributor or dealer of GRUNDFOS products from which it was purchased together with proof of purchase and installation date, failure date, and supporting installation data. Unless otherwise provided, the distributor or dealer will contact GRUNDFOS or an authorized service station for instructions. Any defective product to be returned to GRUNDFOS or a service station must be sent freight prepaid; documentation supporting the warranty claim and/or a Return Material Authorization must be included if so instructed.

MANUFACTURER WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, OR EXPENSES ARISING FROM INSTALLATION, USE, OR ANY OTHER CAUSES. THERE ARE NO EXPRESS OR IMPLIED WARRANTIES, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WHICH EXTEND BEYOND THOSE WARRANTIES DESCRIBED OR REFERRED TO ABOVE. EXCEPT AS EXPRESSLY HEREIN PROVIDED THE GOODS ARE SOLD "AS IS", THE ENTIRE RISK AS TO QUALITY AND FITNESS FOR A PARTICULAR PURPOSE, AND PERFORMANCE OF THE GOODS IS WITH THE BUYER, AND SHOULD THE GOODS PROVE DEFECTIVE FOLLOWING THEIR PURCHASE, THE BUYER AND NOT THE MANUFACTURER, DISTRIBUTOR, OR RETAILER ASSUMES THE ENTIRE RISK OF ALL NECESSARY SERVICING OR REPAIR.

Some jurisdictions do not allow the exclusion or limitation of implied warranties of merchantability and fitness for a particular purpose, of incidental or consequential damages and some jurisdictions do not allow limitations on how long implied warranties may last or require you to pay certain expenses as set forth above. Therefore, the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from jurisdiction to jurisdiction.

The telephone number of our service and repair facilities central directory, from which you can obtain the locations of our service and repair facilities is, 1-800-333-1366.

Federal Communications Commission Notice:
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

GRUNDFOS®

Leaders in Pump Technology

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Canada: Oakville, Ontario • **Mexico:** Apodaca, N.L.
Visit our website at www.us.grundfos.com

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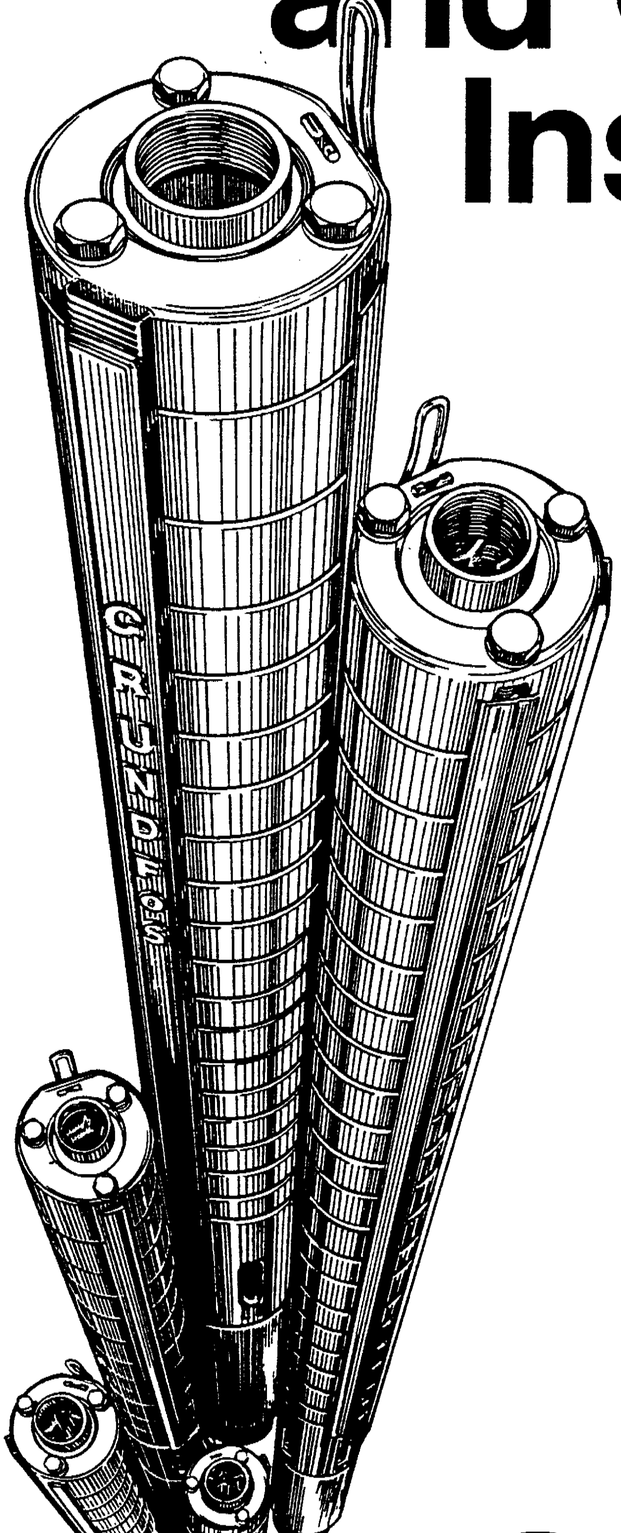
Installation and Operating Instructions

4-Inch Single Phase Stainless Steel Submersible Pumps



1. Pre-Installation
2. Splicing the Motor Cable
3. Installation
4. Electrical
5. Start Up

GRUNDFOS®

Installation and Operating Instructions

4-INCH SINGLE PHASE STAINLESS STEEL SUBMERSIBLE PUMPS

1. Pre-Installation

If the pump is to be installed in a new well, the well should be fully developed and bailed or blown free of cuttings and sand. The stainless steel construction of the GRUNDFOS submersible makes it resistant to abrasion; however, no pump made of any material can forever withstand the destructive wear that occurs when constantly pumping sandy water.

If this pump is used to replace an oil-filled submersible or oil lubricated line-shaft turbine in an existing well, the well must be blown or bailed clear of oil.

Determine the maximum depth of the well, and the drawdown level at the pump's maximum capacity. Pump selection and setting depth should be made based on this data.

Submersible well pumps are designed for pumping clear, cold water, free of air or gases. Decreased pump performance and life expectancy can occur if the water is not clear, cold or contains air or gases. Water temperature should not exceed 102°F.

A check should be made to ensure that the installation depth of the pump will always be at least three feet below the maximum drawdown level of the well.

The bottom of the motor should never be installed lower than the top of the well screen or within five feet of the well bottom.

Ensure that the requirement for minimum flow past the motor (Table A) is met.

2. Splicing the Motor Cable

If the splice is carefully made, it will be as efficient as any other portion of the cable, and will be completely watertight.

There are a number of cable splicing kits available today – epoxy sealed, rubber-sealed and so on. Many perform well if the manufacturer's directions are followed carefully, If one of these kits is not used, we recommend the following method for splicing the motor cable to the drop cable:

> Examine the motor cable and the drop cable carefully for damage. Cut the motor leads off in a staggered manner. Cut the ends of the drop cable so that the ends match up with the motor leads. Be sure to match the colors. Strip back and trim off one-half inch of insulation from each lead, making sure to scrape the wire bare to obtain a good connection. Be careful not to damage the copper conductor when stripping off the insulation. Insert a properly sized Sta-Kon-type connector on each pair of leads, again making sure that colors are matched. Using Sta-Kon crimping pliers, indent the lugs. Be sure to squeeze down hard on the pliers, particularly when using large cable. Form a piece of electrical insulation putty tightly around each Sta-Kon. The putty should overlap on the insulation of the wire. Use a good quality tape such as *#33 Scotch Waterproof* or *Plymouth Rubber Company Slipknot Grey*. Wrap each wire and joint tightly for a distance of about 2½ inches on each side of the joint. Make a minimum of four passes over each joint and overlap each pass approximately one inch to assure a completely watertight seal.

After splicing the motor cable, replace the cable guard by inserting into the slots at the discharge end of the pump. Resecure the tabs at the bottom end of the cable guard. **NOTE: For proper installation the cable guard must be pushed to the TOP end of the mounting slots before securing bottom tabs.**

3. Installation

A back-up wrench should be used when the riser pipe is attached to the pump. The pump should only be gripped by the flats on the top of the discharge chamber. Under no circumstances grip the body of the pump, cable guard or motor.

When tightened down, the threaded end of the first section of the riser pipe or the nipple must not come in contact with the check valve retainer in the discharge chamber of the pump.

After the first section of the riser pipe has been attached to the pump, the lifting cable or elevator should be clamped to the pipe. Do not clamp the pump. When raising the pump and riser section, be careful not to place bending stress on the pump by picking it up by the pump-end only.

Make sure that the electrical cables are not cut or damaged in any way when the pump is being lowered in the well.

Do not use the power cable to support the weight of the pump.

To protect against surface water entering the well and contaminating the water source, the well should be finished off above grade, utilizing a locally-approved well seal or pitless adapter unit.

We recommend that steel riser pipes always be used with the larger submersibles. A pipe thread compound should be used on all joints. Make sure that the joints are adequately tightened in order to resist the tendency of the motor to loosen the joints when stopping and starting.

It is recommended that plastic-type riser pipe be used only with the smaller domestic submersibles. The manufacturer or representative should be contacted to insure the pipe type and physical characteristics are suitable for this use. Use the correct joint compound recommended by the specific pipe manufacturer. Besides making sure that joints are securely fastened, we recommend the use of a torque arrestor when using plastic pipe.

Do not connect the first plastic riser section directly to the pump. Always attach a metallic nipple or adapter into the discharge chamber. The threaded end of the nipple or adapter must not come in contact with the check valve retainer in the discharge chamber when tightened down.

The drop cable should be secured to the riser pipe at frequent intervals to prevent sagging, looping and possible cable damage. Nylon cable clips or waterproof tape may be used. The cable splice should be protected by securing it with clips or tape just above each joint.

IMPORTANT: *Plastic pipe tends to stretch under load. This stretching must be taken into account when securing the cable to the riser pipe. Leave three to four inches of slack between clips or taped points. This tendency for plastic pipe to stretch will also affect the calculation of the pump setting depth. As a general rule, you can estimate that plastic pipe will stretch to approximately 2% of its length. When plastic riser pipe is used, it is recommended that a safety cable be attached to the pump to lower and raise it. The discharge chamber of GRUNDFOS 4-inch submersibles is designed to accommodate this cable. (See figures 1A, 1B, and 2).*

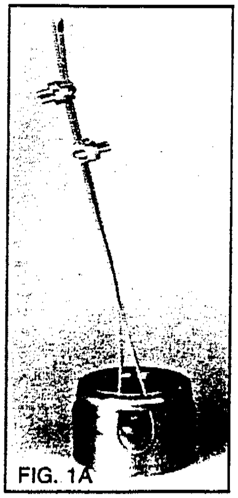


FIG. 1A

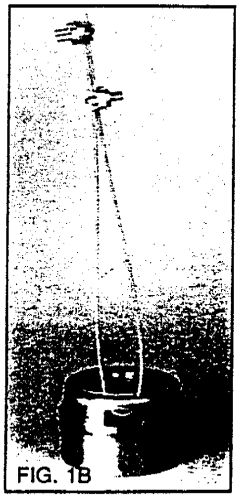


FIG. 1B

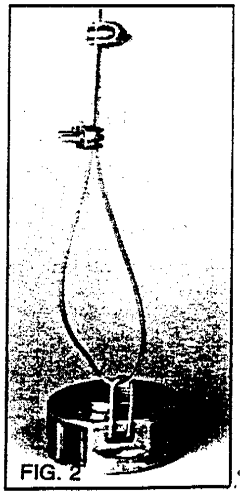


FIG. 2

CHECK VALVES: A check valve should always be installed at the surface of the well. In addition, for installations deeper than 200 feet, check valves should be installed at no more than 200 foot intervals.

4. Electrical

> **WARNING:** *A faulty motor or wiring can be a serious electrical shock hazard if it or surrounding water are accessible to human contact. To avoid this danger, connect the motor frame to the power supply grounding terminal with copper conductor no smaller than the circuit conductors unless the motor and surrounding water are inaccessible, as in a drilled well. In all installations connect above-ground metal plumbing to the power supply ground per National Electrical Code Article 250-80 to prevent electrical shock hazard.*

Verification of the electrical supply should be made to insure the voltage, phase and frequency match that of the motor. Motor electrical data can be found in Table B.

If voltage variations are larger than ± 10%, do not operate the pump.

Single phase motor control boxes should be connected as shown on the wiring diagram mounted on the inside cover of the control box supplied with the motor.

The type of wire used between the pump and control boxes should be approved for submersible pump application. The conductor insulation should be type RW, RUW, TW or equivalent.

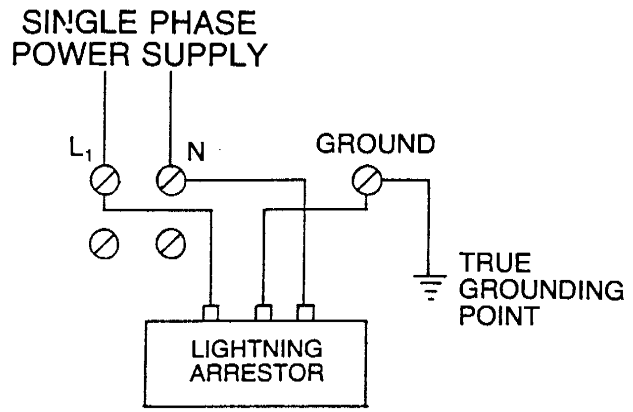
A high voltage surge arrestor should be used to protect the motor against lightning and switching surges. Lightning voltage surges in power lines are caused when lightning strikes somewhere in the area. Switching surges are caused by the opening and closing of switches on the main high-voltage distribution power lines.

The correct voltage-rated arrestor should be installed on the supply (line) side of the control box or starter (see figure 3). The arrestor must be grounded in accordance with the National Electrical Code and local governing regulations.

PUMPS SHOULD NEVER BE STARTED UNLESS THE PUMP IS TOTALLY SUBMERGED. SEVERE DAMAGE MAY BE CAUSED TO THE PUMP AND MOTOR IF THEY ARE RUN DRY.

The control box shall be permanently grounded in accordance with the National Electrical Code and local governing codes or regulations. The ground wire should be a bare stranded copper conductor at least the same size as the drop cable wire size. Ground wire should be run as short a distance as possible and securely fastened to a true grounding point.

True grounding points are considered to be: a grounding rod driven into the water strata; steel well casing submerged into the water lower than the pump setting level; and steel discharge pipes without insulating couplings. If plastic discharge pipe and well casing are used, a properly sized bare copper wire should be connected to a stud on the motor and run to the control panel. Do not ground to a gas supply line. Connect the grounding wire to the ground point first, and then to the terminal in the control box.



SINGLE PHASE HOOK-UP

FIGURE 3

5. Start Up

A. Attach a temporary horizontal length of pipe to the riser pipe.

B. Install a gate valve and another short length of pipe to the temporary pipe.

C. Adjust the gate valve one-third of the way open.

D. Verify that the electrical connections are in accordance with the wiring diagram.

E. After proper rotation has been checked, start the pump and let it operate until the water runs clear of sand, silt and other impurities.

F. Slowly open the valve in small increments as the water clears until the valve is all the way open. The pump should not be stopped until the water runs clear.

G. If the water is clean and clear when the pump is first started, the valve should still be slowly opened until it is all the way open.

Table A — **Min. Water Flow Requirements for 4-Inch Submersible Pump Motors**

Motor Diameter	Casing or Sleeve I.D. in Inches	Min. GPM Flow Passing the Motor
4-Inch	4	1.2
	5	7
	6	13
	7	21
	8	30

NOTES:

a. For Franklin Motors Only: A flow inducer or sleeve must be used if the water enters the well above the motor or if there is insufficient water flow past the motor.

b. For Franklin Motors Only: The minimum water velocity over 4" motors is 0.25 feet per second.

Table B — **GRUNDFOS Electrical Data: 4-Inch, 2-Wire and 3-Wire, 60 Hertz Submersible Pump Motors**

Rated HP	Volts	PH	Service Factor	Rated HP Amps	Service Factor Amps	Circuit Breaker or Standard Fuse	Dual Element Fuse	KVA Code	Locked Rotor Amps	Winding Resistance (Ohms)	
4-Inch, Two-Wire											
⅓	230	1	1.75	3.0	4.4	15	5	S	25.5	6.8 - 8.2	
½	230	1	1.60	4.3	5.9	15	7	R	34.5	5.2 - 6.3	
¾	230	1	1.50	6.6	8.0	20	9	N	40.5	3.2 - 3.8	
1	230	1	1.40	8.0	9.6	25	12	M	47.4	2.5 - 3.1	
1½	230	1	1.30	10.6	13.1	35	15	L	60.8	1.9 - 2.3	
4-Inch, Three-Wire										BY	RY
⅓	230	1	1.75	3.0	4.4	15	5	L	14.0	6.8 - 8.3	17.3 - 21.1
½	230	1	1.60	4.3	5.9	15	7	L	20.0	4.7 - 5.7	15.8 - 19.6
¾	230	1	1.50	6.6	8.0	20	9	L	30.8	3.2 - 3.9	14.0 - 17.2
1	230	1	1.40	8.0	9.6	25	12	K	36.3	2.6 - 3.1	10.3 - 12.5
1½	230	1	1.30	9.7	11.5	30	15	H	44.0	1.9 - 2.3	7.8 - 9.6

Table C

Franklin Electrical Data: 4-Inch, 60 Hz Submersible Pump Motors

Rated HP	Volts	PH	Service Factor	Rated HP Amps	Service Factor Amps	Circuit Breaker or Standard Fuse	Dual Element Fuse	KVA Code	Locked Rotor Amps	Winding Resistance (Ohms)
nch, Two Wire										
⅓	115	1	1.75	7.0	8.9	25	10	S	48.4	1.5-1.9
	230	1	1.75	3.5	4.4	15	5	S	24.2	6.0-7.4
½	115	1	1.60	9.6	11.9	30	15	R	62.4	1.0-1.3
	230	1	1.60	4.8	5.9	15	7	R	31.2	4.2-5.2
¾	230	1	1.50	6.4	8.0	20	9	N	40.2	2.7-3.4
1	230	1	1.40	8.2	9.6	25	12	M	46.0	2.2-2.8
1½	230	1	1.30	10.6	13.1	35	15	L	56.8	1.5-1.9

Rated HP	Volts	PH	Service Factor	Rated HP Amps	Service Factor Amps	Circuit Breaker or Standard Fuse	Dual Element Fuse	KVA Code	Locked Rotor Amps	Winding Resistance (Ohms)	
										BY	RY
4-Inch, Three Wire											
⅓	115	1	1.75	7.0	8.9	20	8	N	32.8	1.5-1.9	5.7-7.1
	230	1	1.75	3.5	4.4	15	5	N	16.4	6.0-7.4	23.4-28.6
½	115	1	1.60	9.6	11.9	30	15	M	46.0	1.0-1.3	3.8-4.7
	230	1	1.60	4.8	5.9	15	7	M	23.1	4.2-5.2	15.5-19.6
¾	230	1	1.50	6.4	8.0	20	9	M	33.1	2.7-3.4	11.0-13.6
1	230	1	1.40	8.0	9.6	25	12	L	42.0	2.2-2.8	9.5-11.7
1½	230	1	1.30	10.0	11.5	30	15	J	52.8	1.5-1.9	6.2-8.5
2	230	1	1.25	10.0	13.1	35	15	G	51.0	1.6-2.3	5.2-7.1
3	230	1	1.15	14.0	16.5	45	20	F	71.0	0.9-1.5	3.0-4.9
5	230	1	1.15	23.0	27.5	80	30	F	118.0	0.7-1.0	2.1-2.8

LIMITED WARRANTY

Products manufactured by GRUNDFOS PUMPS CORPORATION (GRUNDFOS) are warranted to the original user only to be free of defects in material and workmanship for a period of 18 months from date of installation, but not more than 24 months from date of manufacture. GRUNDFOS' liability under this warranty shall be limited to repairing or replacing at GRUNDFOS' option, without charge, F.O.B. GRUNDFOS' factory or authorized service station, any product of GRUNDFOS manufacture. GRUNDFOS will not be liable for any costs of removal, installation, transportation, or any other charges which may arise in connection with a warranty claim. Products which are sold but not manufactured by GRUNDFOS are subject to the warranty provided by the manufacturer of said products and not by GRUNDFOS' warranty. GRUNDFOS will not be liable for damage or wear to products caused by abnormal operating conditions, accident, abuse, misuse, unauthorized alteration or repair, or if the product was not installed in accordance with GRUNDFOS' printed installation and operating instructions.

To obtain service under this warranty, the defective product must be returned to the distributor or dealer of GRUNDFOS products from which it was purchased together with proof of purchase and installation date, failure date, and supporting installation data. Unless otherwise provided, the distributor or dealer will contact GRUNDFOS or an authorized service station for instructions. Any defective product to be returned to GRUNDFOS or a service station must be sent freight prepaid; documentation supporting the warranty claim and/or a Return Material Authorization must be included if so instructed.

GRUNDFOS WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, OR EXPENSES ARISING FROM INSTALLATION, USE OR ANY OTHER CAUSES. THERE ARE NO EXPRESS OR IMPLIED WARRANTIES, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WHICH EXTEND BEYOND THOSE WARRANTIES DESCRIBED OR REFERRED TO ABOVE.

Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages and some jurisdictions do not allow limitations on how long implied warranties may last. Therefore, the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from jurisdiction to jurisdiction. GRUNDFOS PUMPS CORPORATION, 2555 Clovis Avenue, Clovis California 93612, telephone number (209) 292-8000.

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Support Centers: Allentown, PA • Atlanta, GA • Mississauga, Ontario, Canada

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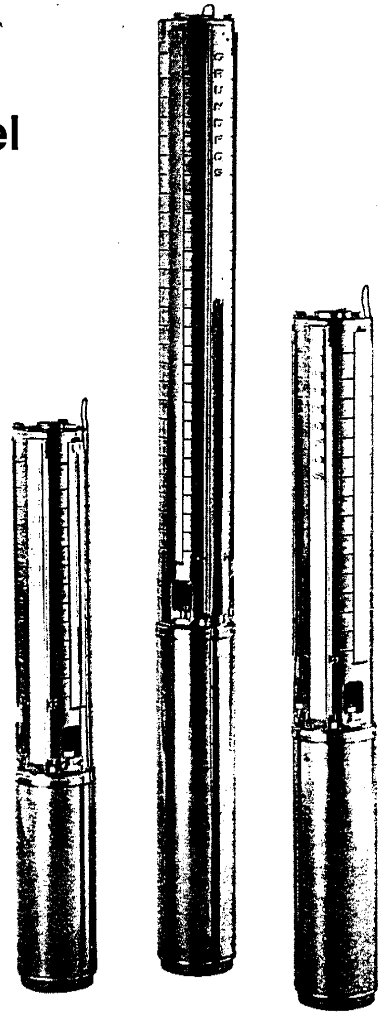
SP4"

Installation and Operating Instructions

4-Inch Stainless Steel Submersible Pumps



CLASSIFIED UL

DRINKING WATER SYSTEM COMPONENTS
ANSI/NSF 61 - 1999
65 GM

Please leave these instructions with the pump for future reference.

GRUNDFOS®
Leaders in Pump Technology

SAFETY WARNING

Electrical Work

WARNING: Reduced risk of electric shock during operation of this pump requires the provision of acceptable grounding. If the means of connection to the supply connected box is other than grounded metal conduit, ground the pump back to the service by connecting a copper conductor (at least the size of the circuit supplying the pump) to the grounding screw provided within the wiring compartment.

Pre-Installation Checklist

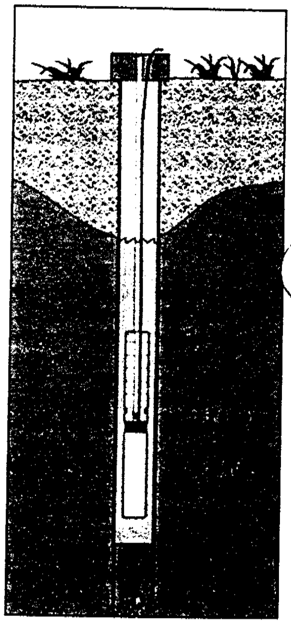
1. Well Preparation

If the pump is to be installed in a new well then the well should be fully developed and bailed or blown free of cuttings and sand. The stainless steel construction of the GRUNDFOS submersibles make it resistant to abrasion; however, no pump made of any material can forever withstand the destructive wear that occurs when constantly pumping sandy water.

If this pump is used to replace an oil-filled submersible or oil-lubricated line-shaft turbine in an existing well, the well must be blown or bailed clear of oil.

2. Make Sure You Have The Right Pump

Determine the maximum depth of the well, and the draw-down level at the pump's maximum capacity. Pump selection and setting depth should be based on this data.



3. Pumped Fluid Requirements

CAUTION: Submersible well pumps are designed for pumping clear, cold water; free of air or gases. Decreased pump performance and life expectancy can occur if the water is not cold, clear or contains air or gasses. Water temperature should not exceed 102°F.

A check should be made to ensure that the installation depth of the pump will always be at least three feet below the maximum drawdown level of the well. The bottom of the motor should never be installed lower than the top of the screen or within five feet of the well bottom.

Ensure that the requirement for minimum flow past the motor is met, as shown in the table below:

Minimum Water Flow Requirements for Submersible Pump Motors

MINIMUM DIAMETER	CASING OR SLEEVE I.D. IN INCHES	MIN. GPM FLOW PASSING THE MOTOR
4-Inch	4	1.2
	5	7
	6	13
	7	21
	8	30

NOTES:

a. For Franklin Motors Only: A flow inducer or sleeve must be used if the water enters the well above the motor or if there is unsufficient water flow past the motor.

b. For Franklin Motors Only: The minimum water velocity over 4" motors is 0.25 feet per second.

c. Grundfos 4" submersible motors do not require a minimum flow or flow sleeve.

Pre-Installation Checklist

4. Splicing the Motor Cable

If the splice is carefully made, it will be as efficient as any other portion of the cable, and will be completely watertight. There are a number of cable splicing kits available today – epoxy filled, rubber-sealed and so on. Many perform well if the manufacturer's directions are followed carefully. If one of these kits is not used, we recommend the following method for splicing the motor cable.

> Examine the motor cable and drop cable carefully for damage. Cut the motor leads off in a staggered manner. Cut the ends of the drop cable so that the ends match up with the motor leads. Be sure to match the colors. Strip back and trim off one-half inch of insulation from each lead, making sure to scrape the wire bare to obtain a good connection. Be careful not to damage the copper conductor when stripping off the insulation. Insert a properly sized Sta-kon-type connector on each pair of leads, again making sure that colors are matched. Using Sta-kon crimping pliers, indent the lugs. Be sure to squeeze down hard on the pliers, particularly when using large cable. Form a piece of electrical insulation putty tightly around each Sta-Kon. The putty should overlap on the insulation of the wire. Use a good quality tape such as ***#33 Scotch Waterproof*** or ***Plymouth Rubber Company Slipknot Grey***. Wrap each wire and joint tightly for a distance of about 2-1/2 inches on each side of the joint. Make a minimum of four passes over each joint and overlap each pass approximately one inch to assure a completely watertight seal.

Installation Procedures

1. Attach the Pump to the Pipe

A back-up wrench should be used when riser pipe is attached to the pump. The pump should only be gripped by the flats on the top of the discharge chamber. Under no circumstances grip the body of the pump, cable guard or motor. When tightened down, the threaded end of the first section of the riser pipe or the nipple must not come in contact with the check valve retainer in the discharge chamber of the pump. After the first section of the riser pipe has been attached to the pump, the lifting cable or elevator should be clamped to the pipe. Do not clamp the pump. When raising the pump and riser section, be careful not to place bending stress on the pump by picking it up by the pump-end only. It is recommended that plastic-type riser pipe be used only with the smaller domestic submersibles. The manufacturer or representative should be contacted to ensure the pipe type and physical characteristics are suitable for this use. Use the correct joint compound recommended by the specific pipe manufacturer. Besides making sure that points are fastened, we recommend the use of a torque arrestor when using plastic pipe.

Do not connect the first plastic riser section directly to the pump. Always attach a metallic nipple or adapter into the discharge chamber. The threaded end of the nipple or adapter must not come in contact with the check valve retainer in the discharge chamber when tightened down.

2. Lower the Pump Into the Well

Make sure the electrical cables are not cut or damaged in any way when the pump is being lowered in the well. Do not use the power cables to support the weight of the pump.

To protect against surface water entering the well and contaminating the water source, the well should be finished off above grade utilizing a locally approved well seal or pitless adaptor unit. We recommend that steel riser pipes always be used with the larger submersibles. A pipe thread compound should be used on all joints. Make sure that the joints are adequately tightened in order to resist the tendency of the motor to loosen the joints when stopping and starting.

The drop cable should be secured to the riser pipe at approximately every 10 ft/3 m to prevent sagging, looping and possible cable damage. Nylon cable clips or waterproof tape may be used. The cable splice should be protected by securing it with clips or tape just above each joint.

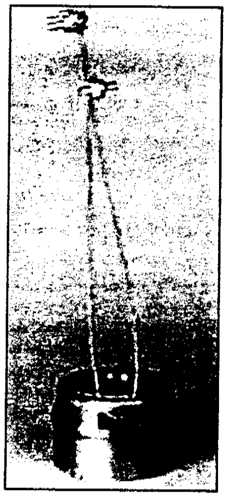


Figure 1

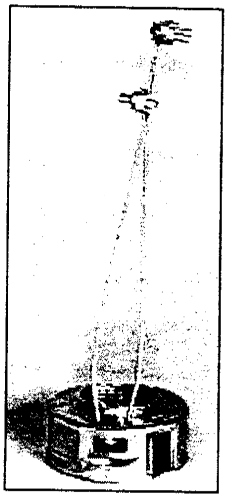


Figure 2

IMPORTANT: *Plastic pipe tends to stretch under load. This stretching must be taken into account when securing the cable to the riser pipe. Leave three to four inches of slack between clips or taped points. This tendency for plastic pipe to stretch will also affect the calculation of the pump setting depth. As a general rule, you can estimate that plastic pipe will stretch to approximately 2% of its length. When plastic riser pipe is used, it is recommended that a safety cable be attached to the pump to lower and raise it. The discharge chamber of GRUNDFOS 4-inch submersibles is designed to accommodate this cable. (See Figures 1 & 2.)*

Check Valves: A check valve should always be installed at the surface of the well and one at a maximum of 25 feet above static water level. In addition, for installations deeper than 200 feet, check valves should be installed at no more than 200 foot intervals.

3. Electrical Connections

WARNING: Reduced risk of electric shock during operation of this pump requires the provision of acceptable grounding. If the means of connection to the supply connected box is other than grounded metal conduit, ground the pump back to the service by connecting a copper conductor (at least the size of the circuit supplying the pump) to the grounding screw provided within the wiring compartment.

Verification of the electrical supply should be made to ensure the voltage, phase and frequency match that of the motor. Motor electrical data can be found on page 6. If voltage variations are larger than ± 10%, do not operate the pump. Single-phase motor control boxes should be connected as shown on the wiring diagram mounted on the inside cover of the control box supplied with the motor. The type of wire used between the pump control boxes should be approved for submersible pump application. The conductor insulation should be type RW, RUW, TW or equivalent.

A high-voltage surge arrestor should be used to protect the motor against lightning and switching surges. Lightning voltage surges in power lines are caused when lightning strikes somewhere in the area. Switching surges are caused by the opening and closing of switches on the main high-voltage distribution power lines.

The correct voltage-rated surge arrestor should be installed on the supply (line) side of the control box or starter (See Figure 3a & 3b). The arrestor must be grounded in accordance with the National Electric Code and local governing regulations.

PUMPS SHOULD NEVER BE STARTED UNLESS THE PUMP IS TOTALLY SUBMERGED. SEVERE DAMAGE MAY BE CAUSED TO THE PUMP AND MOTOR IF THEY ARE RUN DRY.

The control box shall be permanently grounded in accordance with the National Electric Code and local governing codes or regulations. The ground wire should be a bare stranded copper conductor at least the same size as the drop cable wire size. Ground wire should be as short a distance as possible and securely fastened to a true grounding point. True grounding points are considered to be: a grounding rod driven into the water strata; steel well casing submerged into the water lower than the pump setting level; and steel discharge pipes without insulating couplings. If plastic discharge pipe and well casing are used, a properly sized bare copper wire should be connected to a stud on the motor and run to the control panel. Do not ground to a gas supply line. Connect the grounding wire to the ground point first, then to the termianl in the control box.

Single Phase Hookup

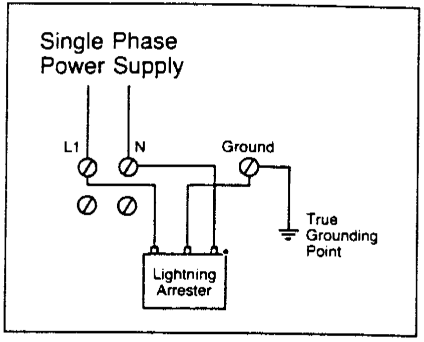


Figure 3a

Three Phase Hookup

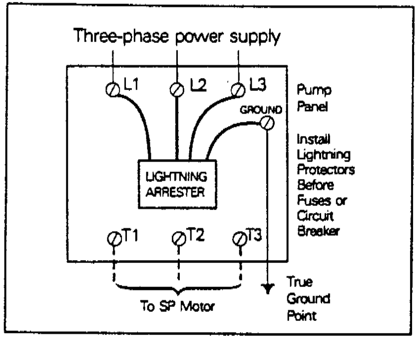


Figure 3b

Installation Procedures

Single-Phase 2-Wire Wiring Diagram for Submersible Motors

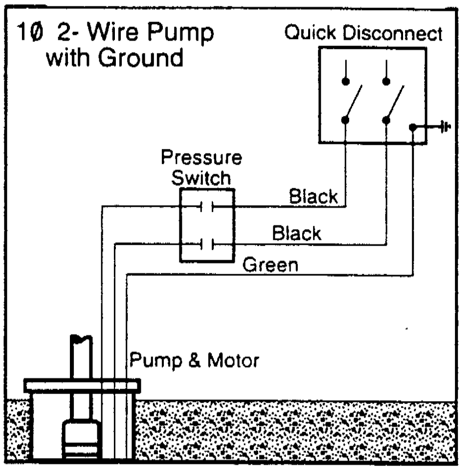


Figure 4

Three-Phase Wiring Diagram for Submersible Motors

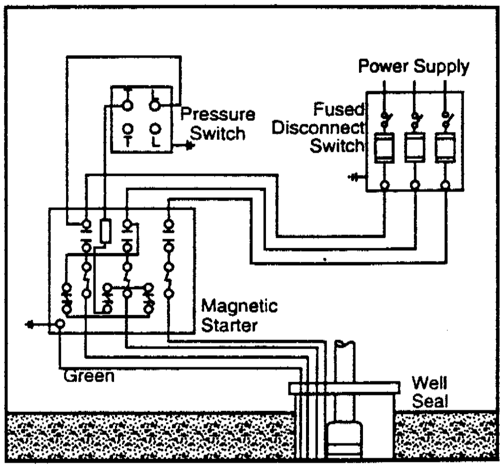


Figure 5

Single-Phase 3-Wire Control Box for Submersible Motors

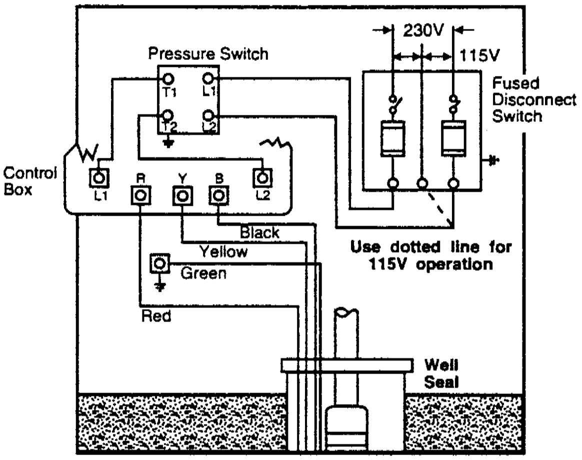


Figure 6

4. Starting the Pump for the First Time

A. Attach a temporary horizontal length of pipe to the riser pipe.
B. Install a gate valve and another short length of pipe to the temporary pipe.
C. Adjust the gate valve one-third of the way open.
D. Verify that the electrical connections are in accordance with the wiring diagram.
E. After proper rotation has been checked, start the pump and let it operate until the water runs clear of sand, silt and other impurities.
F. Slowly open the valve in small increments as the water clears until the valve is all the way open. The pump should not be stopped until the water runs clear.
G. If the water is clean and clear when the pump is first started, the valve should still be opened until it is all the way open.

Motor Information

GRUNDFOS MOTORS Submersible Pump Motors -Electrical Data 60Hz

HP	Ph	Volt	S.F.	Circ. Brkr or Fuses		Amperage		Full Load		Max. Thrust	Line-to-Line Resistance (Ohms)		KVA Code	3-Ph. Overload Protection	
				Std.	Delay	Start	Max.	Eff. (%)	Pwr Fact.	(lbs)	Blk-Yel	Red-Yel	**	Starter Size	Furnas Amb. Comp
4-Inch, Single Phase, 2-Wire Motors (control box not required)															
1/3	1	230	1.75	15	5	25.7	4.6	59	77	900	6.8-8.2		S	-	-
1/2	1	115	1.60	30	15	55.0	12.0	62	76	900	1.1-1.3		R	-	-
1/2	1	230	1.60	15	7	34.5	6.0	62	76	900	5.2-6.3		R	-	-
3/4	1	230	1.50	20	9	40.5	8.4	62	75	900	3.2-3.8		N	-	-
1	1	230	1.40	25	12	48.4	9.8	63	82	900	2.5-3.1		M	-	-
1-1/2	1	230	1.30	35	15	62.0	13.1	64	85	900	1.9-2.3		L	-	-
4-Inch, Single Phase, 3-Wire Motors															
1/3	1	115	1.75	25	10	29.0	9.0	59	77	900	1.55-1.9	2.4-3	M	-	-
1/3	1	230	1.75	15	5	14.0	4.6	59	77	900	6.8-8.3	17.3-21.1	L	-	-
1/2	1	115	1.60	30	15	42.5	12.0	61	76	900	0.9-1.1	1.9-2.35	L	-	-
1/2	1	230	1.60	15	7	21.5	6.0	62	76	900	4.7-5.7	15.8-19.6	L	-	-
3/4	1	230	1.50	20	9	31.4	8.4	62	75	900	3.2-3.9	14-17.2	L	-	-
1	1	230	1.40	25	12	37.0	9.8	63	82	900	2.6-3.1	10.3-12.5	K	-	-
1-1/2	1	230	1.30	35	15	45.9	11.6	69	89	900	1.9-2.3	7.8-9.6	H	-	-
2	1	230	1.25	30	15	57.0	13.2	72	86	1500	1.5-1.8	3.4-4.1	G	-	-
3	1	230	1.15	45	20	77.0	17.0	74	93	1500	1.2-1.4	2.45-3	F	-	-
5	1	230	1.15	70	30	110	27.5	77	92	1500	0.65-0.85	2.1-2.6	F	-	-
4-Inch, Three Phase, 3-Wire Motors															
1-1/2	3	230	1.30	15	8	40.3	7.3	75	72	750	3.9		K	0	K41
		460	1.30	10	4	20.1	3.7	75	72	750	15.9		K	0	K32
		575	1.30	10	4	16.1	2.9	75	72	750	25.2		K	0	K28
2	3	230	1.25	20	10	48	8.7	76	75	750	3.0		J	0	K50
		460	1.25	10	5	24	4.4	76	75	750	12.1		J	0	K34
		575	1.25	10	4	19.2	3.5	76	75	750	18.8		J	0	K31
3	3	230	1.15	30	15	56	12.2	77	75	1000	2.2		H	0	K54
		460	1.15	15	7	28	6.1	77	75	1000	9.0		H	0	K37
		575	1.15	15	6	22	4.8	77	75	1000	13.0		H	0	K36
5	3	230	1.15	40	25	108	19.8	80	82	1000	1.2		H	1	K61
		460	1.15	20	12	54	9.9	80	82	1000	5.0		H	0	K50
		575	1.15	15	9	54	7.9	80	82	1000	7.3		H	0	K43
7-1/2	3	230	1.15	60	30	130	25.0	81	82	1000	0.84		H	1	K67
		460	1.15	35	15	67	13.2	81	82	1000	3.24		J	1	K56
		575	1.15	30	15	67	10.6	81	82	1000	5.2		J	1	K53
10	3	460	1.15	50	25	90	18.0	81	80	1500	1.16		H	1	K61
		575	1.15	40	20	72	14.4	81	80	1500	1.84		H	1	K58

*All Grundfos 4" motors have a ground (green wire)

The Franklin 1 PH, 3 wire motors listed below require the use of the following Franklin Control Box:

RATING		FRANKLIN MOTOR MODEL NO.	CONTROL BOX.
HP	VOLT	THE MODEL MAY HAVE ADDITIONAL DIGITS	THE MODEL MAY HAVE ADDITIONAL DIGITS
1/3	115	214502	28010249
1/3	230	214503	28010349
1/2	115	214504	28010449
1/2	230	214505	28010549
3/4	230	214507	28010749
1	230	214508	28010849
1.5	230	224300	2823008
2	230	224301	2823018
3	230	224302	2823028
5	230	224303	2821138
			2821139

(Refer to the Franklin Submersible Motors Application Maintenance Manual)

Motor Information

Maximum Cable Length

Motor Service to Entrance

(Length in feet)

Single-Phase 60 Hz

MOTOR RATING		COPPER WIRE SIZE								
VOLTS	HP	14	12	10	8	6	4	2	0	00
115	1/3	130	210	340	540	840	1300	1960	2910	
	1/2	100	160	250	390	620	960	1460	2160	
230	1/3	550	880	1390	2190	3400	5250	7960		
	1/2	400	650	1020	1610	2510	3880	5880		
	3/4	300	480	760	1200	1870	2890	4370	6470	
	1	250	400	630	990	1540	2380	3610	5360	6520
	1-1/2	190	310	480	770	1200	1870	2850	4280	5240
	2	150	250	390	620	970	1530	2360	3620	4480
	3	120	190	300	470	750	1190	1850	2890	3610
	5			180	280	450	710	1110	1740	2170

Three-Phase 60 Hz

VOLTS	HP	14	12	10	8	6	4	2
208	1-1/2	310	500	790	1260			
	2	240	390	610	970	1520		
	3	180	290	470	740	1160	1810	
		5170	280	4690	1080			1660
230	1-1/2	360	580	920	1450			
	2	280	450	700	1110	1740		
	3	210	340	540	860	1340	2080	
	5		200	320	510	800	1240	1900
460	1-1/2	1700						
	2	1300	2070					
	3	1000	1600	2520				
	5	590	950	1500	2360			
575	1-1/2	2620						
	2	2030						
	3	1580	2530					
	5	920	1480	2330				

FOOTNOTES:

1. If aluminum conductor is used, multiply lengths by 0.5. Maximum allowable length of aluminum is considerably shorter than copper wire of same size.
2. The portion of the total cable which is between the service entrance and a 3Ø motor starter should not exceed 25% of the total maximum length to ensure reliable starter operation. Single-phase control boxes may be connected at any point of the total cable length.
3. Cables #14 to #0000 are AWG sizes, and 250 to 300 are MCM sizes.

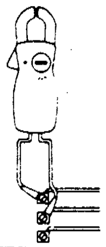
CLASSIFIED UL ®

DRINKING WATER SYSTEM COMPONENTS
ANSI/NSF 61 - 1999
65 GM

Pump Model & Stages	Temp °C	Temp °F	Water Contact Volume in Liters for Highest Number of Stages	Contact Volume in Gallons for Highest Number of Stages	Minimum Submergence in Feet for Highest Number of Stages 4" Well ID
5S					
9-26	30	86	26	7	11
31-48	30	86	37	10	15
7S					
8-26	30	86	26	7	11
10S					
6-27	30	86	27	8	11
34-48	30	86	37	10	15
58	30	86	45	12	18
16S					
5-24	30	86	25	7	10
38	30	86	30	8	12
56-75	30	86	58	16	24
25S					
3-26	30	86	26	7	11
39	30	86	26	7	11
52	30	86	40	11	17
40S					
3-44	30	86	268	71	109
50-66	30	86	401	106	162
60S					
4-18	30	86	35	9	14
75S					
3-16	30	86	31	8	13

Troubleshooting

SUPPLY VOLTAGE



How to Measure

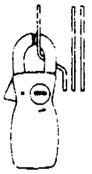
By means of a voltmeter, which has been set to the proper scale, measure the voltage at the control box or starter. On single-phase units, measure between line and neutral.

What it Means

When the motor is under load, the voltage should be within ± 10% of the nameplate voltage. Larger voltage variation may cause winding damage. Large variations in the voltage indicate a poor electrical supply and the pump should not be operated until these variations have been corrected.

If the voltage constantly remains high or low, the motor should be changed to the correct supply voltage.

CURRENT MEASUREMENT



How to Measure

By use of an ammeter, set on the proper scale, measure the current on each power lead at the control box. See page 6, for motor amp draw information.

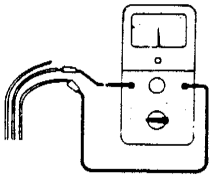
Current should be measured when the pump is operating at a constant discharge pressure with the motor fully loaded.

What it Means

If the amp draw exceeds the listed service factor amps (SFA), check for the following:

1. Loose terminals in control box or possible cable defect. Check winding and insulation resistances.
2. Too high or low supply voltage.
3. Motor windings are shorted.
4. Pump is damaged causing a motor overload.

WINDING RESISTANCE



How to Measure

Turn off power and disconnect the drop cable leads in the control box. Using an ohmmeter, set the scale selectors to Rx1 for values under 10 ohms and Rx10 for values over 10 ohms.

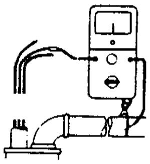
Zero-adjust the meter and measure the resistance between leads. Record the values. Motor resistance values can be found on page 6.

What it Means

If all the ohm values are normal, and the cable colors correct, the windings are not damaged. If any one ohm value is less than normal, the motor may be shorted. If any one ohm value is greater than normal, there is a poor cable connection or joint. The windings or cable may also be open.

If some of the ohm values are greater than normal and some less, the drop cable leads are mixed. To verify lead colors, see resistance values on page 6.

INSULATION RESISTANCE



How to Measure

Turn off power and disconnect the drop cable leads in the control box. Using an ohm or mega ohmmeter, set the scale selector to Rx 100K and zero-adjust the meter. Measure the resistance between the lead and ground (discharge pipe or well casing, if steel).

What it Means

For ohm values, refer to table below. Motors of all Hp, voltage, phase and cycle duties have the same value of insulation resistance.

OHM VALUE	MEGAOHM VALUE	CONDITION OF MOTOR AND LEADS
		Motor not yet installed:
2,000,000 (or more)	2.0	New Motor.
1,000,000 (or more)	1.0	Used motor which can be reinstalled in the well.
		Motor in well (Ohm readings are for drop cable plus motor):
500,000 - 1,000,000	0.5 - 1.0	A motor in reasonably good condition.
20,000 - 500,000	0.02 - 0.5	A motor which may have been damaged by lightning or with damaged leads. Do not pull the pump for this reason.
10,000 - 20,000	0.01 - 0.02	A motor which definitely has been damaged or with damaged cable. The pump should be pulled and repairs made to the cable or the motor replaced. The motor will still operate, but probably not for long.
less than 10,000	0 - 0.01	A motor which has failed or with completely destroyed cable insulation. The pump must be pulled and the cable repaired or the motor replaced. The motor will not run in this condition.

Troubleshooting

Pump Won't Start

POSSIBLE CAUSE	CHECK THIS BY...	CORRECT THIS BY...
No power at the motor	Check for voltage at the control box or panel.	If there is no voltage at the control panel, check the feeder panel for tripped circuits and reset those circuits.
Fuses are blown or the circuit breakers have tripped	Turn off the power and remove the fuses. Check for continuity with an ohmmeter.	Replace the blown fuses or reset the circuit breaker. If the new fuses blow or the circuit breaker trips, the electrical installation, motor, and wires must be check for defects.
(3-phase motors only) **Motor starter overloads are burned or have tripped**	Check for voltage on the line and load side of the starter. Check the amp draw and make sure the heater is sized correctly.	Replace any burned heaters or reset. Inspect the starter for other damage. If the heater trips again, check the supply voltage. Ensure that heaters are sized correctly and the trip setting is appropriately adjusted.
(3-phase motors only) **Starter does not energize**	Energize the control circuit and check for voltage at the holding coil.	If there is no voltage, check the control circuit fuses. If there is voltage, check the holding coil for weak connections. Ensure that the holding coil is designed to operate with the available control voltage. Replace the coil if defects are found.
Defective controls	Check all safety and pressure switches for defects. Inspect the contacts in control devices.	Replace worn or defective parts or controls.
Motor or cable is defective	Turn off the power and disconnect the motor leads from the control box. Measure the lead-to-lead resistance with an ohmmeter (set to R x 1). Measure the lead-to-ground values with an ohmmeter (set to R x 100K).	If an open or grounded winding is found, remove the motor from the well and recheck the measurements with the lead separated from the motor. Repair or replace the motor or cable.
(1-phase motors only) **Defective capacitor**	Turn off the power and discharge the capacitor by shorting the leads together. Check it with an analog ohmmeter (set to R x 100k).	When the meter is connected to the capacitor, the needle should jump toward 0 (zero) ohms and slowly drift back to infinity (∞). Replace capacitor if it is defective.
Defective pressure switch or the tubing to it is plugged	Watch the pressure gauges as the pressure switch operates. Remove the tubing and blow through it.	Replace as necessary.
The pump is mechanically bound or stuck	Turn off the power and manually rotate the pump shaft. Also check the motor shaft rotation, the shaft height, and the motor's amp draw (to see if it indicates a locked rotor).	If the pump shaft doesn't rotate, remove the pump and examine it. If necessary, dismantle it and check the impellers and seal for obstruction. Check for motor corrosion.

Pump Does Not Produce Enough Flow (GPM)

POSSIBLE CAUSE	CHECK THIS BY...	CORRECT THIS BY...
(3-phase motors only) **Shaft is turning in the wrong direction**	Check to make sure the electrical connections in the control panel are correct.	Correct the wiring. For single phase motors, check the wiring diagram on the motor. For three phase motors, simply switch any two power leads.
Pump is operating at the wrong speed (too slow)	Check for low voltage and phase imbalance.	Replace defective parts or contact power company, as applicable.
Check valve is stuck (or installed backwards)	Remove the check valve.	Re-install or replace.
Parts or fittings in the pump are worn **– or –** **Impellers or Inlet Strainer is clogged**	Install a pressure gauge near the discharge port, start the pump, and gradually close the discharge valve. Read the pressure at shutoff. (Do not allow the pump to operate for an extended period at shutoff.)	Convert the PSI you read on the gauge to Feet of Head by: $\frac{\textbf{PSI x 2.31 ft/PSI = \_\_\_\_\_ ft.}}{\textbf{Specific Gravity}}$ Add to this number the number of feet (vertically) from the gauge down to the water's pumping level. Refer to the pump curve for the model you are working with to determine the shutoff head you should expect for that model. If that head is close to the figure you came up with (above), the pump is probably OK. If not, remove the pump and inspect impellers, chambers, etc.
The water level in the well may be too low to supply the flow desired **– or –** **Collapsed well**	Check the drawdown in the well while the pump is operating.	If the pumping water level (including drawdown) is not **AT LEAST 3 FEET** above the pump's inlet strainer, either: 1. Lower the pump further down the well. 2. Throttle back the discharge valve to decrease the flow, thereby reuding drawdown.
Broken shaft or coupling	Pull pump and inspect.	Replace as necessary.
There are leaks in the fittings or piping	Pull the pump out of the well.	The suction pipe, valves, and fittings must be made tight. Repair any leaks and retighten all loose fittings.

Troubleshooting

Fuses Blow or Heaters Trip

POSSIBLE CAUSE	CHECK THIS BY...	CORRECT THIS BY...
Improper voltage	Check the voltage at the control box or panel.	If the voltage varies by more than 10% (+ or -), contact the power company.
	If the incoming voltage is OK, check the wire size and the distance between the pump motor and the pump control panel.	Rewire with correct gauge. Undersized wire and a great distance between the control panel and the pump motor increases resistance and decreases the voltage by the time it reaches the pump motor.
The starter overloads are set too low	Cycle the pump and measure the amperage.	Increase the heater size or adjust the trip setting. Do not, however, exceed the recommended rating.
(3-phase motors only) **The three-phase current is imbalanced**	Check the current draw on each lead to the motor.	The current draw on each lead must be within 5% of each other (+ or -). If they are not, check the wiring.
The wiring or connections are faulty	Check to make sure the wiring is correct and there are no loose terminals.	Tighten any loose terminals and replace any damaged wire.
(1-phase motors only) **Capacitor is defective**	Turn off the power and discharge the capacitor. Check the capacitor with an ohmmeter (set at R x 100k). See page 15 for instructions.	When the meter is connected to the capacitor, the needle should jump toward 0 (zero) ohms and then slowly drift back to infinity (∞). Replace capacitor if it is defective.
Fuse, heater, or starter are the wrong size	Check the fuses and heaters against the motor manufacturer's specification charts.	Replace as necessary.
The control box location is too hot	Touch the box with your bare hand during the hottest part of the day – you should be able to keep your hand on it without burning.	Shade, ventilate, or move the control box so its environment does not exceed 120°F.
(1-phase motors only) **Wrong control box**	Check requirements for the motor against the control box specifications.	Replace as necessary.
Defective pressure switch	Watch gauges as pressure switch operates.	Replace as necessary.
The motor is shorted or grounded.	Turn off the power and disconnect the wiring. Measure the lead-to-lead resistance with an ohmmeter (set to R x 1). Measure the lead-to-ground values with an ohmmeter (set to R x 100K) or a megaohmmeter. Compare these measurements to the rated values for your motor.	If you find an open or grounded winding, remove the motor and recheck the leads. If OK, check the leads for continuity and for bad splice.
Poor motor cooling	Find the internal diameter of the well casing (or sleeve, if used). For proper cooling, the flow of water **must not be less than the GPM shown across the bottom scale on page __.**	Throttle up the pump flow (GPM) so proper cooling is possible. – or – Pull the pump out of the well and add a sleeve with a smaller internal diameter.

Pump Cycles Too Often

POSSIBLE CAUSE	CHECK THIS BY...	CORRECT THIS BY...
The pressure switch is defective or is not properly adjusted	Check the pressure setting on the switch. Check the voltage across closed contacts.	Readjust the pressure switch or replace it if defective.
The tank is too small	Check the tank size and amount of air in the tank. The tank volume should be approximately 10 gallons for each Gallon-Per-Minute of pump capacity. At the pump cut-in pressure, the tank should be about 2/3 filled with air.	Replace the tank with one that is the correct size.
There is insufficient air charging of the tank or piping is leaking	Pump air into the tank or diaphragm chamber. Check the diaphragm for leaks. Check the tank and piping for leaks with soapy water. Check the air-to-water ratio in the tank.	Repair as necessary.
Plugged snifter valve or bleed orifice (causing pressure tank to be waterlogged)	Examine them for dirt or erosion.	Repair or replace as necessary.
Leak in the pressure tank or piping	Apply soapy water to pipes and tank, then watch for bubbles, indicating leaks.	Repair or replace as necessary.
The level control is defective or is not properly set	Check the setting and operation of the level control.	Readjust the level control setting (according to the manufacturer's instructions) or replace it if defective.
Pump is oversized for the application. It is outpumping the yield of the well and pumping itself dry.	Check the yield of the well (determined by the well-test) against the pump's performance curve.	Reduce the flow by throttling back the valve. – or – Change the pump.

Notes

LIMITED WARRANTY

Products manufactured by GRUNDFOS are warranted to the original user only to be free of defects in material and workmanship for a period of 18 months from date of installation, but not more than 24 months from date of manufacture. GRUNDFOS' liability under this warranty shall be limited to repairing or replacing at GRUNDFOS' option, without charge, F.O.B. GRUNDFOS' factory or authorized service station, any product of GRUNDFOS' manufacture. GRUNDFOS will not be liable for any costs of removal, installation, transportation, or any other charges which may arise in connection with a warranty claim. Products which are sold but not manufactured by GRUNDFOS are subject to the warranty provided by the manufacturer of said products and not by GRUNDFOS' warranty. GRUNDFOS will not be liable for damage or wear to products caused by abnormal operating conditions, accident, abuse, misuse, unauthorized alteration or repair, or if the product was not installed in accordance with GRUNDFOS printed installation and operating instructions.

To obtain service under this warranty, the defective product must be returned to the distributor or dealer of GRUNDFOS products from which it was purchased together with proof of purchase and installation date, failure date, and supporting installation data. Unless otherwise provided, the distributor or dealer will contact GRUNDFOS or an authorized service station for instructions. Any defective product to be returned to GRUNDFOS or a service station must be sent freight prepaid; documentation supporting the warranty claim and/or a Return Material Authorization must be included if so instructed.

MANUFACTURER WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, OR EXPENSES ARISING FROM INSTALLATION, USE, OR ANY OTHER CAUSES. THERE ARE NO EXPRESS OR IMPLIED WARRANTIES, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WHICH EXTEND BEYOND THOSE WARRANTIES DESCRIBED OR REFERRED TO ABOVE. EXCEPT AS EXPRESSLY HEREIN PROVIDED THE GOODS ARE SOLD "AS IS", THE ENTIRE RISK AS TO QUALITY AND FITNESS FOR A PARTICULAR PURPOSE, AND PERFORMANCE OF THE GOODS IS WITH THE BUYER, AND SHOULD THE GOODS PROVE DEFECTIVE FOLLOWING THEIR PURCHASE, THE BUYER AND NOT THE MANUFACTURER, DISTRIBUTOR, OR RETAILER ASSUMES THE ENTIRE RISK OF ALL NECESSARY SERVICING OR REPAIR.

Some jurisdictions do not allow the exclusion or limitation of implied warranties of merchantability and fitness for a particular purpose, of incidental or consequential damages and some jurisdictions do not allow limitations on how long implied warranties may last or require you to pay certain expenses as set forth above. Therefore, the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from jurisdiction to jurisdiction.

The telephone number of our service and repair facilities central directory, from which you can obtain the locations of our service and repair facilities is, 1-800-333-1366.

GRUNDFOS®

Leaders in Pump Technology

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PRESSURE SYSTEMS

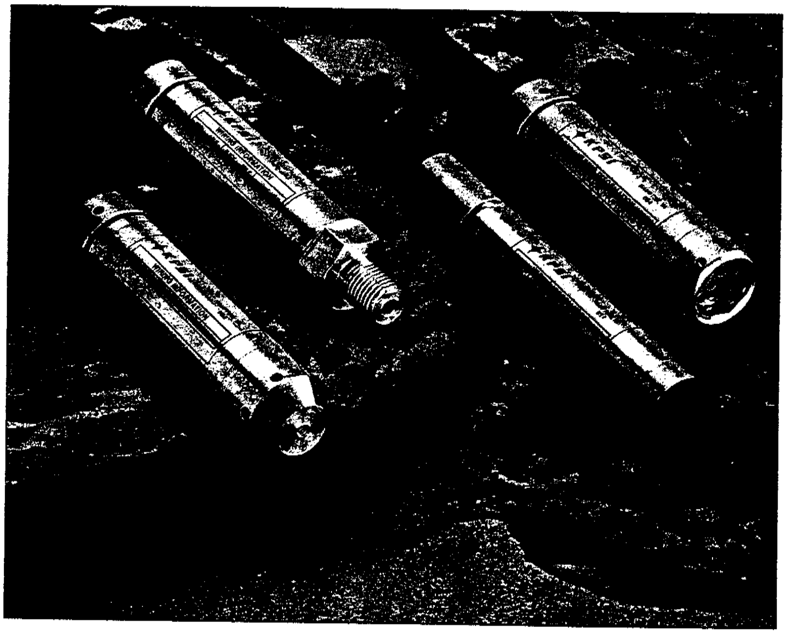
KPSI™ Level & Pressure Transducers

User's Manual

6th Edition

March 1, 2001

Order On-line!



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A Weston Company of Roxboro Group PLC

Introduction

PSI is an ISO-9001 certified U.S. manufacturer of submersible and above ground pressure transducers for environmental, industrial and municipal applications. Our KPSI transducers have been specified in hundreds of projects throughout the United States and Canada by geologists, system integrators, national engineering firms and a variety of government agencies. Typical applications include, but are not limited to, pump control, tank level monitoring, sewage lift station operation, reservoirs, weirs, flumes, site remediation, stormwater/well monitoring, pump/pipeline pressures and compressor pressures.

800 Number Support

Twelve hours a day, Monday through Friday, knowledgeable technical assistance is provided by factory personnel (800-328-3665). We work with customers to understand their specific needs and then recommend the pressure measurement device that best fits their application. If no standard is available, we will propose optional modifications to standard products or new product designs to solve the pressure measurement problem.

Product Quality

Each pressure transducer is shipped with its own calibration sheet that describes its exact performance characteristics. This information is NIST traceable! We also keep a duplicate record of each calibration sheet for three years in our record archives in Hampton, VA. Should you misplace your calibration sheet, we can fax or mail a duplicate to you. In emergencies, such information will gladly be provided during a phone discussion.

Website and E-Mail

Visit our website at www.PressureSystems.com to look at our latest new product releases, application notes or product specifications then e-mail your questions and comments to us.

E-commerce

Orders may be placed on-line by visiting our website *(www.PressureSystems.com)* or by contacting the factory or local representative.

Minimum Order

$50.00

Applicable Products

This manual provides information applicable to the use of the following KPSI water level transducers:

Series 169/173
Series 700/710/720/730/735
Series 300/320/330/335
Series 300DS
Series 27/28/30/35
Series 750
Series 760

Table of Contents

1.0 Order Administration

Order Entry

We accept orders by fax, phone, mail and e-mail. To ensure accuracy, all orders are reviewed by two technical specialists before being submitted for production. Orders are scheduled into production within 4 hours of order receipt.

E-commerce

Orders may be placed on-line by visiting our website *(www.PressureSystems.com)* or by contacting the factory or local representative.

Payment

Net 30 terms are available upon approved credit. We accept Visa/MasterCard, corporate checks, money orders and cash. Many orders are shipped C.O.D.

Method of Delivery

All orders are shipped freight on board (FOB) from our factory in Hampton, Virginia USA. We typically ship UPS, but will use any shipper you specify.

Delivery Times

Shipment for standard products is typically 10 working days but we do offer two Expedited Shipment Options for selected products.

Option 1: 5-9 working days from receipt of order is $60.00 per unit.
Option 2: 2-4 working days from receipt of order is $100.00 per unit.

Warranty Protection

Any transducer/transmitter that is less than 2 years old (see DOM) which does not meet the product's specifications and exhibits **no obvious physical damage to the housing, sensor, or cable (cuts),** will be replaced under warranty.

Units 2-3 years old: Units that fall within this age group and exhibit no obvious physical damage to the housing, sensor, or cable (cuts), are replaced at a discounted list price.

Units greater than 3 years old: Units that fall within this age group are not repaired or replaced. The customer will need to contact our Sales Department at **1-800-328-3665** for replacement.

Example DOM: (The DOM is located on each transducer/transmitter housing)

DOM: 9914 — 99 is the last two digits of the year of manufacture (1999)
14 is the week of manufacture (14th week of 52 week year)

- When returning units to the Repair Department, please include the vent filter or aneroid bellows.
- **Vent filters should be changed when they are 75% spent (pink).** Do not remove the old vent filter until a new one is available. The number one failure mode is moisture and corrosion damage due to lack of maintenance of the vent filter. Remember to remove yellow protective cap upon operation. This will allow air to breathe into dessicant fill.
- There is a 90 day warranty on all repairs.

Intrinsic Safety

Most of our products have FM, UL and CSA certification for intrinsic safety as well as CE approval for EMC.

2.0 Product Description and Use

General Characteristics

Our submersible pressure transducers use isolated diaphragm sensors that are specifically designed for use with hostile fluids and gases. These sensors utilize a silicon pressure cell that has been fitted into a stainless steel or titanium package with an integral, compliant stainless steel or titanium barrier diaphragm. This sensor assembly is housed in a rugged 316 stainless steel or titanium case which provides for a variety of pressure inputs from 0-2 through 0-300 PSI. Our devices feature internal signal conditioning. Standard outputs are 4 to 20 mA , 0 to 100 mV and 0 to 5 VDC. Other outputs are available upon request.

All units containing active electronic components have surge and reverse polarity protection. For ease of use in the field, our transducers are permanently etched with our logo and name, wiring information, part number (P/N), serial number (S/N), date of manufacture (DOM), range, excitation and output. Pressure transducers are offered in diameters of 1.0 and .74 inches.

Care and Handling

Our submersible transducers are designed for rugged use. However, they need protection from overpressure and sharp impact. When lowering them into a liquid, penetrate the surface slowly and only to the depth necessary. Avoid dropping the unit from above the surface. Clean all transducers by rinsing them in a mild detergent. Direct probing of the diaphragm or attempts to remove protective screens will damage the sensor, voiding the warranty.

Calibration

All pressure transducers are shipped with calibration information unique to each transducer. Make sure you keep each calibration report. However, should you misplace your calibration sheet, you can contact the factory to have a duplicate faxed or mailed to you.

3.0 Product Accessories and Options

Nose Caps

There are several different user-installable nose caps for the Series 700, 710, 720, 730, 735 submersible pressure transducers. The closed-faced ported cap (316 SS, titanium or Delrin) with #8-32UNC-2B threaded hole is best used where weights are required and for those installations where users may encounter sharp, protruding objects. The open-faced cap which allows maximum contact with the liquid media is ideal for wastewater and "greasy" applications where clogging of the sensor is a concern. The 1/4" male NPT pressure cap is not only useful for calibration purposes but also allows the device to be used as a submersible or above ground pressure transducer. The piezometer cap allows the unit to be buried in saturated soil without damage to the sensor diaphragm.

Series 810 Vent Filter or Series 815 Bellows

We supply with each submersible pressure transducer, a protective barrier against moisture collecting in the cable vent tube. This ensures reliable operation and long life as it protects sensitive electronic components from mildew, corrosion, rust and prevents the formation of a liquid column in the vent tube. Any such column directly affects calibration.

Series 820 Sacrificial Anode

The Series 820 Sacrificial Anode provides cathodic protection against galvanic corrosion for our submersible pressure transducers. Galvanic corrosion occurs when dissimilar metals are placed in contact with an electrolyte. This condition causes a potential difference to exist between the two metals, causing electron flow between them. Corrosion of the less corrosion-resistant metal is increased and attack of the more resistant metal is decreased. The Series 820 Sacrificial Anode is clamped to the exterior of the transducer. We also offer a 1" diameter version that attaches to the nose cap of the transducer.

Our sacrificial anodes are made from a special zinc alloy formulated to guarantee continued effectiveness over long periods. Because the anodes are 95% galvanic, they will not corrode unless there is an electrolytic demand. The anode maintains a high driving potential throughout its 12 month life, is self-sluffing and always exposes new zinc for the best possible protection. For those applications where cable buoyancy is a problem, the nominal 21 ounce sacrificial anode can be substituted for hanging weights.

Polyurethane & Tefzel® Jacketed Cable

Most installations of our submersible pressure transducers connect our polyurethane or Tefzel® cable to a junction box. From this junction box, users run their own cable to the required instrumentation. Polyurethane is used for most applications while Tefzel® is recommended for highly corrosive environments.

Specifications for our standard polyurethane and Tefzel® jacketed cable are as follows:

Specifications	Standard Submersible Cable
Weight	0.05 lbs/ft
Min. OD	0.28"
Max OD	0.31"
Conductors	4 - 22 AWG
Insulation **Conductors** **Outerjacket**	 PVC Polyurethane or Tefzel®
Shield	36 gauge spiral tinned copper wire
Vent Tube	polyethylene, .060" ID

Chemical Resistance of Polyurethane: Potable Water, Waste Water, Borax, Butane, Animal Fat, Carbonic Acid, Citric Acid, Cod Liver Oil, Corn Oil, Glycerin, Glycol, Mineral Oils, Potassium Nitrate, Potassium Sulfate, Silicone Oils, Stoddard Solvent, Tannic Acid (10), Tartaric Acid, Turbine Oil.

Chemical Resistance of Tefzel®: Acetic Acid (Glacial), Acetic Anhydride, Acetone, Aluminum Chloride, Anti-Freeze, Bromine, Calcium Chloride, Calcium Hydroxide, Chlorine, Copper Chloride, Ferrous Chloride, Hydrochloric Acid, Ketones, Lacquer Thinners, Sulfuric Acid.

The vented cable termination end is specially prepared at the factory to eliminate future moisture migration down its length. It can be noticed where the lead wires emerge from under the jacket that a potting material plus shrink tube "boot" have been added. Every effort should be made to leave this feature intact. Should the cable be longer than is needed for the particular installation, it is recommended that the excess length be accommodated in a service loop and that the potted end of the cable NOT be shortened.

The cable attached to this instrument is specifically engineered for submersible applications. The polyurethane outer jacket provides long term reliability under most conditions. The cable should be handled carefully, however, as the jacket may be subject to cutting should it be "raked" over extremely sharp edges. To guard against water incursion should an inadvertent cut occur, we have incorporated an exclusive "water block" feature immediately beneath the jacket. This feature makes the cable "self-sealing" in all but the most extreme cases. The cable is fully shielded, with the shield connected to the metal housing at the transducer end and terminated in a blue-insulated wire at the termination end. The shield should always be terminated to a good earth ground, unless the transducer is installed in an area where electrolytic corrosion is known to be a serious problem.

Lightning Protection

We can provide optional lightning and surge protection for the 0-5 VDC and 4-20 mA output of our 1 inch diameter units. This is achieved through the use of 2 protectors. One is housed in a 4 inch long, 1 inch OD 316 SS tubing attached directly to the non-pressure sensing end of the transducer while the other is the located at the surface and grounded to a DIN-3.

Featuring quick response and low clamping voltages, these devices protect against fast rising voltage transients as well as severe current surges associated with lightning discharges up to 20,000 amperes. Following a surge, the protector automatically restores the line to normal operation and awaits the next surge without having to reset a breaker or replace a fuse.

½" Male NPT Conduit Fitting

Submersible pressure transducers can be attached to a rigid conduit and the cable run through the conduit. To achieve this, all of our submersible transducers can be fitted with an optional ½" NPT male conduit fitting where the cable exits the transducer. This fitting can then be mated to a standard rigid conduit.

Variety of Electrical Outputs

Most applications call for a 0-5 VDC, 4-20 mA or a 0-100 mV output. But where necessary, our transducers offer a broad choice of possibilities including, among others, 0-10 VDC, 0-2.5 VDC, or ratiometric mV/V.

Temperature Output

A 4-20 mA output for temperature is also available for most transducers having a 4-20 mA pressure output. The temperature sensor requires an excitation of 9-30 VDC and is calibrated for a temperature range of 0-50°C. Wiring information: White = + Excitation, Green = Signal out. Please see Appendix B.

Cable Hanger

We can supply an optional cable hanger to help end users secure the cable. The cable hanger can be positioned anywhere on the cable by pushing the ends together. Once positioned, the cable hanger expands and provides a snug grip on the cable.

When mounting the transducer in a well casing, the cable hanger can be secured to a hook on the well plate or an eyebolt may be attached to the side of the well casing. The cable hanger loop is then secured to the eyebolt by using any number of types of fasteners. A similar technique can be used when working in still wells for surface water level measurement. In this case, the loop-end of the cable hanger can be attached directly to a screw or bolt bored into the still well shelf.

Cable Splicing Kit

Our field-installable cable splice allows you to splice our polyurethane and Tefzel® cable. It is most commonly used for well applications where the more expensive Tefzel® cable is required for suspension in corrosive media where the liquid level is fairly shallow but the well is hundreds of feet in depth. It also is used in those emergency situations where cable must be spliced together to get an application up and running.

4.0 Installation & Maintenance Tips

General Installation Procedures - Submersible Units

Most installations either suspend our submersible transducer in a perforated 1 ½" or 2" PVC instrumentation stilling well or attach the transducer (using our optional conduit fitting) to a rigid conduit. It is not advisable to tie the transducer to the pump or piping, as a problem with the transducer would then require that the pump be pulled (very expensive).

A minority of applications use our optional bracket to clamp the transducer to a fixed object (i.e., wall, ladder, step) or require the unit to be suspended without any protective still well or attachment device. In all installations, care should be taken to ensure no damage occurs to the cable as cable damage represents one of the most frequent causes of transducer failure.

Cable Lengths

The maximum length of cable to be used with our submersible pressure transducers is largely dependent upon the type of electrical output of the pressure transducer. For a 0-5 VDC output, a maximum cable length of 100 feet is recommended as a voltage output is more susceptible to electrical interference than a 4-20 mA signal.

A 4-20 mA signal can be transmitted much longer distances depending upon such factors as temperature, wire size, length of wire, power supply and voltage requirements of any devices to be powered. At 25°C the 22 AWG conducting copper wire used in our polyurethane jacketed cable has a resistance of 16.45 ohms per 1000 feet.

Using Ohms Law (E=IR) where E=voltage, I=current and R =resistance, one finds that a 20 mA signal requires .329 volts to drive it along 1000 feet of 22 AWG copper wire (E=16.45 x .020).

To find out how much voltage is required to drive our Series 700 submersible pressure transducer's 4-20 mA signal 10,000 feet, just add the minimum power requirement of the 700 (9 VDC) to the resistance offered by 10,000 feet of our polyurethane jacketed cable (10,000÷1000 x .329=3.29). The resulting power requirement is 12.29 VDC (9 + 3.29).

Reverse Signal

For some applications, it is important to know how far the water is from the top of the tank or the surface of the ground. If specified by the customer, our factory can set the transducer so that zero pressure reads full scale electrical output and maximum pressure reads zero output.

Drying Transducers

If you happen to get water in the vent tube and in the submersible pressure transducer, coil the cable and transducer in a pan and place the pan in an oven at 50°C for 2 hours. This on-site remedy may do the trick. Be careful that the oven temperature does not exceed 50°C. Otherwise, you may damage the transducer and cable.

4-20 mA Wiring

To connect a 2 wire 4-20 mA transducer to a typical power supply and mA meter, connect the + (red) lead of the transducer to the + terminal of the power supply. Connect the - (black) lead of the transducer to the + input terminal of the meter. Connect the - input terminal of the meter to the - terminal of the power supply with a length of 22-24 AWG wire.

VDC Wiring

To connect a 3 wire VDC output transducer to a typical power supply and the voltmeter, connect the - terminal of the power supply to the - input terminal of the meter with a length of 22-24 AWG wire. Connect the - excitation (black) lead of the transducer to the - input terminal of the meter. Connect the + input terminal of the meter to the signal lead (white) of the transducer. Connect the + terminal of the power supply to the + lead (red) of the transducer.

Cable Protection

An inexpensive way to protect the cable from damage is to order the submersible pressure transducer with a ½" conduit attachment. Connect an inexpensive flexible 5/8" garden hose to the ½" conduit fitting with an equally inexpensive female PVC ½" NPT x 3/4" NHT swivel fitting, available at your local hardware store.

Bending of Cable

Our polyurethane and Tefzel® jacketed cables are quite flexible. Care needs to be taken to ensure that when bending the cable to suit your installation you do not crimp the vent tube inside the cable. Consequently, do not bend the cable more than a radius of 1 inch.

Cable Compression

Many users require a compression fitting to secure our Tefzel® and polyurethane jacketed cable as it enters a junction box. Care needs to be taken that you do not overtighten the fitting so as to damage the cable.

Appendix A

Frequently Asked Questions

1. I need proof pressure much greater than 1.5 X. How can you help me?

   We can provide 5 X over pressure protection on most ranges if you can accept a thermal error of 0.1% full scale output per degree Centigrade.

2. What installation ideas do you have to help me get rid of electrical noise interfering with the signal?

   An ounce of prevention goes a long way. Either try to eliminate the source of noise or move the transducer as far away from it as possible. We strongly encourage you to secure our cable shield to a good earth ground and that you use a 4-20 mA signal output. Armed with these precautions and the fact that many of our transducers are CE approved for electromagnetic interference, you should have few problems.

3. My cable on the submersible always seems to get cut and damaged. What am I doing wrong?

   This is the most common problem that our users encounter. Make sure that all of your colleagues and staff understand the importance of handling the cable with care. The cable should not be bent around rough or sharp edges. Always use a cable reel during transport. Where possible, suspend the unit in a perforated 2" PVC pipe and thread the cable through protective conduit to the nearest junction box. This is a problem that KPSI directly addresses with the water block feature in our cable.

4. I have an application where the transducer is frequently damaged by voltage spikes. What can be done to prevent this?

   At a minimum, make sure the cable shield is connected to an earth ground as near as possible to the transducer. We can provide a surge protection kit for both our below and above ground transducers and transmitters. These kits will handle typical spikes that might come in through the power lines as well as surges that travel through the ground due to nearby lightning strikes.

5. How much impact shock can your submersible transducers withstand?

   The lower pressure ranges can be damaged if dropped from several feet onto an unforgiving surface like concrete, so we recommend that the protective shipping foam remain in place until the unit is installed.

6. What is the response time of your transducer?

   From initial power up, the transducer output will stabilize within a fraction of a second. The frequency response is rather low, probably less than 1 kHz, but it really depends on the application, the media, plumbing, etc. Call our factory for application assistance if frequency response is critical in your application.

7. How do I attach your vent filter or aneroid bellows to my cable vent tube?

   The vent filter can be mounted anywhere convenient, preferably out of the weather. It can be mounted in any position and connects to the cable vent tube via the extension tube with metal connector tube provided. The aneroid bellows must be mounted in a way that its movement is not encumbered. It is provided with a mounting base that will install to a standard DIN3 mounting rail common to most control panels. Also provided with the bellow is a 3 inch length of DIN3 rail, just in case one is not already available.

8. What is the best way to mark my cable?

   Use white vinyl marking tape available from your local hardware or electronic stores. These same stores may also sell cable marking kits.

9. Any ideas for preventing marine growth on your submersible transducers?

   You might want to try waterproof grease. Remove the threaded nose cap to facilitate applying the grease. Take care when applying the grease not to trap air bubbles against the sensing diaphragm and not to damage the diaphragm.

10. How many pressure measurements can you make before the diaphragm on the pressure sensor fails?

    In normal operation - millions of cycles. We find that transducer failure is rarely due to diaphragm fatigue.

11. What is the mean time between failure for your submersible pressure transducer?

    Most failures are due to misuse by the end user. However, properly installed units last tens of thousands of hours.

12. What is the turnaround time on repairs?

    Once we receive a unit into our facility it takes approximately 5 working days.

13. What is the longest length of cable you have attached to a submersible transducer?

    Two thousand feet.

14. Why do you use 316 SS housings and sensors for your standard transducers?

    It offers a good combination of corrosion resistance and reasonable cost. As an option, we do offer Titanium for very corrosive environments.

15. What wire gauge should I limit myself to when connecting to your 22 AWG wire?

    Use 22 AWG or greater.

16. Does it make any difference if I mount the transducer in a vertical or horizontal position?

    No. Our units have a minimum amount of position sensitivity. You should mount it in the same position, however, throughout the measurement cycle.

17. What is the longest length of time one of your products has run continuously?

    Since 1986, the year we first started manufacturing all-media pressure transducers.

18. What happens when you freeze your transducer in a column of water?

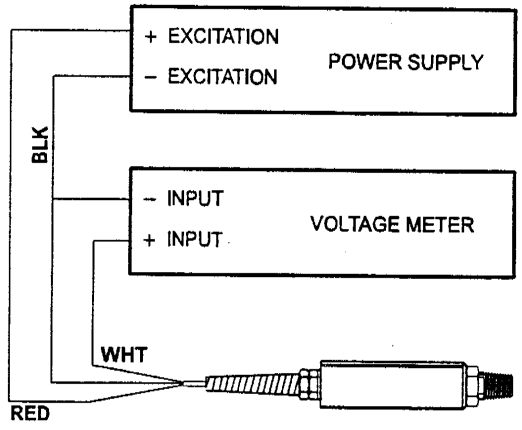
    We have frozen our submersibles in a container of water in a home freezer, with no resulting damage. However, depending on the pressure range of the unit, over pressure of the unit is possible. In harsh environments where debris is common and ice shifts, you might expect damage to both the transducer and cable.

19. What are the most common reasons customers keep buying your products?

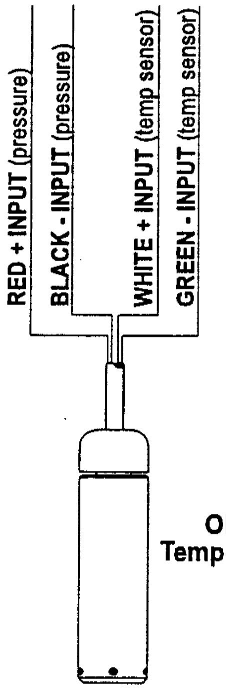
    No hassle service.
    Reliable, long lasting products.
    We offer lightning protection lifetime warrranty.
    Use 800 numbers for order entry and support.
    Excellent pre and post sales application support.
    Quick response to problems.
    Rapid delivery.

Appendix B

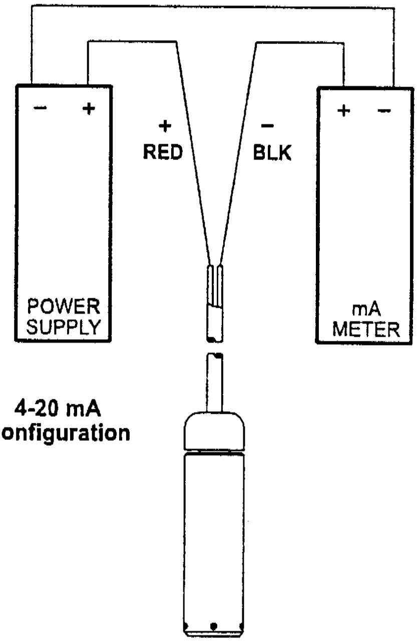
VDC Configuration



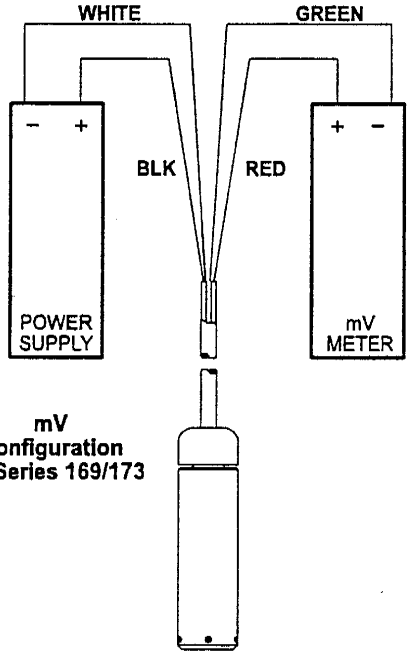
Note: These diagrams depict typical installations. Refer to your power supply and instrumentation manufacturer for the specifics of your application.



OPTION-023
Temperature output

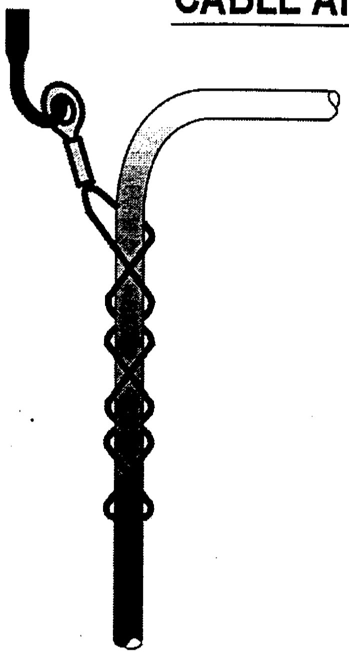


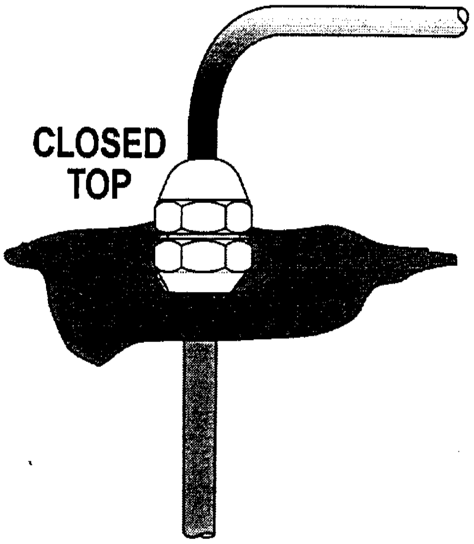
4-20 mA Configuration



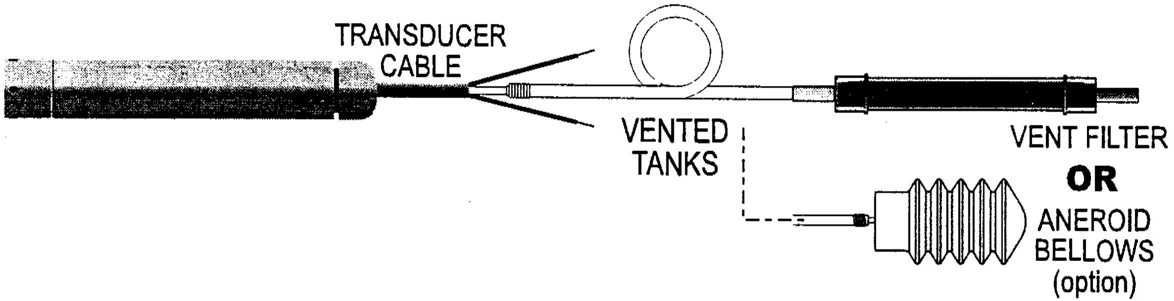
mV Configuration for Series 169/173

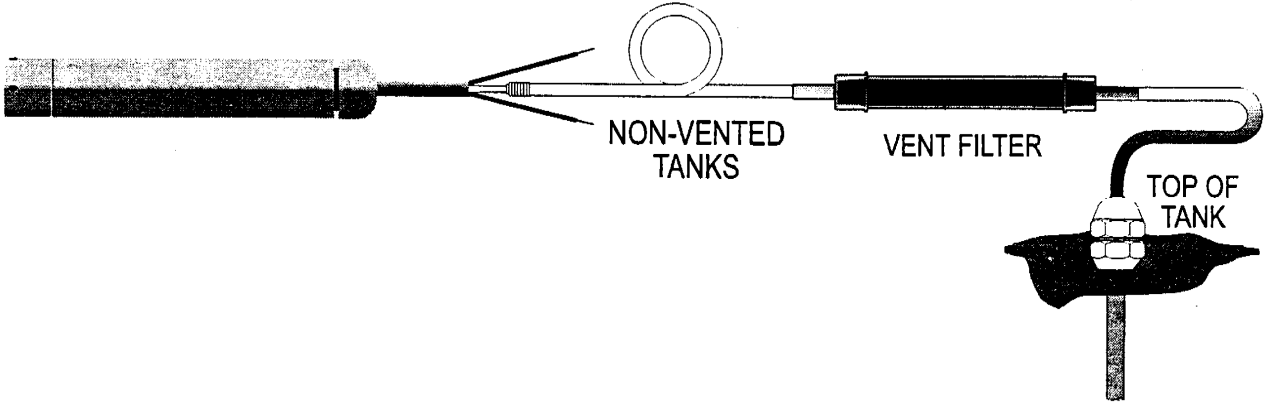
CABLE ANCHORING SCHEMES



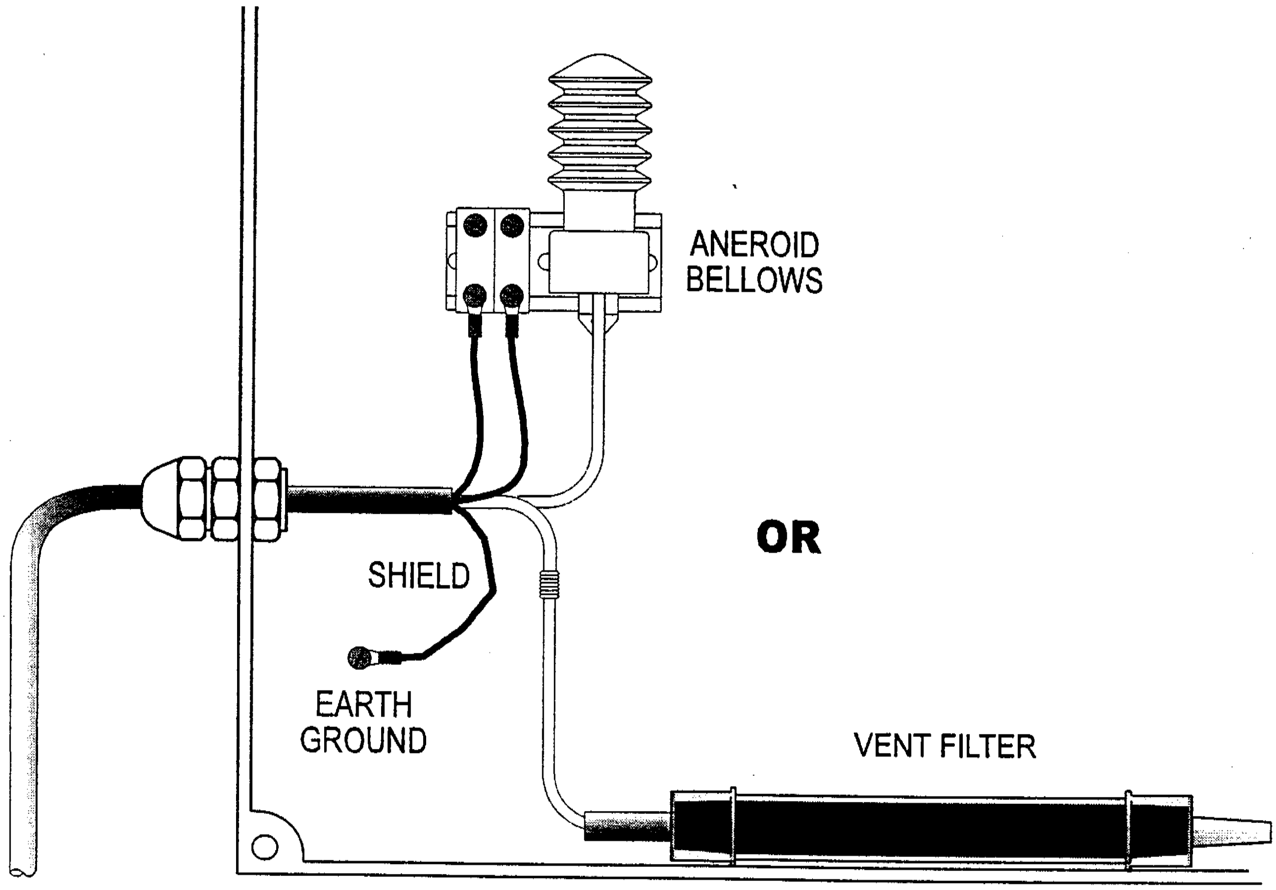


REFERENCE CONNECTION SCHEMES





Submersible Cable Termination



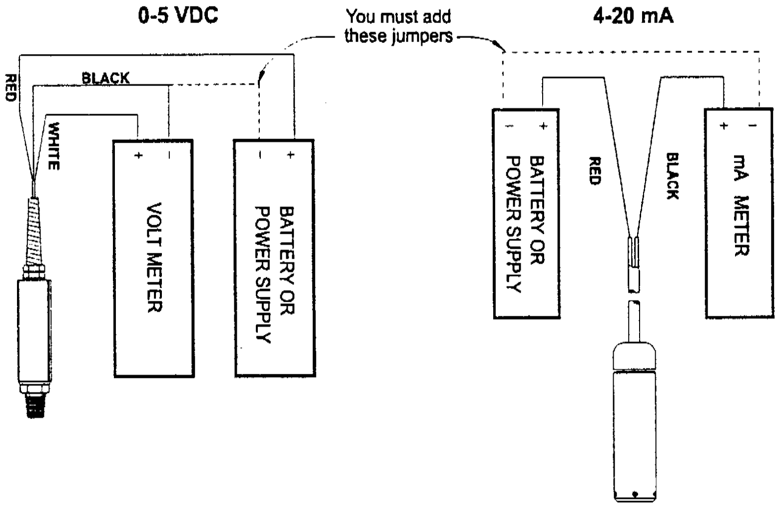
Quick Check Procedure for KPSI Transducers/Transmitters

Should a problem be encountered with a KPSI transducer or transmitter, it is sometimes helpful to test the transducer independently from the rest of the system, thereby establishing where to concentrate the troubleshooting effort.

Shown below are simple hookup diagrams for the two most common types of electrical output, a 0-5 VDC transducer and a 4-20 mA transmitter. In either case, the "power supply" can be a common 12 volt lantern battery, or even a 9 volt transistor radio battery, although the lifetime of a 9 volt battery will be limited. The meter should be a digital type capable of reading at least 2 digits to the right of the decimal point. Use 20-24 gage hookup wire or clip leads for jumpers. If your unit has other than a 0-5 VDC or 4-20 mA output, please call **(800) 328-3665** for assistance.

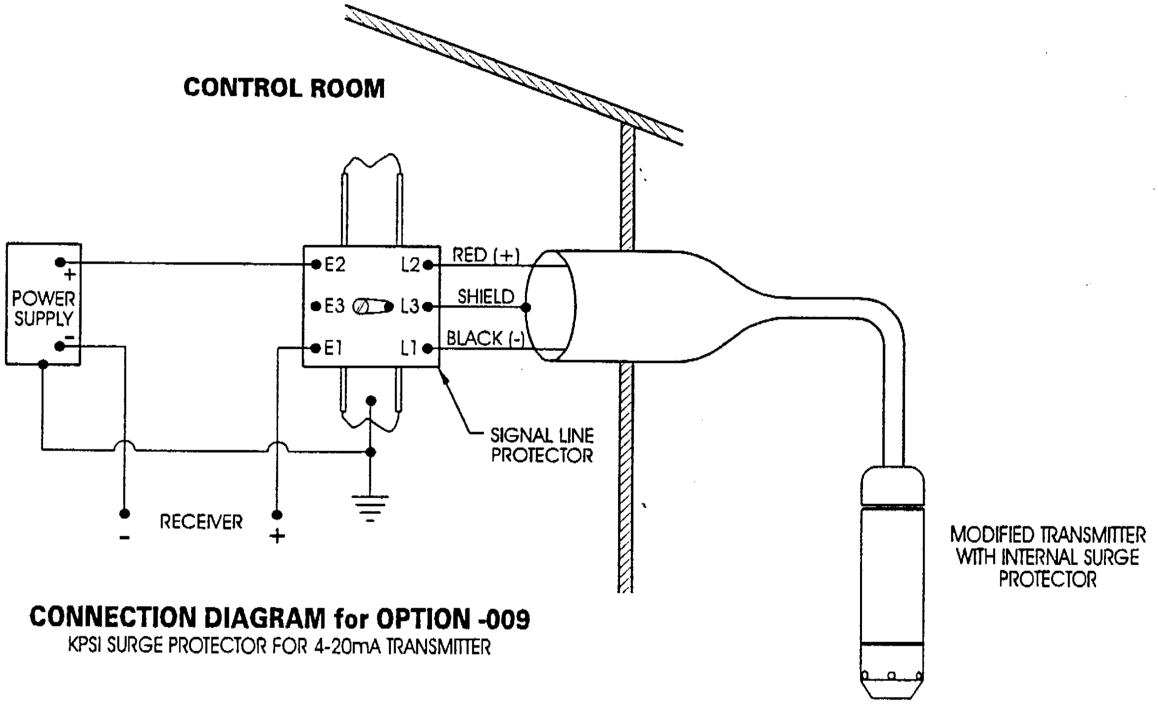
Once your transducer is correctly configured per one of the diagrams below, orient the transducer in a vertical position and then read the zero output on your meter. For a 0-5 VDC output, the zero should be between 0 and 0.060 volts, and for a 4-20 mA output, between 3.88 and 4.12 mA. If the output is outside of these limits, you may, at your option, choose to troubleshoot the transducer per the suggested measurements shown below. Otherwise, contact our Repair Department at **(800) 328-3665** for a Return Material Authorization number (RMA).

If the zero output is within these limits, the problem will more than likely be found elsewhere in your system.

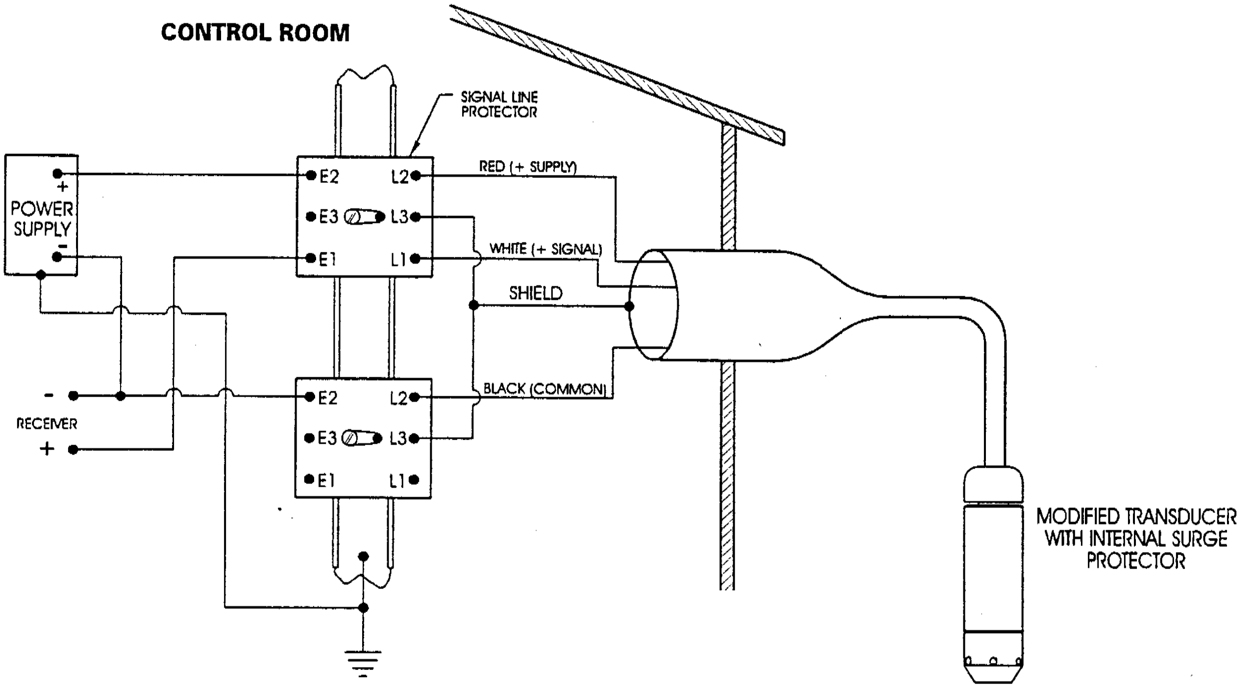


FURTHER MEASUREMENTS:

0-5 VDC	Should read:	4-20 mA	Should read:
+Excitation to Shield	> 2.5 Mohms	+Excitation to Shield	> 2.5 Mohms
-Excitation to Shield	> 2.5 Mohms	-Excitation to Shield	> 2.5 Mohms
+Output to Shield	> 2.5 Mohms	Shield to Housing	< 2 ohms
Shield to Housing	< 2 ohms		



CONNECTION DIAGRAM for OPTION -009
KPSI SURGE PROTECTOR FOR 4-20mA TRANSMITTER



CONNECTION DIAGRAM for OPTION -012
KPSI SURGE PROTECTOR FOR 0-5VDC TRANSDUCER

KROHNE

09/97

Electromagnetic flowmeters

• Primary heads

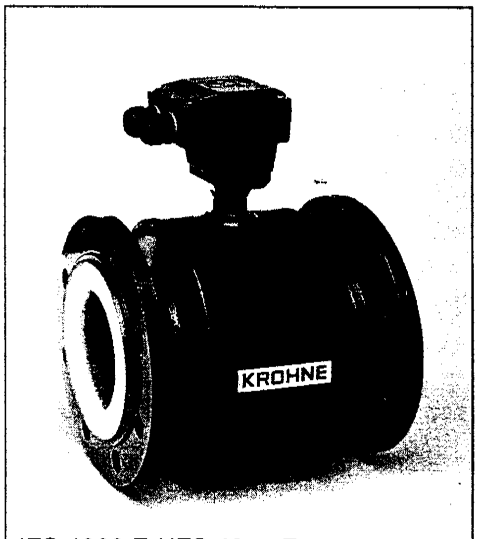
• Compact flowmeters

Installation instructions

ALTOFLUX

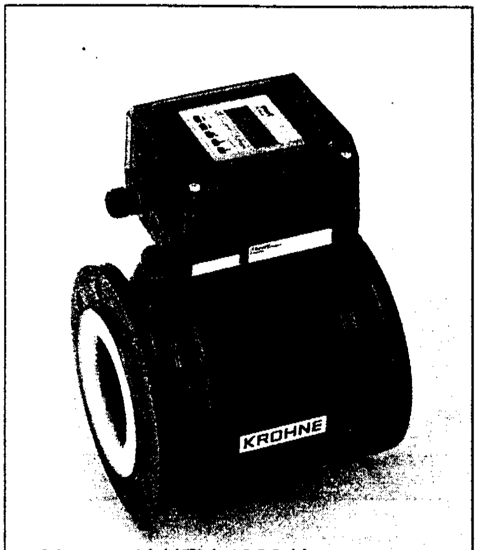
IFS 4000 F
IFS 4005 F

IFM 4010 K
IFM 4020 K
IFM 4080 K

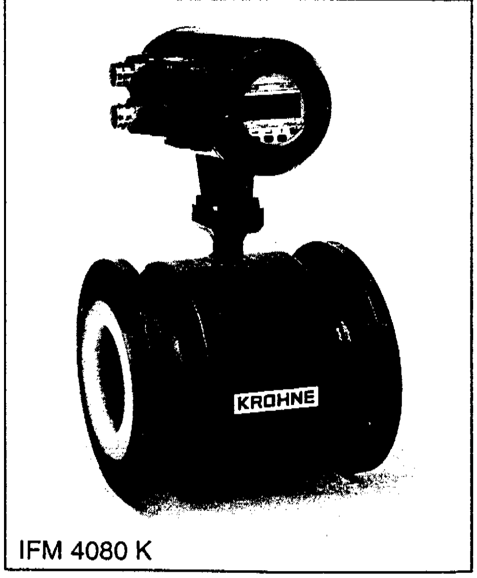


IFS 4000 F / IFS 4005 F

CONTENTS



IFM 4010 K / IFM 4020 K



IFM 4080 K

Order No. DIN size 7.02147.32.00
US size 7.02147.72.00

Contents

System description

ALTOFLUX electromagnetic flowmeters are precision measuring instruments designed for the linear flow measurement of process liquids.

The process liquids must be electrically conductive: ≥ 5 µS/cm
≥ 20 µS/cm for demineralized cold water

The **full-scale range $Q_{100\%}$** can be set as a function of the **meter size**:

IFM 4010 K, IFM 4020 K, IFM 4080 K:	DN 10 - 1000 / 3/8" - 40"	$Q_{100\%}$ = 0.1 - 33 900 m^3/hr = 0.02 - 156 640 US GPM
IFS 4000 F:	DN 10 - 3000 / 3/8" - 120"	$Q_{100\%}$ = 0.1 - 305 000 m^3/hr = 0.02 - 1 400 000 US GPM
IFS 4005 F:	DN 50 - 1000 / 2" - 40"	$Q_{100\%}$ = 2.1 - 33 900 m^3/hr = 9.80 - 156 640 US GPM

This is equivalent to a flow velocity of 0.3 - 12 m/s, or 1 - 40 ft/s.

Product liability and warranty

ALTOFLUX electromagnetic flowmeters are designed solely for measuring the volumetric flowrate of electrically conductive, liquid process products.

Special codes and regulations apply to their use in hazardous locations, and these are referred to in the special "Ex" installation and operating instructions (supplied only with hazardous-duty equipment).

Responsibility as to suitability and intended use of these electromagnetic flowmeters rests solely with the operator.

Improper installation and operation of the flowmeters (systems) may lead to loss of warranty.

In addition, the "General conditions of sale" forming the basis of the purchase contract are applicable.

If ALTOFLUX flowmeters need to be returned to Krohne, please note the information given on the last-but-one page of this manual. Krohne regret that they cannot repair or check your flowmeter(s) unless accompanied by the completed form sheet.

Standards and approvals

Please refer to the installation and operating instructions for the signal converter.

Items included with supply

IFS 4000 F / IFS 4005 F primary heads

- Primary head in the size as ordered
- Connecting wires for grounding, refer to Section 7 ”Grounding”
- Certificate of calibration data
- Grounding rings (optional), if ordered
- Installation instructions

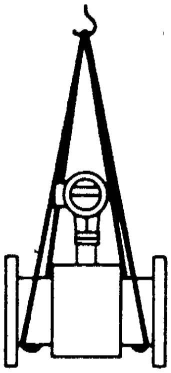
IFM 4010 K, IFM 4020 K and IFM 4080 K compact flowmeters

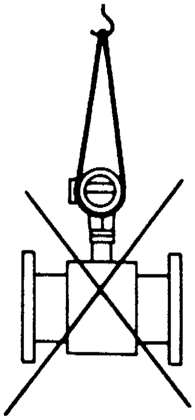
- Compact flowmeter in the size as ordered
- Connecting wires for grounding, see Section 7 ”Grounding”
- Certificate of calibration data
- Grounding rings (optional), if ordered
- Installation instructions
- Installation and operating instructions for the signal converter

Fitting accessories (stud bolts, nuts, gaskets, etc.) **are not supplied with the flowmeter, to be provided by customer!**

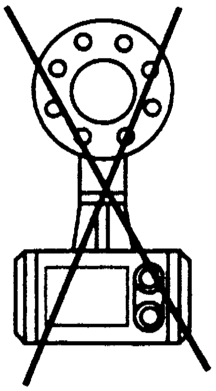
Handling

Do not lift flowmeter by the signal converter housing or the terminal box.





Do not set flowmeter down on signal converter housing or terminal box.



1 Important information for installation: PLEASE NOTE !

- Use only solventless detergents to **clean** the signal converter housing (polycarbonate).

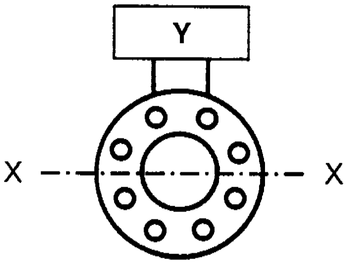
- **Temperatures**
  Refer to Section 11 "Limits" for operating pressure and vacuum load based on flange standards and type of tube liner.

	Ambient temperature	Process temperature
Compact systems	-25 to +**60** °C (-13 to +**140** °F)	-25 to ≤ +**60** °C (-13 to ≤ +**140** °F)
	-25 to +**40** °C (-13 to +**104** °F)	-25 to > +**60** °C (-13 to > +**140** °F)
IFS 4000 F IFS 4005 F	-25 to +60 °C (-13 to +140 °F)	-25 to > +**60** °C (-13 to > +**140** °F)
In storage	-25 to +60 °C (-13 to +140 °F) with liners made of Teflon®-PFA, Teflon®-PTFE, FEP, Tefzel, Irathane and soft rubber	
	-20 to +60 °C (-04 to +140 °F), kept immobile, with **Neoprene** liner	
Transport	-25 to +60 °C (-13 to +140 °F), with liners made of Teflon®-PFA, Teflon®-PTFE, FEP, Tefzel, Irathane and soft rubber	
	- **5** to +**50** °C (- 4 to +**140** °F), with **Neoprene** liner	

Teflon® is a registered trademark of Du Pont

- **Location and position as required,**
  but electrode axis **X – • – • – • – X**
  must be approximately horizontal in a horizontal pipe run.

  Y terminal box or converter housing



- **Measuring tube must be completetly filled at all times.**

- **Direction of flow is arbitrary.** Arrow on flowmeter can normally be ignored.
  For exceptions, refer to Section "Factory settings" in the installation and operating instructions for the signal converter.

- **Stud bolts and nuts:** to fit, make sure there is sufficient room next to the pipe flanges.

- **Vibration:** support the pipeline on both sides of the compact flowmeter.
  Level of vibration in conformity with IEC 068-2-34: below 2.2g for compact flowmeters in the frequency range of 20-50 Hz with the IFC 010 K / IFC 020 K and 20-150 Hz with the IFC 090 K.

- **Do not expose to direct sunlight,**
  fit a sunshade if necessary, not included with flowmeter, to be provided by customer.

- **Large meter sizes (≥ DN 200 / ≥ 8"):** use adapter pipes to allow axial shifting of the counterflanges and to facilitate installation.

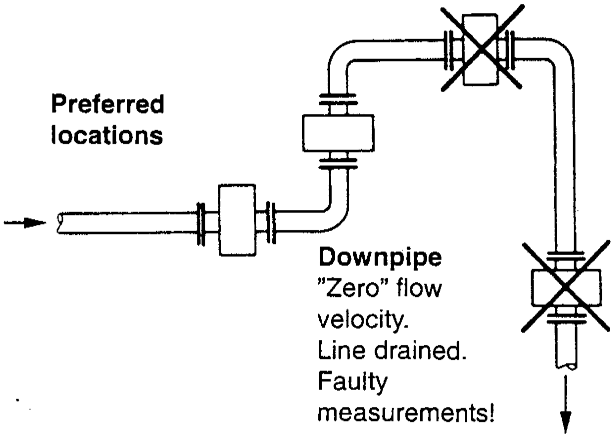
- **Strong electromagnetic fields,** avoid in vicinity of flowmeter
- **Straight inlet run minimum of 5 × DN and outlet run minimum of 2 × DN,** (DN = meter size), measured from the electrode axis.
- **Vortex and corkscrew flow:** increase length of inlet and outlet runs or install flow conditioners.
- **Mixing different process liquids:** install flowmeter upstream of mixing point or at an adequate distance downstream (minimum of 30 × DN), otherwise display may be unsteady.
- **Plastic pipes and internally coated metal pipelines:** grounding rings required, see Section 7 "Grounding"..
- **Insulated pipeline:** do not insulate flowmeter
- **Zero setting not necessary.** To check, it should be possible to set "zero" flow velocity in the completely filled measuring tube. Shutoff valves should therefore be provided either downstream of the flowmeter or upstream and downstream of the flowmeter.

10 up 5 down preferred

2 Suggestions for installation

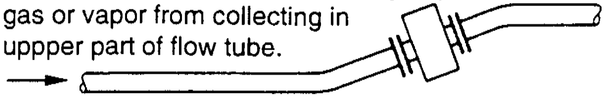
To avoid measuring errors due to gas/air inclusion or to pipe running empty, please observe the following:

Highest point of pipe run
(Air bubbles collect in measuring tube - faulty measurements!)

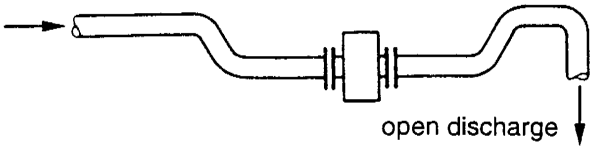


Downpipe
"Zero" flow velocity.
Line drained.
Faulty measurements!

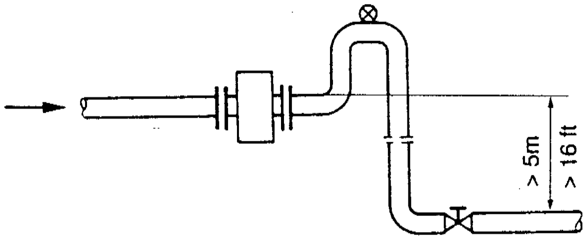
Horizontal pipe run
Install in slightly ascending pipe section. If not possible, assure adequate velocity to prevent air, gas or vapor from collecting in uppper part of flow tube.



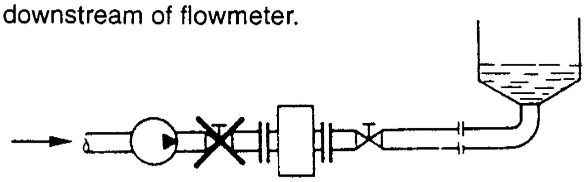
Open feed or discharge
Install meter in low section of pipe.



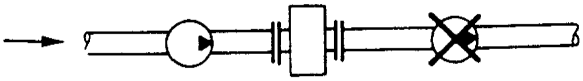
Downpipe over 5 m (16 ft) length
Install air valve ⊗ downstream of flowmeter.



Long pipeline
Always install control and shutoff valves downstream of flowmeter.

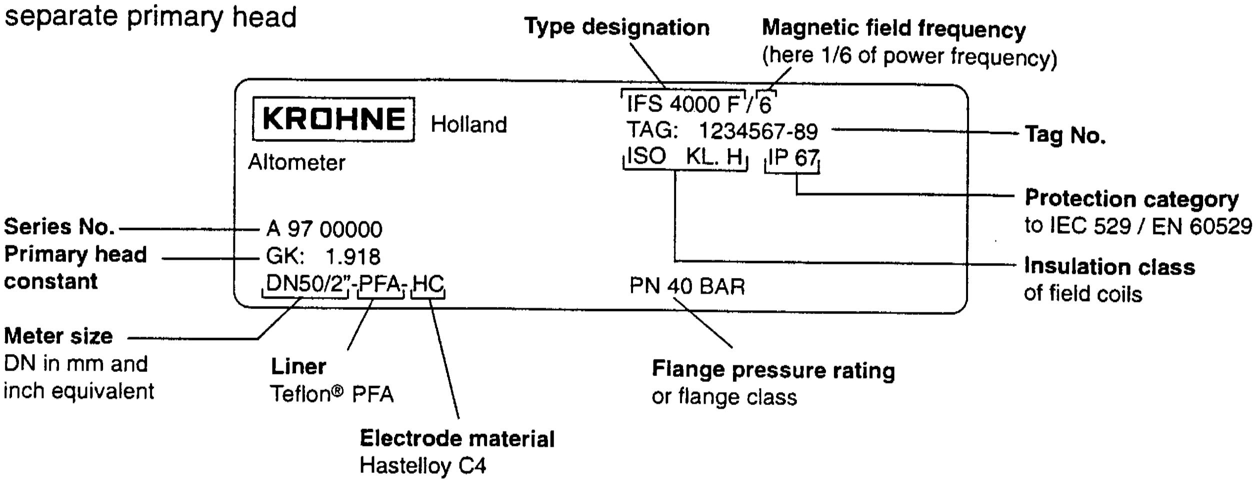


Pumps
Never install flowmeter on pump suction side.



3 Instrument nameplate

IFS 4000 F/IFS 4005 F
separate primary head



Liner materials

NE	Neoprene
PFA	Teflon®-PFA
PUI	Irathane
T	Teflon®-PTFE
TZ	Tefzel
W	Soft rubber
FEP	FEP

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Electrode materials

C	Conductive rubber compound	
HB	Hastelloy B2	
HC	Hastelloy C4	
IN	Incoloy	
M4	Monel 400	
NI	Nickel	
PT	Platinum	
TA	Tantalum	
TI	Titanium	
V4A	Stainless steel 1.4571	
XX/TC	**xx** with conductive, PTFE compound	**XX** = base material, e.g. HC
XX/CO	**xx** low-noise version	

Instrument nameplate for compact flowmeters
see installation and operating instructions for the signal converter.

4 Flowmeter versions

IFS 4000 F **Separate primary head (F)**, electrically connected to the signal converter by signal and field current cables.

IFM 4005 F **Separate primary head (F)**, electrically connected to the signal converter by signal and field current cables. Designed for higher field currents.
The double coil insulation (insulation class II) rules out the need for special protective grounding.

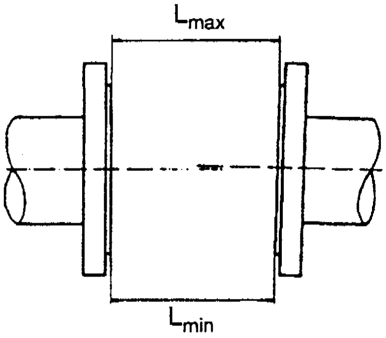
IFM 4010 K,
IFM 4010 K **Compact flowmeter (K),** IFC 010 K or IFC 020 K signal converter mounted direct on the primary head.

IFM 4080 K **Compact flowmeter (K),** IFC 090 K signal converter mounted direct on the primary head.

Versions for hazardous locations
IFS 4000 F and IFM 4080 K are approved as electrical equipment to the harmonized European Standards and to Factory Mutual (FM).
Test certificate, certificate of conformity and wiring instructions for these devices are attached to the **"Ex" installation instructions**, provided only with hazardous-duty equipment.

5 Installation in the pipeline

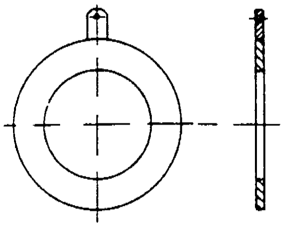
- **Installation material not included,** to be provided by customer (stud bolts, nuts, gaskets, etc.)
- **Pipe flanges and operating pressure:** refer to tables on "limits" in Section 11.
- **Distance between pipe flanges**
  see **fitting dimension "a",** in Section 10 "Dimensions and weights".
- **High-temperature pipelines**
  Where process temperatures exceed 100 °C/212 °F, provide for facilities to compensate for longitudinal expansion on heat-up of the pipeline.
  For **short** pipelines use resilient gaskets and
  for **long** pipelines install flexible pipe elements (e.g. elbows).
- **Position of flanges**
  Install flowmeter in line with the pipe axis. Pipe flange faces must be parallel to each other,
  max. permissible deviation:
  $L_{max} - L_{min} \leq 0.5$ mm
  ≤ 0.02"



- **Neoprene liners**
  Process temperatures **below - 5 °C (+ 23 °F)** are only permissible if the pipeline is supported on both sides of the flowmeter and provided there is only slight vibration and no water hammer in the pipe.
- **Teflon®-PTFE liners**
  Install at the lowest point of the pipe run to avoid an excessive vacuum condition at the meter. Do not remove or damage liner, which is formed around the flange edges.
- **Irathane liner, thickness > 12 mm / > 0.50"**
  The nominal diameter of the pipe flanges must be greater than the nominal diameter of the measuring tube, see tables in Section 10 "Dimensions and weights".
- **Gaskets**
  Use gaskets suitable for the application and appropriate to the liner, not included with flowmeter, to be provided by customer.
- **Grounding rings / protective rings** (option)
  On plastic pipes and internally coated metal pipelines, grounding rings must form the conductive connection with the fluid. Refer to Section 7 "Grounding for electrical connection.

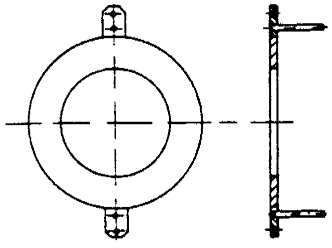
Grounding ring No. 1

3 mm/0.12" thick



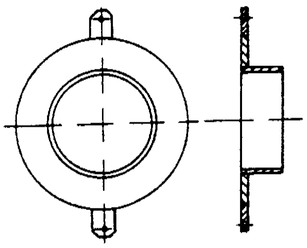
Grounding ring, protective ring No. 2

for flowmeters with Teflon®-PTFE liner, solidly fitted to the flanges, 3 mm/0.12" thick



Grounding ring, protective ring No. 3

with cylindrical neck, to protect the liner particularly at the inlet edge against abrasive products, 3 mm/0.12" thick.
Length: 30 mm/1.18", for ≤ DN 300, ≤ 12"
100 mm/3.94", for ≥ DN 350, ≥ 14"



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6 Torques

- Tighten **stud bolts** uniformly in diagonally opposite sequence, see table for number and type.
- **Irathane liner, thickness > 12 mm / > 0.50”**
  The max. torque refers to the nominal diameter of the pipe flanges and **not** to the nominal diameter of the measuring tube.
- **Column A**
  Torques for Teflon®-PFA and Teflon®-PTFE liners.
- **Column B**
  Torques for liners made of
  Neoprene, Irathane, Tefzel, soft rubber and FEP.
- **10 Nm ~ 1.0 kpm ~ 7.23 ft × lbf**

Meter size DN mm	**Pressure rating** PN	**Bolts**	**Max. torque** Nm (ft × lbf) A	B
10	40	4 × M 12	7.6 (5.5)	4.6 (3.3)
15	40	4 × M 12	9.3 (6.7)	5.7 (4.1)
20	40	4 × M 12	16 (11.6)	9.6 (6.9)
25	40	4 × M 12	22 (15.9)	11 (8.0)
32	40	4 × M 16	37 (26.8)	19 (13.0)
40	40	4 × M 16	43 (31.1)	25 (18.1)
50	40	4 × M 16	55 (39.8)	31 (22.4)
65	16	4 × M 16	51 (36.9)	42 (30.4)
65	40	8 × M 16	38 (27.5)	21 (15.2)
80	25	8 × M 16	47 (34.0)	25 (18.1)
100	16	8 × M 16	39 (28.2)	30 (21.7)
125	16	8 × M 16	53 (38.3)	40 (28.9)
150	16	8 × M 20	68 (49.2)	47 (34.0)
200	10	8 × M 20	84 (60.7)	68 (49.2)
200	16	12 × M 20	68 (49.2)	45 (32.5)
250	10	12 × M 20	78 (56.4)	65 (47.0)
250	16	12 × M 24	116 (83.9)	78 (56.4)
300	10	12 × M 20	88 (63.7)	76 (54.9)
300	16	12 × M 24	144 (104.2)	105 (75.9)
350	10	16 × M 20	97 (70.1)	75 (54.2)
400	10	16 × M 24	139 (100.5)	104 (75.2)
450	10	20 × M 24	127 (91.8)	93 (67.2)
500	10	20 × M 24	149 (107.7)	107 (77.4)
600	10	20 × M 27	205 (148.2)	138 (99.8)
700	10	20 × M 27	238 (172.1)	163 (117.8)
800	10	24 × M 30	328 (237.1)	219 (158.3)
900	10	28 × M 30	–	205 (148.2)
1000	10	28 × M 35	–	261 (188.7)

Meter size inch	**Body pressure rating** lb	**Bolts** for ANSI class 150 flanges	**Max. torque** Nm (ft × lbf) A	B
3/8	580	4 × 1/2”	3.5 (2.5)	3.6 (2.6)
1/2	580	4 × 1/2”	3.5 (2.5)	3.6 (2.6)
3/4	580	4 × 1/2”	4.8 (3.5)	4.8 (3.5)
1	580	4 × 1/2”	6.7 (4.8)	4.4 (3.2)
1 1/2	580	4 × 1/2”	13 (9.4)	12 (8.7)
2	580	4 × 5/8”	24 (17.4)	23 (16.6)
3	360	4 × 5/8”	43 (31.1)	39 (28.2)
4	230	8 × 5/8”	34 (24.6)	31 (22.4)
6	230	8 × 3/4”	61 (44.1)	51 (36.9)
8	145	8 × 3/4”	86 (62.2)	69 (49.9)
10	145	12 × 7/8”	97 (70.2)	79 (57.1)
12	145	12 × 7/8”	119 (86.1)	104 (75.2)
14	145	12 × 1”	133 (96.2)	93 (76.2)
16	145	16 × 1”	130 (94.0)	91 (65.8)
18	145	16 × 1 1/8”	199 (143.9)	143 (103.4)
20	145	20 × 1 1/8”	182 (131.6)	127 (91.8)
24	145	20 × 1 1/4”	265 (191.6)	180 (130.1)
28	145	28 × 1 1/4”	242 (175.0)	161 (116.4)
32	145	28 × 1 1/2”	380 (274.7)	259 (187.3)
36	145	32 × 1 1/2”	–	269 (194.5)
40	145	36 × 1 1/2”	–	269 (194.5)

Note: Process pressure must not exceed ANSI flange rating. Refer to ANSI Standard B 16.5.

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7 Grounding

- All flowmeters must be properly grounded to avoid personnel shock hazard.
- The ground conductor should not transmit any interference voltages, therefore do not ground any other electrical devices together with this conductor.

IFS 4000 F and IFS 4005 F separate primary heads with terminal box

- An **FE functional ground** must always be connected.
- **Signal converter field power supply > 125 mA / 60 V:**
  IFS 4005 F primary head: no special measures required.
  IFS 4000 F primary head: because of the higher field current from the signal converter, a **PE protective conductor** must be connected to the primary head, see grounding diagrams below.

IFM 4010 K, IFM 4020 K and IFM 4080 K compact systems

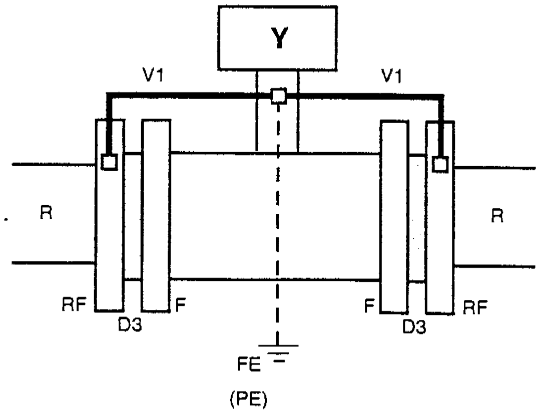
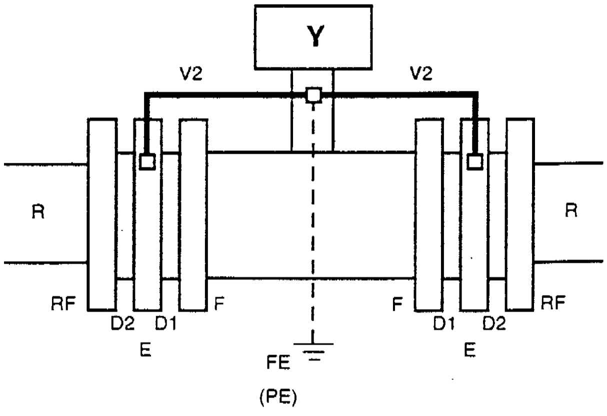
Supply power > 50 V AC

- Grounding is via the **PE protective ground conductor** incorporated in the power supply cable, see also Section "Connection to power" in the installation and operating instructions for the signal converter.
- **EXCEPTION: Do not connect up the PE protective ground conductor in the terminal box** if e.g. compact units are operated in the proximity of electric furnaces, electrolysis plants, etc., and large potential differences occur in the pipeline system. An FE functional ground must simultaneously take over the function of the protective conductor (combined protective/functional ground). Refer to appropriate national codes for specific requirements for this type of installation, which may require the addition of a ground fault detection circuit interrupter.

Power supply 24 V AC or DC

- Protective separation (PELV) must be ensured (VDE 0100 / VDE 0106 or IEC 364 / IEC 536 or equivalent national regulations).
- An **FE functional ground conductor** must be connected for measurement reasons.

Grounding diagrams

Metal pipelines, not internally coated grounding without grounding rings	**Metal pipelines, with or without internal coating, and plastic pipelines** grounding with grounding rings
	

D1, D2, D3	Gaskets, not included with supply, to be provided by customer.
E	Grounding rings (option)
F	Flowmeter flanges
FE	Functional ground, wire ≥ 4 mm² Cu (10 AWG), not included with flowmeter, to be provided by customer
PE	Protective conductor required if the IFS 4000 F is operated with a signal converter that supplies a field current of **> 125 mA / > 60 V**. Wire ≥ 4 mm² Cu (10 AWG), not included with flowmeter, to be provided by customer.
R	Pipeline
RF	Pipe flanges
V1, V2	Interconnecting wires, included with flowmeter
Y	Terminal box or signal converter

8 Replacement of the separate primary head

Switch off power source before commencing work !

1) Note down terminal assignment before dismantling the "old" primary head.
2) Install the new primary head as described in the supplied installation instructions.
3) Make electrical connection at the signal converter as described in the installation and operating instructions for the signal converter.
4) Specific calibration data are defined during factory calibration for each primary head, which are indicated on the instrument nameplate.
   This includes the primary constant GK and the magnetic field frequency. These data need to be reset in the signal converter.
5) If the size of primary head is also different from the old one, the full-scale range $Q_{100\%}$ and the meter size will need to be reset.
6) After resetting the signal converter, carry out a zero point check.
7) If necessary, reset the internal electronic totalizer of the signal converter.

9 Technical data

Meter sizes		
IFM 4010 K, IFM 4020 K, IFM 4080 K	DN 10 - 1000 and 3/8" - 40"	
IFS 4000 F	DN 10 - 3000 and 3/8" - 120"	
IFS 4005 F	DN 50 - 1000 and 2" - 40"	
Pipe flanges		
to DIN 2501 (=BS 4504)	DN 10-50 and DN 80 / PN 40 DN 65 and DN 100-150 / PN 16 DN 200-1000 / PN 10 DN 1100-2000 / PN 6 DN 2200-3000 / PN 2.5	
to ANSI B 16.5	3/8"- 24" / Class 150 lb / RF	
to AWWA	14"-120" / Class B or D / FF	
Electrical conductivity	≥ 5 µS/cm, ≥ 20 µS/cm for demineralized cold water	
Temperatures	Ambient temperature	Process temperature
Compact systems	-25 to + **60** °C -13 to +**140** °F	-25 to ≤ + 60 °C -13 to ≤ +140 °F
	-25 to + **40** °C -13 to +**104** °F	-25 to +140 °C* -13 to +284 °F*
IFS 4000 F / IFS 4005 F	-25 to + 60 °C -13 to +140 °F	-25 to +180 °C* -13 to +356 °F*
	* dependent on liner, flange standard, etc.	
Max. allowable operating data	Process temperature, operating pressure and vacuum load for the liner, refer to Section 11 "Limits"	

Insulation class of field coils	
IFM 4010 K, IFM 4020 K, IFM 4080 K	
DN 10- 300 / 3/8" - 6"	H / ≤ 140 °C / ≤ 284 °F process temperature
DN 350-1000 / 14" - 40"	E / ≤ 120 °C / ≤ 248 °F process temperature, (option H / ≤ 140 °C / ≤ 284 °F)
IFS 4000 F	
DN 10- 300 / 3/8" - 6"	H / ≤ 180 °C / ≤ 356 °F process temperature
DN 350-1000 / 14" - 40"	E / ≤ 120 °C / ≤ 248 °F process temperature, (option H / ≤ 180 °C / ≤ 356 °F)
IFS 4005 F	
DN 50-1000 / 3/8" - 40"	H / ≤ 180 °C / ≤ 356 °F process temperature
Electrode design	
DN 10-3000 / 3/8" - 120"	flat elliptical electrodes, solidly fitted, surface-polished
Option DN 350-3000 / 14" - 120"	field-replaceable electrodes WE
Protection category (EN 60 529/IEC 529)	
Standard	IP 67, equivalent to NEMA 6 (with field replaceable electrodes WE: IP 65, equivalent to NEMA 4/4X)
Option (not IFS 4005 F)	IP 68, equivalent to NEMA 6
Grounding rings	available as an option
Materials	
Measuring tube	stainless steel 1.4301 (or higher materials number), equivalent to SS 304
Liner	
Standard DN 10- 20 / 3/8"- 3/4"	Teflon®-PTFE
DN 25- 150 / 1"- 6"	Teflon®-PFA (reinforced with stainless steel mesh)
DN 200- 600 / 8"- 24"	Tefzel
DN 700-2000 / 4"- 80"	FEP
Option DN 200- 600 / 8"- 24"	Teflon®-PTFE
DN 200-1200 / 8"- 48"	soft rubber
DN 200-1800 / 8"- 72"	Irathane
DN 200-3000 / 8"-120"	Neoprene
≥ DN 200 / ≥ 8"	others on request
Electrodes	
Standard	Hastelloy C4
Option	stainless steel 1.4571 or SS 316 Ti, Hastelloy B2, titanium, tantalum, platinum, platinum-iridium, others on request
Field replaceable WE	stainless steel 1.4571 or SS 316 Ti
Connecting flanges*	
DIN: DN 10 - 50, DN 80 (3/8" - 2", 3")	steel1.0402 (C 22) or AISI C 1020
DN 65, ≥ DN 100 (≥ 4")	steel 1.0501 (RST 37.2) or AISI C 1035
ANSI	steel ASTM A 105 N
Housing*	
DN 10 - 40 / 3/8"-1 1/2"	GTW-S 30 (malleable cast iron)
≥ DN 50 / ≥ 2"	sheet steel
Terminal box* (IFS 4000 and IFS 4005 F only)	die-cast aluminium
Grounding rings (option)	stainless steel 1.4571 or SS 316 Ti

* with polyurethane coating

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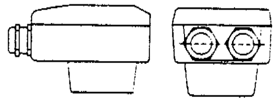
10 Dimensions and weights

PLEASE NOTE

The **total dimension for the height** is obtained from **dimension b** (see table) **plus the height** of the terminal box or the signal converter, see drawings.

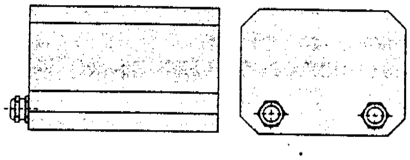
The **total weight** is made up of the weight of the signal converter (see table) **plus** the weight of the terminal box or signal converter, see below.

Terminal box



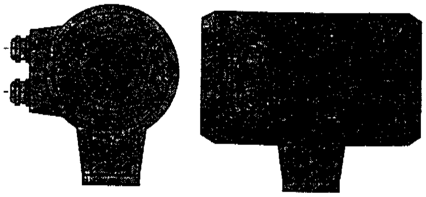
Weight approx.
0.5 kg (1.1 lb)

IFC 010 K and IFC 020 K signal converters



Weight approx.
1.6 kg (3.6 lb)

IFC 090 K signal converter



Weight approx.
2.3 kg (5.1 lb)

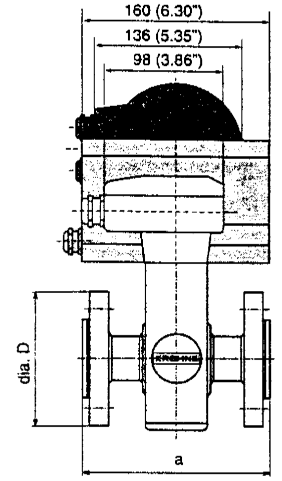
Flange connections to ...			**Dimensions** in mm (inch)
DIN 2501 (= BS 4504)	DN 10- 300 DN 350-1000 DN 350-1000 ≥ DN 1200	PN 40, 16, 10 PN 10 PN 25 PN 6, 2.5	see table see table see table, dimension "$a_{standard}$" + 200 mm information supplied on request
ANSI B 16.5	3/8"-24"	150 lb / RF ≥ 300 lb / RF	see table dimensions supplied on request
AWWA	≥ 14"	Class B, D / FF	dimensions supplied on request

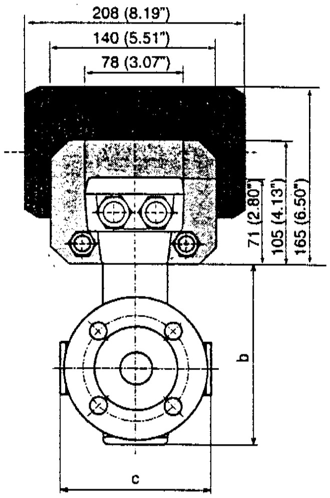
- **Dimension "a" without flange gaskets:**
  not included with flowmeter, to be provided by customer.
- **Irathane liner ≥ DN 350 / ≥ 14"; thickness > 12 mm:**
  nominal size of flanges greater than nominal size of measuring tube, see table
- **Meter size 3/8":** flange connection 1/2"

Nominal size			**Dimensions** in mm (inch)							**Approx. weight** in kg (lb)
DIN		ANSI	a (fitting length)			b	c	dia. D		
DN	PN	inch	Standard	ISO 13 359	ANSI			DIN, ISO	ANSI	
10	40	3/8	150 (5.91)	–	150 (5.91)	146 (5.75)	121 (4.76)	90 (3.54)	88.9 (3.50)	3.5 (7.7)
15	40	1/2	150 (5.91)	200 (7.87)	150 (5.91)	146 (5.75)	121 (4.76)	95 (3.74)	88.9 (3.50)	3.5 (7.7)
20	40	3/4	150 (5.91)	200 (7.87)	150 (5.91)	146 (5.75)	121 (4.76)	105 (4.13)	98.6 (3.88)	5.5 (12.1)
25	40	1	150 (5.91)	200 (7.87)	150 (5.91)	146 (5.75)	121 (4.76)	115 (4.53)	108 (4.25)	5.5 (12.1)
32	40	–	150 (5.91)	200 (7.87)	–	161 (6.34)	139 (5.47)	140 (5.51)	–	6.5 (15)
40	40	1 1/2	150 (5.91)	200 (7.87)	150 (5.91)	161 (6.34)	139 (5.47)	150 (5.91)	127 (5.00)	6.5 (15)
50	40	2	200 (7.87)	200 (7.87)	200 (7.87)	199 (7.83)	160 (6.30)	165 (6.50)	152 (6.00)	7.5 (17)
65	16	–	200 (7.87)	200 (7.87)	–	209 (8.23)	173 (6.81)	185 (7.28)	–	12 (27)
80	40	3	200 (7.87)	200 (7.87)	200 (7.87)	216 (8.50)	173 (6.81)	200 (7.87)	191 (7.50)	12 (27)
100	16	4	250 (9.84)	250 (9.84)	250 (9.84)	267 (10.51)	233 (9.17)	220 (8.66)	228 (8.98)	14 (31)
125	16	–	250 (9.84)	250 (9.84)	–	278 (10.94)	233 (9.17)	250 (9.84)	–	19 (42)
150	16	6	300 (11.81)	300 (11.81)	300 (11.81)	308 (12.13)	257 (10.12)	285 (11.22)	279 (10.98)	22 (49)
200	10/16	8	350 (13.78)	350 (13.78)	350 (13.78)	366 (14.41)	291 (11.46)	340 (13.39)	343 (13.50)	45 (100)
250	10/16	10	400 (15.75)	450 (17.72)	400 (15.75)	418 (16.46)	331 (13.03)	395 (15.55)	406 (16.00)	65 (144)
300	10/16	12	500 (19.69)	500 (19.69)	500 (19.69)	481 (18.94)	381 (15.00)	445 (17.52)	533 (21.00)	95 (210)
350	10/16	14	500 (19.69)	550 (21.65)	700 (27.56)	529 (20.83)	428 (16.85)	505 (19.88)	597 (23.50)	135 (298)
400	10/16	16	600 (23.62)	600 (23.62)	800 (31.50)	587 (23.11)	483 (19.02)	565 (22.24)	635 (25.00)	170 (375)
500	10/16	20	600 (23.62)	–	800 (31.50)	632 (24.88)	533 (20.98)	670 (26.38)	699 (27.50)	230 (508)
600	10/16	24	600 (23.62)	–	800 (31.50)	801 (31.54)	585 (23.03)	780 (30.71)	813 (32.00)	315 (695)
700	10/16	28	700 (27.56)	–	flanges to AWWA, dimensions on request	918 (36.14)	694 (27.32)	895 (35.24)	flanges to AWWA, dimensions on request	255 (565)*
800	10/16	32	800 (31.50)	–		1039 (40.91)	922 (36.30)	1015 (39.96)		335 (740)*
900	10/16	36	900 (35.43)	–		1145 (45.08)	1026 (40.39)	1115 (43.90)		435 (960)*
1000	10/16	40	1000 (39.37)	–		1259 (49.57)	1132 (44.57)	1230 (48.43)		520 (1150)*

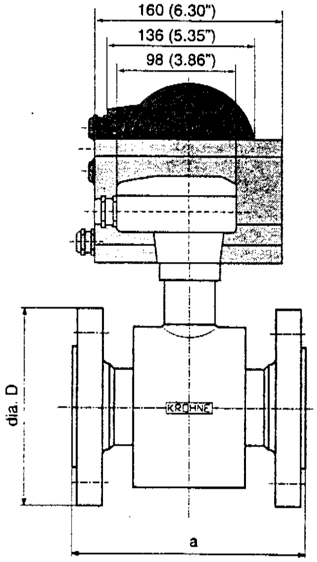
* weight with DIN flanges

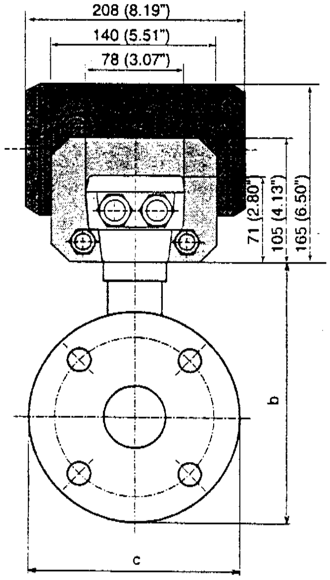
DN 10 - 40 / 3/8" - 1 1/2"





DN 50 - 300 / 2" - 12"



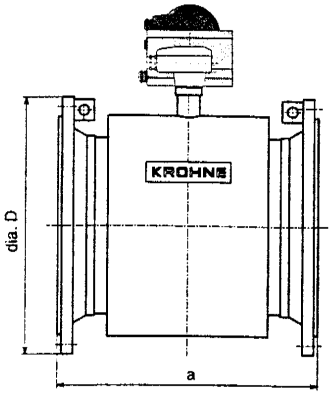


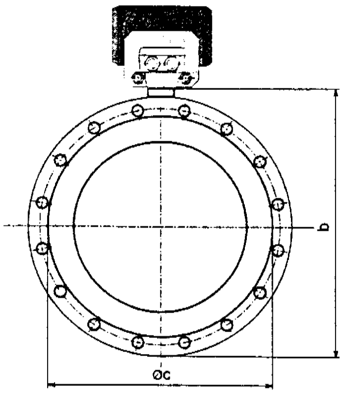
Tolerance details for fitting length dimension "a"

to DIN 2501 and ANSI B 16.5
DN ≤ 300 / ≤ 12": ± 0.5 %,
min. ± 1 mm / ± 0.04"
DN ≥ 350 / ≥ 14": ± 0.5 %

to ISO DIS 13 359
DN ≤ 200 / ≤ 8": +0 / -3
DN ≥ 250 / ≥ 10": +0 / -5

DN 350 - 2000 / 14" - 80"





Flange size for Irathane liners, thickness > 12 mm/> 0.50"

Nominal diameter of measuring tube	Flange size		
DN in mm		in inch	
DN 350	DN 400	14	16
DN 400, 500	DN 500	14, 16	20
DN 500, 550	DN 600	20, 22	24
DN 600, 650	DN 700	24, 26	28
DN 700, 750	DN 800	28, 30	32
DN 800, 850	DN 900	32, 34	36
DN 900, 950	DN 1000	36, 38	40
DN 1000	DN 1200	40	48

11 Limits

PLEASE NOTE!

- The limits specified in the table for process temperature and operating pressure make allowance for the tube liner and the flange standard. Refer also to footnotes 1) to 4).
- Refer to certificates of conformity for max. allowable operating data for hazardous-duty versions, provided only with hazardous-duty equipment.
- **Abbreviations used:**
  - **DIN** = DIN 2501 (= BS 4504)
  - **ANSI** = ANSI B 16.5
  - **AWWA** = AWWA
  - **API** = API 6 BX

Limits for Teflon®-PFA, Teflon®-PTFE and Tefzel

Liner	Flange			**Max. operating pressure in bar (psig)** at a process temperature of							
	Standard	Nominal diameter	Pressure rating/ Class	≤ 40 °C (≤ 105 °F)	≤ 60 °C (≤ 140 °F)	≤ 70 °C (≤ 158 °F)	≤ 90 °C (≤ 195 °F)	≤ 100 °C (≤ 210 °F)	≤ 120 °C (≤ 250 °F) 1)	≤ 140 °C (≤ 285 °F) 1) 2)	≤ 180 °C (≤ 355 °F) 1) 2)
PFA	DIN	DN 25-50, DN 80	PN 40	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)
		DN 65, DN 100-150	PN 16	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)
	ANSI	1"-6"	150 lb	19.6 (284)	19.0 (275)	18.7 (271)	18.1 (262)	17.7 (256)	17.0 (246)	16.2 (235)	14.7 (213)
PTFE	DIN	DN 10-20	PN 40	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	on request
		DN 200-600	PN 10	10 (150)	10 (150)	10 (150)	10 (150)	10 (150)	10 (150)	10 (150)	10 (150)
			PN 16	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)
	ANSI	3/8"-3/4", 8"-24"	150 lb	19.6 (284)	19.0 (275)	18.7 (271)	18.1 (262)	17.7 (256)	17.0 (246)	16.2 (235)	14.7 (213)
			300 lb	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	on request
Tefzel	DIN	DN 200-600	PN 10	10 (150)	10 (150)	10 (150)	10 (150)	10 (150)	10 (150)	–	–
			PN 16	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)	–	–
	ANSI	8"-24"	150 lb	19.6 (284)	19.0 (275)	18.7 (271)	18.1 (262)	17.7 (256)	17.0 (246)	–	–
			300 lb	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	–	–

1) With **insulation class** E of the field coils, the **maximum** process temperature allowable is **120 °C (250 °F)**.

2) **Max. process temperature 140 °C (285 °F)** for the IFM 4010 K, IFM 4020 K and IFM 4080 K compact flowmeters. Ambient temperature max. 40 °C (105 °F).

Limits for FEP, soft rubber, Irathane and Neoprene

Flange			**Max. operating pressure in bar (psig)** at a process temperature of			
Standard	Meter size/ Nom. dia.	Pressure/ rating/Class	Soft rubber ≤ 40 °C (≤ 105 °F)	Neoprene ≤ 60 °C (≤ 140 °F)	Irathane ≤ 70 °C (≤ 158 °F)	FEP ≤ 100 °C (≤ 210 °F)
DIN	DN 200-1000	PN 10	10 (150)	10 (150)	10 (150)	on request
		PN 16-1500	16-64 (150-920) 3)	16-100 (150-1450) 3)	16-1500 (150-20000) 3)	
	≥ DN 1100	DN 2.5-6	2.5-6 (37-90) 3)	2.5-6 (37-90) 3)	2.5-6 (37-90) 3)	
ANSI	8"-40"	150 lb	≤ 19.6 (≤ 284) 4)	≤ 19.0 (≤ 275) 4)	≤ 18.7 (≤ 271) 4)	
		300 lb	≤ 50.8 (≤ 737) 4)	≤ 49.2 (≤ 714) 4)	≤ 48.4 (≤ 702) 4)	
		600 lb	≤ 64.0 (≤ 920)	≤ 100.0 (≤ 1450)	≤ 100.0 (≤ 1450)	
AWWA	≥ 14"	B	6 (90)	6 (90)	6 (90)	
		D	10 (150)	10 (150)	10 (150)	
API	≥ 8"	20 000 psig	–	–	≤ 1500 (≤ 20000)	

3) dependent on flange pressure rating

4) dependent on process temperature

Vacuum load

Liner	Meter size/Nom. dia.		**Min. operating pressure in mbar abs. (psia)** at a process temperature of							
	DN mm	inch	≤ 40 °C (≤ 105 °F)	≤ 60 °C (≤ 140 °F)	≤ 70 °C (≤ 158 °F)	≤ 90 °C (≤ 195 °F)	≤ 100 °C (≤ 210 °F)	≤ 120 °C (≤ 250 °F)	≤ 140 °C (≤ 285 °F)	≤ 180 °C (≤ 355 °F)
PFA	DN 25- 150	1"- 6"	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
PTFE	DN 10- 20	3/8"- 3/4"	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	500 (7.3)	750 (9.7)	1000 (15.0)
	DN 200- 300	8"- 12"	500 (7.3)	750 (9.7)	1000 (15.0)	1000 (15.0)	1000 (15.0)	1000 (15.0)	1000 (15.0)	1000 (15.0)
	DN 350- 600	14"- 24"	800 (11.2)	1000 (15.0)	1000 (15.0)	1000 (15.0)	1000 (15.0)	1000 (15.0)	1000 (15.0)	1000 (15.0)
Tefzel	DN 200- 600	8"- 12"	100 (1.5)	100 (1.5)	100 (1.5)	100 (1.5)	100 (1.5)	100 (1.5)	–	–
Soft rubber	DN 200- 300	8"- 12"	500 (7.3)	–	–	–	–	–	–	–
	DN 350-1200	14"- 48"	600 (8.7)	–	–	–	–	–	–	–
Irathane	DN 200-1800	8"- 72"	500 (7.3)	–	–	–	–	–	–	–
Neoprene	DN 200- 300	8"- 12"	400 (5.6)	400 (5.6)	–	–	–	–	–	–
	DN 350-3000	14"-120"	600 (8.7)	600 (8.7)	–	–	–	–	–	–
FEP	DN 200-2000	8"- 80"	on request							

Teflon® is a registered trademark of Du Pont.

If you need to return flowmeters for testing or repair to Krohne

Your electromagnetic flowmeter

- has been carefully manufactured and tested by a company with ISO 9001 certification
- and volumetrically calibrated in one of the world's most accurate test rigs.

If installed and operated in accordance with these operating instructions, your flowmeter will rarely present any problems.

Should you nevertheless need to return a flowmeter for checkout or repair, please pay strict attention to the following points:

Due to statutory regulations concerning protection of the environment and the health and safety of our personnel, Krohne may only handle, test and repair returned flowmeters that have been in contact with liquids if it is possible to do so without risk to personnel and environment. This means that Krohne can only service your flowmeter if it is accompanied by a certificate in line with the following model confirming that the flowmeter is safe to handle.

If the flowmeter has been operated with toxic, caustic, flammable or water-endangering liquids, you are kindly requested

- to check and ensure, if necessary by rinsing or neutralizing, that all cavities in the flowmeter are free from such dangerous substances.
  (Directions on how you can find out whether the primary head has to be opened and then flushed out or neutralized are obtainable from Krohne on request.)
- to enclose a certificate with the flowmeter confirming that the flowmeter is safe to handle and stating the liquid used.

Krohne regret that they cannot service your flowmeter unless accompanied by such a certificate.

SPECIMEN certificate

Company: ....

Address: ....

Department: ....

Name: ....

Tel. No.: ....

The enclosed electromagnetic flowmeter

Type: ....

Krohne Order No. or Series No.: ....

has been operated with the following liquid: ....

Because this liquid is

water-endangering * / toxic * / caustic * / flammable *

we have

– checked that all cavities in the flowmeter are free from such substances *
– flushed out and neutralized all cavities in the flowmeter *

(* delete if not applicable)

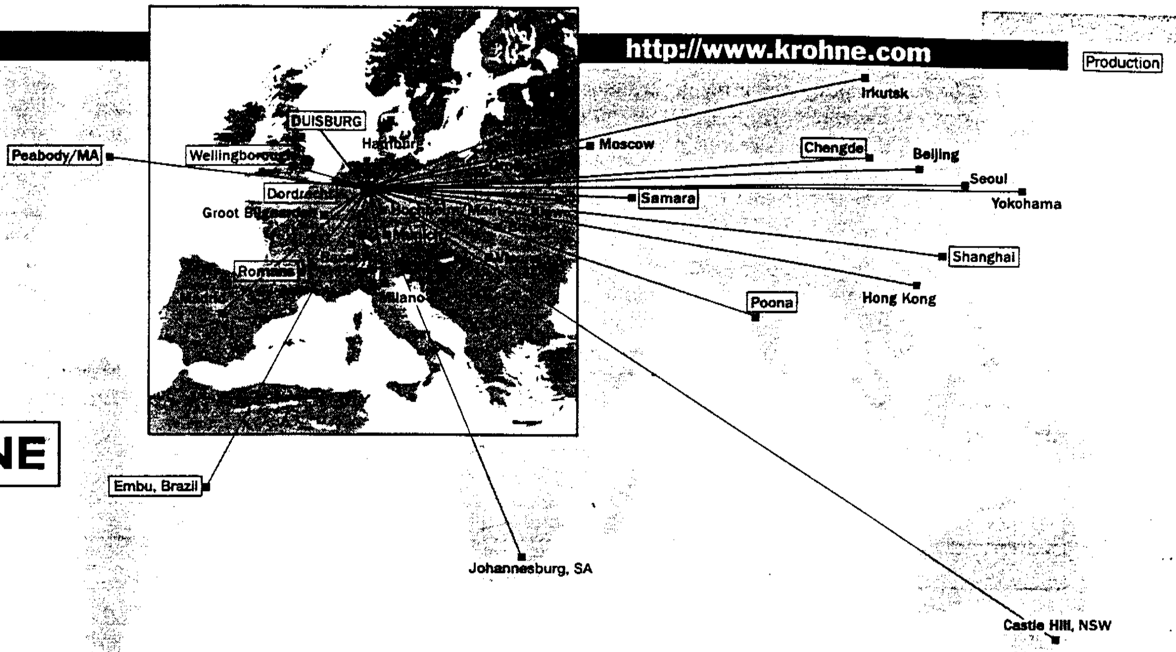
We confirm that there is no risk to man or environment through any residual liquid contained in this flowmeter.

Date: ....

Signature: ....

Company stamp:

KROHNE



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Subject to change without no

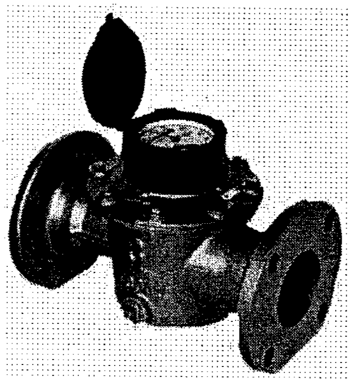
EFFluent Flow. Meter

Specification Sheet

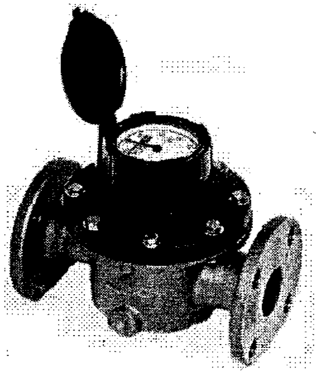
Industrial Turbine Meters

Model T3000 Bronze, Magnetic Drive, Flanged Ends

Sizes: 1 1/2", 2" and 3"



T3000CB



T3000CP

Description

Specifications

side of the cover with four stainless steel screws and washers, one insert of which is placed eccentrically in the cover. The internal regulator assembly is interconnected with an external regulator shaft located on top of the cover. This allows meter calibration without depressurizing the test bench or meter service. The regulator is protected by a tamperproof device. The main case and cover are assembled with an O-ring gasket and stainless steel bolts. The register assembly is secured to the main case with a slotted screw and is hinged over the inlet throat. However, the register can be rotated and locked in any 360 degree position therein.

Register. The register is contained within a 90% copper seamless can which is oven cured at 150°F for 90 minutes to eliminate condensation. The 1/4" true tempered glass lens is secured in an "L" shaped gasket, then roll sealed to produce a permanent sealed design. To assure easy reading, the totalizer wheels are large and color coded. The applicable size, model, registration, part number and date code are printed on the calibrated dial face. Moving clockwise during operation, the extra thin sweep hand does not interfere with meter reading, and the flow indicator will detect plumbing leaks.

Magnetic Drive. The magnetic drive design eliminates miscoupling associated with right angle drives. Torque is absorbed in the undergear assembly below the driving magnet. As a result, the driving magnet is turning slowly at all flows, assuring magnetic coupling with the register assembly. The undergearing is protected by an appropriately filtered encasement.

Connections. All sizes are available with 4-bolt round flanged end connections. The 1 1/2" and 2" meters are also available with 2-bolt oval flanged-end connections. Both flanged connections conform to ANSI B16.1 cast-iron pipe flange, Class 125. Both bronze and cast-iron companion flanges are available. The companion flanges are faced, drilled and tapped with ANSI B2.1 internal taper pipe thread and conform to ANSI B16.1 cast-iron pipe flange, Class 125.

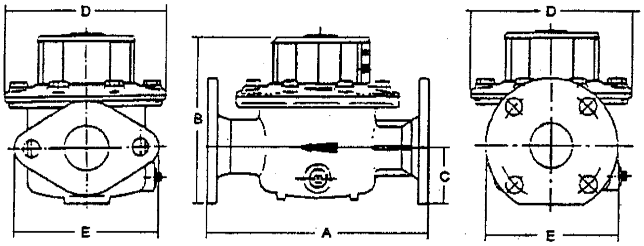
Maintenance. The measuring element with integral straightening vanes can be removed, repaired or replaced without removing the main case from the service line. Blank cover plates are available for use during repair. Pretested and calibrated measuring elements with cover plates and registers are available for exchange or purchase. In addition, AMCO Water Metering Systems Inc. maintains a fully equipped and staffed repair facility in Ocala, Florida.

Pulsers. See Specification Sheet #LRP/HRP-T3000.
LRP (2-wire) Reed Switch, 4 Watt (50V AC/DC Max.)
HRP (3-wire) Slotted Disc, 6-15 VDC
Both units require power from an external source.

Dimensions and Net Weights

Meter Size	Dimensions (Inches) A	B	C	D	E	Weight (lbs.)
1 1/2" Oval	10	7 3/4	2 7/16	7 3/8	5 5/8	19 1/2
1 1/2" Round	10	7 3/4	2 7/16	7 3/8	5 1/16	20
2" Oval	10	7 3/4	2 7/16	7 3/8	6 1/8	21 1/2
2" Round	10	7 7/8	2 9/16	7 3/8	6 1/16	22
3"	11 7/8	9 3/8	3 13/16	7 3/8	7 1/2	33 3/8

Note: Add ¾" to overall height with polymer top plate (1½" - 3")



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KROHNE

04/98

Signal converters for electromagnetic flowmeters

Installation and operating intructions

IFC 010 K
IFC 010 F

IFC 010D

How to use these Instructions

The flowmeters are supplied ready for operation.

The primary head must be installed in the pipeline as described in the installation instructions inside the packing of the primary head.

- Installation location and connection to power (Section 1)	Pages 1/1-1/6
- Electrical connection of outputs and inputs (Section 2)	Pages 2/1-2/6
- Factory settings and start-up (Section 3)	Pages 3/1-3/2

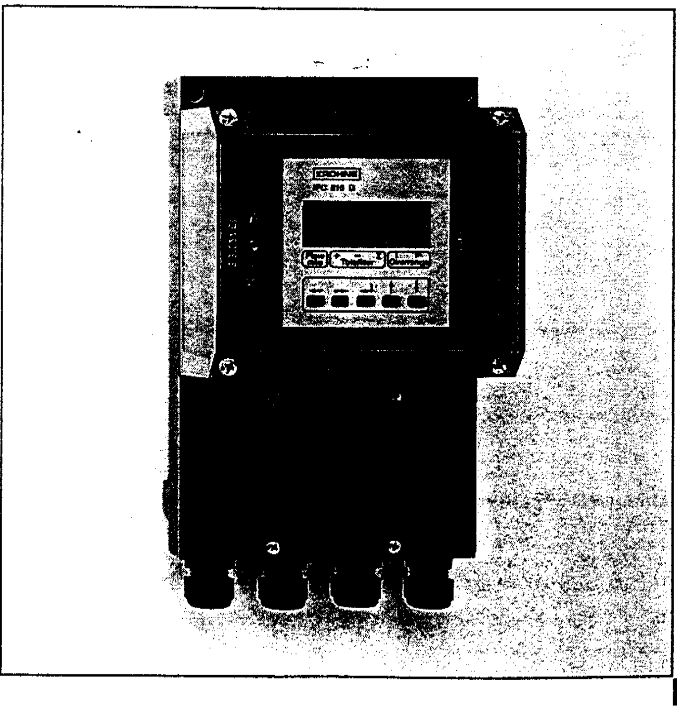
- **Operator control of the signal converter** is described in Sections 4 and 5.

Power the flowmeter. THAT'S ALL. The system is operative.

16-page pull-out condensed instructions

are located in the centrefold of these Installation and Operation Instructions.

Contents:
Installation (Sect. 1), electrical connection (Sect. 1 + 2),
start-up (Sect. 3) and operator control of the signal converter (Sect. 4)



Applicable to Software Versions

- IFC 010 – / D
  Display version
  No. **806325.07**
  and
  No. **317551.02**
  and higher
- IFC 010 – / B
  Basic version
  operator-controllable
  with HHT 010
  No. **806323.06**
  and higher

Order No. 7.02140.34.00

Contents

Versions IFC 010 signal converter

IFC 010_ / B	**Basic version** (standard) **without** local display and control elements. All operating data factory-set to your order specifications. Optionally available for operator control: - RS 232 adapter, incl. software for DOS-PC **or** - HHT hand-held terminal
IFC 010_ / D	**Display version (option)** **with** local display and control elements. All operating data factory-set to your order specifications.
IFC 010 K / _	**Compact flowmeter** signal converter mounted direct on primary head.
IFC 010 F / _	**Signal converter in field housing,** electrical connection to primary head via field power and signal cables.

Items included with supply

- Signal converter in the version as ordered, see above.
- These installation and operating instructions for the signal converter, including 16-page pull-out condensed instructions for installation, electrical connection, start-up and operator control of the signal converter.
- 2 plug connectors for connection of power supply and outputs/inputs
- for separate system version only, F Version:
  signal cable in the version and length as ordered (standard: signal cable A, length 10 m / 30 ft)

Software history

Display & control unit		**Hand-held HHT 010**		**CONFIG user software**	
IFC 010 _ / D		**IFC 010 _ / B****		**IMoCom**	**RS 485**
Software	Status	Software	Status	Software	Software
806325.07*	current	806328.06	current	V 2.00 and higher	V 3.15 and higher
≥ 317551.02*	replaces 806325.07	806328.06	current		
813269.00***	current	**Czech** user interface ***			
813340.00***	current	**Swedish** user interface ***			

* At least the same setting ranges and functional scope as preceding versions. Also, customer- and application-specific add-on equipment possible, which has to be installed and activated by the factory. Documented by enclosures to these Installation and Operating Instructions.

** **Please note:** Connect HHT 010 only to devices **without** display and operator control software.

*** Does not contain the functional scope of the currently valid standard version; this has been taken into account in the documentation of the respective national language.

System description

Electromagnetic flowmeters with the IFC 010 signal converter are precision instruments designed for linear flow measurement of liquid products.

The process liquids must be electrically conductive: ≥ 5 µS/cm
(for cold demineralized water ≥ 20 µS/cm).

The full-scale range $Q_{100\%}$ can be set as a function of the meter size:
DN 2.5 - 1000 / 1/10" - 40" $Q_{100\%} = 0.01$ - 34 000 m^3/hr = 0.03 - 151 000 US Gal/min
This is equivalent to a flow velocity of 0.3 - 12 m/s or 1 - 40 ft/s.

Product liability and warranty

The electromagnetic flowmeters with the IFC 010 signal converter are designed solely for measuring the volumetric flowrate of electrically conductive, liquid process products.

These flowmeters are not certified for use in hazardous areas. Other flowmeter series are available for such applications.

Responsibility as to suitability and intended use of these electromagnetic flowmeters rests solely with the operator.

Improper installation and operation of the flowmeters (systems) may lead to loss of warranty.

In addition, the "General conditions of sale" forming the basis of the purchase contract are applicable.

If flowmeters need to be returned to Krohne, please note the information given on the last-but-one page of these Instructions. Krohne regrets that it cannot repair or check your flowmeter(s) unless accompanied by the completed form sheet.

CE / EMC / Standards / Approvals

- Electromagnetic flowmeters with the IFC 010 signal converter meet the protection requirements of **Directive 89/336/EEC** in conjunction with **EN 50081-1** (1992) and **EN 50082-2** (1995), as well as **Directives 73/23/EEC** and **93/68/EEC** in conjunction with **EN 61010-1,** and bear the **CE marking.**

CE

Part A System installation and start-up

1 Electrical connection: power supply

1.1 Important installation notes

PLEASE NOTE !

1.1.1 Location

- **Electrical connection in accordance with VDE 0100** "Regulations governing heavy-current installations with line voltages up to 1000 V" or **equivalent national regulations.**
- Do not cross or loop **cables inside the terminal compartment.**
- Use **separate cable entries** (see below) for power supply, field current cables, signal lines, outputs and inputs.
- Protect flowmeters or switchgear cabinets with built-in devices from direct **sunlight.** Fit a sunshade if necessary.
- When installed in switchgear cabinets, signal converters must be adequately cooled, e.g. use fans or heat exchangers.
- Do not expose signal converters to intense **vibration.**

1.1.2 Only for separate systems/signal converters (F versions)

- Keep **distance between primary head and signal converter** as short as possible. Refer to Sect. 1.3.4 for maximum permissible length of signal and field current cables.
- Use the supplied **Krohne signal cable A** (Type DS), standard length 10 m (33 ft).
- Always **calibrate** primary head and signal converter **together.** Therefore, when installing, ensure **primary constant GKL is identical;** refer to instrument nameplate for the primary head. If the GKL is not identical, set the signal converter to the GKL of the primary head. Refer also to Sections 4.
- **Dimensions of signal converter;** refer to Section 10.4.

1.1.3 Cable entries

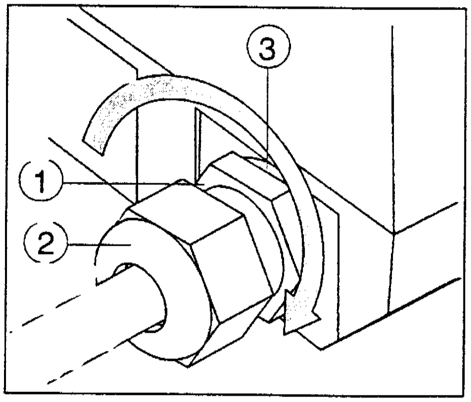
Number of cable entries: **2** for the compact flowmeters
4 for the IFC 010 F signal converter

NOTE: Ensure gaskets are fitted correctly and maintain the following max. torques!

1 Max. torques for PG 13.5, 1/2" NPT or 1/2" PF adapters: **4 Nm / 2.8 ft × lbf**

2 Max. torques for PG 13.5 only: **3 Nm / 2.1 ft × lbf**

3 Gasket



A) PG 13.5 cable entries

These cable entries may only be used for flexible electrical cables if the relevant electrical regulations so allow, e.g. National Electric Code (NEC).
Do not fix rigid metal conduits (IMC) or flexible plastic conduits to the PG 13.5 cable entries, refer to "Point B, C" below (1/2" NPT or PF adapters).

B) 1/2" NPT adapters **C) 1/2" PF adapters**

For most North American systems the regulations require that electrical conductors be laid in conduits, particularly where power voltages > 100 V AC are concerned.
In such cases, use the 1/2" NPT or 1/2" PF adapters to which flexible plastic conduits can be screwed. **Do not use rigid metal conduits (IMC)!**
Lay conduits such that no moisture can penetrate into the converter housing.
Should there be risk of any condensation water forming, fill the cross-section of the conduit around the cables at these adapters with a suitable sealing compound.

PLEASE NOTE !

- Rated values: The flowmeter housings protecting the electronic equipment from dust and moisture must always be kept closed. The selected creepage distances and clearances have been dimensioned in conformity with VDE 0110 and IEC 664 for contamination category 2. Supply circuits and output circuits are designed to meet the standards of overvoltage classes III and II, respectively.
- Safety isolation: the flowmeters (signal converters) must be provided with an isolating facility.

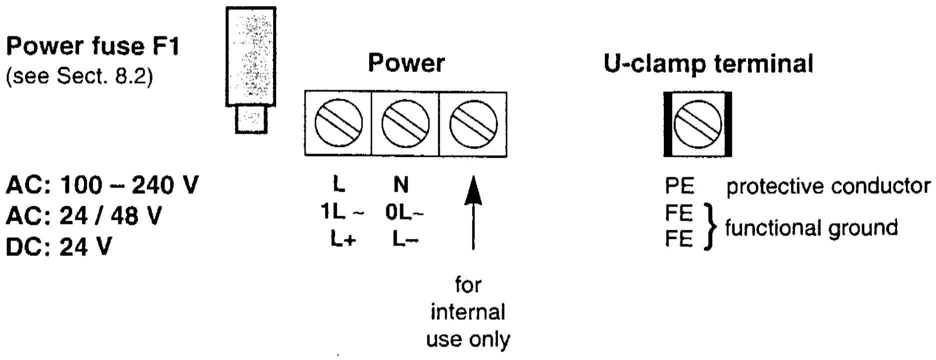
1. AC Version	2. AC Version
230/240 V AC (200 - 260 V AC) switch-selectable to **115/120 V AC** (100 - 130 V AC)	**200 V AC** (170 - 220 V AC) switch-selectable to **100 V AC** (85 - 110 V AC)

- **Note information on instrument nameplate:** supply voltage and frequency
- The **PE protective ground conductor** for the power supply **must be connected** to the separate U-clamp terminal in the terminal compartment of the signal converter.
  For exceptions (compact systems), refer to installation instructions for the primary head.
- **Connection diagrams I and II** for electrical connection between primary head and signal converter: refer to Section 1.3.5.

3. AC Version	DC Version
48 V AC (41 - 53 V AC) switch-selectable to **24 V AC** (20 - 26 V AC)	**24 V DC** (11-32 V DC)

- **Note information on instrument nameplate:** supply voltage and frequency.
- For measurement reasons, connect an **FE functional ground conductor** to the separate U-clamp terminal in the terminal compartment of the signal converter.
- If connected to a functional extra-low voltage source (24 V AC / DC, 48 V AC), provide for **protective separation (PELV)** in conformity with VDE 0100 / VDE 0106 or IEC 364 / IEC 536, or equivalent national regulations.
- **Connection diagrams I and II** for power supply and electrical connection between primary head and signal converter: refer to Section 1.3.5.

Connection to power



Warning: Instrument must be properly grounded to avoid personnel shock hazard.

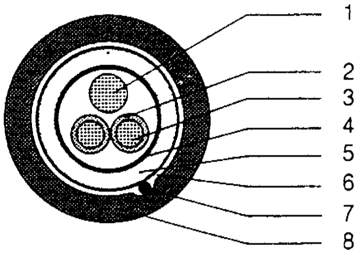
1.3 Electrical connection of separate primary head (F Versions)

1.3.1 General information on signal cable A and field current cable C

Use of the Krohne signal cable A with foil screen and magnetic shield will ensure proper operation of the equipment.

- Signal cable to be solidly laid.
- Connect shields via stranded drain wires.
- Underwater and underground installation possible.
- Insulating material is flame-retardant to IEC IEC 332.1 / VDE 0742.
- Signal cables are low in halogen, unplasticized, and stay flexible at low temperatures.

Signal cable A (Type DS), with double shielding



1 Stranded drain wire, 1st shield, 1.5 mm^2 or AWG14
2 Insulation
3 Conductor 0.5 mm^2 or AWG 20 (3.1 red / 3.2 white)
4 Special foil, 1st shield
5 Inner sheath
6 Mu-metal foil, 2nd shield
7 Stranded drain wire, 2nd shield, 0.5 mm^2 or AWG 20
8 Outer sheath

Field current cable C with single shielding
Cross-section is dependent on required length of cable, see Table in Sect. 1.3.4.

1.3.2 Grounding of primary head

All flowmeters must be properly grounded.

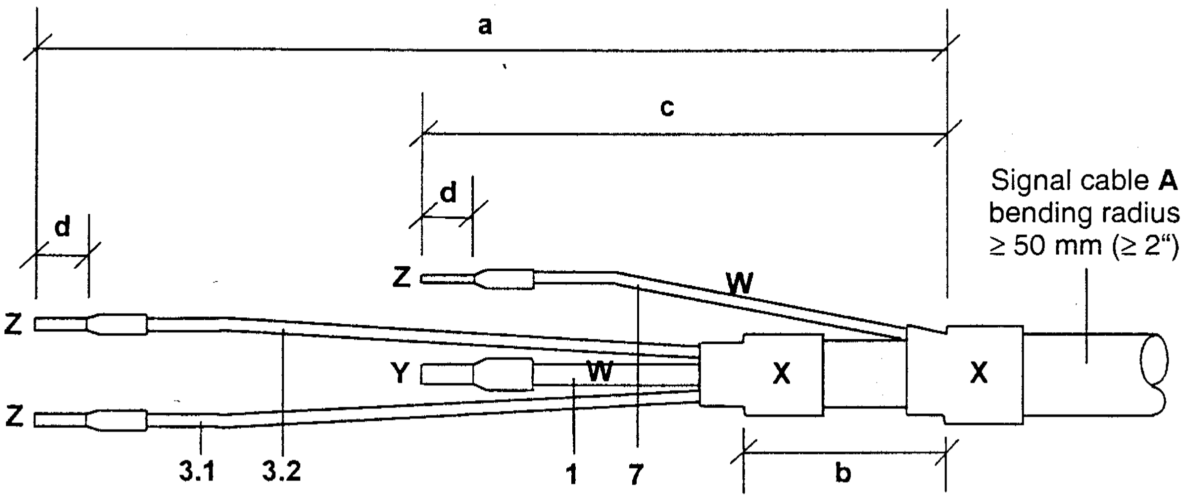
- The grounding conductor should not transmit any interference voltages.
- Do not ground any other electrical device together with this conductor.
- The primary head is connected to ground by means of an **FE functional ground conductor.**
- Special information on grounding various primary heads is contained in the separate **installation instructions for primary heads.**
- These instructions also contain detailed descriptions on how to use grounding rings and how to install primary heads in metal or plastic pipes or internally coated pipelines.

Please note the different lengths given in the table for signal converter and primary head.

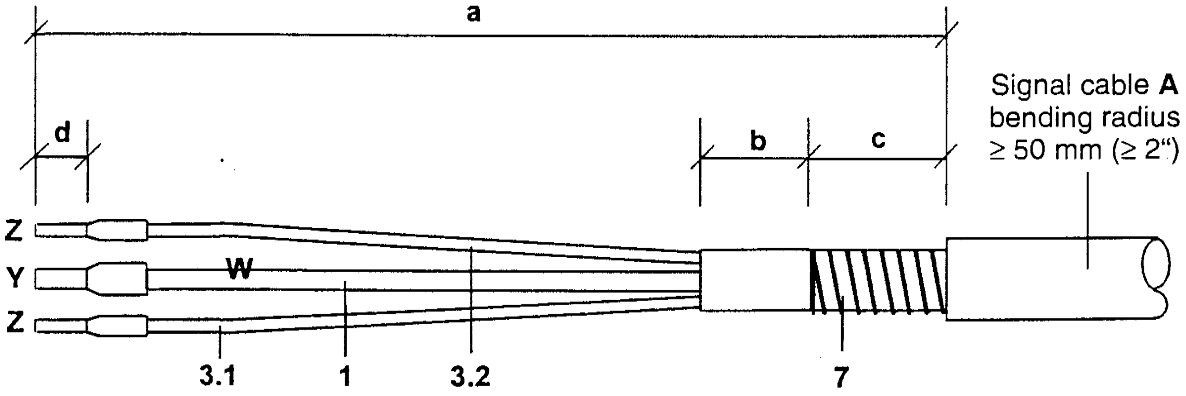
Length	Converter		Primary head	
	mm	(inch)	mm	(inch)
a	55	(2.17)	90	(3.60)
b	10	(0.39)	8	(0.30)
c	15	(0.59)	25	(1.00)
d	8	(0.30)	8	(0.30)

Customer-supplied materials	
W	Insulation tubing (PVC), Ø 2.0 - 2.5 mm (dia. 1")
X	Heat-shrinkable tubing or cable sleeve
Y	Wire end sleeve to DIN 41 228: E 1.5-8
Z	Wire end sleeve to DIN 41 228: E 0.5-8

Preparation for connection to primary head



Preparation for connection to IFC 010 F signal converter



External shielding of signal cable A (Type DS)
Wrap stranded drain wire (7) around the mu-metal foil (6) and clamp under the shield terminal in the signal converter terminal box (see also diagram in Sect. 1.3.5).

Cable routing in signal converter housing
see illustration in Sect. 10.4.

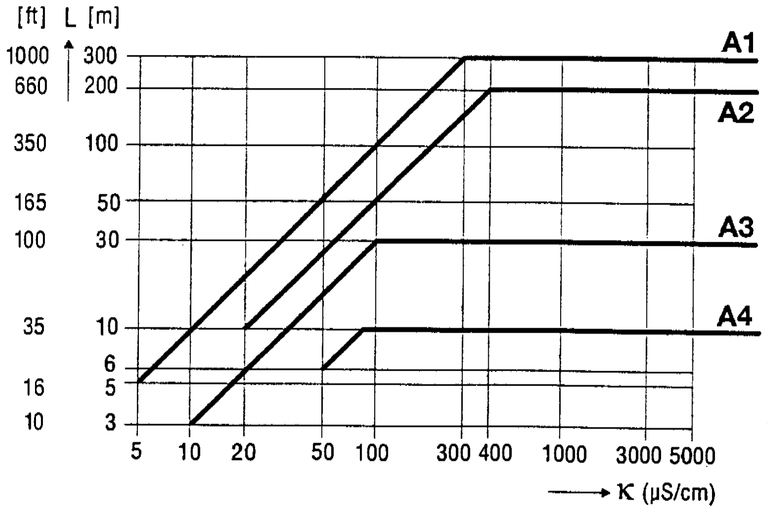
1.3.4 Cable lengths (max. distance between signal converter and primary head)

Abbreviations and explanatory notes
used in the following tables, diagrams and connection diagrams

A	**Signal cable A** (type DS), with double shielding, see diagram for max. length
C	**Field current cable C,** with single shielding, type and length see Table
D	High-temperature silicone cable, 3 × 1.5 mm^2 (14 AWG) Cu, with single shielding, max. length 5 m (16 ft)
E	High-temperature silicone cable, 2 × 1.5 mm^2 (14 AWG) Cu, max. length 5 m (16 ft)
L	Cable length
κ	Electrical conductivity of the process liquid
ZD	Intermediate connection box required in connection with cables D and E for primary heads ALTOFLUX IFS 4000 F, PROFIFLUX IFS 5000 F and VARIFLUX IFS 6000 F in cases where process temperatures exceed 150 °C (302 °F)

Recommended length of signal cable
for magnetic field frequency ≤ 1/6 × power frequency

Primary head	**Meter size**		**Signal cable**
	DN mm	inch	
ECOFLUX IFS 1000 F	10 - 15	3/8 - 1/2	A4
	25 - 150	1 - 6	A3
AQUAFLUX F	10 - 1000	3/8 - 40	A1
ALTOFLUX IFS 4000 F	10 - 150	3/8 - 6	A2
	200 - 1000	8 - 40	A1
PROFIFLUX IFS 5000 F	2.5 - 15	1/10 - 1/2	A4
	25 - 100	1 - 4	A2
VARIFLUX IFS 6000 F	10 - 15	1/8 - 1/2	A4
	25 - 80	1 - 3	A2



Field current cable C: max. length and min. cross-section

Length		**Type of cable,** single shielding
0 - 150 m	5 - 500 ft	2 × 0.75 mm^2 Cu / 2 × 18 AWG
150 - 300 m	500 - 1000 ft	2 × 1.50 mm^2 Cu / 2 × 14 AWG

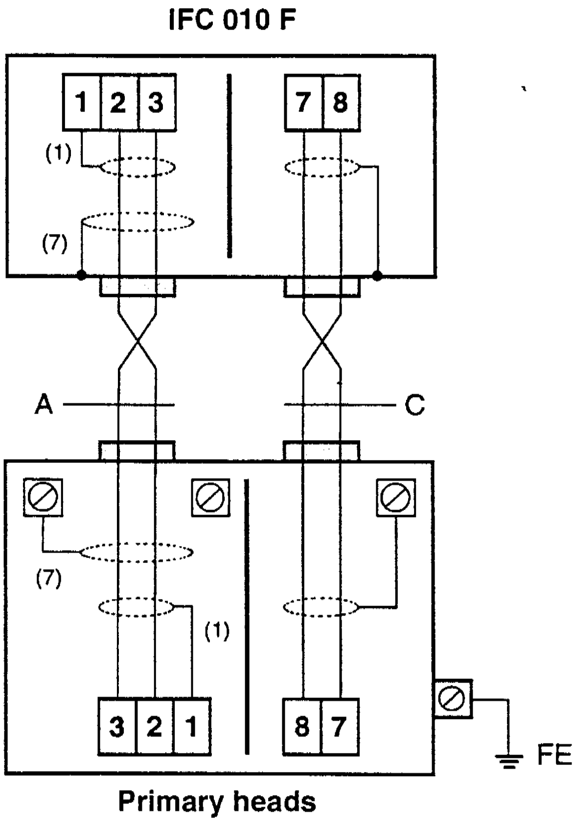
Warning: Instrument must be properly grounded to avoid personnel shock hazard.

Connection diagrams I and II (power supply, converter and primary head) 1.3.5

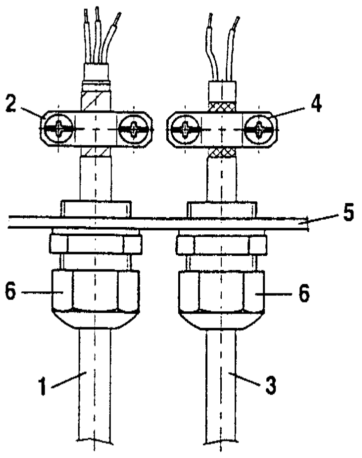
Important information PLEASE NOTE !

- The figures in brackets indicate the stranded drain wires for the shields, see cross-sectional drawing of signal cable in Section 1.3.1.
- **Electrical connection to VDE 0100** "Regulations governing heavy-current installations with line voltages up to 1000 V" or equivalent national regulations.
- **Power supply 24 V AC / DC:** functional extra-low voltage with protective separation in conformity with VDE 0100, Part 410 or equivalent national regulations.
- **PE** = protective conductor **FE** = functional ground conductor

I Process temperature < 150 °C (302 °F)

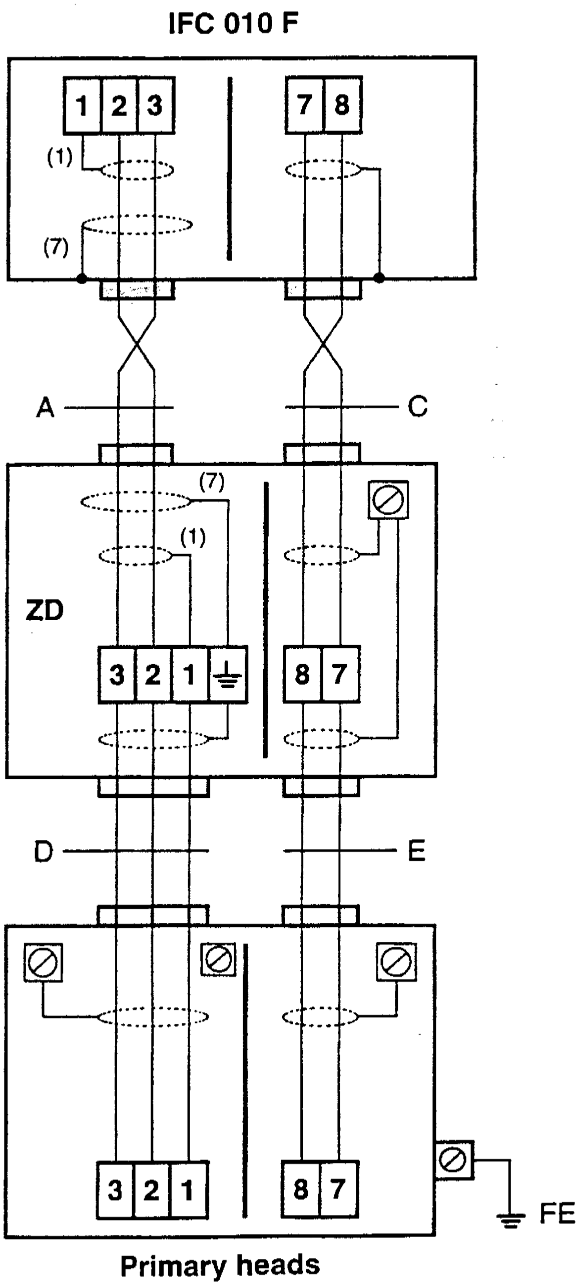


Connection of shields at the IFC 010



1 Signal cable A (Type DS)
2 Shield terminal for shielded signal cable
3 Field power cable
4 Shield terminal for shielded field power cable
5 Housing wall, signal converter
6 Cable entries

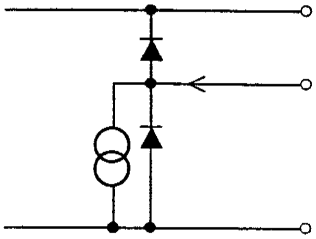
II Process temperature > 150 °C (302 °F)



2 Electrical connection of outputs

2.1 Current output I

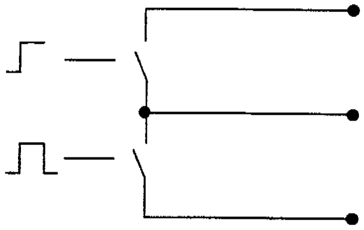
- The current output is galvanically isolated from all input and output circuits.
- Factory-set data and functions can be noted down in Sect. 5.16.
  Please also refer to Sect. 3.2 "Factory settings".
- Typical current output



- All operating data and functions can be set. .
- **Display** version: IFC 010 **D**, see Sect. 4 and 5.6, Fct. 1.05 for operator control
  Basic version: IFC 010 **B**, see Sect. 6.1 for operator control
- The current output can also be used as an internal voltage source for the outputs.
  U_{int} = 15 V DC I = 23 mA when operated **without** receiver instruments at the current output
  I = 3 mA when operated **with** receiver instruments at the current output
- **Connection diagrams,** see Sect. 2.3: diagrams ① ② ④ ⑥

2.2 Pulse output P and status output S

- The pulse and status outputs are galvanically isolated from the current output and all input circuits.
- Factory-set data and functions can be noted down in Sect. 5.16.
  Please also refer to Sect. 3.2 "Factory settings".
- Typical pulse and status outputs B1



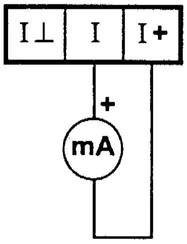
- All operating data and functions can be set:
  Display version: IFC 010 **D**, see Sect. 4 and 5.7, Fct. 1.06 for operator control
  Basic version: IFC 010 **B**, see Sect. 6.1 for operator control
- The pulse and status outputs can be operated in the active or passive mode.
  Active mode: The current output is the internal voltage source, connection of electronic totalizers (EC)
  Passive mode: External DC or AC voltage source required, connection of electronic (EC) or electromechanical (EMC) totalizers
- Digital pulse division, interpulse period is non-uniform. Therefore, if frequency meters or cycle counters are connected, allow for minimum counting interval:

  gate time, counter $\leq \frac{1000}{P_{100\%}\,[\text{Hz}]}$

- **Connection diagrams** see Sect. 2.3: diagrams - pulse output ③ ④
  diagrams - status output ⑤ ⑥

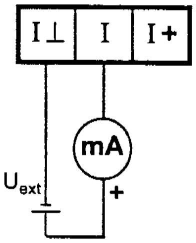
(mA)	Milliammeter
000 Σ	Totalizer – electronic (EC) – electromechanical (EMC)
⊣⊢	DC voltage, external power source (U_{ext}), note connection polarity
(≈)	External voltage source (U_{ext}), DC or AC voltage, connection polarity arbitrary

① Stromausgang I_{active}



I = 0/4 - 20 mA
R_i ≤ 500 Ω

② Stromausgang $I_{passive}$



I	= 0/4 - 20 mA	
U_{ext}	15...20 V DC	20...32 V DC
R_i	0...500 Ω	250...750 Ω

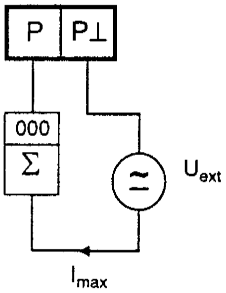
Active mode

The current output supplies the power for operation of the outputs.

Passive mode

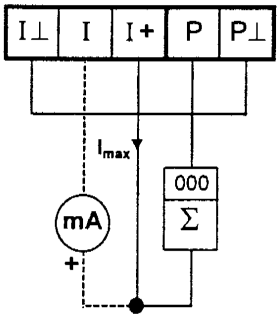
External power source required for operation of the outputs.

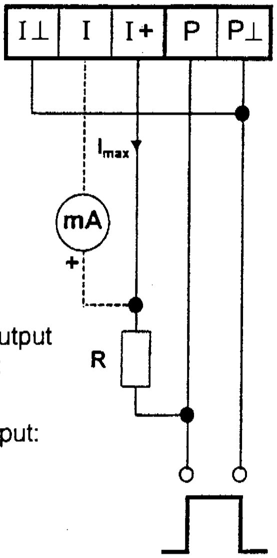
③ Pulse output $P_{passive}$ for electronic (EC) or electromechanical (EMC) totalizers



U_{ext} ≤ 32 V DC/≤ 24 V AC
I_{max} ≤ 150 mA
(incl. status output)

④ Pulse output P_{active} (and current output I_{active}) for electronic (EC) totalizers **with** and **without** current output I

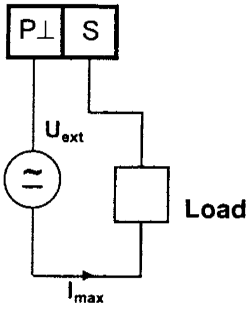




U_{int} ≤ 15 V DC from current output
Operation **with** current output:
I_{max} ≤ 3 mA
Operation **without** current output:
I_{max} ≤ 23 mA

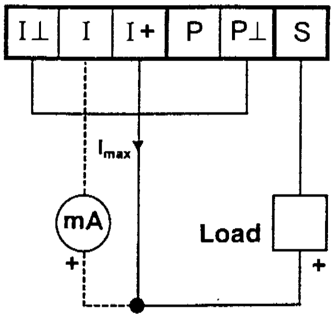
$$R \leq \frac{15\ V}{I_{max}}$$

⑤ Status output $S_{passive}$



U_{ext} ≤ 32 V DC/≤ 24 V AC
I_{max} ≤ 150 mA
(incl. pulse output)

⑥ Status output S_{active} **with** and **without** current output I



U_{int} ≤ 15 V DC from current output

I_{max} ≤ 3 mA Operation **with** current output

I_{max} ≤ 23 mA Operation **without** current output

3 Start-up

3.1 Power-on and measurement

- Before powering the system, please check that it has been correctly installed according to Sect. 1 and 2.
- The flowmeter is delivered ready for operational use. All operating data have been factory set in accordance with your specifications.
  Please refer to Sect. 3.2 “factory settings”.
- Power the unit, and the flowmeter will immediately start process flow measurement.

Basic version, signal converter IFC 010 _ / **B**

- A light emitting diode (LED) under the cover of the electronic section shows the measurement status.
  LED flashing . . .

□ □	**green:**	measurement correct, everything all right.
□ ■	**green / red:**	momentary overdriving of outputs and/or A/D converter.
■ ■	**red:**	fatal error, parameter error or hardware fault, please consult factory.

- Refer to Sect. 6.1 for operator control of the “basic version”.

Display version, signal converter IFC 010 _ / **D**

- When powered, the display shows in succession: START UP and READY.
  This is followed by display of the current flow rate and/or the current totalizer count on either a continuous or alternating basis, depending on the setting under Fct. 1.04.
- Refer to Sect. 4 and 5 for operator control of the “display version”.

All operating data are factory set according to your order specifications.

If you have not made any particular specifications at the time of ordering, the instruments will be delivered with the standard parameters and functions listed in the Table below.

To facilitate easy and rapid initial start-up, current output and pulse output are set to process flow measurement in "2 flow directions", so that the current flowrate is displayed and the volumetric flow counted independent of the flow direction. On instruments equipped with a display, measured values may possibly be shown with a " – " sign.

This factory setting for the current and pulse outputs may possibly lead to measuring errors, particularly in the case of volume flow counting:

for example, if pumps are switched off and a "backflow" occurs which is not within the range of the low-flow cutoff (SMU), or if separate displays and counts are required for both flow directions.

To avoid faulty measurements, therefore, it may be necessary to change the factory setting of some or all of the following functions:
- low-flow cutoff SMU, Fct. 1.03, Sect. 5.3
- current output I, Fct. 1.05, Sect. 5.6
- pulse output P, Fct. 1.06, Sect. 5.7
- display (option), Fct. 1.04, Sect. 5.4

Instrument operation:

Display versions: IFC 010 _ / **D,** operation: refer to **Sect. 4 and 5.**

Basic versions: IFC 010 _ / **B,** operation: refer to **Sect. 6.1.**

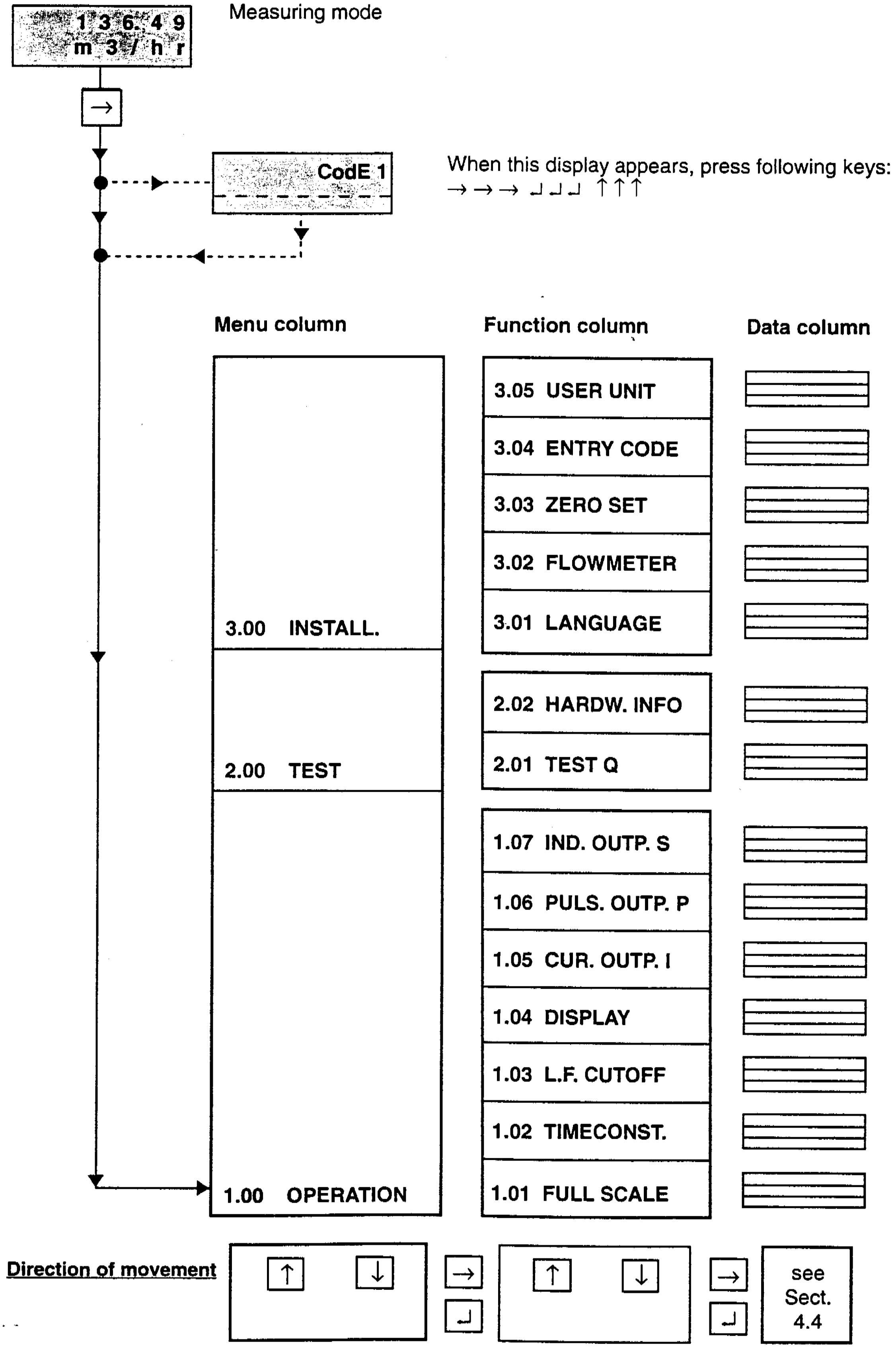
Standard factory settings

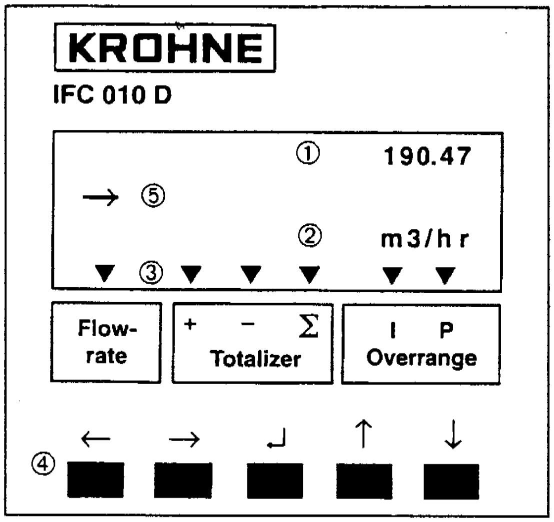
Function		Setting
1.01	Full-scale range $Q_{100\%}$	see nameplate
1.02	Time constant	3 s, for I, S and display
1.03	Low-flow cutoff SMU	ON: 1 % OFF: 2 %
1.04	Display (option) flow rate totalizer(s)	 m³/hr or US Gal/min m³ or US Gal
1.05	Current output I function range error message	 2 directions 4 - 20 mA 22 mA
1.06	Pulse output P function pulse value pulse width	 2 directions 1 pulse/s 50 ms
1.07	Status output P	flow direction

Function		Setting
3.01	Language for display only	English
3.02	Flowmeter diameter flow direction (see arrow on primary head)	 see nameplate + direction
3.04	Entry code	no
3.05	User unit	Liter/hr or US MGal/day

4 Operation of the signal converter

4.1 Krohne operator control concept





The controls are accessible after unscrewing the 4 screws and removing the housing cover.

① Display, 1st line

② Display, 2nd line

③ Display, 3rd line: arrows to identify display

Flowrate		current flowrate
Totalizer	+	totalizer
	–	totalizer
	Σ	sum totalizer (+ and –)
Overrange	**I**	overranging, current output I
	P	overranging, pulse output P

④ Keys for operator control of signal converter

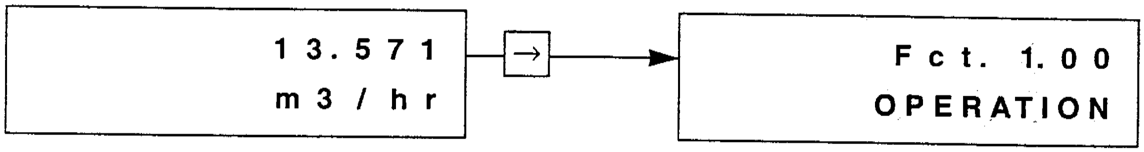
⑤ Compass field, signals actuation of a key.

4.3 Function of keys

The **cursor** (flashing part of display) has a **grey** background in the following descriptions.

To start operator control

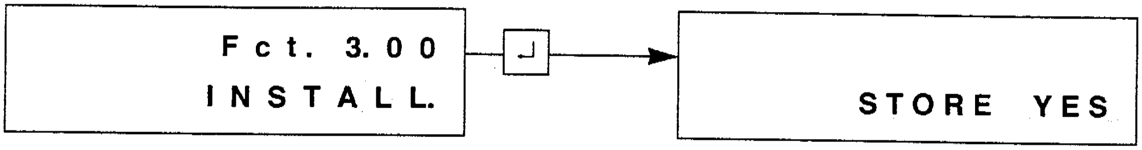
Measuring mode *Operator control mode*



PLEASE NOTE: When **"YES"** is set under **Fct. 3.04 ENTRY CODE,** "CodE 1 - - - - - - - - -" appears in the display after pressing the → key.
The 9-keystroke Entry Code 1 must now be entered: → → → ↵ ↵ ↵ ↑ ↑ ↑
(each keystroke acknowledged by "*").

To terminate operator control
Press key ↵ repeatedly until one of the following menus **Fct. 1.00 OPERATION, Fct. 2.00 TEST** or **Fct. 3.00 INSTALL.** is displayed.

Press key ↵

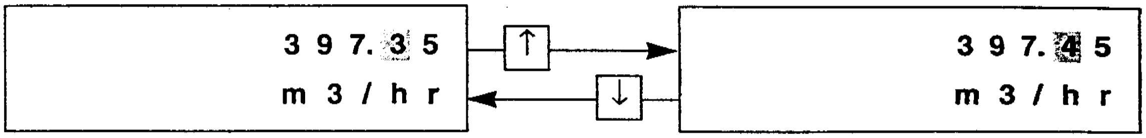


Store new parameters: *acknowledge by pressing key ↵. Measuring mode continued with the new parameters.*

New parameters not to be stored:
press key ↑ to display *„STORE.NO".*
Measuring mode continued with the „old" parameters after pressing key ↵.

To change numbers

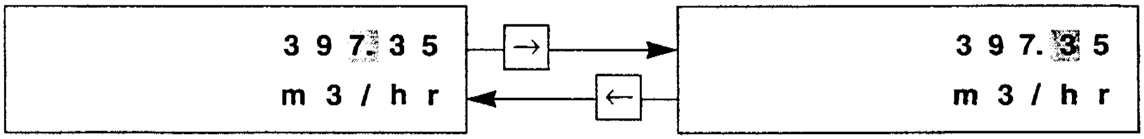
increase number



decrease number

To shift cursor (flashing position)

shift to right

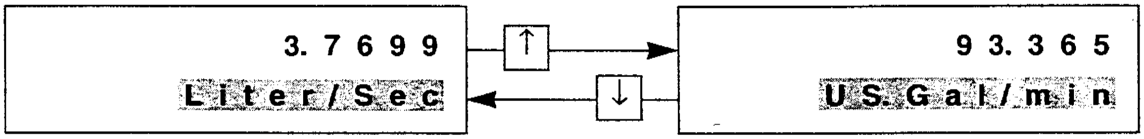


shift to left

To alter texts (units)

For units, the numerical value is converted automatically.

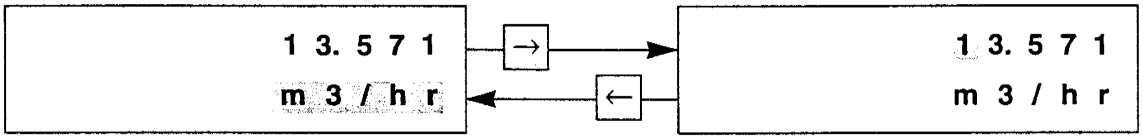
select next text



select preceding text

To transfer from text (unit) to number setting

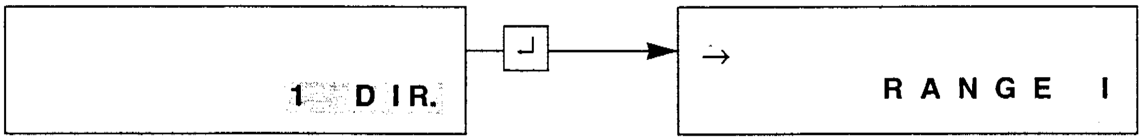
Change to number setting



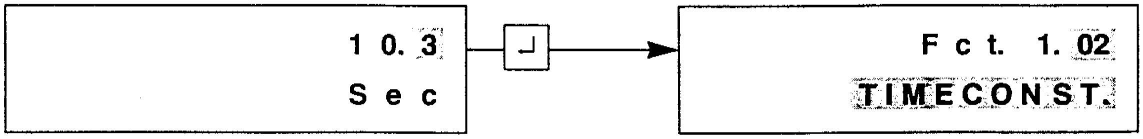
Return to text setting

To transfer to subfunction

Subfunctions do not have a "Fct.No." and are identified by a " → ".



To revert to function display



4.4 Table of settable functions

Abbreviations used

DN	Nominal size, meter size
F_{max}	Highest frequency of the pulse output
F_{min}	Lowest frequency of the pulse output
F_M	Conversion factor <u>volume</u> for any unit, see Fct. "FACT. VOL."
F_T	Conversion factor <u>time</u> for any unit, see Fct. 3.05 "FACT. Time"
F/R	Forward/reverse flow in F/R mode
GKL	Primary constant
I	Current output
P	Pulse output
P_{max}	$= F_{max} / Q_{100\%}$
P_{min}	$= F_{min} / Q_{100\%}$
Q	actual flowrate
$Q_{100\%}$	100% flow = full scale range
Q_{max}	$= \frac{\pi}{4}$ DN² x v_{max} / max. full-scale range ($Q_{100\%}$) at v_{max} = 12 m/s / 40 ft/s
Q_{min}	$= \frac{\pi}{4}$ DN² x v_{min} / min. full-scale range ($Q_{100\%}$) at v_{min} = 0.3 m/s / 1 ft/s
S	Status output, control input
SMU	Low-flow cutoff for I and P
v	Flow velocity
v_{max}	Max. flow velocity (12 m/s / 40 ft/s) at $Q_{100\%}$
v_{min}	Min. flow velocity (0.3 m/s / 1 ft/s) at $Q_{100\%}$

Fct.	Text	Description and settings
1.00	**OPERATION**	**Operations menu**
1.01	**FULL SCALE** 20mA Fact Set @ 55.00 NES Set @ 100.00	**Full-scale range for flowrate $Q_{100\%}$** <u>Select unit</u> • m3/hr • Liter/Sec • [✓ US.Gal/min] • user unit, factory set is "Liter/hr" or "US MGal/day" (see Fct. 3.05) *Press → key to transfer to number setting.* <u>Setting ranges</u> The ranges are dependent on the meter size (DN) and the flow velocity (v): $Q_{min} = \frac{\pi}{4}$ DN² x v_{min} $Q_{max} = \frac{\pi}{4}$ DN² x v_{max} <u>Nom. dia./meter size</u> v_{min} = 0,3 m/s (1 ft/s) v_{max} = 12 m/s (40 ft/s) • DN 2.5–1000 / 1/10"–40": 0.0053 – 33 900 m³/hr 0.0237 – 152 000 US.Gal/min *Press ↲ key to return to Fct. FULL SCALE.*
X	**→ VALUE P**	**Pulse value** (Fct. 1.06 *"VALUE P"*) **has been changed.** With the "old" pulse values the output frequency (F) would have been exceeded or not reached. $P_{min} = F_{min} / Q_{100\%}$ $P_{max} = F_{max} / Q_{100\%}$ **Check new values!**
1.02 FD	**TIMECONST.**	**Time constant** <u>Select:</u> • ALL (applies to display and all outputs) • ONLY I+S (only display, current and status outputs) *Press ↲ key to transfer to number setting.* <u>Range:</u> • 0.2 – 99.9 Sec *Press ↲ key to return to Fct. 1.02 TIMECONST.*
1.03	**L.F.CUTOFF** Off	**Low-flow cutoff** (SMU) • OFF (fixed trip points: ON = 0.1% / OFF = 0.2% for 100 and 1000 Hz, see Fct. 1.06, 1% or 2%) • PERCENT (variable values) ON 1 – 19% OFF 2 – 20% *Press → key to transfer to number setting.* <u>Note:</u> Cutoff "off" value must be greater than cutoff "on" value. *Press ↲ key to return to Fct. 1.03 L.F. CUTOFF.*

Fct.	Text	Description and settings
1.04	**DISPLAY**	**Display functions**
	→ DISP.FLOW	**Select flow display** • NO DISP. • user unit, factory set is "Liter/hr" or "US MGal/day (see Fct. 3.05) • m3/hr • PERCENT • Liter/Sec • BARGRAPH (value and bargraph display in %) [✓ • US.Gal/min] *Press ↵ key to transfer to subfunction "DISP. TOTAL.".*
	→ DISP.TOTAL.	**Select totalizer display** • NO DISP. (totalizer switched on but not displayed) • OFF (totalizer switched off) [✓ • +TOTAL.] • –TOTAL. • +/–TOTAL. • SUM (Σ) • ALL (displaysingle counts or all)
		• m3 • Liter [✓ • US.Gal] • user unit, factory set is "Liter" or "US MGal" (see Fct. 3.05). *Press → key to transfer to format setting.*
		Format setting • **Auto** (exponent notation) • # . ####### • ##### . ### • ## . ###### • ###### . ## • ### . ##### • ####### . # • #### . #### • ######## *Press ↵ key to transfer to subfunction "DISP.MSG".*
	→ DISP.MSG.	**Additional messages required in measuring mode?** • NO • YES (cyclic change with displays of measured values) *Press ↵ key to return to Fct. 1.04 DISPLAY.*
1.05	**CURRENT I**	**Current output I**
	→ FUNCT. I	**Select function for current output I** • OFF (switched off) [✓ • 1 DIR. (1 flow direction)] • 2 DIR. (forward/reverse flow, F/R flow measurement) *Press key ↵, transfer to subfunction* "RANGE I"; *if* "2 DIR." *selected, transfer to subfunction* "REV.RANGE"!
	→ RANGE I	**Select measuring range** • 0 - 20 mA [✓ • 4 - 20 mA (fixed ranges)] *Press key ↵ to transfer to subfunction* "I ERROR".
	→ I ERROR	**Select error value** • 0 mA • 3.6 mA (only with range 4-20 mA) [✓ • 22 mA] *Press key ↵ to revert to* Fct. 1.05 CURRENT. I.

Fct.	Text	Description and settings
1.06	**PULS.OUTP. P**	**Pulse output P**
	→ FUNCTION P	**Select function for pulse output P** • OFF (switched off) • 1 DIR. (1 flow direction) • 2 DIR. (forward/reverse flow, F/R measurement) *Press ↵ key to transfer to subfunction "SELECT P".*
	→ SELECT P	**Select pulse type** • 100 Hz • PULSE/VOL. (pulses per unit volume, flow rate) • 1000 Hz • PULSE/TIME (pulses per unit time for 100% flowrate) *Press ↵ key to transfer to subfunction "PULSWIDTH".* *When 100 Hz and 1000 Hz selected, return to* *Fct. 1.06 PULS.OUTP. P, pulse width 50% cyclic.*
	→ PULSWIDTH	**Select pulse width** • 50 mSec • 100 mSec • 200 mSec • 500 mSec • 1 Sec *Press ↵ key to transfer to subfunction "VALUE P".*
	→ VALUE P	**Set pulse value per unit volume** (appears only when "PULSE/VOL." has been set under "SELECT P"). • xxxx PulS/m3 • xxxx PulS/Liter • xxxx PulS/US.Gal • xxxx PulS/ user unit, factory set is "Liter" or "US MGal" (see Fct. 3.05). Setting range „xxxx" is dependent on the pulse width and the full-scale range: $\mathbf{P_{min}} = F_{min} / Q_{100\%}$ $\mathbf{P_{max}} = F_{max} / Q_{100\%}$ *Press ↵ key to return to Fct. 1.06 "PULS.OUTP. P".*
	→ VALUE P	**Set pulse value per unit time** (appears only when „PULSE/TIME" has been set under „SELECT P"). • xxxx PulS/Sec (=Hz) • xxxx PulS/min • xxxx PulS/hr • xxxx PulS/user unit, factory set is "hr" or "day" (see Fct. 3.05) "xxxx" setting range is dependent on pulse width, see above. *Press ↵ key to return to Fct. 1.06 "PULS.OUTP. P".*
1.07	**IND. OUTP. S**	**Status output S** • ALL ERROR • FATAL ERROR • OFF • ON • F/R INDIC. (F/R indication for forward/reverse measurement) • TRIP. POINT <u>Setting range:</u> 002 - 115 PERCENT • EMPTY PIPE (appears only when this option is installed) *(Press ↵ key to transfer to number setting.)* *Press ↵ key to return to Fct. 1.07 "IND.OUTP. S".*

Fct.	Text	Description and settings
2.00	**TEST**	**Test menu**
2.01	**TEST Q**	**Test measuring range Q** <u>Precautionary query</u> • SURE NO *Press ↵ key to return to Fct. 2.01 "TEST Q".* • SURE YES *Press ↵ key, then use ↑ or ↓ key to select value:* -110 / -100 / -50 / -10 / 0 / +10 / +50 / +100 / +110 PCT. of set full-scale range $Q_{100\%}$. Displayed value present at outputs I and P. *Press ↵ key to return to Fct. 2.01 "TEST Q".*
2.02	**HARDW. INFO**	**Hardware information and error status** Before consulting factory, please note down all 6 codes.
	→ MODUL ADC	X.XXXXXX.XX YYYYYYYYYY *Press ↵ key to transfer to* "MODUL IO".
	→ MODUL IO	X.XXXXXX.XX YYYYYYYYYY *Press ↵ key to transfer to* "MODUL DISP.".
	→ MODUL DISP.	X.XXXXXX.XX YYYYYYYYYY *Press ↵ key to return to Fct. 2.02* "HARDW. INFO".

Fct.	Text	Description and settings
3.00	**INSTALL.**	**Installation menu**
3.01	**LANGUAGE**	**Select language for display texts** [✓ • GB / USA (English)] • F (French) • D (German) • others on request *Press* ↵ *key to return to Fct. 3.01* "LANGUAGE".
3.02	**FLOWMETER**	**Set data for primary head**
	→ DIAMETER 1,5	**Select size from meter size table** • DN 10 - 1000 mm equivalent to 3/8 - 40 inch *Select with* ↑ *or* ↓ *key.* *Press* ↵ *key to transfer to subfunction "FULL SCALE".*
	→ FULL SCALE	**Full-scale range for flow $Q_{100\%}$** To set, refer to Fct. 1.01 "FULL SCALE" above. *Press* ↵ key to transfer to subfunction "GKL VALUE".
	→ VALUE P	**Pulse value (Fct. 1.06 *"VALUE P"*) has been changed.** With the "old" pulse values the output frequency (F) would have been exceeded or not reached. $P_{min} = F_{min} / Q_{100\%}$ $P_{max} = F_{max} / Q_{100\%}$ **Check new values!**
	→ GKL VALUE	**Set primary constant GKL** see primary head nameplate. Range: • 1.0000 - 9.9999 *Press* ↵ *key to transfer to subfunction* "FIELD. FREQ.".
	→ FIELD FREQ.	**Magnetic field frequency** Values: 1/6 or 1/18 of power frequency, [✓ see nameplate.] *Press* ↵ *key to transfer to subfunction "FLOW DIR.";* DC units only: to transfer to subfunction *"LINE FREQ.".*
	→ LINE FREQ.	**Normal line frequency in your country** Please note: This function is only provided for units with DC power supply to suppress line-frequency interference. Values: *50 Hz* and [✓ *60 Hz*] *Press* ↵ *key to transfer to subfunction "FLOW DIR.".*
	→ FLOW DIR.	**Define flow direction** (in F/R mode: forward flow). Set according to direction of arrow on primary head: [✓ • + DIR.] • – DIR. *Select using* ↑ *or* ↓ *key.* *Press* ↵ *key to return to Fct. 3.02 "FLOWMETER".*
3.03	**ZERO SET** ✓	**Zero calibration** Note: Carry out only at "0" flow and with completely filled measuring tube! Precautionary query • CALIB. NO *Press* ↵ *key to return to Fct. 3.03 "ZERO SET".* • CALIB. YES Press ↵ *key to start calibration.* Duration approx. 15–90 seconds, current flowrate displayed in the selected unit (see Fct. 1.04 "DISP. FLOW"). *A "WARNING" sign appears when flowrate "> 0";* *acknowledge by pressing* ↵ *key.* • STORE NO (do **not** store new zero value) • STORE YES (store new zero value) *Press* ↵ *key to return to Fct. 3.03 "ZERO SET".*
3.04	**ENTRY CODE** PW	**Entry code required to enter setting mode?** • NO (= entry with → only) • YES (= entry with → and Code 1: → → → ↵ ↵ ↵ ↑ ↑ ↑) *Press* ↵ *to return to Fct. 3.04 "ENTRY CODE".*

Fct.	Text	Description and settings
3.05	**USER UNIT**	**Set any required unit for flowrate and counting**
	→ TEXT VOL.	**Set text for required flowrate unit** (max. 5 characters) Factory-set: "Liter" or "MGal". Characters assignable to each place: • A-Z, a-z, 0-9, or " – " (= blank character). *Press ↵ key to transfer to subfunction "FACT. VOL."*
	→ FACT. VOL. custom unit	**Set conversion factor (F_M) for volume** Factory set "1.00000" for "Liter" or "2.64172E-4" for "US MGal" (exponent notation, here: 1×10^3 or 2.64172×10^{-4}). Factor F_M = volume per $1 m^3$. Setting range • 1.00000 E-9 to 9.99999 E+9 (= 10^{-9} to 10^{+9}) *Press ↵ key to transfer to subfunction "TEXT TIME".*
	→ TEXT TIME MIN	**Set text for required time unit** (max. 3 characters) Factory-set: "hr" or "day": Characters assignable to each place: • A-Z, a-z, 0-9, or " – " (= blank character). *Press* ↵ key to transfer to subfunction "FACT. TIME"
	→ FACT. TIME	**Set conversion factor (F_T) for time** Factory-set: "3.60000 E+3" for "hour" or "8.64000 E+4" for "day" (exponent notation, here: 3.6×10^3 or 8.64×10^{-4}). Set factor F_T in seconds. Setting range • 1.00000 E-9 to 9.99999 E+9 (= 10^{-9} to 10^{+9}) *Press ↵ key to return to Fct. 3.05 "USER UNIT".*
3.06	**APPLICAT.**	**Set overload point for A/D converter**
	→ EMPTY PIPE Error if electrodes not wet	**Switch on "empty tube" identifier option?** (appears only when this option is installed) • YES • NO *Select with key ↑ or ↓ .* *Press ↵ key to return to* Fct. 3.06 "APPLICAT.".

4.5 Error messages in measuring mode

The following list gives all errors that can occur during process flow measurement.
Errors shown in display when "YES" set in Fct. 1.04 DISPLAY, subfunction "DISP. MSG.".

Error messages	Description of error	Error clearance
LINE INT.	Power failure Note: no counting during power failure	Cancel error in RESET/QUIT. menu Reset totalizer if necessary.
CUR. OUTP. I	Current output overranged.	Check and if necessary correct instrument parameters. After elimination of cause, error message deleted automatically.
PULSOUTP. P	Pulse output overranged. Note: totalizer deviation possible.	Check and if necessary correct instrument parameters. After elimination of cause, error message deleted automatically.
ADC	Analog / digital converter overranged	Error message deleted automatically after elimination of cause.
FATAL. ERROR	Fatal error, all outputs set to "min. values"	Please consult factory.
TOTALIZER	Totalizer has been reset	Cancel error message in RESET/QUIT. menu.
EMPTY PIPE	Pipe has run dry. This message appears only when the **"empty pipe identifier" option is installed** and the function is switched on under Fct. 3.06 APPLICAT., submenu "EMPTY PIPE".	Fill pipe.

Reset totalizer and cancel error messages, RESET / QUIT menu 4.6

Cancel error messages in RESET / QUIT menu

Key	Display		Description
	- - - - - - -	- - - - - / - - -	Measuring mode
↵	**CodE 2**	- -	Key in entry code 2 for RESET / QUIT menu: ↑ →
↑ →		**ERROR QUIT.**	Menu for error acknowledgement
→		**QUIT. NO**	Do **not** delete error messages, press ↵ twice = return to measuring mode
↑		**QUIT. YES**	Delete error messages
↵		**ERROR QUIT.**	Error messages deleted
↵	- - - - - - -	- - - - - / - - -	Return to measuring mode

Reset totalizer(s) in RESET / QUIT menu

Key	Display		Description
	- - - - - - -	- - - - - / - - -	Measuring mode
↵	**CodE 2**	- -	Key in entry code 2 for RESET / QUIT menu: ↑ →
↑ →		**ERROR QUIT.**	Menu for error acknowledgement
↑		**TOTAL. RESET**	Menu for resetting totalizer
→		**RESET NO**	Do **not** reset totalizer, press ↵ twice = return to measuring mode
↑		**RESET. YES**	Reset totalizer
↵		**RESET QUIT.**	Totalizer reset
↵	- - - - - - -	- - - - - / - - -	Return to measuring mode

Examples of setting the signal converter 4.7

The **cursor,** flashing part of display, is shown below in **bold** type.

- **Change measuring range of current output and value for error messages** (Fct. 1.05):
- Change measuring range from 04-20 mA to **00-20 mA**
- Change value for error messages from 0 mA to **22 mA**

Key	Display		Description
→			If “YES” set under Fct. 3.04 ENTRY CODE, key in the 9-keystroke CODE 1 now: → → → ↵ ↵ ↵ ↑ ↑ ↑
	Fct. 1.00	**OPERATION**	
→	Fct. 1.01	**FULL SCALE**	
4x ↑	Fct. 1.05	**CURRENT I**	
→		FUNCT. I	
→ ↵		RANGE I	If “REV. RANGE” appears here, press keys → and ↵ again.
→	**04-20**	mA	Old current range
↑	**00-20**	mA	New current range
↵		I ERROR	
→	**0**	mA	Old value for error messages
2x ↑	**22**	mA	New value for error messages
↵	Fct. 1.05	**CURRENT I**	
↵	Fct. 1.00	**OPERATION**	
↵		**STORE YES**	
↵	- - - - - - -	- - - - - / - - -	Measuring range with new data for the current output

5 Description of functions

5.1 Full-scale range $Q_{100\%}$

Fct. 1.01 FULL SCALE
Press → key.

Choice of unit for full-scale range $Q_{100\%}$

m3/hr	(cubic metres per hour)
Liter/Sec	(litres per second)
US.Gal/min	(US gallons per minute)

- User-defined unit, factory-set is **"Liter/hr"** (litres per hour) or **"US MGal/day"**, see Sect. 5.12.

Select with ↑ *or* ↓ key.
Use → key to transfer to numerical setting, 1st number (cursor) flashes.

Set full-scale range $Q_{100\%}$
The setting range is dependent on meter size (DN) and flow velocity (v).

$Q_{min} = \frac{\pi}{4} DN^2 \times v_{min}$ $Q_{max} = \frac{\pi}{4} DN^2 \times v_{max}$ (refer to flow table in Sect. 10.1)

0.0053 –	33 929	m^3/hr
0.00147 –	9 424.5	Liter/Sec
0.00233 –	151 778	US.Gal/min

Change flashing number (cursor) with ↑ *or* ↓ key.
Use → key to shift cursor 1 place to right.
Press ↵ key to return to Fct. 1.01 FULL SCALE.

Note if **"VALUE P"** is displayed after pressing ↵ key:
PULSE/VOL. is set under Fct. 1.06 PULS B1, subfunction "SELECT P". Due to the changed full-scale range $Q_{100\%}$, the output frequency (F) of the pulse output will be over- or undershot:
$P_{min} = F_{min} / Q_{100\%}$ $P_{max} = F_{max} / Q_{100\%}$
Change pulse value accordingly, see Sect. 5.7 pulse output B1, Fct. 1.06.

5.2 Time constant

Fct. 1.02 TIMECONST.
Press → key.

Choice

ALL	(applies to display and all outputs)
ONLY I+S	(applies only to display, current and status output)

Select with ↑ *or* ↓ key.
Transfer to number setting with ↵ key. 1st number (cursor) flashes.

Set numerical value
- **0.2 - 99.9 Sec** (seconds)

Change flashing number (cursor) with the ↑ *or* ↓ key.
Use → key to shift cursor 1 place to right.
Press ↵ key to return to Fct. 1.02 TIMECONST.

Low-flow cutoff 5.3

Fct. 1.03 L.F.CUTOFF
Press → key.

Choice

- **OFF** (fixed trip points: ON = 0.1 % / OFF = 0.2 %, for 100 or 1000 Hz, see Fct. 1.06, 1% or 2%)
- **PERCENT** (variable tripping points: ON = 1 - 19 % / OFF = 2 - 20 %)

Select with ↑ or ↓ key.
Transfer to number setting using → key (only if "PERCENT" selected).
1st number (cursor) flashes.

Setting the numerical value when "PERCENT" selected

- **01** to **19** (cutoff "on" value, left of hyphen)
- **02** to **20** (cutoff "off" value, right of hyphen)

Change flashing number (cursor) with the ↑ or ↓ key.
Shift cursor 1 place to right using → key.
Press ↲ key to return to Fct. 1.03 L.F.CUTOFF.

Note: The cutoff "off" value must be greater than the cutoff "on" value.

Display 5.4

Fct. 1.04 DISPLAY
Press → key.

→ DISP. FLOW = select unit for display of flowrate, *press → key*

- **NO DISP.** (no display)
- **m3/hr** (cubic metres per hour)
- **Liter/Sec** (litres per second)
- **US.Gal/min** (US gallons per minute)
- user-defined unit, factory-set: **"Liter/hr"** (litres per hour) or **"US MGal/day"**, see Sect. 5.14
- **PERCENT** (percentage display)
- **BARGRAPH** (numerical value and bar graph display in %)

Select with ↑ or ↓ key.
Press ↲ key to transfer to subfunction "DISP. TOTAL".

→ DISP. TOTAL = select unit for totalizer display, *press → key*

- **NO DISP.** (no display)
- **OFF** (internal totalizer switched off)
- **+ TOTAL.**
- **– TOTAL.**
- **+/– TOTAL.**
- **SUM (Σ)**
- **ALL (sequential)**

Select with ↑ or ↓ key.
Transfer to totalizer unit setting using ↲ key.

- **m3** (cubic metres)
- **Liter** (litres)
- **US.Gal** (US gallons)
- user-defined unit, factory-set: **"Liter"** or **"US MGal"**, see Sect. 5.14

Select with ↑ or ↓ key.
Transfer to totalizer format setting using → key.

Continuation see next page

Setting of totalizer format

- **Auto** (exponent notation)
- **# . #######**
- **## . ######**
- **### . #####**
- **#### . ####**
- **##### . ###**
- **###### . ##**
- **####### . #**
- **########**

Select with key ↑ *or* ↓ .
Press ⏎ key to transfer to subfunction "DISP. MSG".

→ DISP. MSG. = additional messages required in measuring mode, *press → key*

• **NO**	(no other messages)
• **YES**	(display other messages, e.g. errors, in sequence with the measured values)

Select using the ↑ *or* ↓ key.
Press ⏎ *key to return to Fct. 1.04 DISPLAY.*

Note: "BUSY" is displayed in the measuring mode when all displays are set to "NO DISP." or "NO". Sequencing of displays is automatic. However, in the measuring mode, manual sequencing can be carried out with the ↑ key. Return to automatic sequencing after approx. 3 minutes.

Please refer to Sect. 3.2 "factory settings"

5.5 Internal electronic totalizer

The internal electronic totalizer counts in m^3, regardless of the unit set under Fct. 1.04, subfunction "DISP. FLOW".
The counting range is dependent upon the meter size and has been selected such that the totalizer will count for a minimum of 1 year without overflow:

Meter size		**Counting range**	
DN mm	inch	in m^3	US Gal equivalent
10 - 50	$^3/_8$ - 2	0 - 999 999.99999999	0 - 264 172 052.35800
65 - 200	$2^1/_2$ - 8	0 - 9 999 999.9999999	0 - 2 641 720 523.5800
250 - 600	10 - 24	0 - 99 999 999.999999	0 - 26 417 205 235.800
700 -1000	28 - 40	0 - 999 999 999.99999	0 - 264 172 052 358.00

Only part of the totalizer count is shown in the display because it is not possible to output a 14-digit number. Unit and format of the display are freely selectable, see Fct. 1.04, subfunction "DISP. TOTAL" and Sect. 5.4. This determines which part of the count is to be displayed. Display overflow and totalizer overflow are independent of one another.

Example

Internal count	0000123 . 7654321	m^3
Format, display unit	XXXX . XXXX	Liter
Internal count in unit	0123765 . 4321000	Liter
Displayed	3765 . 4321	Liter

<u>Fct. 1.05 CURRENT I</u>
Press → key.

→ FUNCT. I = select function for current output, *press → key*

- **OFF** (switched off, no function)
- **1 DIR.** (1 flow direction)
- **2 DIR.** (2 flow directions, F/R mode, forward/reverse)

Select using ↑ *or* ↓ key.
Transfer to subfunction "RANGE I" with ↲ *key.*
Exception: *When "OFF" selected, return to Fct. 1.05 CURRENT I.*

→ RANGE I = select measuring range, *press → key*

- **0 - 20 mA** fixed ranges
- **4 - 20 mA**

Press → key to transfer to number setting.
Select with key ↑ *or* ↓.
Press key ↲ *to transfer to subfunction "I ERROR".*

→ I ERROR = set error value, *press → key*

- **0 mA**
- **3.6 mA** (only possible if range "4-20 mA" selected)
- **22 mA**

Select using key ↑ *or* ↓*. Press → key to transfer to number setting.*
Press key ↲ *to return to Fct. 1.05 CURRENT I.*

Please refer to Sect. 3.2 "Factory settings".

Refer to Sect. 2.3 for connection diagrams, and to Sect. 5.14 for characteristics.

5.7 Pulse output P

<u>NOTE!</u> Check whether under Fct. 3.07 “HARDWARE” the output terminal **“B1”** is defined as pulse output, refer also to Sect. 2.2 and Sect. 5.16.

<u>Fct. 1.06 PULS.OUTP. P</u>
Press key →.

<u>→ FUNCT. P = select function for pulse output,</u> *<u>press → key</u>*

- **OFF** (switched off, no function)
- **1 DIR.** (1 flow direction)
- **2 DIR.** (2 flow directions, F/R mode, forward/reverse)

Select with key ↑ or ↓.
Press ↵ key to transfer to <u>subfunction “SELECT P”.</u>
***Exception:** When “OFF” selected, return to Fct. 1.06 PULS B1.*

<u>→ SELECT P = select pulse type,</u> *<u>press → key</u>*

- **100 Hz**
- **1000 Hz**
- **PULSE/VOL.** (pulses per unit volume, flow)
- **PULSE/ZEIT** (pulses per unit time for 100% flow)

Select using ↑ or ↓ key.
Transfer to <u>subfunction "PULSWIDTH"</u> with ↵ key.
***Note:** when 100 Hz or 1000 Hz selected, return to Fct. 1.06 PULS.OUTP. P.*

<u>→ PULSWIDTH = set pulse width,</u> *<u>press → key</u>*

- **50 mSec** F_{max} = 10 Hz F_{min} = 0.0056 Hz (= 20 Pulse / hr)
- **100 mSec** = 5 Hz
- **200 mSec** = 2.5 Hz
- **500 mSec** = 1 Hz
- **1 Sec** = 0,5 Hz

Select using ↑ or ↓ key.
Transfer to <u>subfunction "VALUE P"</u> with ↵ key or return to Fct. 1.06 PULS.OUT. P, depending on choice of pulse type in subfunction "SELECT P".

→ VALUE P = set pulse value per unit volume
(appears only when "PULSE/VOL." set under "SELECT P", press → *key.*

- **XXXX PulS/m3**
- **XXXX PulS/Liter**
- **XXXX PulS/US.Gal**
- **XXXX PulS/** user unit, factory-set: **"Liter"** or **"US MGal",** see Sect. 5.12.

Select using ↑ or ↓ key.
Transfer to number setting with → key. 1st digit (cursor) flashes.

Set numerical value

- **XXXX** (setting range depends on pulse width and full-scale range: $\mathbf{P}_{\mathbf{min}} = F_{min} / Q_{100\%}$ $\mathbf{P}_{\mathbf{max}} = F_{max} / Q_{100\%}$)

Change flashing digit (cursor) with ↑ or ↓ key,
shift cursor 1 place to right or left with → key.
Press ↲ key to return to Fct. 1.06 PULS.OUTP. P.

---

or

→ VALUE P = set pulse value per unit time,
(appears only when "PULSE/TIME" has been set under "SELECT P"), *press → key.*

- **XXXX PulSe/Sec**
- **XXXX PulSe/min**
- **XXXX PulSe/hr**
- **XXXX PulSe/** user unit, factory-set: **"hr"**, or **"day",** see Sect. 5.12.

Select using ↑ or ↓ key.
Transfer to number setting with → key, 1st digit (cursor) flashes.

Set numerical value

- **XXXX** (setting range depends on pulse width)

Change flashing digit (cursor) with ↑ or ↓ key,
shift cursor 1 place to right or left with → key.
Press ↲ key to return to Fct. 1.06 PULS.OUTP. P.

Please refer to Sect. 3.2 "factory settings"

Refer to Sect. 2.3 for connection diagrams, and to Sect. 5.14 for characteristics.

5.8 Status output S

Fct. 1.07 IND. OUTP. S
Press key →.

Select function of status outputs, *press → key*

• **ALL ERROR**	(indicates all errors)
• **FATAL.ERROR**	(indicates fatal errors only)
• **OFF**	(switched off, no function)
• **ON**	(indicates that flowmeter is operative)
• **F/R INDIC.**	(indicates direction for current and pulse outputs, F/R mode)
• **EMPTY PIPE**	(option "empty tube identification")
• **TRIP. POINT**	(setting range: 002 – 115 PERCENT of $Q_{100\%}$, full-scale range) *Transfer to number setting with ↵ key, 1st digit (cursor) flashes. Change flashing digit (cursor) with ↑ and ↓ keys. Use → and ← keys to shift cursor 1 place to right or left.*

Press ↵ key to return to Fct. 1.07 IND. OUTP. S.

• **Characteristic of status output**	**Switch open**	**Switch closed**
OFF (switched off)	no function	
ON (e.g. operation indicator)	power OFF	power ON
F/R INDIC.	Forward flow	Reverse flow
TRIP POINT (limit switch)	inactive	active
ALL ERROR (all errors)	errors	no error
FATAL.ERROR (fatal errors only)	errors	no error
EMPTY PIPE (option)	when measuring tube is empty	when measuring tube is full

---

Please refer to Sect. 3.2 "factory settings"

Refer to Sect. 2.3 for connection diagrams, and to Sect. 5.14 for characteristics.

Language 5.9

Fct. 3.01 LANGUAGE

Press → key.

Select language for texts in display

D	(German)
GB/USA	(English)
F	(French)
others	on request

Select using ↑ key.
Press ↵ key to return to Fct. 3.01 LANGUAGE.

Entry code 5.10

Fct. 3.04 ENTRY CODE

Press → key.

Choice

NO	(no code, enter setting mode with → key)
YES	(enter setting mode with → key and Code 1: → → → ↵ ↵ ↵ ↑ ↑ ↑)

Select using ↑ key.
Press ↵ key to return to Fct. 3.04 ENTRY CODE.

5.11 Primary head

Fct. 3.02 FLOW METER
Press → key.

<u>→ DIAMETER = set meter size</u> <u>(see instrument nameplate)</u> *<u>press → key</u>*
Select size from table of meter sizes:

- **DN 2.5 - 1000 mm** equivalent to **1/10 - 40 inch**

Select using ↑ or ↓ key.
Transfer to <u>subfunction "FULL SCALE"</u> with ↵ key.

<u>→ FULL SCALE = set full-scale range,</u> *<u>press → key.</u>*
Set as described in Sect. 5.1.

Transfer to <u>subfunction "GKL VALUE"</u> with ↵ key.

Note: if **"VALUE P"** is displayed after pressing ↵ key.
PULSE/VOL. is set under Fct. 1.06 PULS.OUTP. P, subfunction "SELECT P". Because the full-scale range $Q_{100\%}$ has been changed, the output frequency (F) of the pulse output is over- or undershot: $P_{min} = F_{min} / Q_{100\%}$ $P_{max} \doteq F_{max} / Q_{100\%}$
Change pulse value accordingly, see Sect. 5.7 pulse output P, Fct. 1.06.

<u>→ GKL VALUE = set primary constant GK,</u> *<u>press → key.</u>*

- **1.0000 - 9.9999** (note information on instrument nameplate, do **not** change setting !)

Change flashing digit (cursor) with ↑ or ↓ key.
Shift cursor 1 place to right or left with → or ← key.
Transfer to <u>subfunction "FIELD FREQ."</u> with ↵ key.

<u>→ FIELD FREQ. = set magnetic field frequency,</u> *<u>press → key</u>*

- **1/6**
- **1/18**

} (1/6 or 1/18 of power frequency, see instrument nameplate, do **not** change setting)

Select using ↑ or ↓ key.
Transfer to <u>subfunction "FLOW DIR."</u> with ↵ key.
(only for units with DC power supply, transfer to subfunction "LINE FREQ").

<u>→ LINE FREQ. = normal line frequency in your country,</u> *<u>press → key.</u>*

- **50 Hz** *Select using the ↑ key.*
- **60 Hz** *Transfer to <u>subfunction "FLOW DIR."</u> with ↵ key.*

<u>→ FLOW DIR. = set flow direction,</u> *<u>press → key.</u>*

- **+ DIR.** (for identification of flow direction, see "+" arrow on primary head;
- **- DIR.** for F/R mode, identifies the "positive" flow direction)

Select using the ↑ or ↓ key.
Press ↵ key to return to Fct. 3.02 FLOW METER.

<u>Zero check</u>, see Fct. 3.03 and Sect. 7.1.

Please refer to Sect. 3.2 "factory settings"

KROHNE

04/98

Condensed Instructions

Signal converters for electromagnetic flowmeters

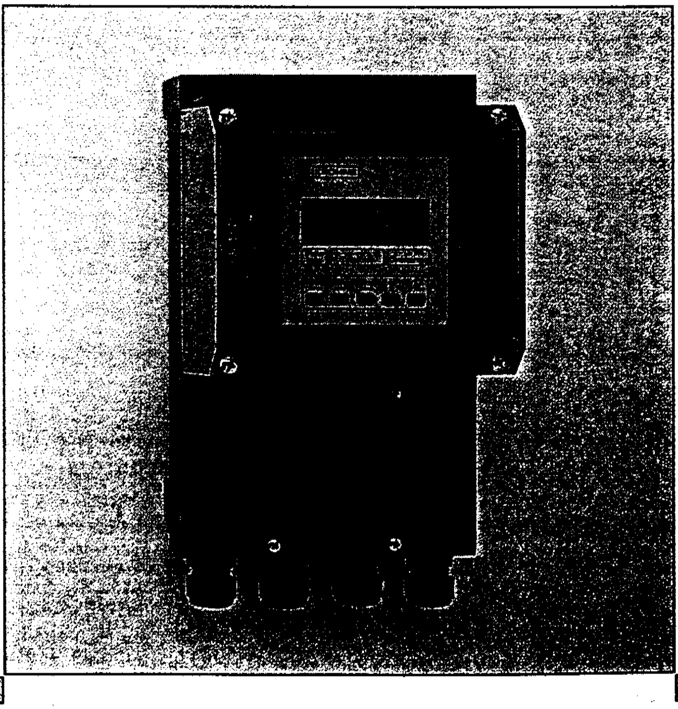
IFC 010 K
IFC 010 F

Contents

PLEASE NOTE

These concise instructions do not include the following: device description, technical data, standards, approvals, etc., nor conditions pertaining to product liability and warranty.

The operator is, however, obligated to take note of these sections in the detailed Installation and Operating Instructions.



Applicable to Software Versions

- IFC 010 – / D
  Display version
  No. **806325.07**
  and
  No. **317551.02**
  and higher
- IFC 010 – / B
  Basic version
  operator-controllable
  with HHT 010
  No. **806323.06**
  and higher

Part A System installation and start-up

1 Electrical connection: power supply

1.1 Important installation notes

PLEASE NOTE !

1.1.1 Location

- **Electrical connection in accordance with VDE 0100** "Regulations governing heavy-current installations with line voltages up to 1000 V" or **equivalent national regulations.**
- Do not cross or loop **cables inside the terminal compartment.**
- Use **separate cable entries** (see below) for power supply, field current cables, signal lines, outputs and inputs.
- Protect flowmeters or switchgear cabinets with built-in devices from direct **sunlight.** Fit a sunshade if necessary.
- When installed in switchgear cabinets, signal converters must be adequately cooled, e.g. use fans or heat exchangers.
- Do not expose signal converters to intense **vibration.**

1.1.2 Only for separate systems/signal converters (F versions)

- Keep **distance between primary head and signal converter** as short as possible. Refer to Sect. 1.3.4 for maximum permissible length of signal and field current cables.
- Use the supplied **Krohne signal cable A** (Type DS), standard length 10 m (33 ft).
- Always **calibrate** primary head and signal converter **together.** Therefore, when installing, ensure **primary constant GKL is identical;** refer to instrument nameplate for the primary head. If the GKL is not identical, set the signal converter to the GKL of the primary head. Refer also to Sections 4.
- **Dimensions of signal converter;** refer to Section 10.4.

1.1.3 Cable entries

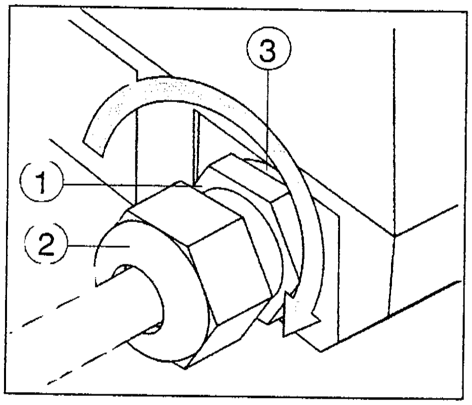
Number of cable entries: 2 for the compact flowmeters
4 for the IFC 010 F signal converter

NOTE: Ensure gaskets are fitted correctly and maintain the following max. torques!

1 Max. torques for PG 13.5,
1/2" NPT or 1/2" PF adapters: **4 Nm / 2.8 ft x lbf**

2 Max. torques for PG 13.5 only: **3 Nm / 2.1 ft x lbf**

3 Gasket



A) PG 13.5 cable entries

These cable entries may only be used for flexible electrical cables if the relevant electrical regulations so allow, e.g. National Electric Code (NEC).
Do not fix rigid metal conduits (IMC) or flexible plastic conduits to the PG 13.5 cable entries, refer to "Point B, C" below (1/2" NPT or PF adapters).

B) 1/2" NPT adapters **C) 1/2" PF adapters**

For most North American systems the regulations require that electrical conductors be laid in conduits, particularly where power voltages > 100 V AC are concerned.
In such cases, use the 1/2" NPT or 1/2" PF adapters to which flexible plastic conduits can be screwed. **Do not use rigid metal conduits (IMC)!**
Lay conduits such that no moisture can penetrate into the converter housing.
Should there be risk of any condensation water forming, fill the cross-section of the conduit around the cables at these adapters with a suitable sealing compound.

PLEASE NOTE !

- Rated values: The flowmeter housings protecting the electronic equipment from dust and moisture must always be kept closed. The selected creepage distances and clearances have been dimensioned in conformity with VDE 0110 and IEC 664 for contamination category 2. Supply circuits and output circuits are designed to meet the standards of overvoltage classes III and II, respectively.

- Safety isolation: the flowmeters (signal converters) must be provided with an isolating facility.

1. AC Version
230/240 V AC (200 - 260 V AC)
switch-selectable to
115/120 V AC (100 - 130 V AC)

2. AC Version
200 V AC (170 - 220 V AC)
switch-selectable to
100 V AC (85 - 110 V AC)

- **Note information on instrument nameplate:** supply voltage and frequency

- The **PE protective ground conductor** for the power supply **must be connected** to the separate U-clamp terminal in the terminal compartment of the signal converter.
For exceptions (compact systems), refer to installation instructions for the primary head.

- **Connection diagrams I and II** for electrical connection between primary head and signal converter: refer to Section 1.3.5.

3. AC Version
48 V AC (41 - 53 V AC)
switch-selectable to
24 V AC (20 - 26 V AC)

DC Version
24 V DC (11-32 V DC)

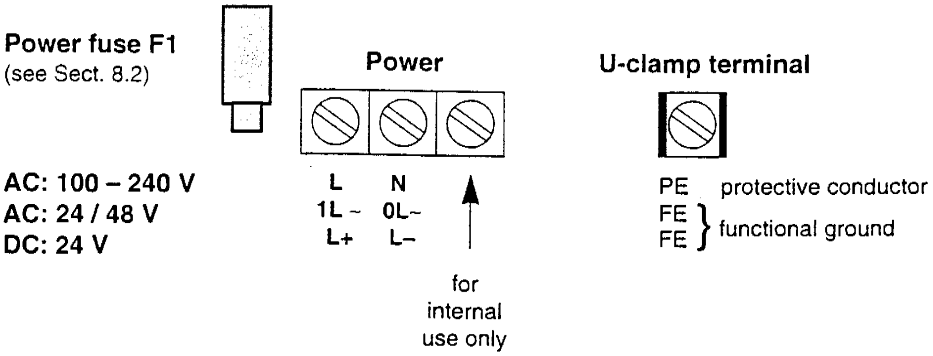
- **Note information on instrument nameplate:** supply voltage and frequency.

- For measurement reasons, connect an **FE functional ground conductor** to the separate U-clamp terminal in the terminal compartment of the signal converter.

- If connected to a functional extra-low voltage source (24 V AC / DC, 48 V AC), provide for **protective separation (PELV)** in conformity with VDE 0100 / VDE 0106 or IEC 364 / IEC 536, or equivalent national regulations.

- **Connection diagrams I and II** for power supply and electrical connection between primary head and signal converter: refer to Section 1.3.5.

Connection to power



Warning: Instrument must be properly grounded to avoid personnel shock hazard.

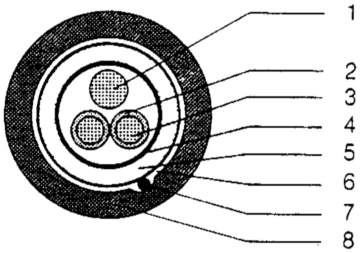
1.3 Electrical connection of separate primary head (F Versions)

1.3.1 General information on signal cable A and field current cable C

Use of the Krohne signal cable A with foil screen and magnetic shield will ensure proper operation of the equipment.

- Signal cable to be solidly laid.
- Connect shields via stranded drain wires.
- Underwater and underground installation possible.
- Insulating material is flame-retardant to IEC IEC 332.1 / VDE 0742.
- Signal cables are low in halogen, unplasticized, and stay flexible at low temperatures.

Signal cable A (Type DS), with double shielding



1	Stranded drain wire, 1st shield, 1.5 mm^2 or AWG14
2	Insulation
3	Conductor 0.5 mm^2 or AWG 20 (3.1 red / 3.2 white)
4	Special foil, 1st shield
5	Inner sheath
6	Mu-metal foil, 2nd shield
7	Stranded drain wire, 2nd shield, 0.5 mm^2 or AWG 20
8	Outer sheath

Field current cable C with single shielding
Cross-section is dependent on required length of cable, see Table in Sect. 1.3.4.

1.3.2 Grounding of primary head

All flowmeters must be properly grounded.

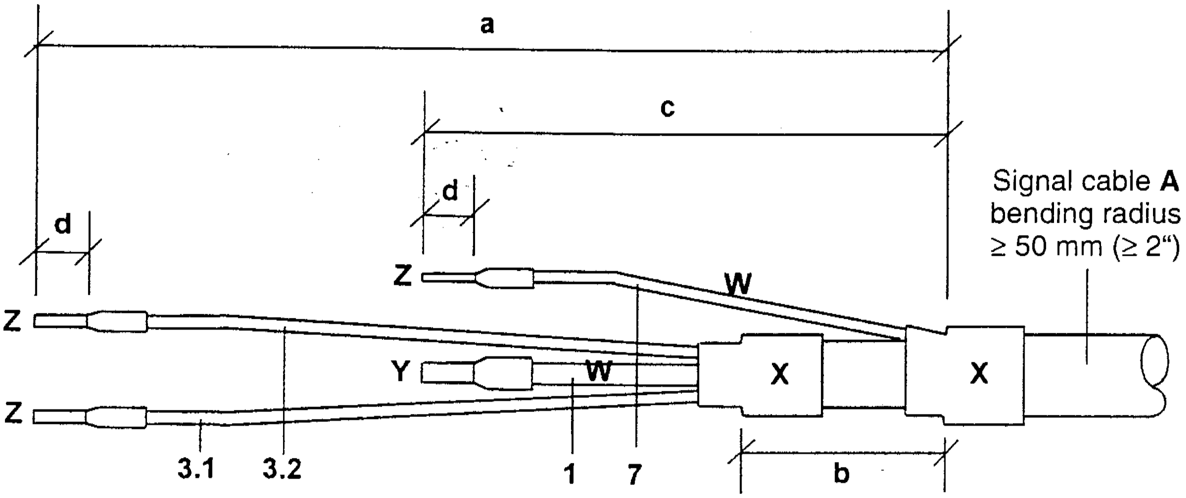
- The grounding conductor should not transmit any interference voltages.
- Do not ground any other electrical device together with this conductor.
- The primary head is connected to ground by means of an **FE functional ground conductor.**
- Special information on grounding various primary heads is contained in the separate **installation instructions for primary heads.**
- These instructions also contain detailed descriptions on how to use grounding rings and how to install primary heads in metal or plastic pipes or internally coated pipelines.

Please note the different lengths given in the table for signal converter and primary head.

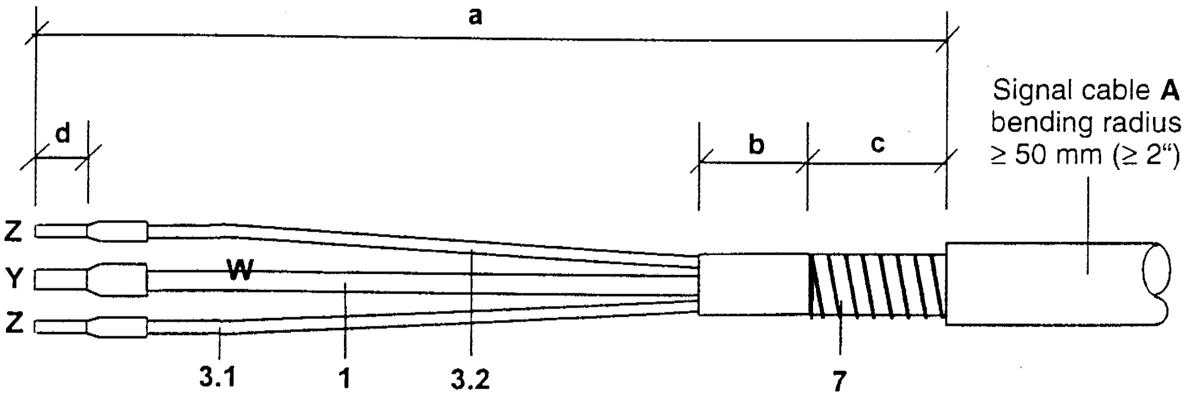
Length	Converter		Primary head	
	mm	(inch)	mm	(inch)
a	55	(2.17)	90	(3.60)
b	10	(0.39)	8	(0.30)
c	15	(0.59)	25	(1.00)
d	8	(0.30)	8	(0.30)

Customer-supplied materials	
W	Insulation tubing (PVC), Ø 2.0 - 2.5 mm (dia. 1")
X	Heat-shrinkable tubing or cable sleeve
Y	Wire end sleeve to DIN 41 228: E 1.5-8
Z	Wire end sleeve to DIN 41 228: E 0.5-8

Preparation for connection to primary head



Preparation for connection to IFC 010 F signal converter



External shielding of signal cable A (Type DS)
Wrap stranded drain wire (7) around the mu-metal foil (6) and clamp under the shield terminal in the signal converter terminal box (see also diagram in Sect. 1.3.5).

Cable routing in signal converter housing
see illustration in Sect. 10.4.

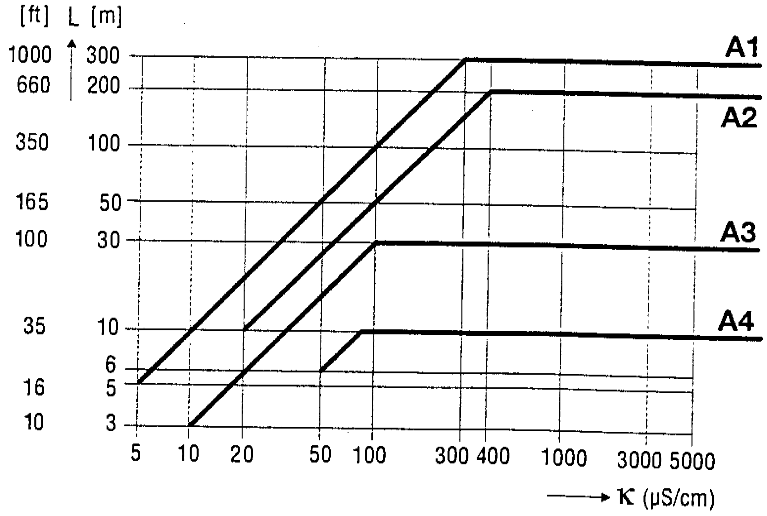
1.3.4 Cable lengths (max. distance between signal converter and primary head)

Abbreviations and explanatory notes
used in the following tables, diagrams and connection diagrams

- **A** **Signal cable A** (type DS), with double shielding, see diagram for max. length
- **C** **Field current cable C,** with single shielding, type and length see Table
- **D** High-temperature silicone cable, 3 × 1.5 mm^2 (14 AWG) Cu, with single shielding, max. length 5 m (16 ft)
- **E** High-temperature silicone cable, 2 × 1.5 mm^2 (14 AWG) Cu, max. length 5 m (16 ft)
- **L** Cable length
- **κ** Electrical conductivity of the process liquid
- **ZD** Intermediate connection box required in connection with cables D and E for primary heads ALTOFLUX IFS 4000 F, PROFIFLUX IFS 5000 F and VARIFLUX IFS 6000 F in cases where process temperatures exceed 150 °C (302 °F)

Recommended length of signal cable
for magnetic field frequency $\leq 1/6 \times$ power frequency

Primary head	**Meter size**		**Signal cable**
	DN mm	inch	
ECOFLUX IFS 1000 F	10 - 15	3/8 - 1/2	A4
	25 - 150	1 - 6	A3
AQUAFLUX F	10 - 1000	3/8 - 40	A1
ALTOFLUX IFS 4000 F	10 - 150	3/8 - 6	A2
	200 - 1000	8 - 40	A1
PROFIFLUX IFS 5000 F	2.5 - 15	1/10 - 1/2	A4
	25 - 100	1 - 4	A2
VARIFLUX IFS 6000 F	10 - 15	1/8 - 1/2	A4
	25 - 80	1 - 3	A2



Field current cable C: max. length and min. cross-section

Length		**Type of cable,** single shielding
0 - 150 m	5 - 500 ft	2 × 0.75 mm^2 Cu / 2 × 18 AWG
150 - 300 m	500 - 1000 ft	2 × 1.50 mm^2 Cu / 2 × 14 AWG

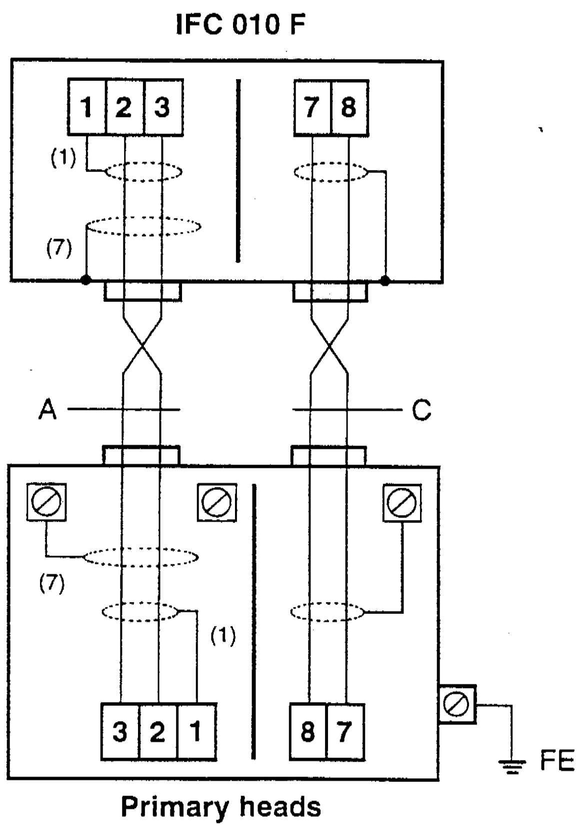
Warning: Instrument must be properly grounded to avoid personnel shock hazard.

Connection diagrams I and II (power supply, converter and primary head) 1.3.5

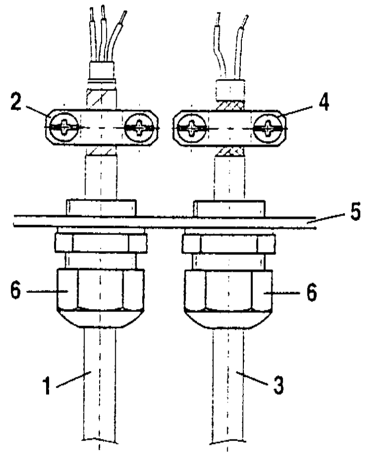
Important information PLEASE NOTE !

- The figures in brackets indicate the stranded drain wires for the shields, see cross-sectional drawing of signal cable in Section 1.3.1.
- **Electrical connection to VDE 0100** "Regulations governing heavy-current installations with line voltages up to 1000 V" or equivalent national regulations.
- **Power supply 24 V AC / DC:** functional extra-low voltage with protective separation in conformity with VDE 0100, Part 410 or equivalent national regulations.
- **PE** = protective conductor **FE** = functional ground conductor

I Process temperature < 150 °C (302 °F)

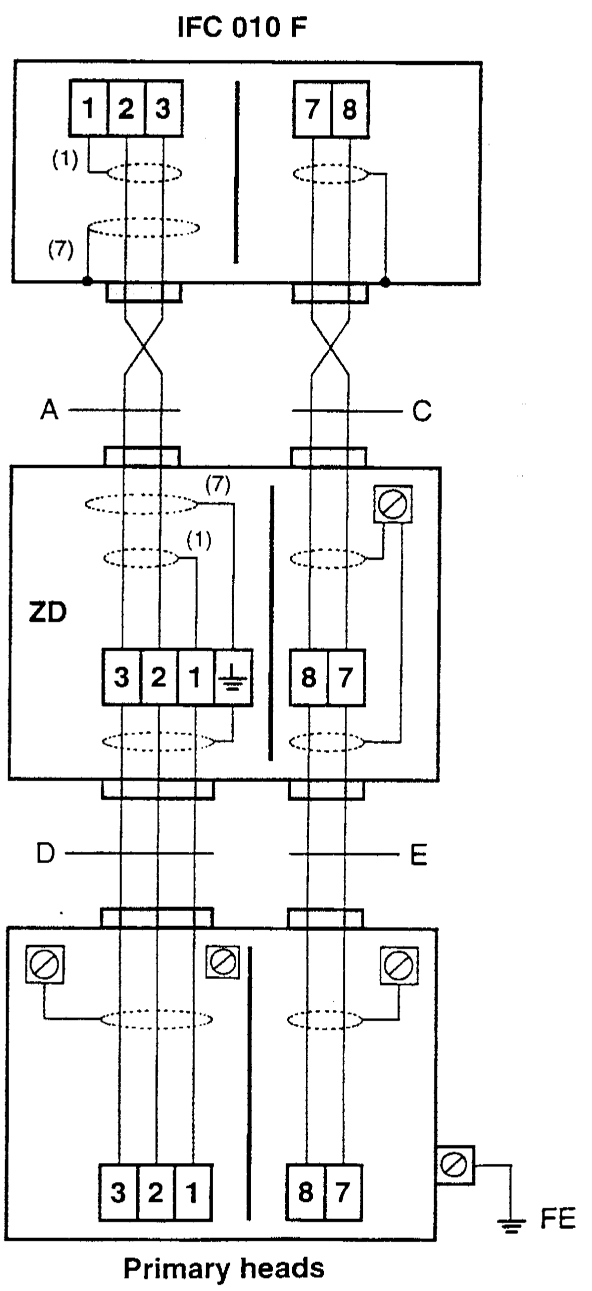


Connection of shields at the IFC 010



1 Signal cable A (Type DS)
2 Shield terminal for shielded signal cable
3 Field power cable
4 Shield terminal for shielded field power cable
5 Housing wall, signal converter
6 Cable entries

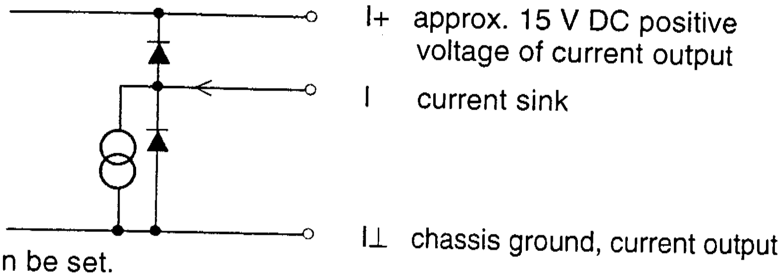
II Process temperature > 150 °C (302 °F)



2 Electrical connection of outputs

2.1 Current output I

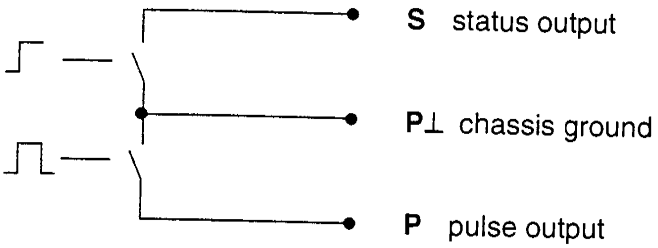
- The current output is galvanically isolated from all input and output circuits.
- Factory-set data and functions can be noted down in Sect. 5.16.
  Please also refer to Sect. 3.2 "Factory settings".
- Typical current output



- All operating data and functions can be set.
- **Display** version: IFC 010 **D**, see Sect. 4 and 5.6, Fct. 1.05 for operator control
  Basic version: IFC 010 **B**, see Sect. 6.1 for operator control
- The current output can also be used as an internal voltage source for the outputs.
  U_{int} = 15 V DC I = 23 mA when operated **without** receiver instruments at the current output
  I = 3 mA when operated **with** receiver instruments at the current output
- **Connection diagrams,** see Sect. 2.3: diagrams ① ② ④ ⑥

2.2 Pulse output P and status output S

- The pulse and status outputs are galvanically isolated from the current output and all input circuits.
- Factory-set data and functions can be noted down in Sect. 5.16.
  Please also refer to Sect. 3.2 "Factory settings".
- Typical pulse and status outputs B1



- All operating data and functions can be set:
  Display version: IFC 010 **D**, see Sect. 4 and 5.7, Fct. 1.06 for operator control
  Basic version: IFC 010 **B**, see Sect. 6.1 for operator control
- The pulse and status outputs can be operated in the active or passive mode.
  Active mode: The current output is the internal voltage source, connection of electronic totalizers (EC)
  Passive mode: External DC or AC voltage source required, connection of electronic (EC) or electromechanical (EMC) totalizers
- Digital pulse division, interpulse period is non-uniform. Therefore, if frequency meters or cycle counters are connected, allow for minimum counting interval:

$$\text{gate time, counter} \leq \frac{1000}{P_{100\%}\,[\text{Hz}]}$$

- **Connection diagrams** see Sect. 2.3: diagrams - pulse output ③ ④
  diagrams - status output ⑤ ⑥

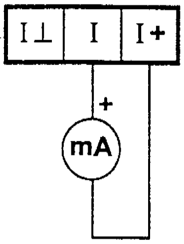
(mA) Milliammeter

000 Σ Totalizer
– electronic (EC)
– electromechanical (EMC)

┤├ DC voltage,
external power source (U_{ext}),
note connection polarity

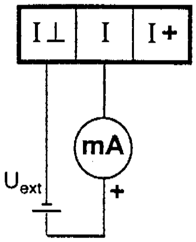
(≃) External voltage source (U_{ext}),
DC or AC voltage,
connection polarity arbitrary

① Stromausgang I_{active}



I = 0/4 - 20 mA
R_i ≤ 500 Ω

② Stromausgang $I_{passive}$



I = 0/4 - 20 mA

U_{ext}	15...20 V DC	20...32 V DC
R_i	0...500 Ω	250...750 Ω

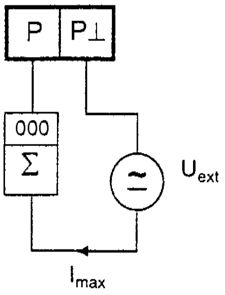
Active mode

The current output supplies the power for operation of the outputs.

Passive mode

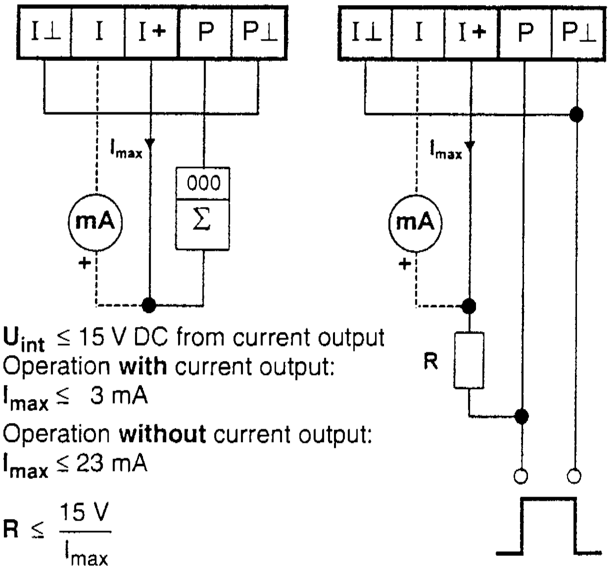
External power source required for operation of the outputs.

③ Pulse output $P_{passive}$
for electronic (EC) or
electromechanical (EMC) totalizers



U_{ext} ≤ 32 V DC/≤ 24 V AC
I_{max} ≤ 150 mA
(incl. status output)

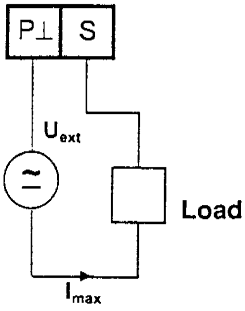
④ Pulse output P_{active} (and current output I_{active})
for electronic (EC) totalizers
with and **without** current output I



U_{int} ≤ 15 V DC from current output
Operation **with** current output:
I_{max} ≤ 3 mA
Operation **without** current output:
I_{max} ≤ 23 mA

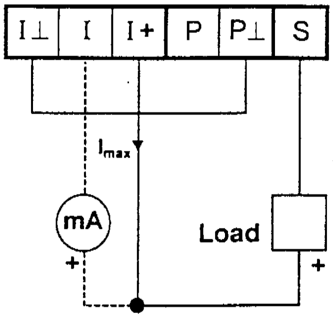
$$R \leq \frac{15\ V}{I_{max}}$$

⑤ Status output $S_{passive}$



U_{ext} ≤ 32 V DC/≤ 24 V AC
I_{max} ≤ 150 mA
(incl. pulse output)

⑥ Status output S_{active}
with and **without** current output I



U_{int} ≤ 15 V DC
from current output

I_{max} ≤ 3 mA
Operation **with**
current output

I_{max} ≤ 23 mA
Operation **without**
current output

3 Start-up

3.1 Power-on and measurement

- Before powering the system, please check that it has been correctly installed according to Sect. 1 and 2.
- The flowmeter is delivered ready for operational use. All operating data have been factory set in accordance with your specifications.
  Please refer to Sect. 3.2 "factory settings".
- Power the unit, and the flowmeter will immediately start process flow measurement.

Basic version, signal converter IFC 010 _ / B

- A light emitting diode (LED) under the cover of the electronic section shows the measurement status.
  LED flashing . . .

▭ ▭	**green:**	measurement correct, everything all right.
▭ ▬	**green / red:**	momentary overdriving of outputs and/or A/D converter.
▬ ▬	**red:**	fatal error, parameter error or hardware fault, please consult factory.

- Refer to Sect. 6.1 for operator control of the "basic version".

Display version, signal converter IFC 010 _ / D

- When powered, the display shows in succession: START UP and READY.
  This is followed by display of the current flow rate and/or the current totalizer count on either a continuous or alternating basis, depending on the setting under Fct. 1.04.
- Refer to Sect. 4 and 5 for operator control of the "display version".

Fct. 3.05 USER UNIT

Press → key.

→ TEXT VOL = set text for user-defined unit, *press → key*

- **Liter** (max. 5 characters, factory-set: "Liter" or "US MGal")
  Characters assignable to each place: **A-Z, a-z, 0-9,** or "–" (= blank character)

Change flashing place (cursor) using ↑ or ↓ key.
Use → or ← key to shift cursor 1 place to right or left.
Transfer to subfunction "FACT. VOL." with ↵ key.

→ FACT. VOL. = set factor F_M for volume, *press → key*

- **1.00000 E+3** (factory-set: "10^3 or 2.64172 x 10^{-4}" / factor F_M = volume per 1 m^3)
  Setting range: 1.00000 E-9 to 9.99999 E+9 (= 10^{-9} to 10^{+9})

Change flashing place (cursor) using ↑ or ↓ key..
Use → or ← key to shift cursor 1 place to right or left.
Transfer to subfunction "TEXT TIME" with ↵ key.

→ TEXT TIME = set text for required time, *press → key*

- **hr** (max. 3 places, factory-set: "hr = hour" or "day")
  Characters assignable to each place: **A-Z, a-z, 0-9,** or "–" (= blank character)

Change flashing place (cursor) using ↑ or ↓ key.
Use → or ← key to shift cursor 1 place to right or left.
Transfer to subfunction "FACT. TIME" with ↵ key.

→ FACT. TIME = set factor F_T for time, *press → key*

- **3.60000 E+3** (factory-set: "3.6 x 10^3" for hour or "8.64 x 10^4" for day / set factor F_T in seconds)
  Setting range: 1.00000 E-9 to 9.99999 E+9 (= 10^{-9} to 10^{+9})

Change flashing place (cursor) using ↑ or ↓ key.
Use → or ← key to shift cursor 1 place to right or left.
Press ↵ key to return to Fct. 3.05 USER UNIT.

Factors for volume F_M (factor F_M = volume per 1 m^3)

Volumetric unit	Text examples	Factor F_M	Setting
Cubic metres	**m3**	1.0	**1.00000 E+0**
Litres	**Liter**	1 000	**1.00000 E+3**
Hectolitres	**h Lit**	10	**1.00000 E+1**
Decilitres	**d Lit**	10 000	**1.00000 E+4**
Centilitres	**c Lit**	100 000	**1.00000 E+5**
Millilitres	**m Lit**	1 000 000	**1.00000 E+6**
US gallons	**USGal**	264.172	**2.64172 E+2**
Millions US gallons	**USMG**	0.000264172	**2.64172 E-4**
Imperial gallons	**GBGal**	219.969	**2.19969 E+2**
Mega imperial gallons	**GBMG**	0.000219969	**2.19969 E-4**
Cubic feet	**Feet3**	35.3146	**3.53146 E+1**
Cubic inches	**inch3**	61 024.0	**6.10240 E+4**
US barrels liquid	**US BaL**	8.36364	**8.38364 E+0**
US barrels ounces	**US BaO**	33 813.5	**3.38135 E+4**

Factors for time F_T (factor F_T in seconds)

Time unit	Text examples	Factor F_T (seconds)	Setting
Seconds	**Sec**	1	**1.00000 E+0**
Minutes	**min**	60	**6.00000 E+1**
Hours	**hr**	3 600	**3.60000 E+3**
Day	**DAY**	86 400	**8.64000 E+4**
Year (= 365 days)	**YR**	31 536 000	**3.15360 E+7**

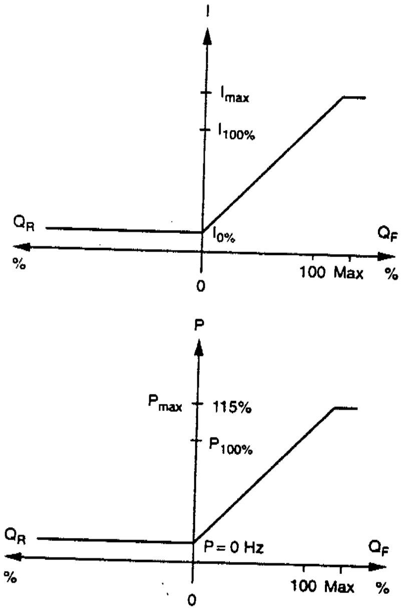
5.13 F/R mode, forward/reverse flow measurement

- **Refer to Sect. 2.6 for electrical connection of outputs.**
- **Define direction of forward (normal) flow,** see Fct. 3.02, subfunction “FLOW DIR.”: in conjunction with F/R operation, set the direction for the forward flow here.
  “+” signifies the same direction as shown by the arrow on the primary head,
  “–” signifies the opposite direction.
- Set the **status output** to ”F/R INDIC.”, see Fct. 1.07.
- **Current and/or pulse output** must be set to “2 DIR.”, see Fct. 1.05 and 1.06, subfunctions “FUNCT. I” and “FUNCT. B1”.

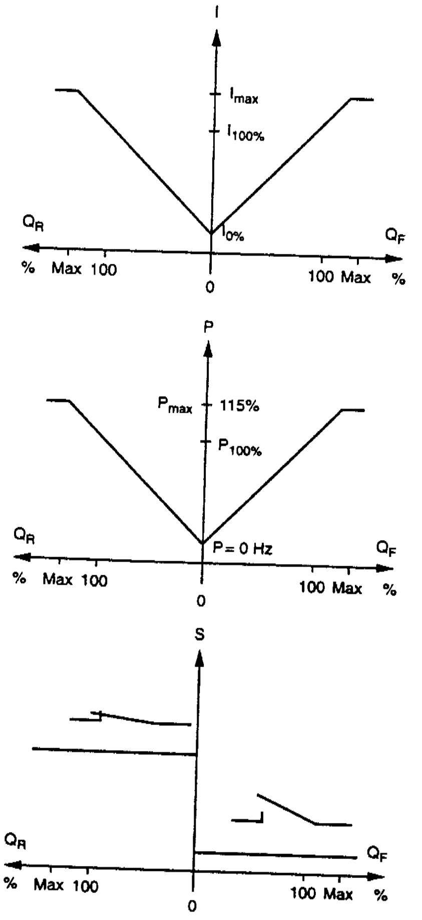
5.14 Characteristic of outputs

I	Current output
$I_{0\%}$	0 or 4 mA
$I_{100\%}$	20 mA
P	Pulse output
$P_{100\%}$	Pulses at $Q_{100\%}$, full-scale range
Q_F	1 flow direction, forward flow in F/R operation
Q_R	Reverse flow in F/R operation
$Q_{100\%}$	Full-scale range
S	Status output
	switch open
	switch closed

1 flow direction



2 flow directions, F/R operation



All operating data are factory set according to your order specifications.

If you have not made any particular specifications at the time of ordering, the instruments will be delivered with the standard parameters and functions listed in the Table below.

To facilitate easy and rapid initial start-up, current output and pulse output are set to process flow measurement in "2 flow directions", so that the current flowrate is displayed and the volumetric flow counted independent of the flow direction. On instruments equipped with a display, measured values may possibly be shown with a " – " sign.

This factory setting for the current and pulse outputs may possibly lead to measuring errors, particularly in the case of volume flow counting:

for example, if pumps are switched off and a "backflow" occurs which is not within the range of the low-flow cutoff (SMU), or if separate displays and counts are required for both flow directions.

To avoid faulty measurements, therefore, it may be necessary to change the factory setting of some or all of the following functions:
- low-flow cutoff SMU, Fct. 1.03, Sect. 5.3
- current output I, Fct. 1.05, Sect. 5.6
- pulse output P, Fct. 1.06, Sect. 5.7
- display (option), Fct. 1.04, Sect. 5.4

Instrument operation:

Display versions:	IFC 010 _ / **D,** operation: refer to **Sect. 4 and 5.**
Basic versions:	IFC 010 _ / **B,** operation: refer to **Sect. 6.1.**

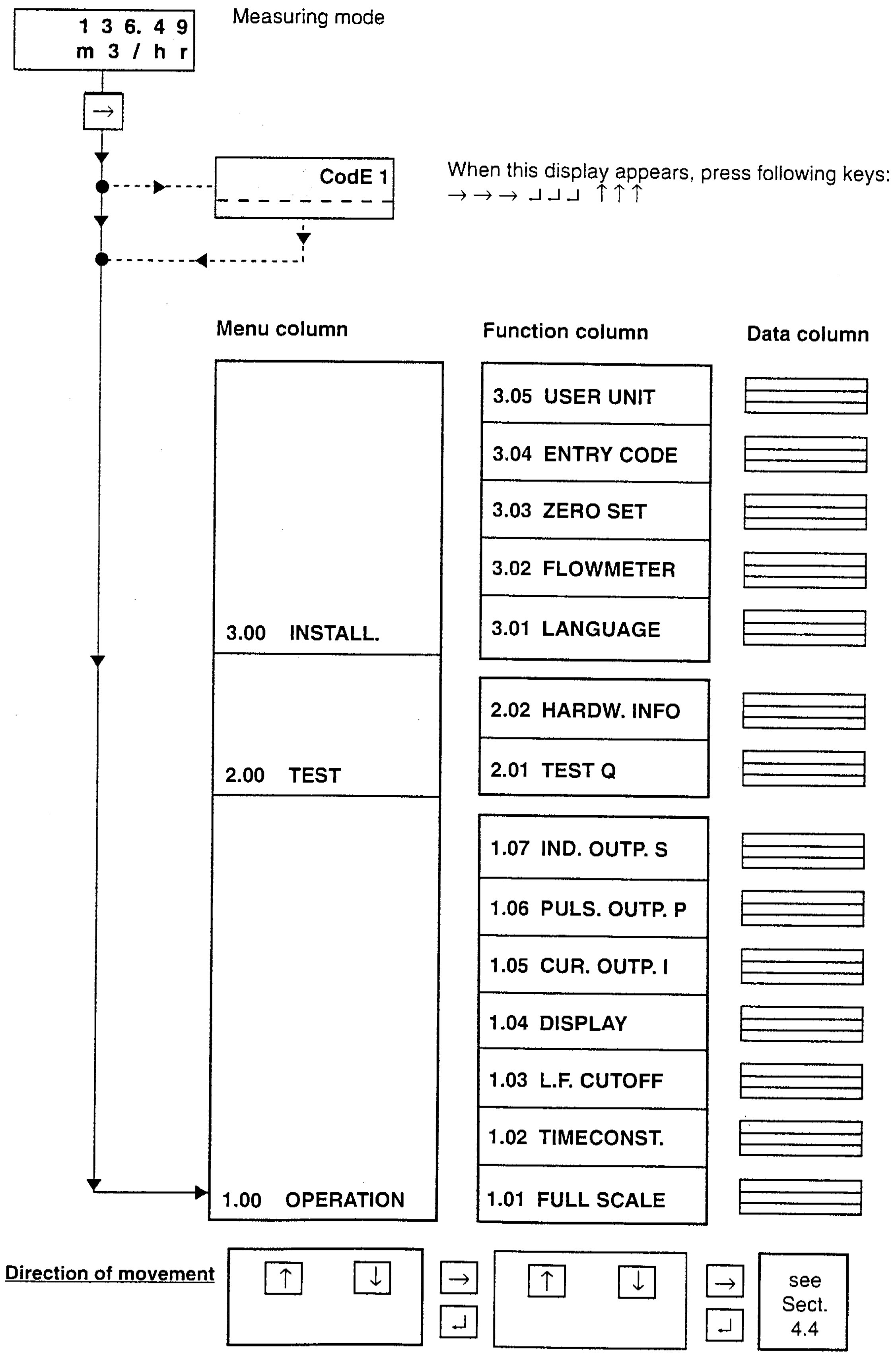
Standard factory settings

Function		Setting
1.01	Full-scale range $Q_{100\%}$	see nameplate
1.02	Time constant	3 s, for I, S and display
1.03	Low-flow cutoff SMU	ON: 1 % OFF: 2 %
1.04	Display (option) flow rate totalizer(s)	 m³/hr or US Gal/min m³ or US Gal
1.05	Current output I function range error message	 2 directions 4 - 20 mA 22 mA
1.06	Pulse output P function pulse value pulse width	 2 directions 1 pulse/s 50 ms
1.07	Status output P	flow direction

Function		Setting
3.01	Language for display only	English
3.02	Flowmeter diameter flow direction (see arrow on primary head)	 see nameplate + direction
3.04	Entry code	no
3.05	User unit	Liter/hr or US MGal/day

4 Operation of the signal converter

4.1 Krohne operator control concept



Fct.	Text	Description and settings
1.00	**OPERATION**	**Operations menu**
1.01	**FULL SCALE**	**Full-scale range for flowrate $Q_{100\%}$** Select unit • m3/hr • Liter/Sec • US.Gal/min • user unit, factory set is "Liter/hr" or "US MGal/day" (see Fct. 3.05) Setting ranges The ranges are dependent on the meter size (DN) and the flow velocity (v): $Q_{min} = \frac{\pi}{4} DN^2 \times v_{min}$ $Q_{max} = \frac{\pi}{4} DN^2 \times v_{max}$ Nom. dia./meter size v_{min} = 0,3 m/s (1 ft/s) v_{max} = 12 m/s (40 ft/s) • DN 2.5–1000 / 1/10"–40": 0.0053 – 33 900 m3/hr 0.0237 – 152 000 US.Gal/min
	→ VALUE P	**Pulse value** (Fct. 1.06 *"VALUE P"*) **has been changed.**
1.02	**TIMECONST.**	**Time constant** Select: • ALL (applies to display and all outputs) • ONLY I+S (only display, current and status outputs) Range: • 0.2 – 99.9 Sec
1.03	**L.F.CUTOFF**	**Low-flow cutoff** (SMU) • OFF (fixed trip points: ON = 0.1% / OFF = 0.2% for 100 and 1000 Hz, see Fct. 1.06, 1% or 2%) • PERCENT (variable values) ON 1 – 19% OFF 2 – 20% Note: Cutoff "off" value must be greater than cutoff "on" value.
1.04	**DISPLAY**	**Display functions**
	→ DISP.FLOW	**Select flow display** • NO DISP. • user unit, factory set is "Liter/hr" or "US MGal/day (see Fct. 3.05) • m3/hr • Liter/Sec • US.Gal/min • PERCENT • BARGRAPH (value and bargraph display in %)
	→ DISP.TOTAL.	**Select totalizer display** • NO DISP. • OFF • ALL • +TOTAL • -TOTAL • +/-TOTAL • SUM TOTAL • m3 • Liter • US.Gal • user unit, factory set is "Liter" or "US MGal" (see Fct. 3.05). Format setting • **Auto** (exponent notation) • # . ####### • ##### . ### • ## . ###### • ###### . ## • ### . ##### • ####### . # • #### . #### • ########
	→ DISP.MSG.	**Additional messages required in measuring mode?** • NO • YES (cyclic change with displays of measured values)
1.05	**CURRENT I**	**Current output I**
	→ FUNCT. I	**Select function for current output I** • OFF • 1 DIR. • 2 DIR.
	→ RANGE I	**Select measuring range** • 0 - 20 mA • 4 - 20 mA (fixed ranges)
	→ I ERROR	**Select error value** • 0 mA • 3.6 mA (only with range 4-20 mA) • 22 mA

Fct.	Text	Description and settings
1.06	PULS.OUTP. P	**Pulse output P**
	→ FUNCTION P	**Select function for pulse output P** • OFF • 1 DIR. • 2 DIR.
	→ SELECT P	**Select pulse type** • 100 Hz • 1000 Hz • PULSE/VOL. • PULSE/TIME
	→ PULSWIDTH	**Select pulse width** • 50 mSec • 100 mSec • 200 mSec • 500 mSec • 1 Sec
	→ VALUE P	**Set pulse value per unit volume** • xxxx PulS/m3 • xxxx PulS/Liter • xxxx PulS/US.Gal • xxxx PulS/ user unit, factory set is “Liter“ or “US MGal“ (see Fct. 3.05).
	→ VALUE P	**Set pulse value per unit time** • xxxx PulS/Sec (=Hz) • xxxx PulS/min • xxxx PulS/hr • xxxx PulS/user unit, factory set is “hr“ or “day“ (see Fct. 3.05)
1.07	IND. OUTP. S	**Status output S** • ALL ERROR • FATAL ERROR • OFF • ON • F/R INDIC. • TRIP. POINT Setting range: 002 - 115 PERCENT • EMPTY PIPE (appears only when this option is installed)

Fct.	Text	Description and settings
2.00	TEST	**Test menu**
2.01	TEST Q	**Test measuring range Q** Precautionary query • SURE NO • SURE YES *select value:* -110 / -100 / -50 / -10 / 0 / +10 / +50 / +100 / +110 PCT.
2.02	HARDW. INFO	**Hardware information and error status** Before consulting factory, please note down all 6 codes.
	→ MODUL ADC	X . X X X X X . X X Y Y Y Y Y Y Y Y Y Y
	→ MODUL IO	X . X X X X X . X X Y Y Y Y Y Y Y Y Y Y
	→ MODUL DISP.	X . X X X X X . X X Y Y Y Y Y Y Y Y Y Y

Fct.	Text	Description and settings
3.00	INSTALL.	**Installation menu**
3.01	LANGUAGE	**Select language for display texts** • GB / USA • F • D • others on request
3.02	FLOWMETER	**Set data for primary head**
	→ DIAMETER	**Select size from meter size table** • DN 10 - 1000 mm equivalent to 3/8 - 40 inch
	→ FULL SCALE	**Full-scale range for flow $Q_{100\%}$** (refer to Fct. 1.01 “FULL SCALE” above).
	→ VALUE P	**Pulse value** (Fct. 1.06 *“VALUE P”*) **has been changed.**
	→ GKL VALUE	**Set primary constant GKL** see primary head nameplate. Range: • 1.0000 - 9.9999
	→ FIELD FREQ.	**Magnetic field frequency** Values: 1/6 or 1/18 of power frequency, see nameplate.
	→ LINE FREQ.	**Normal line frequency in your country** Please note: This function is only provided for units with DC power supply to suppress line-frequency interference. Values: *50 Hz* and *60 Hz*
	→ FLOW DIR.	**Define flow direction** (in F/R mode: forward flow). • + DIR. • – DIR.

Fct.	Text	Description and settings
3.03	**ZERO SET**	**Zero calibration** Precautionary query • CALIB. NO • CALIB. YES • STORE NO • STORE YES
3.04	**ENTRY CODE**	**Entry code required to enter setting mode?** • NO (= entry with → only) • YES (= entry with → and Code 1: → → → ┘ ┘ ┘ ↑ ↑ ↑)
3.05	**USER UNIT**	**Set any required unit for flowrate and counting**
	→ TEXT VOL.	**Set text for required flowrate unit** (max. 5 characters) Characters assignable to each place: • A-Z, a-z, 0-9, or " – " (= blank character).
	→ FACT. VOL.	**Set conversion factor (F_M) for volume** Factor F_M = volume per 1m^3. Setting range • 1.00000 E-9 to 9.99999 E+9 (= 10^{-9} to 10^{+9})
	→ TEXT TIME	**Set text for required time unit** (max. 3 characters) Characters assignable to each place: • A-Z, a-z, 0-9, or "–" (= blank character).
	→ FACT. TIME	**Set conversion factor (F_T) for time** Set factor F_T in seconds. Setting range • 1.00000 E-9 to 9.99999 E+9 (= 10^{-9} to 10^{+9})
3.06	**APPLICAT.**	**Set overload point for A/D converter**
	→ EMPTY PIPE	**Switch on "empty tube" identifier option?** (appears only when this option is installed) • YES • NO

Error messages in measuring mode 4.3

The following list gives all errors that can occur during process flow measurement.
Errors shown in display when "YES" set in Fct. 1.04 DISPLAY, subfunction "DISP. MSG.".

Error messages	Description of error	Error clearance
LINE INT.	Power failure Note: no counting during power failure	Cancel error in RESET/QUIT. menu Reset totalizer if necessary.
CUR. OUTP. I	Current output overranged.	Check and if necessary correct instrument parameters. After elimination of cause, error message deleted automatically.
PULSOUTP. P	Pulse output overranged. Note: totalizer deviation possible.	Check and if necessary correct instrument parameters. After elimination of cause, error message deleted automatically.
ADC	Analog / digital converter overranged	Error message deleted automatically after elimination of cause.
FATAL. ERROR	Fatal error, all outputs set to "min. values"	Please consult factory.
TOTALIZER	Totalizer has been reset	Cancel error message in RESET/QUIT. menu.
EMPTY PIPE	Pipe has run dry. This message appears only when the **"empty pipe identifier" option is installed** and the function is switched on under Fct. 3.06 APPLICAT., submenu "EMPTY PIPE".	Fill pipe.

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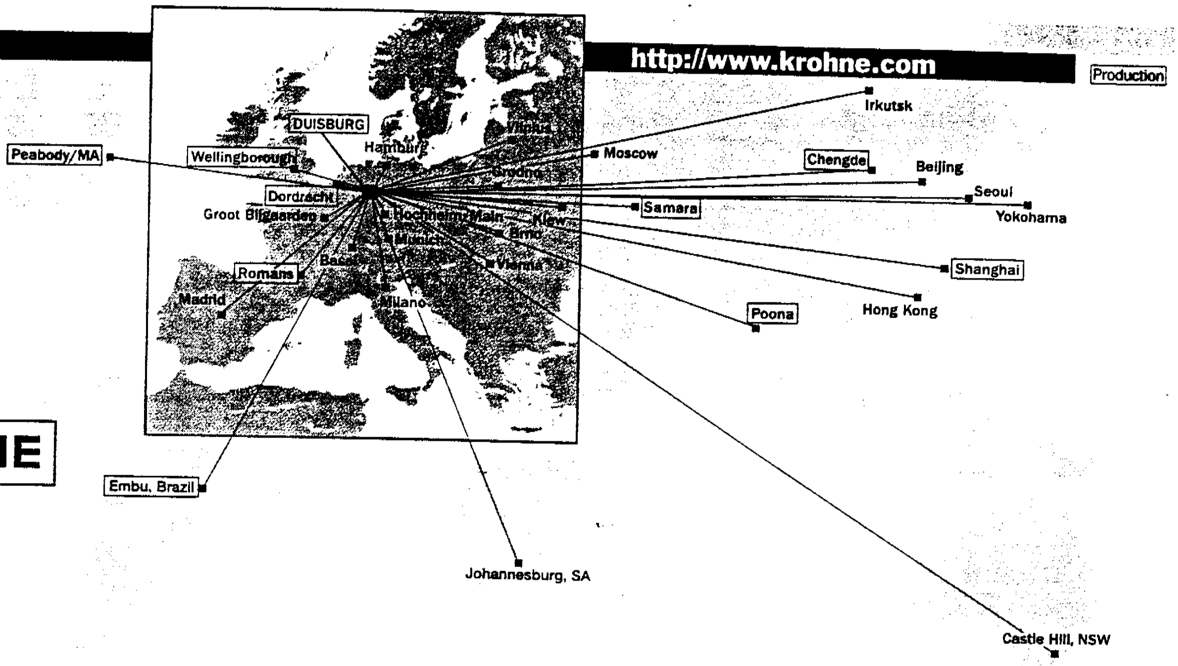

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Subject to change without notice

Application 5.15

Fct. 3.07 APPLICAT.
Press key → .

→ **EMPTY PIPE**, *"function switch on".*
- **YES** • **NO** *select with ↑ or ↓ key.*

Press ↲ key to return to Fct. 3.07 APPLICAT.

Setting data 5.16

Here you can note down the settings of the signal converter !

Fct. No.	Function	Settings
1.01	**Full-scale range**	
1.02	**Time constant**	
1.03	**Low-flow cut-off**	- ON: - OFF:
1.04	**Display**	Flow
		Totalizer
		Messages
1.05	**Current output I**	Function
		Range I
		Error
1.06	**Pulse output P**	Function
		Selection
		Pulse width
		Value
1.07	**Status output S**	
3.01	**Language**	
3.02	**Primary head**	Meter size
		GKL value
		Field frequency
		Power frequency
		Flow direction
3.04	**Entry code required ?**	- no - yes
		→ → → ↲ ↲ ↲ ↑ ↑ ↑
3.05	**User-defined unit**	

Part C Special applications, functional checks, service, and order numbers

6 Special applications

6.1 HHT 010 hand held terminal and RS 232 adapter incl. CONFIG software (options)

External operator control can be carried out with the following options:

- HHT 010 hand-held terminal **only** for IFC 010 – / **B** signal converter (basic version)
- MS-DOS PC via an RS 232 adapter, incl. CONFIG software for signal converter IFC 010 – / **B** (basic version) and IFC 010 – / **D** (display version) Detailed directions supplied.

Switch off power source before opening the housing !

1) Unscrew the 4 recessed head screws and remove the transparent cover.

2) Plug the HHT connection plug **or** the RS 232 adapter into the IMoCom Bus socket and connect to the PC or laptop, see amplifier PCB in Sect. 8.9.

3) Switch on the power.

4) As described in the supplied description, change data, parameters and measured values, and have them called up for display.

5) Switch off the power.

6) Pull the HHT plug **or** the RS 232 adapter off the amplifier PCB.

7) Replace transparent cover and tighten down the 4 recessed head screws.

Please refer to Sect. 3.2 “factory settings”

Stable signal outputs when measuring tube empty 6.2

Output signals can be stabilized to values as for "zero" flow to prevent random output signals when the measuring tube is empty or when the electrodes are not wetted in the event the measuring tube is partially full.

Display: 0
Current output: 0 or 4 mA, see setting in Fct. 1.05.
Pulse output: no pulses (= 0 Hz), see setting in Fct. 1.06.

Precondition:
- electrical conductivity of product ≥ 200 μS/cm (μmho/cm), ≥ 500 μS/cm for meter sizes DN 10 - 15 and 3/8" - 1/2"
- length of signal cable ≤ 10 m / ≤ 30 ft and free of vibration at field signal converter
- process products are homogeneous, free from solids and gas inclusions, and do not tend to cause electrical or catalytic reactions.

Changes on amplifier PCB, see illustration in Sect. 8.9.

Switch off power source before opening the housing !

Refer to Sect. 8.5 for Fig. A, B and D.

1) Unscrew the 4 recessed head screws **(Fig. A)** and remove transparent cover.

2) Unscrew recessed head screw **(Fig. B)** and remove black plastic cover.

3) Unscrew the 2 recessed head screws **(Fig. D)** and remove black metal cover.

4) If display unit provided, unscrew the 4 recessed head screws and fold display carefully to side.

5) Join the two "semicircles" of points **S3** and **S6** on the amplifier PCB with tin solder, see figure in Sect. 8.9.

6) Reassemble in reverse order, Items 4) to 2) above.

7) Switch on power.

8) Check setting of the low-flow cutoff SMU, Fct. 1.03, and reset if necessary:

L.F.CUTOFF switched on, range:

Full scale range $Q_{100\%}$		**Cutoff ...... values**	
		... OFF ...	**... ON ...**
> 3 m/s	> 10 ft/s	> 2 %	1 %
1 - 3 m/s	3 -10 ft/s	> 6 %	4 %
< 1 m/s	< 3 ft/s	>10 %	8 %

Operator control:
Display Version: **(D)**, see Sect. 4 and 5.3, Fct. 1.03
Basic Version: **(B)**, see Sect. 6.1.

9) After checking and/or resetting, replace transparent cover and tighten down the 4 recessed head screws.

7. Functional checks

7.1 Zero check with IFC 010 __ / D signal converter, Fct. 3.03

Switch off power source before opening the housing

- Set **"zero" flow** in the pipeline, but make sure that the **measuring tube** is **completely filled** with fluid.
- Switch on the system and wait 15 minutes.
- Press the following keys for zero measurement:

Key	Display		Description
→			If "YES" set under Fct. 3.04 ENTRY CODE, key in 9-keystroke CODE 1 now: → → → ↵ ↵ ↵ ↑ ↑ ↑
	Fct. 1.00	OPERATION	
2x ↑	Fct. 3.00	INSTALL.	
→	Fct. 3.01	LANGUAGE	
2x ↑	Fct. 3.03	ZERO SET	
→		CALIB. NO	
↑		CALIB. YES	
↵	0.00	- - - - - / - - -	Flowrate displayed in set unit, see Fct. 1.04 DISPLAY, subfunction "DISP. FLOW". Zero measurement in progress, duration approx. 50 seconds. When flow "> 0" "WARNING" notice appears, confirm with ↵ key.
		STORE NO	If new value not to be stored, press ↵ key (3x) 4x = return to measuring mode.
↑		STORE YES	
↵	Fct. 3.03	ZERO SET	Store new zero value.
(2x) 3x ↵	- - - - - - -	- - - - - / - - -	Measuring mode with new zero.

7.2 Test of measuring range Q, Fct. 2.01

Switch off power source before opening the housing !

- For this test a measured value can be simulated in the range of -110 to +110 percent of $Q_{100\%}$ (full-scale range set, see Fct. 1.01 FULL SCALE).
- Switch on the system.
- Press the following keys for this test:

Key	Display		Description
→			If "YES" set under Fct. 3.04 ENTRY CODE, key in 9-keystroke CODE 1 now: → → → ↵ ↵ ↵ ↑ ↑ ↑
	Fct. 1.00	OPERATION	
↑	Fct. 2.00	TEST	
→	Fct. 2.01	TEST Q	
→		SURE NO	
↑		SURE YES	
↵	0	PERCENT	Current, pulse and status indication outputs indicate the corresponding values.
	± 10	PERCENT	
↑	± 50	PERCENT	Select using ↑ or ↓ key
	± 100	PERCENT	
	± 110	PERCENT	
↵	Fct. 2.01	TEST Q	End of test, actual measured values again present at outputs.
(2x) 3x ↵	- - - - - - -	- - - - - / - - -	Measuring mode

Switch off power source before opening the housing !

- Before consulting factory about errors or flow measurement problems, please invoke Fct. 2.02 HARDW. INFO (hardware information).
- An 8-character and a 10-character status code are stored under this function in each of 3 "windows". These 6 status codes allow rapid and simple diagnosis of your compact flowmeter.
- Switch on system.
- Press the following keys for display of the status codes:

Key	Display		Description	
→			If "YES" set under Fct. 3.04 ENTRY CODE, key in the 9-keystroke CODE 1 now: → → → ↵ ↵ ↵ ↑ ↑ ↑	
	Fct. 1.00	OPERATION		
↑	Fct. 2.00	TEST		
→	Fct. 2.01	TEST Q		
↑	Fct. 2.02	HARDW. INFO		
→	→ MODUL ADC	-.- - - - - -.- - - - - - - - - - -	**1st window**	Sample status code **3.25105.02** (8-character code, 1st line) **3A47F01DB1** (10-character code, 2nd line)
↵	→ MODUL IO	-.- - - - - -.- - - - - - - - - - -	**2nd window**	
↵	→ MODUL DISP.	-.- - - - - -.- - - - - - - - - - -	**3rd window**	
PLEASE NOTE DOWN ALL 6 STATUS CODES !				
↵	Fct. 2.02	HARDW. INFO	Terminate hardware information	
(2x) 3x ↵	- - - - - - - -	- - - - - / - - -	Measuring mode	

If you need to return your flowmeter to Krohne, please refer to last but one page of these Instructions !

7.4 Faults and symptoms during start-up and process flow measurement

- Most faults and symptoms occurring with the compact flowmeters can be eliminated with the aid of the following tables.
- For greater clarity, faults and symptoms in the tables are divided into 2 parts and various groups.

- <u>Part 1</u> Signal converter **IFC 010 B** (B = basic version), **without** display **and without** HHT or CONFIG user program (see Sect. 6.1)

Groups:		
	LED	LED display (status messages)
	I	Current output
	P	Pulse output
	LED / I / P	LED display, current output and pulse output

- <u>Part 2</u> Signal converter **IFC 010 D** (D = display version) and Signal converter **IFC 010 B** (B = basic version), **without** display **but with** CONFIG user program (see Sect. 6.1)

Groups:		
	D	Display
	I	Current output
	P	Pulse output
	S	Status indication output
	D / I / P / S	LED display, current output, status output

Before contacting Krohne Service, please read through the following tables. THANK YOU !

Part 1	Converter **IFC 010 B** (B = basic version), **without** display **and without** HHT or CONFIG operator program		
Group LED	**Fault / Symptom**	**Cause**	**Remedial action**
LED 1	LED flashes red/green	Overranging of A/D converter, current or pulse output	Reduce flowrate; if unsuccessful, test as described in Sect. 7.5.
		Measuring tube drained, A/D converter overranged.	Fill measuring tube.
LED 2	LED flashes red	Fatal Error, hardware and/or software error	Replace signal converter (see Sect. 8.4) or contact Krohne Service.
LED 3	cyclic flashing of red LED, approx 1 second	Hardware fault, Watchdog activated.	Replace signal converter (see Sect. 8.4) or contact Krohne Service.
LED 4	LED shows red continuously	Hardware fault	Replace signal converter (see Sect. 8.4) or contact Krohne Service.

Part 1 (cont'd)	Converter **IFC 010 B** (B = basic version), **without** display **and without** HHT or CONFIG operator program		
Group I	**Fault / Symptom**	**Cause**	**Remedial action**
I 1	Receiver instrument indicates "0".	Connection/polarity incorrect.	Connect properly as described in Sect. 2.3.
		Receiver instrument defective.	Check connecting cables and receiver instrument, and replace if necessary.
		Short between current output and pulse output	Check connections and cables, see Sect. 2.3, voltage between I+ and I⊥ approx. 15 V. Switch off device, eliminate short-circuit, switch device on.
		Current output defective	Replace signal converter (see Sect. 8.4) or contact Krohne Service.
I 2	22 mA present at current output (fault current)	Current output I overranged	Check device parameters and change if necessary, see Sect. 6.1, or contact Krohne Service
I 3	22 mA present at current output (fault current) and red LED shows.	Fatal Error	Replace signal converter (see Sect. 8.4) or contact Krohne Service
I 4	Unsteady display	– Process product conductivity too low, particles/air inclusions too large or inhomogeneous – Pulsating flow – Time constant too low	Increase time constant, see Sect. 6.1, or contact Krohne Service.
Group P	**Fault / Symptom**	**Cause**	**Remedial action**
P 1	Connected totalizer not counting any pulses	Connection/polarity incorrect	Connect properly as described in Sect. 2.3
		Totalizer or external voltage source defective	Check connection cables, totalizer and external voltage source, and replace if necessary.
		Current output is external voltage source; short-circuit, or current/pulse output defective.	Check connection and cables (see Sect. 2.3), voltage between I+ and I⊥ approx.15 V. Switch off device. Eliminate short-circuit and switch device on again. If no function then current or pulse output defective. Replace signal converter (see Sect. 8.4) or contact Krohne Service.
		Pulse output inactive, see Fct. 1.06 and report on settings.	Switch on, see Sect. 6.1, or contact Krohne Service.
		Fatal Error, red LED shows.	Replace signal converter (see Sect. 8.4) or contact Krohne Service.
P 2	Unsteady pulse rate	– Process product conductivity too low, particles/air inclusions too large or inhomogeneous – Pulsating flow – Time constant too low or switches off	Increase or switch on time constant, see Sect. 6.1, or contact Krohne Service.
Group LED / I / P	**Fault / Symptom**	**Cause**	**Remedial action**
LED / I / P 1	Red LED flashes, current output indicates fault current and pulse output "0".	Fatal Error, hardware fault and/or software error	Replace signal converter (see Sect. 8.4) or contact Krohne Service.

Part 2	Signal converter **IFC 010 D** (D = display version) and Signal converter **IFC 010 B** (B = basic version), **without** display **but with** HHT or CONFIG operator program (see Sect. 6.1)		
Group D	**Display shows . . .**	**Cause**	**Remedial action**
D 1	LINE INT.	Power failure. <u>Note:</u> no counting during power failure.	Delete error message in RESET/QUIT. menu. Reset totalizer(s) if need be.
D 2	CUR.OUTP. I	Current output overranged.	Check instrument parameters and correct if necessary. Error message deleted automatically after cause has been eliminated.
D 3	PULS.OUTP. P	Pulse output overranged. <u>Note:</u> totalizer deviation possible	Check instrument parameters, correct if necessary, and reset totalizer(s). Error message deleted automatically after cause has been eliminated.
D 4	ADC	Analog/digital converter overranged.	Error message deleted automatically after cause has been eliminated.
D 5	FATAL. ERROR	Fatal Error, all outputs set to "min." values.	Replace signal converter (see Sect. 8.4) or contact Krohne Service, having first noted down hardware information and error status, see Fct. 2.02.
D 6	TOTALIZER	Counts lost (overflow, data error)	Delete error message in RESET/QUIT. menu.
D 7	„STARTUP“ cyclic flashing	Hardware fault, Watchdog activated.	Replace signal converter (see Sect. 8.4) or contact Krohne Service.
D 8	BUSY	Displays for flow, totalizers and errors disabled.	Change setting in Fct. 1.04.
D 9	Unsteady display	– Process product conductivity too low, particles/air inclusions too large or inhomogeneous – Pulsating flow – Time constant too low	Increase time constant, see Sect. 6.1, or contact Krohne Service.
D 10	No display	Power OFF.	Switch on power
		Check power fuse(s) F1 (F1 and F2 with DC).	Replace if defective (see Sect. 8.2).
Group I	**Fault / Symptom**	**Cause**	**Remedial action**
I 1	Receiver instrument indicates "0".	Incorrect connection/polarity	Connect properly, see Sect. 2.3.
		Receiver instrument or current output defective.	Check output (see Sect. 7.2) with new milliammeter: <u>Test ok</u>, check connection cables and receiver instrument, replace if necessary. <u>Test faulty</u>, current output defective. Replace signal converter (see Sect. 8.4) or contact Krohne Service
		Current output disabled, see Fct. 1.05	Activate under Fct. 1.05.
		Short-circuit between current output and pulse output.	Check connection and cables, see Sect. 2.3. Voltage between I+ and I⊥ approx. 15 V. Switch off device, eliminate short-circuit, and switch device on again.
I 2	Unsteady display	– Process product conductivity too low, particles/air inclusions too large or inhomogeneous – Pulsating flow – Time constant too low	Increase time constant, see Sect. 6.1, or contact Krohne Service.

Part 2 (cont'd)	Signal converter **IFC 010 D** (D = display version) and Signal converter **IFC 010 B** (B = basic version), **without** display **but with** HHT or CONFIG operator program (see Sect. 6.1)		
Group P	**Fault / Symptom**	**Cause**	**Remedial action**
P 1	Totalizer connected but does not count any pulses	Incorrect connection/polarity	Connect properly, see Sect. 2.3
		Totalizer or external voltage source defective.	Check output (see Sect. 7.2) with new totalizer: <u>Test ok</u>, check connection cables and previous totalizers and external voltage source, and replace if necessary. <u>Test faulty</u>, pulse output defective, replace signal converter (see Sect. 8.4) or contact Krohne Service.
		Current output is external voltage source, short circuit or current / pulse output defective	Check connection and cables, see Sect. 2.3. Voltage between I+ and I⊥ approx. 15 V. Switch off device, eliminate short circuit, switch device on again. If no function, then current or pulse output defective. Replace signal converter (see Sect. 8.4) or contact Krohne Service.
		Pulse output is deactivated, see Fct. 1.06.	Switch on under Fct. 1.06.
P 2	Unsteady pulse rate	– Process product conductivity too low, particles/air inclusions too large or inhomogeneous – Pulsating flow – Time constant too low or switched off	Increase or switch on time constant, see Sect. 6.1, or contact Krohne Service.
P 3	Pulse rate too high or too low.	Incorrect setting for pulse output.	Change setting under Fct. 1.06.
Group S	**Fault / Symptom**	**Cause**	**Remedial action**
S 1	No function	Incorrect connection/polarity of status display	Connect properly, see Sect. 2.3.
		Status display or output defective or external voltage source not supplying voltage.	Set status output under Fct. 1.07 to "F/R INDIC." (flow direction) and check (see Sect. 7.2) with new status display: <u>Test ok</u>, check previous status display and external voltage source, and replace if necessary. <u>Test faulty</u>, status output defective, replace signal converter (see Sect. 8.4) or contact Krohne Service.
Group D/I/P/S	**Fault / Symptom**	**Cause**	**Remedial action**
D / I / P / S 1	Unsteady display and outputs	– Process product conductivity too low, particles/air inclusions too large or inhomogeneous – Pulsating flow – Time constant too low	Increase time constant, see Sect. 6.1, or contact Krohne Service.
D / I / P / S 2	No display and no function of outputs	Power OFF	Switch power on.
		Check power fuse(s) F1 (F1 and F2 for DC).	Replace if defective, see Sect. 8.2.

7.5 Test of primary head

Always switch off power source before opening the housing !

Required measuring instruments and tools

- A crosstip screwdriver
- Ohmmeter with at least 6 V range

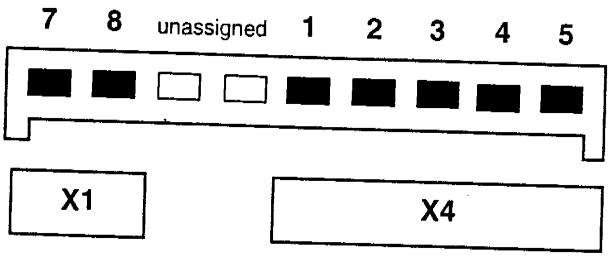
  or AC voltage/resistance measuring bridge.

  Note: Accurate measurements in the area of the electrodes can only be obtained with an AC voltage/resistance bridge. Also, the measured resistance is very heavily dependent on the electrical conductivity of the liquid product.

Preparatory work

- **Switch off power source.**
- Remove transparent cover (unscrew 4 recessed head screws) and black plastic cover (unscrew 1 recessed head screw), see **Fig. A** and **B** in Sect. 8.5.
- Detach blue 9-pin plug, see **Fig. D** in Sect. 8.5, field power supply (pins 7+8) and signal cables (pins 1, 2, 3, 4 +5).
- Completely fill the measuring tube of the flowmeter with the process liquid.

Blue 9-pin plug
(connection to primary head)



Jacks X1 and X4 on amplifier PCB, see Sect. 8.9

Action Resistance measurement at the blue 9-pin plug		**Typical result**	**Incorrect result =** flowmeter defective, return to factory for repair, refer to last but one page !
1	Measure resistance between wires **7** and **8.**	30 - 150 Ω	if lower: interwinding fault if higher: wire break
2	Measure resistance between **U-clamp terminal** in terminal compartment (PE protective conductor or FE functional ground) and wires **7** and **8**	> 10 MΩ	if lower: interwinding fault to PE or FE.
3	Measure resistance between wires **1** and **3** and between **1** and **4** (same measuring lead always on wire **1** !)	1 kΩ - 1 MΩ (see “Note” above). Both values should be approx. equal.	if lower: drain measuring tube and repeat measurement; if still too low, short-circuit in electrode wires. if higher: break in electrode wires or electrodes contaminated. Values not equal: break in electrode wires or electrodes contaminated.

Always switch off power source before opening the housing !

Required measuring instruments and tools
Multimeter, DC and AC voltage, > 20 kohms / V
Crosstip screwdriver

Preparatory work
- Switch off power source.
- Remove transparent cover (unscrew 4 recessed head screws) and black plastic cover (unscrew 1 recessed head screw), see **Fig. A and B** in Sect. 8.5.
- If provided, remove display PCB, see Sect. 8.7.
- Switch power source on again.

Measuring and test points on amplifier PCB, **see Sect. 8.9**
MP = measuring point
TP = test point
X1 = socket connector, 20-pin
X3, X5 = plug connector

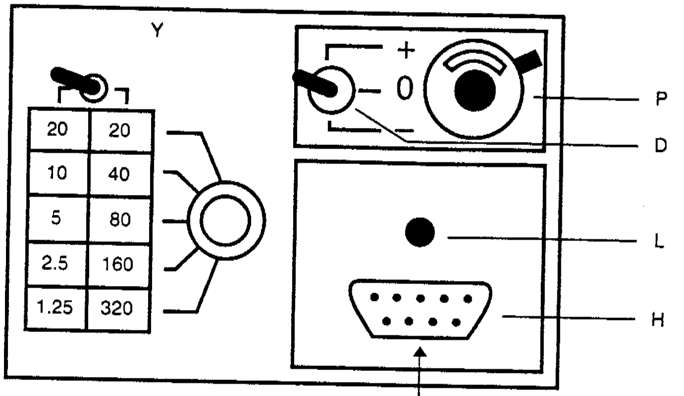
Please note: When carrying out measurements, do **not** produce any short-circuits between the components !

Action Voltage measurements on amplifier PCB, see **Sect. 8.9**		**Typical result**	**Faulty result**
1	between **TP 1** (solder pin) and **Pin 11** of **X1**	15 . . . 30 V DC	If measured voltages lower, signal converter defective, replace, see Sect. 8.4, or contact Krohne Service.
2	between **TP 1** (solder pin) and **Pin 9** of **X1**	30 . . . 40 V DC	
3	between **MP 5** (solder pin) and **Pin 15** of **X1**	19 . . . 26 V DC	
4	between **MP 5** (solder pin) and **Pin 18** of **X1**	-20 . . . -27 V DC	
5	field current supply between **Pin 7** and **Pin 8** of **X3**	> 1.5 V AC	
6	input voltage between **MP 1** and **MP 5**	-10 . . . +10 V DC	If outside range, input amplifier overranged, measuring tube empty or primary head defective; check acc. to Sect. 7.5.
7	Short **Pin 1, 2** and **3** of **X5,** measure input voltage between **MP 1** and **MP 5**	-10 . . . +10 V DC	If outside range, signal converter defective.

Note: A thermostatic switch is installed in the transformers of the AC versions. In the DC version, the PCB is equipped with a thermofuse. All signal converters contain PTR fusible links (typically 100 overload cycles). This allows cyclic switching on and off of the signal converter under overload conditions. The cool-down phase may be anything up to one hour.

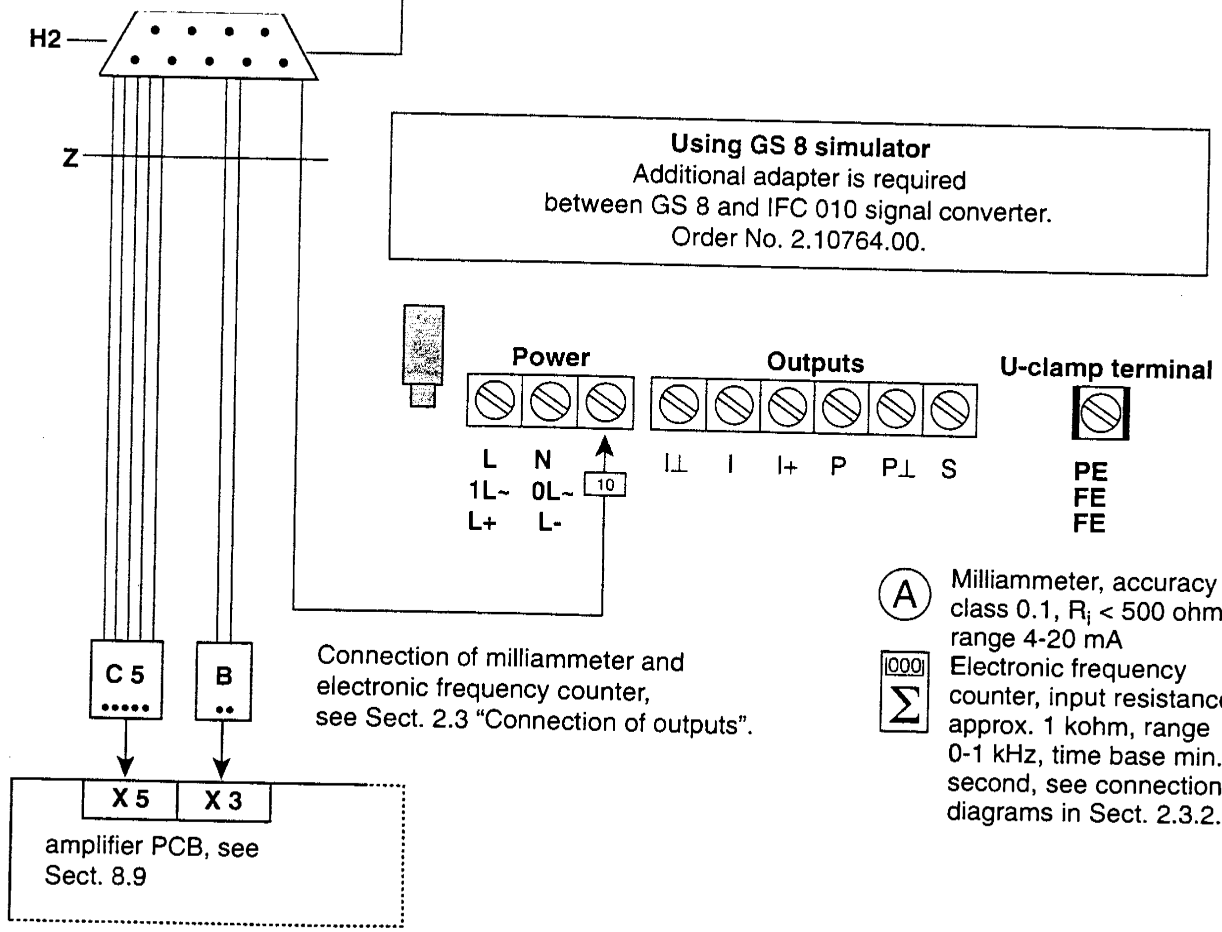
7.7 Test of signal converter using GS 8 A simulator (option)

GS 8 A operating elements and accessories



A	5-to-3 pin adapter for cable **C5**
B	Plug for field power supply, 2-pin
C3 / C5	Plug for signal cable, 3-pin / 5-pin
D	Switch, flow direction
H	Socket for **H2** plug on cable **Z**
H2	Plug of cable **Z**
L	Power supply ON
P	Potentiometer "zero"
X3	Socket for plug **B** on amplifier PCB
X5	Socket for plug **C3** on amplifier PCB
Y	Switch, measuring ranges
Z	Cable between GS 8 A and signal converter

Electrical connection



Using GS 8 simulator
Additional adapter is required
between GS 8 and IFC 010 signal converter.
Order No. 2.10764.00.

Connection of milliammeter and electronic frequency counter, see Sect. 2.3 "Connection of outputs".

Ⓐ	Milliammeter, accuracy class 0.1, R_i < 500 ohms, range 4-20 mA
000 Σ	Electronic frequency counter, input resistance approx. 1 kohm, range 0-1 kHz, time base min. 1 second, see connection diagrams in Sect. 2.3.2.

a) **Switch off power source before opening the housing !**

b) Unscrew the 4 recessed head screws, see **Fig. A** in Sect. 8.5, and remove transparent cover from the signal converter housing.

c) Unscrew recessed head screw, see **Fig. B** in Sect. 8.5, and remove black plastic cover.

d) Pull off blue 7-pin plug from the amplifier PCB, see Sect. 8.9:
socket **X3** field power supply and socket **X5** signal cables.

e) Connect plug **B** to socket **X3** (2-pin) and plug **C** (5-pin) to socket **X5** (3-pin) by way of adapter **A** (5-to-3pin).

Warning: Instrument must be properly grounded to avoid personnel shock hazard.

Check of setpoint display

1) Switch on power source, allow at least 15 minutes' warm-up time.
2) Set switch **D** (front panel of GS 8A) to "0" position.
3) Adjust zero to 0 or 4 mA with the 10-turn potentiometer **P** (front panel of GS 8A), depending on setting in Fct. 1.05, deviation <±10 µA.
4) Calculate position of switch **Y** and displayed setpoints "**I**" and "**f**":

4.1) $X = \frac{Q_{100\%} \times K}{GK \times DN^2}$

$Q_{100\%}$	full-scale range (100%) in volumetric unit **V** per unit time **t**
GK	primary constant, see instrument nameplate
DN	meter size DN im mm, not inches, see instrument nameplate
t	time in seconds **(Sec)**, minutes **(min)** or hours **(hr)**
V	volumetric unit
K	constant, according to following table

t **V**	Sec	min	hr
Liter	25 464	424.4	7.074
m3	25 464 800	424 413	7 074
US gallons	96 396	1 607	26.78

> **Note:**
> Sticker on the GS 8 A primary head simulator still gives values for "inch" flowmeter. **Do not use any more !**

4.2) Determine position of switch Y: Use table (front panel GS 8A) to determine value **Y** which comes closest to factor **X** and meets condition **Y** ≤ **X**.

4.3) Calculate setpoint reading "I" for current output: $I = I_{0\%} + \frac{Y}{X}(I_{100\%} - I_{0\%})$ in mA

$I_{0\%}$ current (0/4mA) at 0% flowrate
$I_{100\%}$ current (20mA) at 100% flowrate

4.4) Calculate setpoint reading "f" for pulse output: $f = \frac{Y}{X} \times P_{100\%}$ in Hz

$P_{100\%}$ pulses per second (Hz) at 100% flowrate

5) Set switch **D** (front panel GS 8A) to position "+" or "-" (forward/reverse flow).
6) Set switch **Y** (front panel GS 8A) to the value determined by the method described above.
7) Check setpoint readings **I** and **f,** see points 4.3 and 4.4 above.
8) Deviation <1.5% of setpoint. If greater, replace signal converter, see Sect. 8.4.
9) Test of linearity: set lower Y values, readings will drop in proportion to the calculated Y values.
10) **Switch off power source** after completing the test.
11) Disconnect the GS 8A.
12) Reassemble in reverse order, see points e) – b) under "electrical connection", see illustration in Sect. 8.5.
13) The system is ready for operation after the power source has been switched on.

Example: see overleaf

Example

Full-scale range	$Q_{100\%}$	= 200 m³/hr	(Fct. 1.01)
Meter size	**DN**	= 80 mm = 3“	(Fct. 3.02)
Current at $Q_{0\%}$	$I_{0\%}$	= 4 mA	(Fct. 1.05)
$Q_{100\%}$	$I_{100\%}$	= 20 mA	
Pulses at $Q_{100\%}$	$P_{100\%}$	= 280 pulses/hr	(Fct. 1.06)
Primary head constant	**GKL**	= 3.571 (see nameplate)	
Constant (**V** in **m3**)			
(**t** in **hr**)	**K**	= 7074 (see Table)	
(**DN** in **mm**)			

Calculation of <u>**“ X ”**</u> and position of <u>**“ Y ”**</u>

$$X = \frac{Q_{100\%} \times K}{GKL \times DN^2} = \frac{200 \times 7074}{3.571 \times 80 \times 80} = 61.905$$

Y = 80, position of switch Y, see front panel GS 8A
(comes closest to X value and is smaller than X).

<u>Calculation of setpoint readings **I** and **f**</u>

$$I = I_{0\%} + \frac{Y}{X}(I_{100\%} - I_{0\%}) = 4\text{ mA} + \frac{40}{61.905}(20\text{mA} - 4\text{mA}) = 14.3\text{ mA}$$

Deviations are permissible between <u>14.1 and 14.6 mA</u> (equivalent to ± 1.5 %).

$$f = \frac{Y}{X} \times P_{100\%} = \frac{40}{61.905} \times \text{pulses / hr} = 129.2\text{ pulses/hr}$$

Deviations are permissible between <u>127.3 and 131.1 pulses/hr</u> (equivalent to ± 1.5 %).

If you need to return your flowmeter to Krohne,
please refer to last but one page of these Instructions !

Cleaning the signal converter housing 8.1

Switch off power source before cleaning !

The housing of the signal converter (material: polycarbonate, PC) may only be cleaned with a solventless detergent !

Replacement of power fuse(s) 8.2

A) Fuse F1 in AC Versions 1, 2 and 3

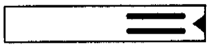
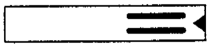
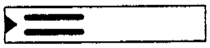
Switch off power source before opening the housing !
Refer to Sect. 8.5 for Figs. A and B.

1) Unscrew the 4 recessed head screws **(Fig. A),** and remove transparent cover from signal converter housing.
2) Unscrew the recessed head screw **(Fig. B)** and remove the black plastic cover.
3) Take out old and insert new power fuse F1, on the left next to the green connecting terminals. Please refer to the following table for fuse rating and order number.
4) Reassemble in reverse order, points 2) – 1) above..

B) Fuse F1 and F2 for the DC Version

Switch off power source before opening the housing !
Refer to Sect. 8.5 for Figs. A to F.

1) Unscrew the 4 recessed head screws **(Fig. A),** and remove transparent cover.
2) Unscrew the recessed head screw **(Fig. B)** and remove the black plastic cover.
3) Carefully pull out the green connecting plugs (supply power and outputs) **(Fig. C).**
4) Unscrew the 2 recessed head screws **(Fig. D)** and remove the black metal cover.
5) Carefully pull out the blue 9-pin plug (connection to the primary head) **(Fig. D).**
6) With a screwdriver, carefully remove the 4 metal clips **(Fig. E).**
7) Remove the electronics unit from the housing **(Fig. F)** and detach the ground conductor.
8) Replace power fuses F1 and F2 on the power supply PCB, refer to Sect. 8.9 for illustration of the PCB. Refer to the following table for fuse rating and order number.
10) Reassemble in reverse order, points 7) - 1) above.

Power PCB	**Supply power**	**Fuse F1 (and F2)**		**Location and position of voltage selector**	
		Rating	Order No.		
1. AC version	230/240 V AC	125 mA T	5.06627	F 1	
	115/117 V AC	200 mA T	5.05678	F 1	
2. AC version	200 V AC	125 mA T	5.06627	F 1	
	100 V AC	200 mA T	5.05678	F 1	
3. AC version	48 V AC	400 mA T	5.05892	F 1	
	24 V AC	800 mA T	5.08085	F 1	
DC version	11-32 V DC	**F1 + F2** 1.25 A T	5.09080		

Warning: Instrument must be properly grounded to avoid personnel shock hazard.

8.3 Changeover of operating voltage on AC Versions 1, 2 and 3 (not DC Version)

Switch off power source before opening the housing !

Refer to Sect. 8.5 for Figs. A-F.

1) Unscrew the 4 recessed head screws **(Fig. A),** and remove transparent cover.
2) Unscrew the recessed head screw **(Fig. B)** and remove the black plastic cover.
3) Carefully pull out the green connecting plugs (supply power and outputs) **(Fig. C).**
4) Unscrew the 2 recessed head screws **(Fig. D)** and remove the black metal cover.
5) Carefully pull out the blue 9-pin plug (connection to the primary head) **(Fig. D).**
6) With a screwdriver, carefully remove the 4 metal clips **(Fig. E).**
7) Remove the electronics unit from the housing **(Fig. F)** and detach the ground conductor.
8) Transpose voltage selector on the power supply PCB (illustration in Sect. 8.9) to obtain the required voltage according to the table in Sect. 8.2.
9) Change power fuse F1, see table for fuse ratings.
10) Reassemble in reverse order, points 7) - 1) above.

8.4 Replacement of electronics unit of signal converter

Switch off power source before opening the housing !

Refer to Sect. 8.5 for Figs. A-G.

1) Unscrew the 4 recessed head screws **(Fig. A),** and remove transparent cover.
2) Unscrew the recessed head screw **(Fig. B)** and remove the black plastic cover.
3) Carefully pull out the green connecting plugs (power supply and outputs) **(Fig. C).**
4) Unscrew the 2 recessed head screws **(Fig. D)** and remove the black metal cover.
5) Carefully pull out the blue 9-pin plug (connection to the primary head) **(Fig. D).**
6) With a screwdriver, carefully remove the 4 metal clips **(Fig. E).**
7) Carefully remove the electronics unit from the housing **(Fig. F)** and detach the ground conductor.
8) Carefully transpose the DATAPROM (IC 13) on the amplifier PCB (illustration in Sect. 8.9) from the "old" to the "new" electronics unit **(Fig. G).** When inserting, note the direction of the IC 13, see Sect. 8.9 "illustration of the PCBs".
9) Check supply power and fuse F1 for the new electronics unit, and if necessary change over or replace as described in Sect. 8.3, points 8) and 9).
10) Reassemble in reverse order, points 7) - 1) above.

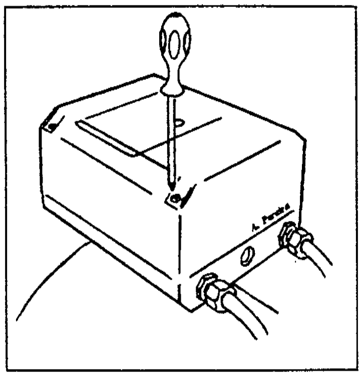


Fig. A

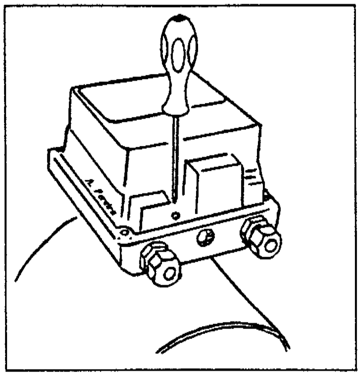


Fig. B

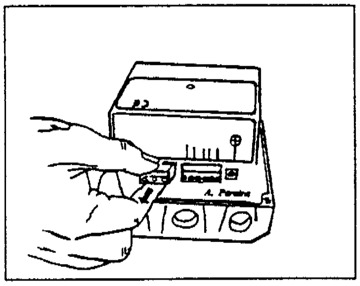


Fig. C

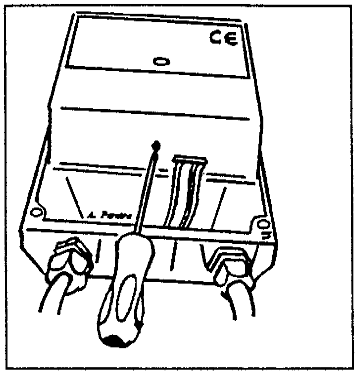


Fig. D

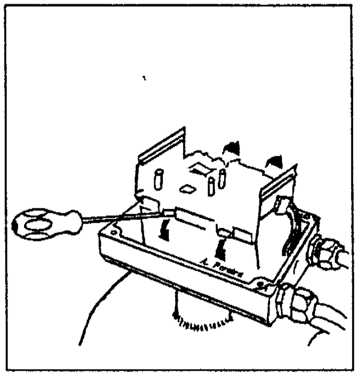


Fig. E

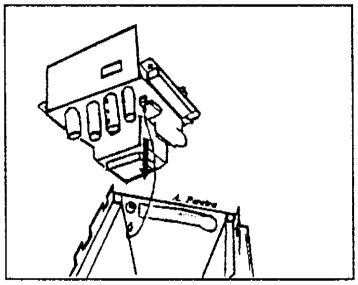


Fig. F

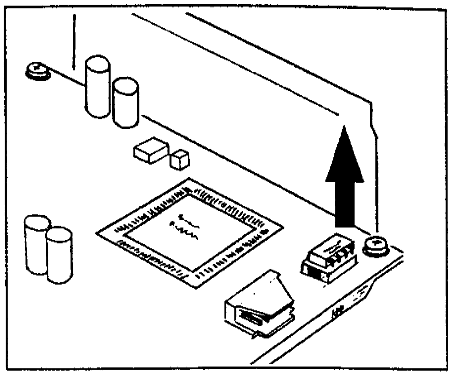


Fig. G

8.6 Turning the display PCB

Switch off power source before opening the housing !

Figs. A, B and D are given in Sect. 8.5.

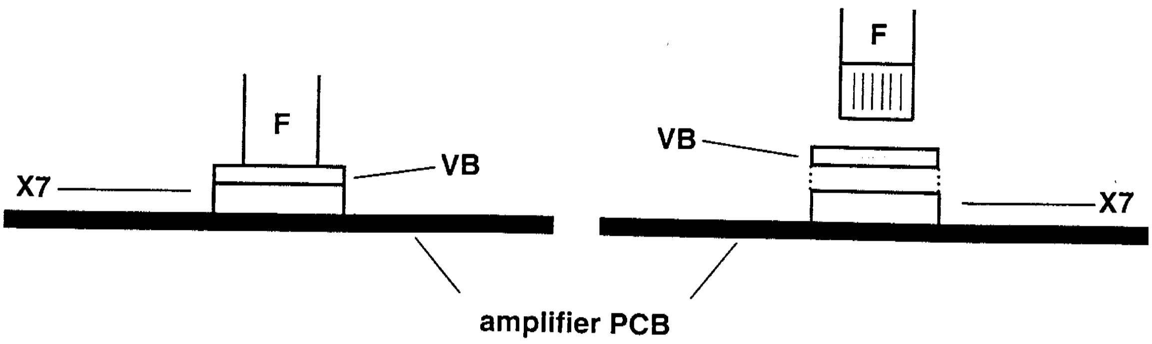
1) Unscrew the 4 recessed head screws **(Fig. A)** and remove the transparent cover.
2) Unscrew the recessed head screw **(Fig. B)** and remove the black plastic cover.
3) Unscrew the 2 recessed head screws **(Fig. D)** and remove the black metal cover.
4) Unscrew the 4 recessed head screws on the display PCB.
5) Turn display PCB carefully.
6) Fold the ribbon cable as shown in the diagrams in Sect. 8.8
   PLEASE NOTE: The ribbon cable must lie flat between the display and amplifier PCBs and must not exert any pressure on electronic components.
7) Reassemble in reverse order, points 4) - 1) above.

8.7 Retrofitting the display unit

Switch off power source before opening the housing !

Figs. A, B and D are given in Sect. 8.5.

1) Unscrew the 4 recessed head screws **(Fig. A)** and remove the transparent cover.
2) Unscrew the recessed head screw **(Fig. B)** and remove the black plastic cover.
3) Unscrew the 2 recessed head screws **(Fig. D)** and remove the black metal cover.
4) Insert the foil connector of the display unit into jack **X7** on the amplifier PCB, see diagram in Sect. 8.9. Ensure contact side is correctly positioned..
5) **Carefully** turn display in the desired direction.
   Fold the ribbon cable as shown in the diagrams in Sect. 8.8
   PLEASE NOTE: The ribbon cable must lie flat between the display and amplifier PCBs and must not exert any pressure on electronic components.
6) Reassemble in reverse order, see points 3) - 2) above.
7) Switch on power source.
8) For operator control and display of measured values, refer to Sect. 4 and 5.
9) Replace transparent cover and tighten down the 4 recessed head screws **(Fig. A).**

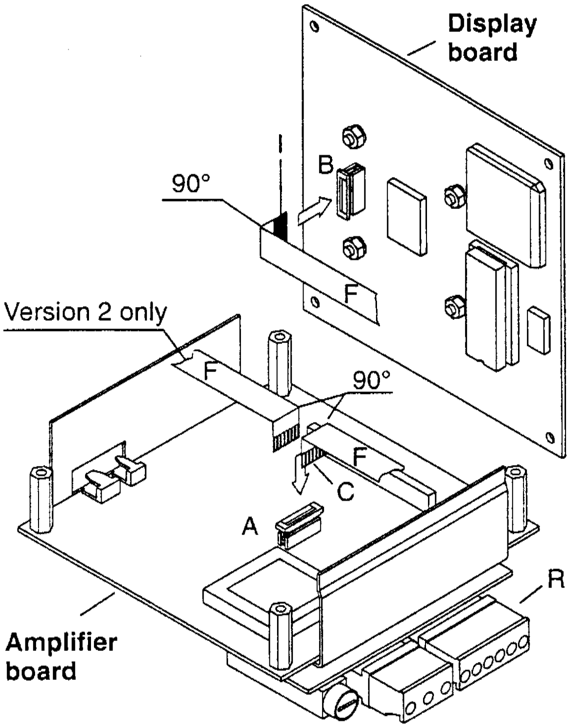


Socket X7 locked

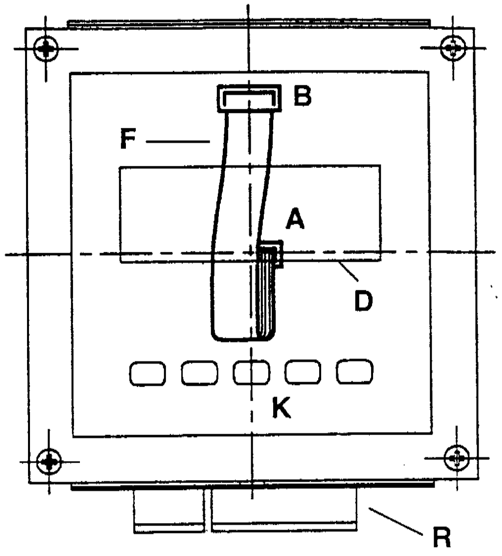
Socket X7 unlocked

F	Ribbon cable
VB	Locking clip X7
X7	Socket on amplifier PCB

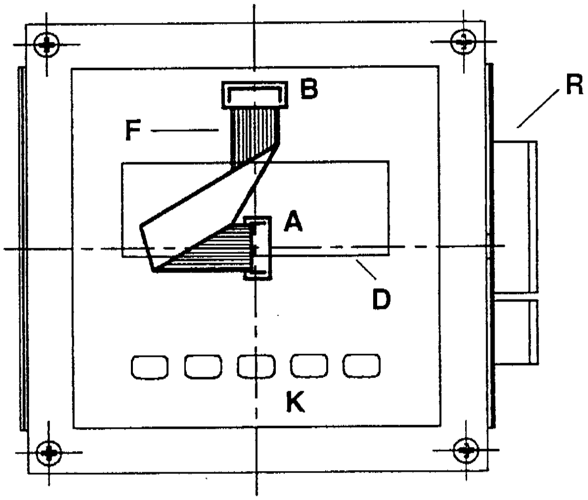
A	Socket X7 on amplifier PCB, see Sect. 8.9
B	Socket on display PCB
C	Contact side
D	Display
F	Ribbon cable
I	Insulated side
K	5 keys for operator control
R	Reference point, power terminals
90°	Bend cables 90° as shown in drawing



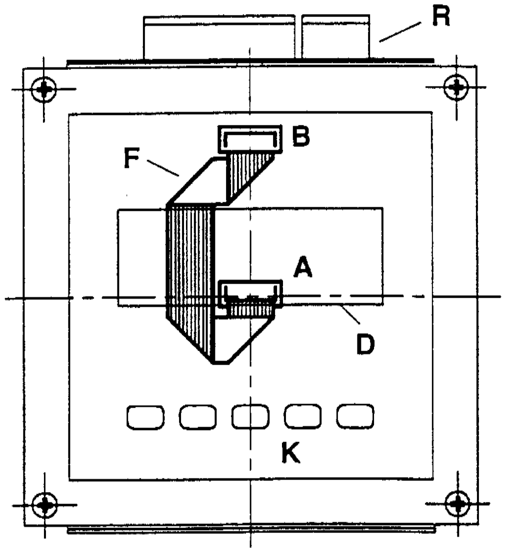
Version 2



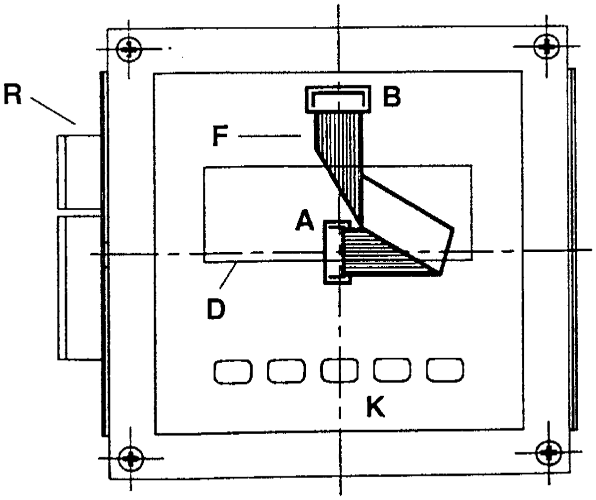
Version 3/ Standard IFC 010 F/D
Separate version



Version 1 / Standard IFC 010 K/D
Compact flowmeter



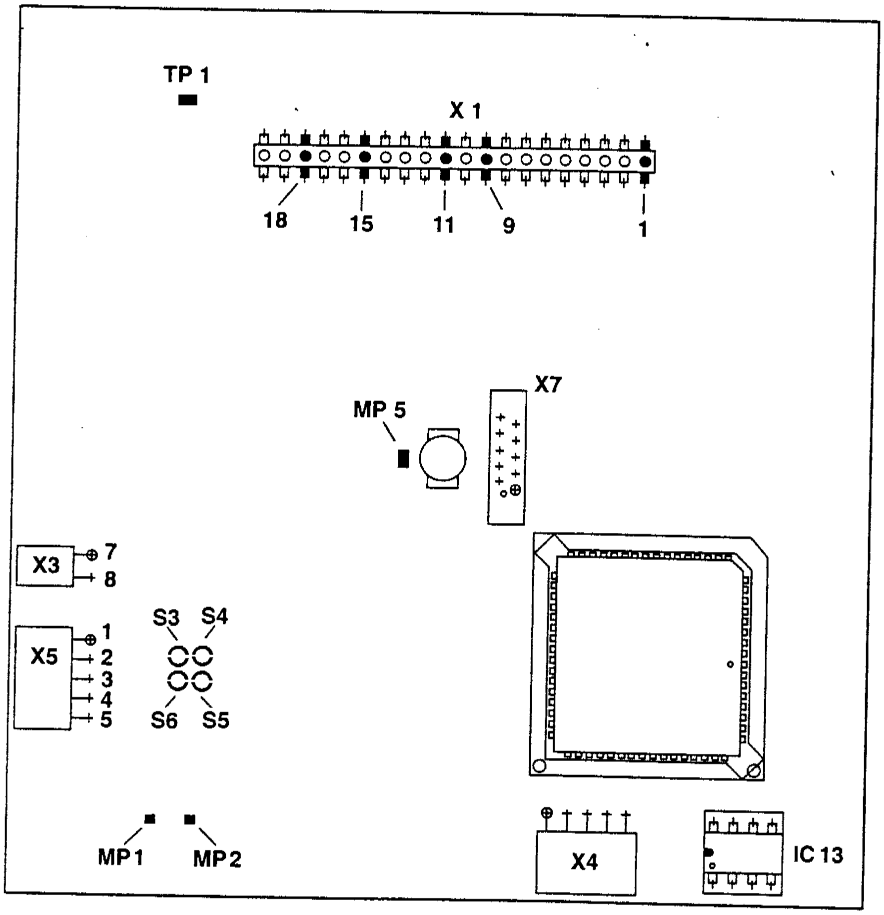
Version 4



8.9 Illustrations of the PCBs

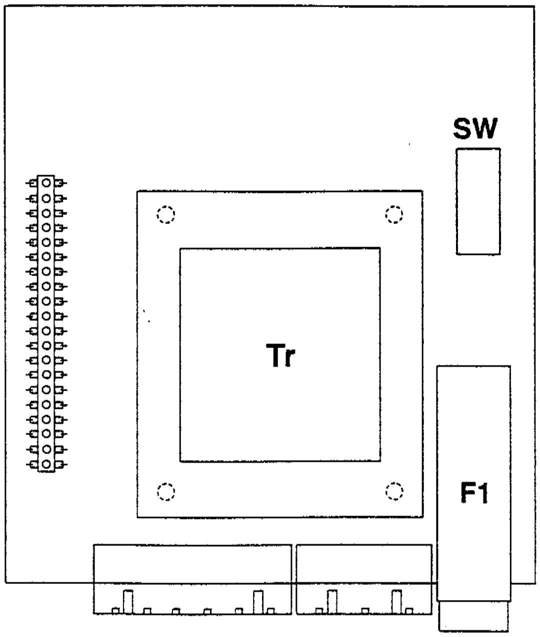
A) Amplifier PCB

IC 13	DATAPROM (sensor), see Sect. 8.4
MP1, MP5	Measuring points, see Sect. 7.6
S3, S6	for "empty tube" cut-out, see Sect. 6.2
TP1	Test point, see Sect. 7.6
X1	20-pin socket connector, see Sect. 7.6 and 7.7
X3	2-pin plug connector, pin 7 and 8, field power supply, see Sect. 7.5 and 7.7
X4	IMoCom Bus, plug connector for connection of RS 232 adapter, see Sect. 6.1
X5	5-pin plug connector, pin 1-5, signal cable, see Sect. 7.5 and 7.7
X7	10-pin socket (A) for foil connector (display unit), see Sect. 8.6 and 8.7.



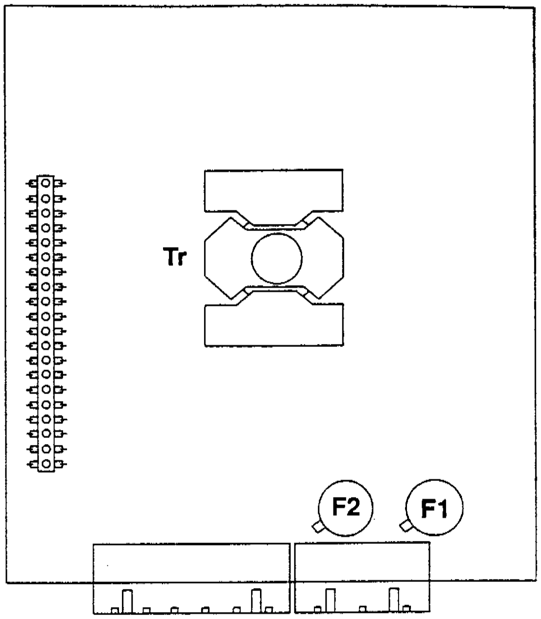
Solder points S3 and S6

B) Power supply PCB, AC Versions 1, 2 and 3



F1	Power fuse, see Sect. 8.2 or 9 for ratings
SW	Voltage selector, see Sect. 8.3 for voltage changeover
Tr	Transformer

C) Power supply PCB, DC Version



F1, F2	Power fuses, see Sect. 8.2 or 9 for ratings
Tr	Transformer

9 Order numbers

Electronic unit

Power supply unit	Supply power	Order No.	
		IFC 010 D **with** display	**IFC 010 B** **without** display
AC Version 1	230 / 240 V AC	2.07494.10	2.07494.00
	115 / 117 V AC	2.07494.15	2.07494.05
AC Version 2	200 V AC	2.07494.12	2.07494.02
	100 V AC	2.07494.14	2.07494.04
AC Version 3	48 V AC	2.07494.34	2.07494.24
	24 V AC	2.07494.58	2.07494.48
DC-Version	24 V DC (11-32 V DC)	2.07527.10	2.07527.00

Power fuse F1 for AC and F1 and F2 for DC

Supply power	Rating	Order No.	Fuse type
200 and 230 / 240 V AC	125 mA T	5.06627	5 x 20 G-fuse switching capacity 1500 A
100 and 115 / 117 V AC	200 mA T	5.05678	
48 V AC	400 mA T	5.05892	
24 V AC	800 mA T	5.08085	
11-32 V DC	1.25 A T	5.09080	TR 5, switching capacity 35 A

Display unit, retrofit kit for basic version IFC 010 _ / **B** incl. transparent cover and connecting cable: Order No. 1.30915.92

RS 232 adapter incl. English CONFIG operator software, for operator control of signal converter via MS-DOS PC or laptop: Order No. 2.10531.01

HHT hand held terminal for operator control of signal converter Order No. 2.10591.01

Part D Technical data, measuring principle and block diagram

10 Technical data

10.1 Full-scale range $Q_{100\%}$

Full-scale ranges $Q_{100\%}$

Flow rate Q = 100 %	6 liter/h to 33 900 m^3/h (0.03 - 156 000 US Gal/min), adjustable as required, equivalent flow velocity 0.3 - 12 m/s (1 - 40 ft/s)
Unit	m^3/hr, Liter/Sec, US gallons/min. or user-defined unit, e.g. Liter/day or US MGal/day

Flow tables

v = flow velocity in m/s

Meter size		Full-scale range $Q_{100\%}$ in m^3/h		
DN mm	inch	v = 0.3 m/s (minimum)	v = 1 m/s	v = 12 m/s (maximum)
2.5	1/10	0.0053	0.0177	0.2121
4	1/8	0.0136	0.4520	0.5429
6	1/4	0.0306	0.1018	1.222
10	3/8	0.0849	0.2827	3.392
15	1/2	0.1909	0.6362	7.634
20	3/4	0.3393	1.131	13.57
25	1	0.5302	1.767	21.20
32	-	0.8686	2.895	34.74
40	1 1/2	1.358	4.524	54.28
50	2	2.121	7.069	84.82
65	-	3.584	11.95	143.3
80	3	5.429	18.10	217.1
100	4	8.483	28.27	339.2
125	-	13.26	44.18	530.1
150	6	19.09	63.62	763.4
200	8	33.93	113.1	1357
250	10	53.02	176.7	2120
300	12	76.35	254.5	3053
400	16	135.8	452.4	5428
500	20	212.1	706.9	8482
600	24	305.4	1018	12215
700	28	415.6	1385	16625
800	32	542.9	1810	21714
900	36	662.8	2290	26510
1000	40	848.2	2827	33929

v = flow velocity in ft/s

Meter size		$Q_{100\%}$ in US Gal/min	
DN mm	inch	v = 1 ft/s (minimum)	v = 40 ft/s (maximum)
2.5	1/10	0.0245	0.979
4	1/8	0.0383	1.530
6	1/4	0.1530	6.120
10	3/8	0.3735	14.93
15	1/2	0.8405	33.61
20	3/4	1.494	59.75
25	1	2.334	93.34
32	1 1/4	3.824	153.0
40	1 1/2	5.979	239.0
50	2	9.339	373.5
65	2 1/2	15.78	630.9
80	3	23.90	955.6
100	4	37.35	1493
125	5	58.38	2334
150	6	84.05	3361
200	8	149.43	5975
250	10	233.4	9334
300	12	336.2	13442
400	16	597.9	23899
500	20	933.9	37345
600	24	1345	53781
700	28	1919	76760
800	32	2507	100272
900	36	3173	126904
1000	40	3917	156672

Pulse output

± F Error in % of flowrate (actual value):

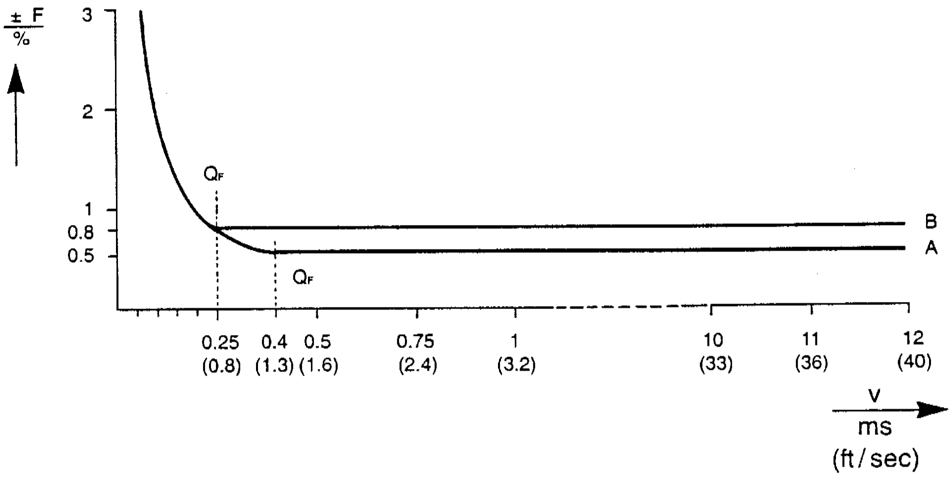
Curve A: DN 10 – 600 / 3/8"- 24"
v ≥ 0.4 m/s or v ≥ 1.3 ft/s : ± 0.5 % of measured value
v ≥ 0.4 m/s or v ≥ 1.3 ft/s : ± 0.002 m/s or 0.0066 ft/s

Curve B: DN 700 – 1000 / 28" – 40"
v ≥ 0.25 m/s or v ≥ 0.8 ft/s : ± 0.8 % of measured value
v ≥ 0.25 m/s or v ≥ 0.8 ft/s : ± 0.002 m/s or 0.0066 ft/s

Q Actual flowrate
Q_F Flow for error limit v_F = 0.25 **or** 0.8 ft/s (see Flow tables)
v Flow velocity in m/s and ft/s
v_F Flow velocity in m/s and ft/s at Q_F (see Flow tables)

Reference conditions

Product	Water, 10 to 30°C / 50 to 86°F
Electrical conductivity	> 300 µS/cm (µmho/cm)
Power supply (line voltage)	U_N (± 2%)
Ambient temperature	20 to 22°C / 68 to 71.6°F
Warm-up time	30 minutes
Straight inlet run	> 10 × DN } (DN = meter size)
Straight outlet run	> 3 × DN
Primary heads	properly grounded and centered



Current output

same as above error limit for pulse output **plus** ...
0 to 20 mA: ± 0.05 %
4 to 20 mA: ± 0.062 %
} of full-scale range in each case

10.3 IFC 010 Signal converter

Versions	
B - version	**without** display / control unit (basic version)
D - version	**with** display / control unit
Add-on equipment (option)	- CONFIG software and RS 232 adapter for control via MS-DOS-PC, connection to IMoCom interface - Hand-Held-Terminal for control of basic versions - Other bus and computer interfaces on request
Current output	
Function	- all operating data settable, galvanically isolated
Current	0 - 20 mA and 4 - 20 mA
Active output	load max. 500 ohms
Passive output	

external voltage:	15 ... 20 V DC	20 ... 32 V DC
load: min. ... max.	0 ... 500 Ω	250 ... 750 Ω

Error identification	0 / 3.6 / 22 mA
Forward/reverse measurement	direction identified via status output
Pulse output	
Function	- all operating data settable - galvanically isolated - digital pulse division, interpulse period non-uniform, therefore if frequency meters connected allow for minimum counting interval: gate time, totalizer $\geq \frac{1000}{P_{100\%}\,[\text{Hz}]}$
Pulse rate for Q = 100 %	10, 100 or 1000 pulses per second (= Hz), fixed or optionally adjustable in pulses per liter, m³ or US gallons (special version: up to 10 kHz scaling)
Active output:	connection: electronic totalizer (EC) internal voltage: approx. 15 V DC, from current output load rating: $I_{max} < 23$ mA when operated without current output $I_{max} < 3$ mA when operated with current output
Passive output:	connection electromechanical (EMC) or electronic (EC) totalizers external voltage: $U_{ext} \leq 30$ V DC / ≤ 24 V AC load current: $I_{max} \leq 150$ mA
Pulse width	50, 100, 200, 500 ms or 1 s, selectable with frequencies below 10 Hz
Forward/reverse measurement	direction identified via status output
Status output (passive)	
Function	settable as indicator for flow direction, errors or trip point
Connection	external voltage: $U_{ext.} \leq 30$ V DC / ≤ 24 V AC load current: $I_{max} \leq 150$ mA
Time constant	0.2 to 99.9 seconds, settable in increments of 0.1 second
Low-flow cutoff	cutoff "on" value: 1 to 19 % } of $Q_{100\%}$, adjustable in cutoff "off" value: 2 to 20 % } 1 % increments
Local display (D versions only)	3-line LCD
Display functions	actual flowrate, forward, reverse and sum totalizers (7-digit) or 25-character bar graph with percent display and status messages
Display units: actual flowrate	settable in liter/s, m³/h, US gallons/min or user-defined unit, e.g. hectoliter/day or US million gallons/day
totalizers	liter, m³ or US gallons and 1 user-defined unit (e.g. hectoliter), selectable overflow time
Language of plain texts	English, German, French, others on request
Display: 1st (top) line	8-character, 7-segment numeral and sign display, symbols for key acknowledgement
2nd (middle) line	10-character, 14-segment text display
3rd (bottom) line	6 markers ▼ to identify display

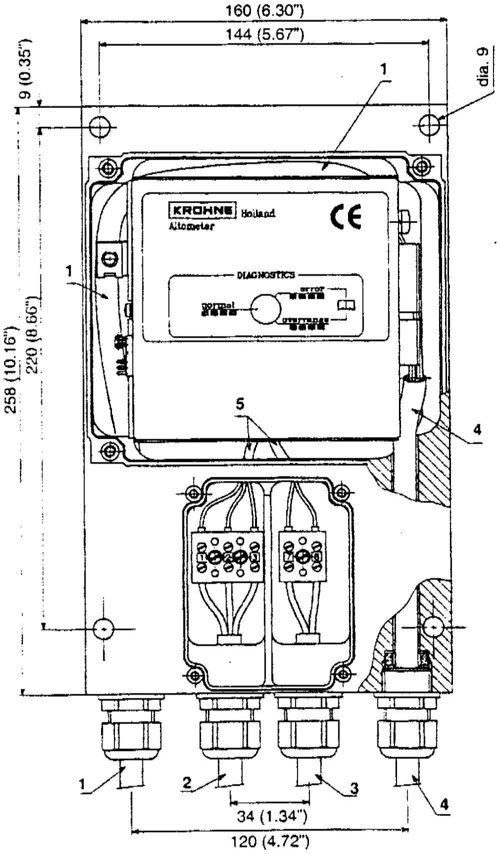
Power supply	**1. AC-Version** Standard	**2. AC-Version** Option	**3. AC-Version** Option	**DC-Version** Option
1. Rated voltage tolerance band	230 / 240 V 200 – 260 V	200 V 170 – 220 V	48 V 41 – 53 V	24 V 11 – 32 V
2. Rated voltage tolerance band	115 / 120 V 100 – 130 V	100 V 85 – 110 V	24 V 20 – 26 V	– –
Frequency	48 – 63 Hz			–
Power consumption (incl. primary head)	approx. 5 VA			approx. 4.5 W
	When connected to a functional extra-low voltage, 11-32 V DC, protective separation (PELV) must be ensured (VDE 0100/VDE 0106 and IEC 364/IEC 536)			

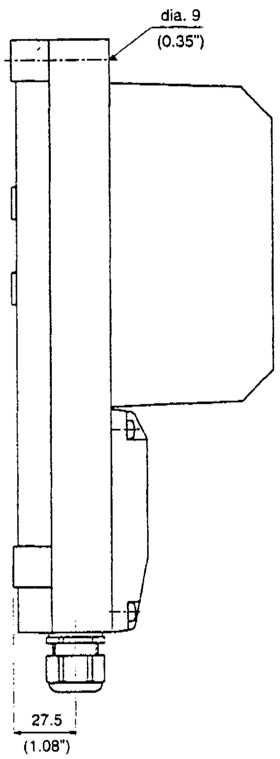
Housing	
Material	polycarbonate (PC)
Protection category (IEC 529/EN 60 529)	
IFC 010 K (compact)	IP 67, equivalent to NEMA 6, same as primary head
IFC 010 F (separate)	IP 65, equivalent to NEMA 4 / 4X

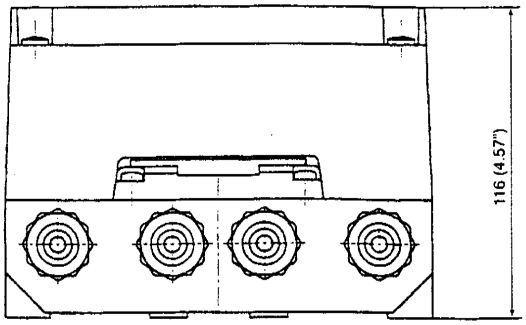
IFC 010 F and ZD dimensions and weights 10.4

IFC 010 F

weight approx. 3.8 kg / 8.4 lb



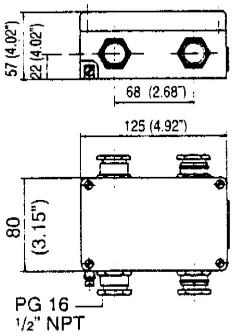




1 output cable (see Sect. 2.3)
2 signal cable of primary head (see Sect. 1.3)
3 field power cable of primary head (see Sect. 1.3)
4 power supply cable (see Sect. 1.2)
5 internal connection (ssee Fig. in Sect. 8.9, plug connectors X3 and X5)

ZD Intermediate connection box

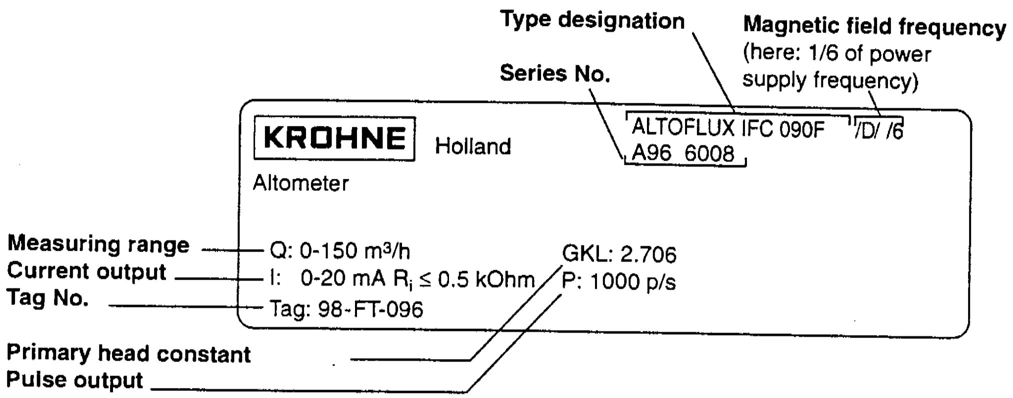
Weight approx. 0.5 kg/1.1 lbs



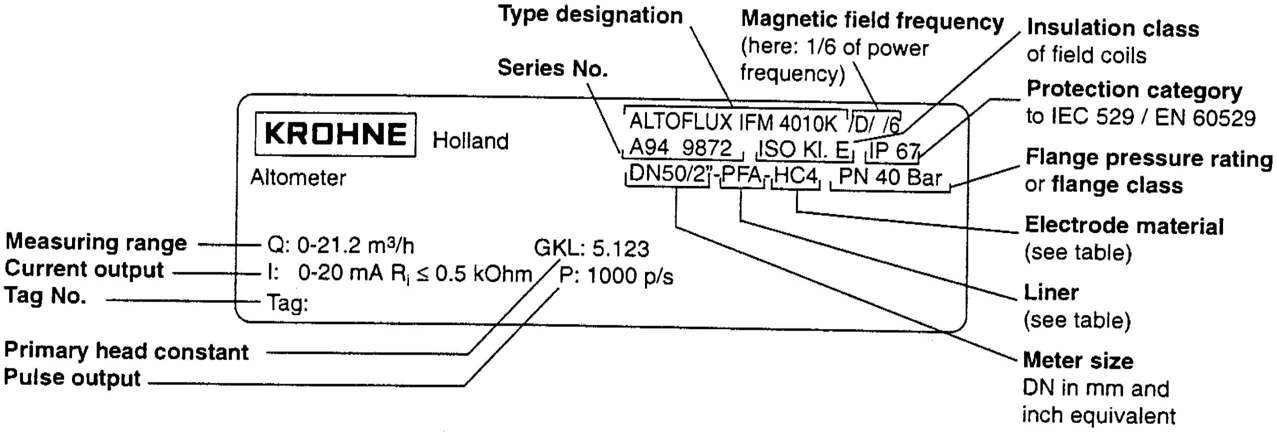
dimensions in mm

10.5 Instrument nameplates

Separate signal converter in rotatable field housing



Compact flowmeters



Abbreviations

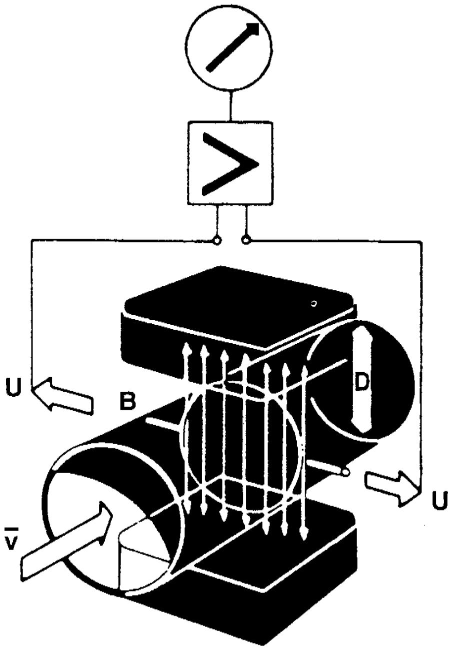
Liner	
AL	Fused aluminium oxide (99.7% Al_2O_3)
H	Hard rubber
NE	Neoprene
PFA	Teflon®-PFA
PP	Polypropylene
PUI	Irethane
T	Teflon®-PTFE
W	Soft rubber

Teflon® is a registered trademark of Du Pont

Electrode material	
C	Conductive rubber compound
HB 2	Hastelloy B2
HC 4	Hastelloy C4
IN	Incoloy
M4	Monel 400
Ni	Nickel
PT	Platinum
TA	Tantalum
TI	Titanium
V4A	Stainless steel 1.4571 (SS 316 Ti)
xx / TC	**xx** with conductive PTFE compound (**xx** = base material, e.g. HC4)

The flowmeter is designed for electrically conductive fluids.

Measurement is based on Faraday's law of induction, according to which a voltage is induced in an electrically conductive body which passes through a magnetic field. The following expression is applicable to the voltage.:



$U = K \times B \times \bar{v} \times D$

where:
U = induced voltage
$\underline{K}$ = an instrument constant
$\bar{B}$ = magnetic field strength
v = mean velocity
D = pipe diameter

Thus the induced voltage is proportional to the mean flow velocity, when the field strength is constant.

Inside the electromagnetic flowmeter, the fluid passes through a magnetic field applied perpendicular to the direction of flow. An electric voltage is induced by the movement of the fluid (which must have a minimum electrical conductivity). This is proportional to the mean flow velocity and thus to the volume of flow. The induced voltage signal is picked up by two electrodes which are in conductive contact with the fluid and transmitted to a signal converter for a standardized output signal.

This method of measurement offers the following advantages:

1. No pressure loss through pipe constriction or protruding parts.
2. Since the magnetic field passes through the entire flow area, the signal represents a mean value over the pipe cross-section; therefore, only relatively short straight inlet pipes 5 × DN from the electrode axis are required upstream of the primary head.
3. Only the tube liner and the electrodes are in contact with the fluid.
4. Already the original signal produced is an electrical voltage which is an exact linear function of the mean flow velocity.
5. Measurement is independent of the flow profile and other properties of the fluid.

The magnetic field of the primary head is generated by a square wave current fed from the signal converter to the field coils.

This field current alternates between positive and negative values. Alternate positive and negative flowrate-proportional signal voltages are generated at the same frequency by the effect of the magnetic field, which is proportional to the current. The positive and negative voltages at the primary head electrodes are subtracted from one another in the signal converter..Subtraction always takes place when the field current has reached its stationary value, so that constant interference voltages or external or fault voltages changing slowly in relation to the measuring cycle are suppressed. Power line interference voltages coupled in the primary head or in the connecting cables are similarly suppressed.

12 Block diagram – signal converter

1 Input amplifier
- overdrive-proof signal processing, rapid and accurate
- digital signal processing and sequence control
- patented, high-resolution A/D converter, digitally controlled and monitored
- high signal-to-noise ratio through low-loss field power supply

2 Field power supply
- the low-loss field power supply generates the pulsed, electronically controlled DC current for the magnetic coils of the primary head

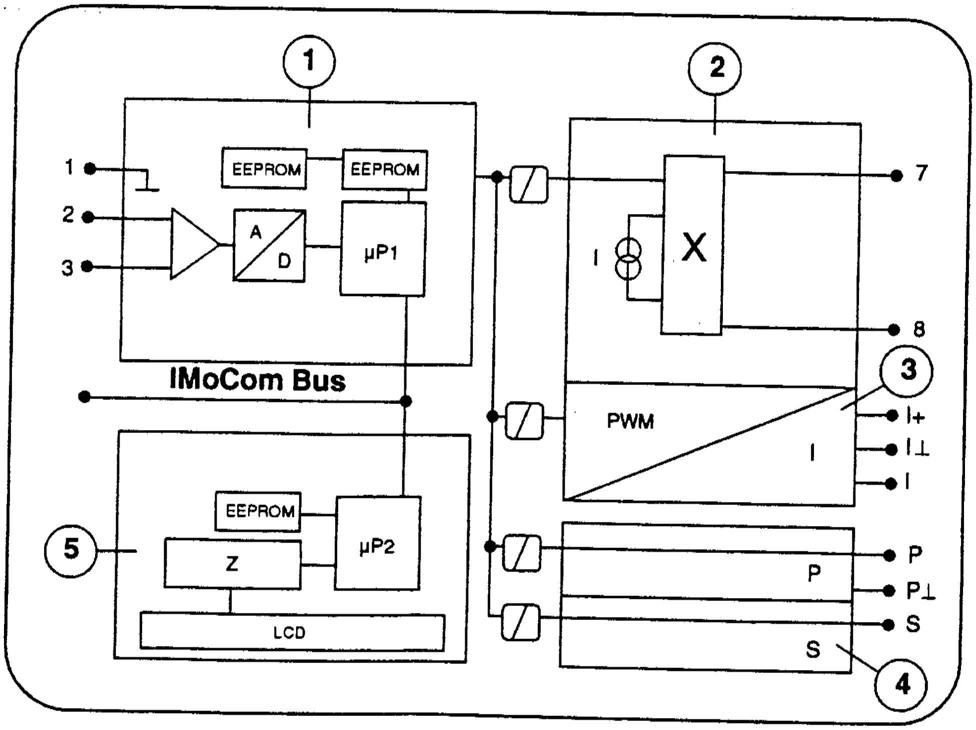
3 Current output
- galvanically isolated from all other groups
- converts the digital output signal from the µP 3 microprocessor into a proportional current

4 Binary outputs
- galvanically isolated from other groups
- selectable input/output combinations
- pulse output (P), passive FET optocouplers allow connection of electronic and electromechanical totalizers
- status output (S), for limit value, error identification, or flow direction in forward/reverse flow mode (F/R)

5 Display/operator control unit (option, D Version)
- large-size illuminated LC display
- 3 keys for operator control of the signal converter
- connection to the internal IMoCom bus
- unit can be retrofitted to basic devices (B Version)

6 IMoCom bus plug connector

for connection of external control and test devices such as:
- HHT handheld terminal (option), display/operator control unit for operation of basic versions
- adapter and CONFIG software for operation via MS-DOS PC



If you need to return flowmeters for testing or repair to Krohne

Your electromagnetic flowmeter
- has been carefully manufactured and tested by a company with ISO 9001 certification
- and volumetrically calibrated in one of the world's most accurate test rigs.

If installed and operated in accordance with these operating instructions, your flowmeter will rarely present any problems.

Should you nevertheless need to return a flowmeter for checkout or repair, please pay strict attention to the following points:

Due to statutory regulations concerning protection of the environment and the health and safety of our personnel, Krohne may only handle, test and repair returned flowmeters that have been in contact with liquids if it is possible to do so without risk to personnel and environment. This means that Krohne can only service your flowmeter if it is accompanied by a certificate in line with the following model confirming that the flowmeter is safe to handle.

If the flowmeter has been operated with toxic, caustic, flammable or water-endangering liquids, you are kindly requested

- to check and ensure, if necessary by rinsing or neutralizing, that all cavities in the flowmeter are free from such dangerous substances.
  (Directions on how you can find out whether the primary head has to be opened and then flushed out or neutralized are obtainable from Krohne on request.)
- to enclose a certificate with the flowmeter confirming that the flowmeter is safe to handle and stating the liquid used.

Krohne regret that they cannot service your flowmeter unless accompanied by such a certificate.

SPECIMEN certificate

Company: ....

Address: ....

Department: ....

Name: ....

Tel. No.: ....

The enclosed electromagnetic flowmeter

Type: ....

Krohne Order No. or Series No.: ....

has been operated with the following liquid: ....

Because this liquid is

water-endangering * / toxic * / caustic * / flammable *

we have

– checked that all cavities in the flowmeter are free from such substances *

– flushed out and neutralized all cavities in the flowmeter *

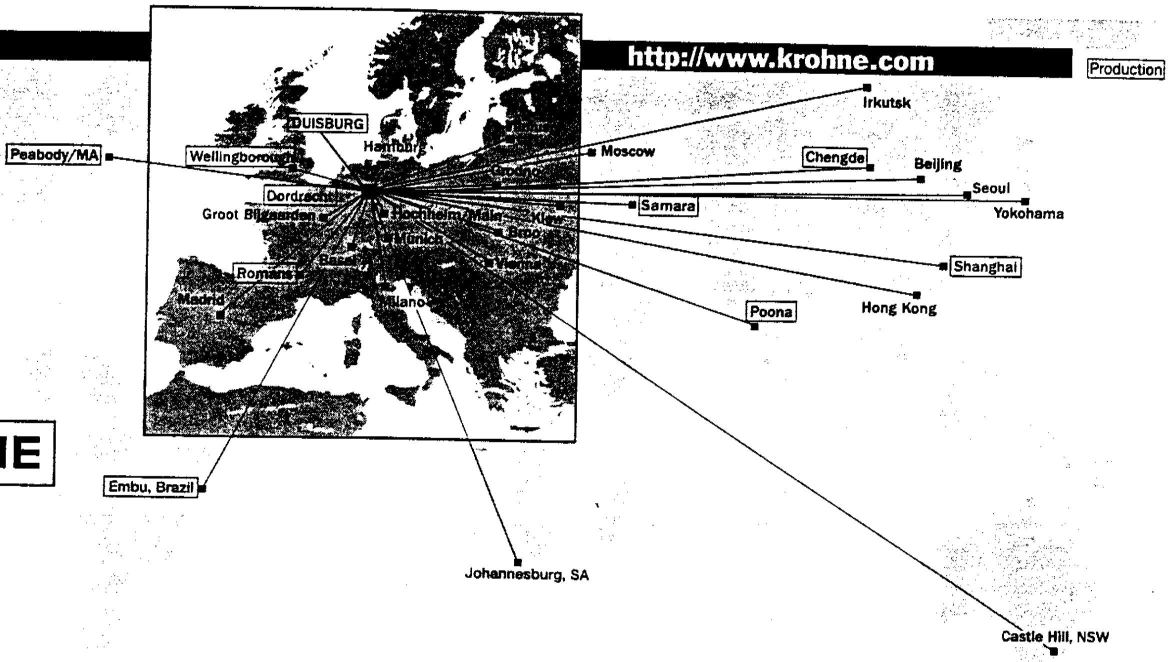
(* delete if not applicable)

We confirm that there is no risk to man or environment through any residual liquid contained in this flowmeter.

Date: .... Signature: ....

Company stamp:

http://www.krohne.com



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Subject to change without notice

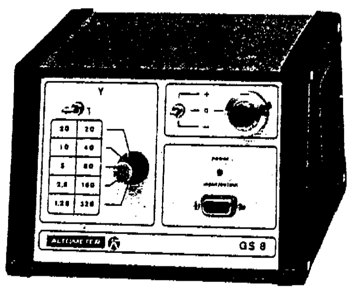
Technische Daten und Betriebsanleitung
Technical data and operating instructions
Caractéristiques techniques et instructions d'utilisation

KROHNE

03/91

Meßwertaufnehmer-Simulator für magnetisch-induktive Durchflußmesser

GS 8



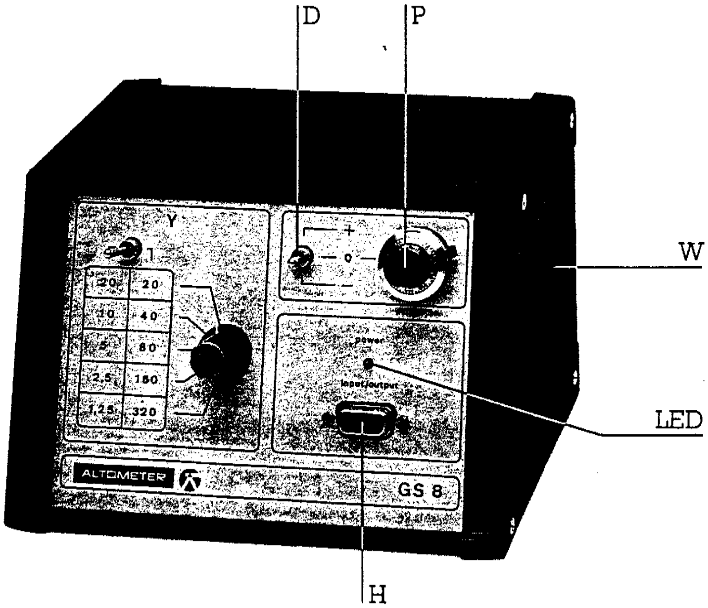
Primary head simulator for magnetic inductive flowmeters

Simulateur de capteur pour débitmètres à induction magnétique

Meßwertaufnehmer Simulator GS8

Primary head simulator GS8

Simulateur de capteur GS8



D	Schalter Durchflußrichtung
H	Buchse für Stecker **H1** und **H2** der Verbindungsleitungen **M** bzw. **Z**
LED	Hilfsenergie „eingeschaltet"
P	Potentiometer „Nullpunkt"
W	Fach für Verbindungsleitungen **M** und **Z**
Y	Schalter Meßbereiche

D	switch flow direction
H	socket for plugs **H1** and **H2** of connection cables **M** or **Z**
LED	power supply "on"
P	potentiometer "zero point"
W	compartment for connection cables **M** and **Z**
Y	switches measuring ranges

D	Commutateur sens de passage du fluide
H	Prise **H1** – **H2** pour câble **M** ou **Z**
LED	Sous tension
P	Potentiomètre point zéro
W	Compartiment pour câbles **M** et **Z**
Y	Commutateur d'échelle

Inhalt

5. **Elektrischer Anschluß**

Content

5. **Electrical connection**

Résumé

5. **Raccordement électrique**

1. Einsatzbereich

Mit dem Meßwertaufnehmer-Simulator GS8 können folgende KROHNE-ALTOMETER-Meßumformer geprüft werden:

- SC 100 A, AS
- SC 80 A, AS [(K 180, K 280, K 380, K 480) AS]
- T 900 F, T 900 F/NF, T 900 E
- F 200
- alle Meßumformer, in deren Montage- und Betriebsanleitung auf den GS8 hingewiesen wird.

Achtung

Bei Meßumformern mit Leistungstreiber NB (SC 100 A/NB, SC 100 AS/NB und T 900 F/NF/NB) darf der GS8 nur an die Feldstromversorgung der Meßumformer (Kl. 7 + 8) angeschlossen werden, **nicht** an die Kl. 7.1 + 8.1 oder 7.2 + 8.2 des Leistungstreibers!

Für folgende Meßumformer ist der GS8 nicht geeignet:

K 300, K 310, K 350, TIV 60, TIV 60 D, TIV 30, TIV 50, IDA 10, IDA 22.

2. Notwendige Prüfgeräte

- Meßwertaufnehmer-Simulator GS8
- mA-Meter (Spezifikation siehe Kap. 5)
- elektronischer Frequenzzähler (Spezifikation siehe Kap. 5)
- Taschenrechner

Für Kap. 4.4, Punkt 8 ist die Montage- und Betriebsanleitung des Meßumformers erforderlich.

1. Range of application

The GS8 primary head simulator can be used for testing the following KROHNE-ALTOMETER signal converters:

- SC 100 A, AS
- SC 80 A, AS [(K 180, K 280, K 380, K 480) AS]
- T 900 F, T 900 F/NF, T 900 E
- F 200
- all signal converters where reference is made to the GS8 in their installation and operating instructions.

Important

On signal converters with power driver NB (SC 100 A/NB, SC 100 AS/NB and T 900 F/NF/NB), the GS8 must only be connected to the field power supply of the signal converter (terminals 7 + 8) **not** to terminals 7.1 + 8.1 or 7.2 + 8.2 of the power driver!

The GS8 is not suitable for the following signal converters:

K 300, K 310, K 350, TIV 60, TIV 60 D, TIV 30, TIV 50, IDA 10, IDA 22.

2. Necessary testing apparatus

- GS8 primary head simulator
- milliammeter (see Section 5 for specification)
- electronic frequency counter (see Section 5 for specification)
- pocket calculator

Signal converter installation and operating instructions are required in conjunction with Section 4.4, Point 8.

1. Domaine d'applications

Le simulateur de Capteur GS8 peut être utilisé pour contrôler les convertisseurs de mesure KROHNE-ALTOMETER suivants:

- SC 100 A, AS
- SC 80 A, AS [(K 180, K 280, K 380, K 480) AS]
- T 900 F, T 900 F/NF, T 900 E
- F 200
- Tous les convertisseurs de mesure dont les instructions de montage et d'utilisation font référence au GS8.

Important

Sur les convertisseurs de mesure avec amplificateur de puissance NB (SC 100 A/NB, SC 100 AS/NB et T 900 F/NF/NB), le GS8 doit être raccordé uniquement à l'alimentation en courant de champ (bornes 7 + 8) et **non** aux bornes 7.1 + 8.1 ni 7.2 + 8.2!

Le GS8 ne convient pas pour les convertisseurs de mesure suivants:

K 300, K 310, K 350, TIV 60, TIV 60 D, TIV 30, TIV 50, IDA 10, IDA 22.

2. Matériel de contrôle nécessaire

- Simulateur de capteur GS8
- Milliampèremètre (caractéristiques § 5)
- Fréquencemètre électronique (caractéristiques § 5)
- Minicalculatrice

Les instructions de montage et d'utilisation du convertisseur de mesure § 4.4 point B (Montage entretien).

3. Lieferumfang

- Meßwertaufnehmer-Simulator GS8
- Verbindungsleitung für SC 100 A, SC 100 AS, T 900 und F 200 (Rundleitungen M mit 9poligem Anschluß-Stecker H1)
- Verbindungsleitung für SC 80 A, AS (Flachbandleitung Z mit 9poligem Anschlußstecker H2)
- Betriebsanleitung, 3sprachig
- 3 Kurz-Bedienungsanleitungen in deutsch, englisch und französisch, zum Aufkleben auf das Gehäuse des GS8

Die Verbindungsleitungen sind in dem seitlichen Fach W des GS8 untergebracht.

Verbindungsleitungen

3. Scope of supply

- GS8 primary head simulator
- connecting cable M for SC 100 A, SC 100 AS, T 900 and F 200 (2 round cables with 9pin plug connector H1)
- connecting cable Z for SC 80 A, AS (ribbon cable with 9pin plug connector H2)
- operating instructions in 3 languages
- 3 brief operating instructions (stick-on label) in German, English and French, for attachment to the housing of the GS8.

The connecting cables are stowed in the side compartment W of the GS8.

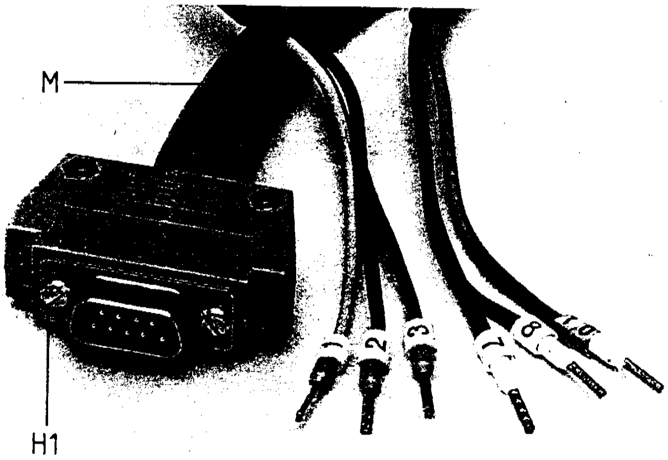
Connection cables

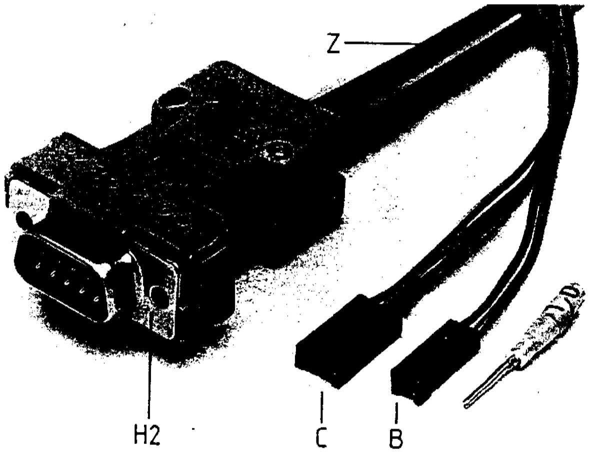
3. Matériel fourni

- Simulateur de Capteur GS8
- cordon de raccordement M pour SC 100 A, SC 100 AS, T 900 et F 200 (2 câbles ronds avec connecteur neuf broches H1)
- câble de raccordement Z pour SC 80 A, AS (câble plat avec connecteur 9 broches H2)
- Instructions d'utilisation en trois langues
- 3 aide-mémoires d'utilisation (étiquettes auto-collantes) en allemand, anglais et français, à coller sur le boîtier du GS8.

Les câbles de raccordement sont rangés dans le compartiment latéral W du GS8.

Câbles de connection





4. Beschreibung

Der Feldstrom i_F des Meßumformers (Kl. 7 + 8) fließt über einen Wandler und den Präzisionswiderstand R_M.

Der Wandler erzeugt die Versorgungsspannung U_B für den GS8. Daher ist keine zusätzliche Hilfsenergie erforderlich.

An dem Präzisionswiderstand R_M steht die Rechteckspannung $i_F * R_M$ mit der Taktfrequenz des Feldstromes an. Eine zusätzliche Prüfung des Feldstromes ist in den meisten Fällen nicht erforderlich.

Über den Schalter D gelangt die Rechteckspannung an die Baugruppe A des GS8, in der die Signalspannung zur Prüfung der Signalverarbeitung des Meßumformers erzeugt wird. Mit dem Schalter Y können verschiedene Signalspannungen präzise eingestellt werden.

Funktionen Schalter D:
Stellung „+“ = Signal für Vorwärtsdurchfluß

Stellung „–“ = Signal für Rückwärtsdurchfluß

Stellung „0“ = Nullpunkt-Einstellung mit dem 10-Gang-Potentiometer P

In Stellung „0“ des Schalters D kann mit dem Potentiometer P der GS8 exakt auf die Nullpunkt-Einstellung des zu prüfenden Meßumformers abgeglichen werden. Dadurch braucht die installationsspezifische Nullpunkt-Einstellung des Meßumformers nicht verändert werden.

4. Description

Field current i_F of the signal converter (terminals 7 + 8) flows through a transformer and precision resistor R_M.

The transformer generates the supply voltage U_B for the GS8, so no additional power is required.

Square-wave voltage $i_F * R_M$ with the same frequency as the field current is present at the precision resistor R_M. Additional testing of the field current is generally not necessary.

The square-wave voltages passes via switch D to module A in the GS8, where the signal voltage is generated for testing signal processing by the signal converter. Various signal voltages can be precisely set with switch Y.

Functions of switch D
Pos. "+" = signal for forward flow

Pos. "–" = signal for reverse flow

Pos. "0" = zero adjustment using ten-turn potentiometer P

When switch D is in position "0", the GS8 can be exactly adjusted to the zero setting of the signal converter by means of potentiometer P. It is therefore not necessary to change the installation-specific zero setting of the signal converter.

4. Description

Le courant de champ i_F du convertisseur de mesure (bornes 7 + 8) traverse un transformateur et la résistance de précision R_M.

Le transformateur élabore la tension d'alimentation U_B du GS8, de sorte qu'aucune alimentation auxiliaire supplémentaire n'est requise.

La tension carrée $i_F * R_M$ de même fréquence que le courant de champ est présente aux bornes de la résistance de précision R_M. Un contrôle supplémentaire du courant de champ n'est généralement pas nécessaire.

La tension carrée arrive, via le sélecteur D, au module A du GS8 où la tension de signal est élaborée en vue de contrôler le traitement du signal par le convertisseur. Le sélecteur Y permet un réglage précis de différentes tensions de signal.

Le sélecteur D a les fonctions suivantes:

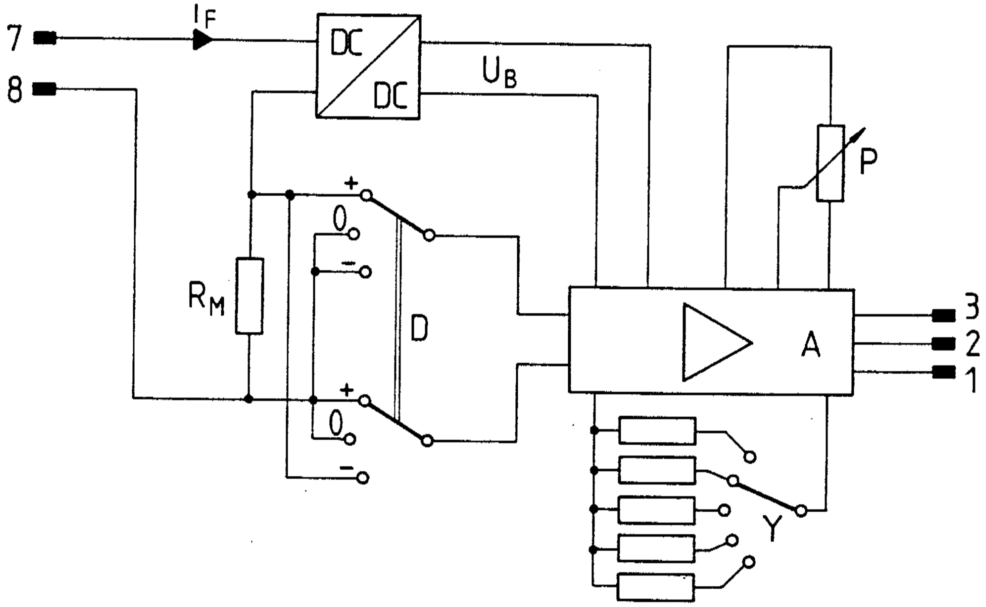
Position "+" = signal de débit direct

Position "–" = signal de débit inverse

Position "0" = réglage zéro à l'aide du potentiomètre dix tours P

Lorsque le sélecteur D est en position "0", le potentiomètre P permet de régler avec exactitude le GS8 sur la position zéro du convertisseur à contrôler. Il n'est par conséquent pas nécessaire de modifier le réglage zéro initial du convertisseur de mesure.

Blockschaltbild GS8 **Block diagram GS8** **Synoptique du GS8**



5. Elektrischer Anschluß

5.1 GS8 an Meßumformer SC 100 A, AS

1. **Hilfsenergie ausschalten!**
2. Deckel vom Anschlußraum entfernen.
3. Leitungen des Meßwertaufnehmers von den Kl. 1, 2 (20), 3 (30), 7 + 8 abklemmen.

   Achtung:
   Klemmenbelegung vorher notieren!
4. Elektrischer Anschluß gemäß folgendem Diagramm mit Rundleitungen **M**. Stecker **H1** in die Buchse **H** auf der Frontplatte des GS8 stecken.

⊘ = mA-Meter
Genauigkeitsklasse 0.1
R_i < 800 Ohm
Bereich 0 bis 20 mA

Ⓒ = elektronischer Frequenzzähler
Eingangswiderstand min. 1 kOhm
Bereich 0 bis 10 kHz
Zeitbasis min. 1 Sekunde

5. Electrical connection

5.1 GS8 to signal converter SC100 A, AS

1. **Switch off power source!**
2. Remove cover from connection compartment.
3. Disconnect primary head cables from terminals 1, 2 (20), 3 (30), 7 + 8.

   Important:
   note terminal assignment beforehand!
4. Electrical connection as shown in the following diagram using 2 round cables **M**. Insert plug connector **H1** into socket **H** on the front panel of the GS8.

⊘ = milliammeter
accuracy class 0.1
R_i < 800 ohms
range 0 to 20 mA

Ⓒ = Electronic frequency counter
input resistance min. 1 kOhm
range 0 to 10 kHz
time base min. 1 second

5. Raccordement électrique

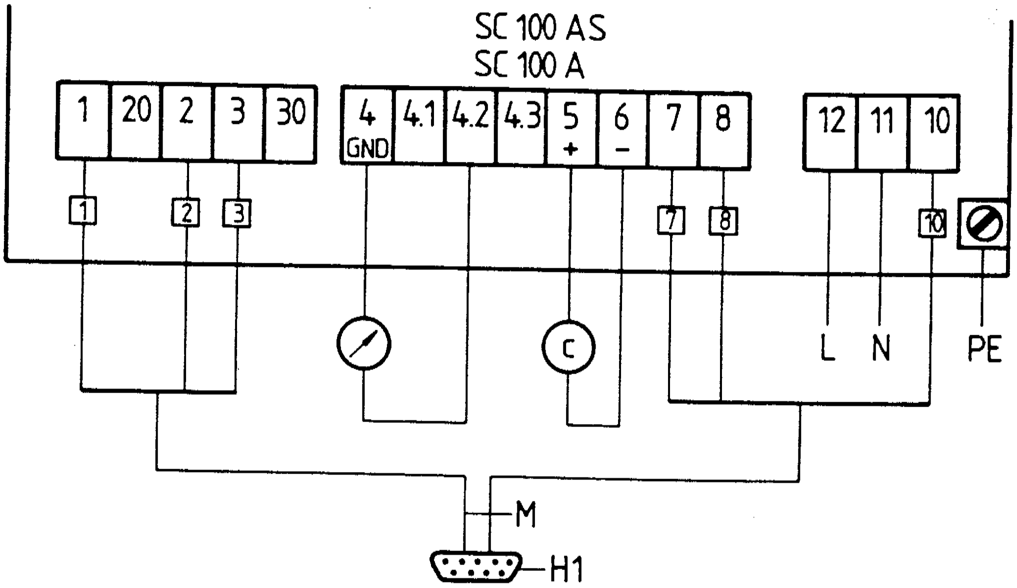
5.1 GS8 au convertisseur SC 100 A, AS

1. **Couper l'alimentation!**
2. Déposer le couvercle du compartiment de connexion.
3. déconnecter les câbles du Capteur des bornes 1, 2 (20), 3 (30), 7 + 8.

   Attention:
   Repérer les bornes au préalable.
4. Etablir le raccordement selon schéma ci-dessous à l'aide des deux câbles ronds **M**. Brancher le connecteur **H1** dans la prise **H** sur la face avant du GS8.

⊘ = Milliampèremètre
classe de précision 0.1
R_i < 800 Ohm
plage 0 à 20 mA

Ⓒ = Fréquencemètre électronique
résistance d'entrée min. 1 kOhm
plage 0 à 10 kHz
base de temps min. 1 seconde


SC 100 AS
SC 100 A
1
20
2
3
30
4
GND
4.1
4.2
4.3
5
+
6
−
7
8
12
11
10
1
2
3
7
8
10
L
N
PE
c
M
H1

5.2 GS8 an Meßumformer SC 80 A, AS

[Kompakt Durchflußmesser
(K 180, K 280, K 380, K 480) AS]

1. **Hilfsenergie ausschalten!**
2. Deckel vom Anschluß- und Elektronikraum abdrehen.

   Achtung:
   Gewinde dürfen weder beschädigt noch verschmutzt werden!
3. Im Elektronikraum Schrauben A lösen und Anzeigeplatine zur Seite klappen. Stecker B (2polig) und C (5polig) vorsichtig am Steckergehäuse abziehen (**nicht an den Leitungen**)!
4. Elektrischer Anschluß gemäß folgendem Diagramm mit Flachbandleitung **Z**. Stecker **H2** in die Buchse **H** auf der Frontplatte des GS8 stecken.
5. Anzeigeplatine wieder provisorisch befestigen (Kurzschlußgefahr!).

⊘ = mA-Meter
Genauigkeitsklasse 0.1
$R_i < 600$ Ohm
Bereich 0 bis 20 mA

Ⓒ = elektronischer Frequenzzähler
Eingangswiderstand min. 1 kOhm
Bereich 0 bis 10 kHz
Zeitbasis min. 1 Sekunde

5.2 GS8 to signal converter SC 80 A, AS

[Compact flowmeters
(K 180, K 280, K 380, K 480) AS]

1. **Switch off power source!**
2. Remove cover from connection and electronic compartments.

   Important:
   make sure screw threads are neither damaged nor dirty.
3. Remove screws A in electronic compartment and fold display circuit board to side. Carefully pull out plug connectors B (2-pin) and C (5-pin) by the connector shell (**not by the cables!**)
4. Electrical connection as shown in the following diagram using ribbon cable **Z**. Insert plug connector **H2** into socket **H** on the front panel of the GS8.
5. Provisionally refix display circuit board (short-circuit risk!).

⊘ = milliammeter
accuracy class 0.1
$R_i < 600$ ohms
range 0 to 20 mA

Ⓒ = Electronic frequency counter
input resistance min. 1 kOhm
range 0 to 10 kHz
time base min. 1 second

5.2 GS8 au convertisseur SC 80 A, AS

[débitmètres compacts
(K 180, K 280, K 380, K 480) AS]

1. **Couper l'alimentation!**
2. Dévisser le couvercle du compartiment électronique et de la boite à bornes.

   Attention:
   les filetages ne doivent être ni endommagés ni encrassés.
3. Déposer les vis A du compartiment électronique et rabattre la carte affichage. Débrancher les connecteurs B (2 broches) et C (5 broches) en tirant doucement sur le connecteur **(et non pas sur les câbles)**.
4. Etablir le raccordement comme indiqué sur le schéma ci-dessous en utilisant le câble plat **Z**. Brancher le connecteur **H2** dans la prise **H** sur la face avant du GS8.
5. Refixer provisoirement la carte de l'affichage (risque de court-circuit!)

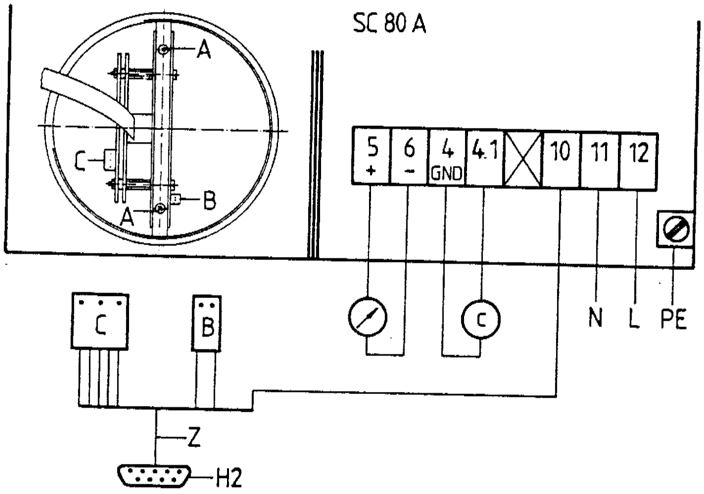
⊘ = Milliampèremètre
classe de précision 0.1
$R_i < 600$ Ohm
plage 0 à 20 mA

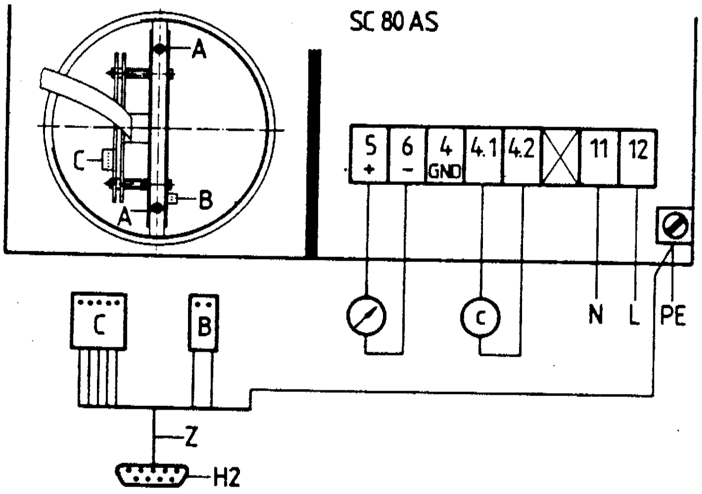
Ⓒ = Fréquencemètre électronique
résistance d'entrée min. 1 kOhm
plage 0 à 10 kHz
base de temps min. 1 seconde

Achtung:
Für Meßumformer SC 80 A (Stecker C, 3polig) ist ein Adapter, Best.-Nr. 2.07161, erforderlich (s. Kap. 8)!

Important:
For signal converter SC 80 A (plug connector C, 3-pin) an adapter, order No. 2.07161, is necessary (see Section 8)!

Attention:
Pour le convertisseur SC 80 A (connecteur C, 3 broches) un adaptateur, référence n° 2.07161, est nécessaire (raccordement électrique § 8)!





5.3 GS8 an Meßumformer T 900

1. **Hilfsenergie ausschalten!**
2. Deckel vom Anschlußraum entfernen.
3. Leitungen des Meßwertaufnehmers von den Kl. 1, 2 (20), 3 (30), 7 + 8 abklemmen.

   Achtung:
   Klemmenbelegung vorher notieren!
4. Elektrischer Anschluß gemäß folgendem Diagramm mit Rundleitungen **M**. Stecker **H1** in die Buchse **H** auf der Frontplatte des GS8 stecken.

Achtung:
Leitung Nr. 10 an Klemme 9!

⊘ = mA-Meter
Genauigkeitsklasse 0.1

R_i < 800 Ohm

Bereich 0 bis 20 mA

Ⓒ = elektronischer Frequenzzähler
Eingangswiderstand min. 1 kOhm

Zeitbasis min. 1 Sekunde

Bereich 0 bis 10 kHz

(V = Vorwärtsdurchfluß/
R = Rückwärtsdurchfluß,
nur bei T 900. . .-V/R)

5.3 GS8 to signal converter T 900

1. **Switch off power source!**
2. Remove cover from connection compartment.
3. Disconnect primary head cables from terminals 1, 2 (20), 3 (30), 7 + 8.

   Important:
   note terminal assignment beforehand!
4. Electrical connection as shown in the following diagram using 2 round cables **M**. Insert plug connector **H1** into socket **H** on the front panel of the GS8.

Important:
Connect cable No. 10 to terminal 9!

⊘ = milliammeter
accuracy class 0.1

R_i < 800 ohms

range 0 to 20 mA

Ⓒ = Electronic frequency counter
input resistance min. 1 kOhm

range 0 to 10 kHz

time base min. 1 second

(V = forward flow/
R = reverse flow,
applies only to T 900. . .-V/R)

5.3 GS8 au convertisseur T 900

1. **Couper l'alimentation!**
2. Déposer le couvercle de la boite à bornes.
3. Déconnecter les câbles du Capteur des bornes 1, 2 (20), 3 (30), 7 + 8.

   Attention:
   Repérer les bornes au préalable!
4. Etablir le raccordement selon le schéma ci-dessous en utilisant les 2 câbles ronds **M**. Brancher le connecteur **H1** dans la prise **H** sur la face avant du GS8.

Attention:
Brancher le câble n° 10 sur la borne 9!

⊘ = Milliampèremètre
classe de précision 0.1

R_i < 800 Ohm

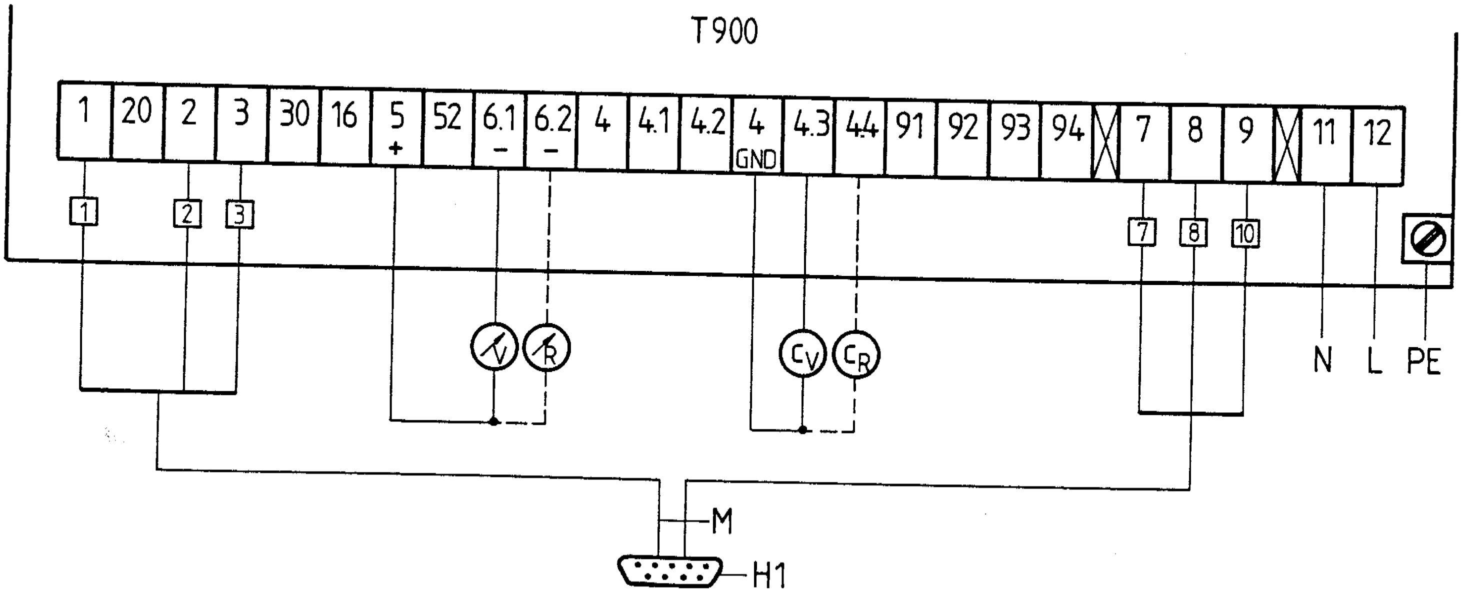
plage 0 à 20 mA

Ⓒ = Fréquencemètre électronique
résistance d'entrée min. 1 kOhm

plage 0 à 10 kHz

base de temps min. 1 seconde

(V = débit direct/
R = débit inverse,
pour T 900 uniquement. . .-V/R)


T900
1
20
2
3
30
16
5
+
52
6.1
−
6.2
−
4
4.1
4.2
4
GND
4.3
4.4
91
92
93
94
7
8
9
11
12
1
2
3
7
8
10
N
L
PE
CV
CR
M
H1

5.4 GS8 an Meßumformer F 200

1. **Hilfsenergie ausschalten!**
2. Gehäusedeckel entfernen.
3. Leitungen des Meßwertaufnehmers von den Kl. 1, 2, 3, 7 + 8 abklemmen.

   Achtung:
   Klemmenbelegung vorher notieren!
4. Elektrischer Anschluß gemäß folgendem Diagramm mit Rundleitungen **M**. Stecker **H1** in die Buchse **H** auf der Frontplatte des GS8 stecken.

Achtung:
Leitung Nr. 10 an Klemme 9!

⊘ = mA-Meter
Genauigkeitsklasse 0.1

$R_i < 750$ Ohm mit GTFVR
($R_i < 500$ Ohm mit GTF)

Bereich 0 bis 20 mA

Ⓒ = elektronischer Frequenzzähler
Eingangswiderstand min. 1 kOhm

Bereich 0 bis 10 kHz

Zeitbasis min. 1 Sekunde

5.4 GS8 to signal converter F 200

1. **Switch off power source!**
2. Remove housing cover.
3. Disconnect primary head cables from terminals 1, 2, 3, 7 + 8.

   Important:
   note terminal assignment beforehand!
4. Electrical connection as shown in the following diagram using 2 round cables **M**. Insert plug connector **H1** into socket **H** on the front panel of the GS8.

Important:
Connect cable No. 10 to terminal 9!

⊘ = milliammeter
accuracy class 0.1

$R_i < 750$ ohms with GTFVR
($R_i < 500$ ohms with GTF)

range 0 to 20 mA

Ⓒ = Electronic frequency counter
input resistance min. 1 kOhm

range 0 to 10 kHz

time base min. 1 second

5.4 GS8 convertisseur F 200

1. **Couper l'alimentation!**
2. Déposer le couvercle du boîtier.
3. Déconnecter les câbles du Capteur des bornes 1, 2, 3, 7 + 8.

   Attention:
   Repérer les bornes au préalable!
4. Etablir le raccordement selon le schéma ci-dessous en utilisant les 2 câbles ronds **M**. Brancher le connecteur **H1** dans la prise **H** sur la face avant du GS8.

Attention:
Brancher le câble n° 10 sur la borne 9!

⊘ = Milliampèremètre
classe de précision 0.1

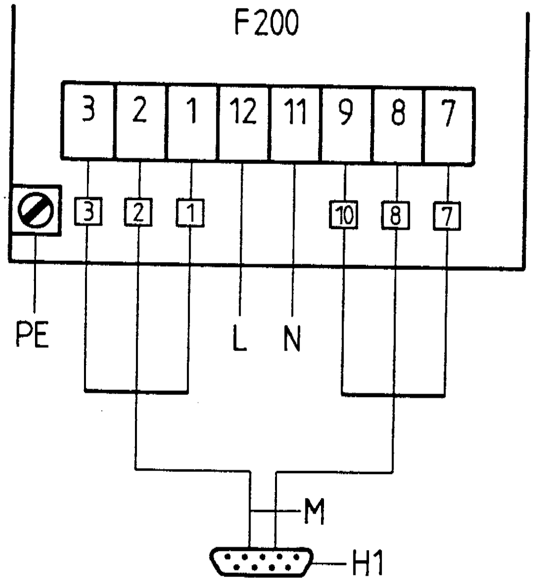
$R_i < 750$ Ohm avec GTFVR
($R_i < 500$ Ohm avec GTF)

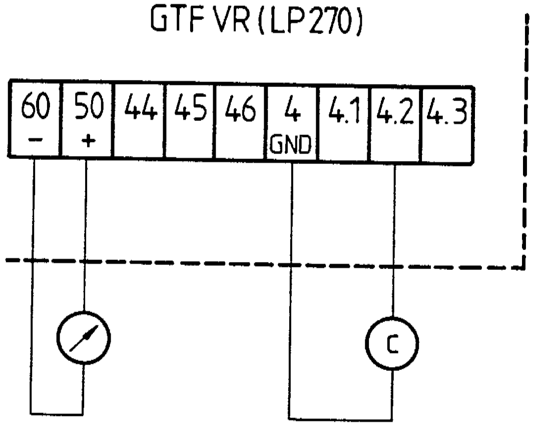
plage de 0 à 20 mA

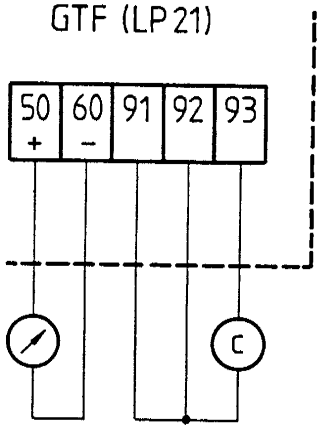
Ⓒ = Fréquencemètre électronique
résistance d'entrée min. 1 kOhm

plage 0 à 10 kHz

base de temps min. 1 seconde


F200
3
2
1
12
11
9
8
7
3
2
1
10
8
7
PE
L
N
M
H1


GTF VR (LP270)
60
–
50
+
44
45
46
4
GND
4.1
4.2
4.3
C


GTF (LP21)
50
+
60
–
91
92
93
C

6. Prüfung des Meßumformers

1. Hilfsenergie einschalten, mindestens 10 Minuten warten.
2. Schalter **D** (Frontplatte GS8) in Stellung „0" schalten.
3. Mit dem 10-Gang-Potentiometer **P** (Frontplatte GS8) den Nullpunkt auf I_{min} ± < 10 µA einstellen.
4. Stellung des Schalters **Y** und Sollanzeigewerte I und f wie folgt bestimmen:

4.1 $$X = \frac{Q * K * F}{GK * DN^2}$$

Q = Meßbereichsendwert (100%) in Volumen-Einheit **(V)** pro Zeit-Einheit **(t)**

GK = Meßwertaufnehmer-Konstante (s. Geräteschild Meßwertaufnehmer)

F = 2, wenn GK-Wert mit „L" beginnt
= 1, GK-Wert ohne L

DN = Nennweite in mm oder in Zoll (inch)

K = Konstante nach Tabelle

t = Zeit in Sekunden (s), Minuten (min), Stunden (h)

V = Volumen (1 = Liter)

6. Testing the signal converter

1. Switch on power source, allow at least 10 minutes' warm-up time.
2. Set switch **D** (front panel GS8) to "0" position.
3. Adjust zero with the 10-turn potentiometer **P** (front panel GS8) to I_{min} ± < 10 µA.
4. Determine position of switch **Y** and setpoint I and f as follows:

4.1 $$X = \frac{Q * K * F}{GK * DN^2}$$

Q = full-scale range (100%) in volumetric units **(V)** per unit time **(t)**
GK = primary constant (see primary head nameplate)
F = 2, if GK value begins with "L"
= 1, GK value without L
DN = meter size in mm or inches
K = constant, see table
t = time in seconds (s), minutes (min), hours (h)
V = volume (1 = litre)

6. Contrôle du convertisseur

1. Brancher l'alimentation et attendre au moins 10 minutes.
2. Mettre le sélecteur **D** (face avant du GS8) sur la position "0".
3. Régler le zéro sur I_{min} ± < 10 µA, à l'aide du potentiomètre dix tours **P** (face avant du GS8).
4. Déterminer la position du sélecteur **Y** et les valeurs de consigne de I et f de la façon suivante:

4.1 $$X = \frac{Q * K * F}{GK * DN^2}$$

Q = Valeur maximale de la plage de mesure (100%) en unités de volume **(V)** par unité de temps **(t)**.
GK = Constante du capteur (voir plaque d'identification du capteur).
F = 2, si la valeur de GK commence par "L"
= 1, si la valeur de GK ne comporte pas L
DN = Diamètre nominal en mm ou en pouces
K = Constante, d'après tableau ci-dessous
t = Temps en secondes (s), minutes (min), heures (h)
V = Volume (1 = litre)

DN	t **V**	s	min	h
mm	l	25464	424.4	7.074
	m^3	25464800	424413	7074
	US gal	96396	1607	26.78
inches	l	39.47	0.6578	0.01096
	m^3	39470	657.8	10.96
	US gal	149.4	2.49	0.0415

4.2 Stellung Schalter Y ermitteln

Aus der Tabelle (Frontplatte GS8) den Wert Y bestimmen, der dem Faktor X am nächsten kommt und die Bedingung $Y \leq X$ erfüllt.

4.3 Sollanzeige (I) Analogausgang berechnen

$$I = I_{min} + \frac{Y}{X} (I_{max} - I_{min}) \text{ [mA]}$$

I_{min} = Minimalwert Analogausgang (z. B. 4 mA, bei 4 bis 20 mA)

I_{max} = Maximalwert Analogausgang (z. B. 20 mA, bei 0/4 bis 20 mA)

4.4 Sollanzeige (f) Impulsausgang berechnen

$$f = \frac{Y}{X} * \frac{f_{max}}{3600} \text{ [Hz]}$$

f_{max} = Maximalwert Impulsausgang [Im/h]

4.2 Determine position of switch Y

Use table (front panel GS8) to determine the value Y which comes closest to the factor X and meets condition $Y \leq X$.

4.3 Calculate setpoint reading (I) analog output

$$I = I_{min} + \frac{Y}{X} (I_{max} - I_{min}) \text{ [mA]}$$

I_{min} = minimum value, analog output (e. g. 4 mA at 4 to 20 mA)

I_{max} = maximum value, analog output (e. g. 20 mA at 0/4 to 20 mA)

4.4 Calculate setpoint reading (f) pulse output

$$f = \frac{Y}{X} * \frac{f_{max}}{3600} \text{ [Hz]}$$

f_{max} = maximum value, pulse output [pulses/h]

4.2 Détermination de la position du sélecteur Y

A l'aide du tableau (face avant du GS8), déterminer la valeur de Y la plus proche du facteur X telle que $Y \leq X$.

4.3 Calcul de la valeur de consigne (I) sortie analogique

$$I = I_{min} + \frac{Y}{X} (I_{max} - I_{min}) \text{ [mA]}$$

I_{min} = valeur minimale, sortie analogique (ex. 4 mA entre 4 et 20 mA)

I_{max} = valeur maximale, sortie analogique (ex. 20 mA entre 0/4 et 20 mA)

4.4 Calcul de la valeur de consigne (f) impulsions en sortie

$$f = \frac{Y}{X} * \frac{f_{max}}{3600} \text{ [Hz]}$$

f_{max} = valeur maximale, impulsions en sortie [imp/h]

5. Schalter **D** (Frontplatte GS8) in Stellung „+“ oder „–“ (positiver oder negativer Durchfluß) schalten.
6. Schalter **Y** (Frontplatte GS8) auf den oben ermittelten Wert einstellen.
7. Sollanzeigen I oder f kontrollieren (siehe Punkte 4.3 + 4.4).
8. Abweichung < 1,5% vom Sollwert! Falls größer, Fehlersuche nach Montage- und Betriebsanleitung des Meßumformers. Zuerst Feldstromversorgung überprüfen.
9. Linearitätsprüfung: Kleinere Y-Werte einstellen, die Anzeigewerte nehmen proportional zu dem ermittelten Y-Wert (s. Punkt 4.2) ab.
10. Nach Beendigung der Prüfung Hilfsenergie ausschalten!
11. GS8 abklemmen.
12. Leitungen oder Stecker (SC 80 A, AS) des Meßwertaufnehmers wieder anklemmen.
13. Gehäusedeckel wieder aufsetzen. **Die Gewinde der beiden Deckel des SC 80 müssen immer eingefettet sein.**
14. Nach dem Einschalten der Hilfsenergie ist die Anlage wieder betriebsbereit.

5. Set switch **D** (front panel GS8) to position "+" or "–" (positive or negative flow).
6. Set switch **Y** (front panel GS8) to the value determined by the method described above.
7. Check setpoint readings I or f (see Points 4.3 and 4.4).
8. Deviation < 1.5% of setpoint! If greater, locate fault as described in the signal converter installation and operating instructions. First check field power supply.
9. Linearity test: adjust lower Y values, readings will drop in proportion to the determined Y value (see Point 4.2).
10. Switch off power source after completing the test.
11. Disconnect GS8.
12. Reconnect leads or plug connector (SC 80 A, AS) of primary head.
13. Replace housing cover. **The screw thread of the two covers on the SC 80 must always be well greased.**
14. The system is ready for operation after the power source has been switched on.

5. Régler le sélecteur **D** (face avant GS8) sur la position "+" ou "–" (débit direct ou inverse).
6. Régler le sélecteur **Y** (face avant GS8) sur la valeur déterminée par la méthode décrite ci-dessus.
7. Contrôler les valeurs de consignes de I ou f (voir § 4.3 et 4.4).
8. Ecart < 1,5% par rapport à la valeur de consigne! Si l'écart est plus important, rechercher le défaut suivant instructions de montage et d'entretien. Contrôler d'abord l'alimentation du courant de champ.
9. Test de linéarité: régler sur les plus faibles valeurs de Y, la valeur affichée doit diminuer proportionnellement à la valeur Y déterminée (voir 4.2).
10. Couper l'alimentation après avoir effectué le test.
11. Débrancher le GS8.
12. Rebrancher les câbles ou le connecteur (SC 80 A, AS) du capteur.
13. Reposer le couvercle du boîtier. **Les filetages des deux couvercles du SC 80 doivent toujours être bien graissés.**
14. Après mise sous tension, le système est de nouveau prêt à fonctionner.

7. Technische Daten

Umgebungstemperatur	−20 bis +60°C
Schutzart	IP 40, nach DIN 40050
Feldstrom	±60 bis ±250 mA
Fehler in % vom Meßwert	
SC 100/T 900/F 200	±0,4%
SC 80 AS (SC 80 A)	±0,4% (±0,6%)

8. Adapter für SC 80 A (Option)

Adapter 2.07161 erforderlich?		Buchse C des...	
		SC 80 A 3polig	**SC 80 AS** 5polig
GS 8: Stecker C der Leitung Z...	3polig	NEIN	JA
	5polig	JA	NEIN

Elektrischer Anschluß

7. Technical data

Ambient temperature	−20 to +60°C
Protection category	IP 40, to DIN 40050
Field current	±60 to ±250 mA
Error as % of measured value	
SC 100/T 900/F 200	±0.4%
SC 80 AS (SC 80 A)	±0.4% (±0.6%)

8. Adapter for SC 80 A (option)

Is adapter 2.07161 necessary?		Socket C of...	
		SC 80 A 3-pin	**SC 80 AS** 5-pin
GS 8: Plug connector C of cable Z...	3-pin	NO	YES
	5-pin	YES	NO

Electrical connection

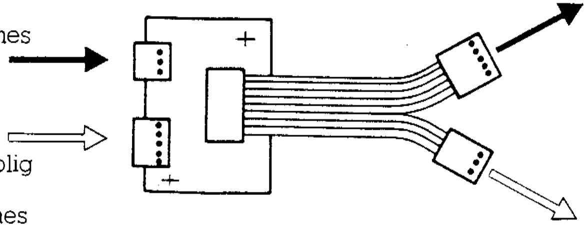
7. Caractéristiques techniques

Température ambiante	de −20 à +60°C
Type de protection	IP 40 (DIN 40050)
Courant de champ	de ±60 à ±250 mA
Erreur en % de la valeur de mesure	
SC 100/T 900/F 200	±0.4%
SC 80 AS (SC 80 A)	±0.4% (±0.6%)

8. Adaptateur pour SC 80 A (option)

L'adaptateur 2.07161 est il necessaire?		Prise C du...	
		SC 80 A 3 broches	**SC 80 AS** 5 broches
GS 8: Connecteur C du câble plat Z...	3 broch.	NON	OUI
	5 broch.	OUI	NON

Raccordement électrique



Adapter
Adapter 2.07161
Adaptateur

Stecker C der **GS 8**-Flachbandleitung Z, 3polig
Socket C of **GS 8** ribbon cable Z, 3-pin
Connecteur C du **GS 8** câble plat Z, 3 broches

Stecker C der **GS 8**-Flachbandleitung Z, 5polig
Socket C of **GS 8** ribbon cable Z, 5-pin
Connecteur C du **GS 8** câble plat Z, 5 broches

in Buchse C des **SC 80 AS**, 5polig
to socket C of **SC 80 AS**, 5-pin
à la prise C du **SC 80 AS**, 5 broches

in Buchse C des **SC 80 A**, 3polig
to socket C of **SC 80 A**, 3-pin
à la prise C du **SC 80 A**, 3 broches

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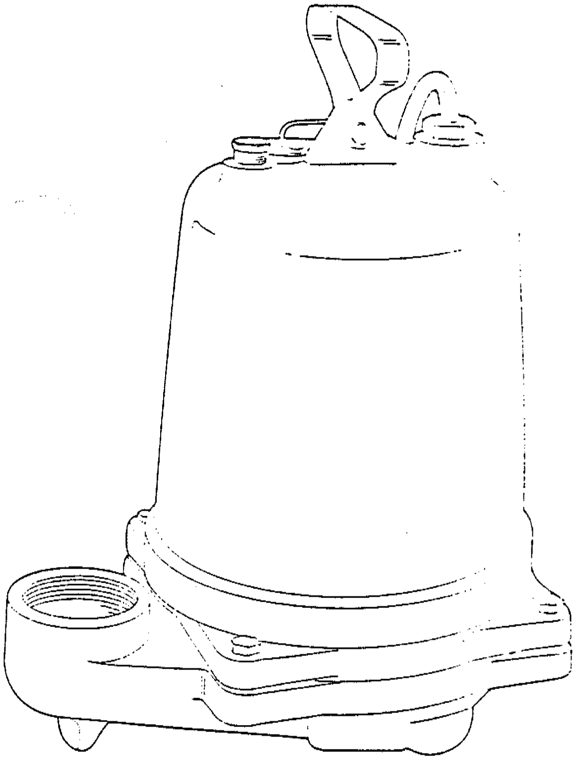
GOULDS PUMPS

Installation, Operation and Maintenance Instructions

Models 3885, 3886, 3887



GOULDS PUMPS
Water Technologies
PROOF OF PURCHASE
ITT Industries

Owner's Information

Model Number:____________________

Serial Number:____________________

Dealer:____________________

Dealer's Phone No.____________________

Date of Purchase:__________ Installation:__________

Current Readings at Startup:

Single Phase:____________________

Three Phase – 1st Phase:____________________

.d Phase:__________ 3rd Phase:__________

Table of Contents

Goulds Pumps
ITT Industries

SAFETY INSTRUCTIONS

TO AVOID SERIOUS OR FATAL PERSONAL INJURY OR MAJOR PROPERTY DAMAGE, READ AND FOLLOW ALL SAFETY INSTRUCTIONS IN MANUAL AND ON PUMP.

THIS MANUAL IS INTENDED TO ASSIST IN THE INSTALLATION AND OPERATION OF THIS UNIT AND MUST BE KEPT WITH THE PUMP.

⚠ This is a **SAFETY ALERT SYMBOL.** When you see this symbol on the pump or in the manual, look for one of the following signal words and be alert to the potential for personal injury or property damage.

⚠ DANGER Warns of hazards that **WILL** cause serious personal injury, death or major property damage.

⚠WARNING Warns of hazards that **CAN** cause serious personal injury, death or major property damage.

⚠ CAUTION Warns of hazards that **CAN** cause personal injury or property damage.

NOTICE: INDICATES SPECIAL INSTRUCTIONS WHICH ARE VERY IMPORTANT AND MUST BE FOLLOWED.

THOROUGHLY REVIEW ALL INSTRUCTIONS AND WARNINGS PRIOR TO PERFORMING ANY WORK ON THIS PUMP.

MAINTAIN ALL SAFETY DECALS.

⚠WARNING

Hazardous fluids can cause fire, burns or death.

UNIT NOT DESIGNED FOR USE WITH HAZARDOUS LIQUIDS OR FLAMMABLE GASES. THESE FLUIDS MAY BE PRESENT IN CONTAINMENT AREAS.

NOTICE: INSPECT UNIT FOR DAMAGE AND REPORT ALL DAMAGE TO THE CARRIER OR DEALER IMMEDIATELY.

DESCRIPTION AND SPECIFICATIONS

The Model 3885 is a 2" NPT discharge, ¾" (19 mm) solids handling, submersible effluent pump. The Model 3886 is a 2" (50 mm) solids handling, submersible sewage pump. The Model 3887 is a 2" flanged (standard) 3" flange (optional) discharge, 2" (50 mm) solids handling, submersible sewage pump.

Lifting of Pump

⚠WARNING

Hazardous voltage can shock, burn or cause death.

DO NOT LIFT, CARRY OR HANG PUMP BY THE ELECTRICAL CABLES. DAMAGE TO THE ELECTRICAL CABLES CAN CAUSE SHOCK, BURNS OR DEATH.

- Lift the pump with an adequately sized chain or cable attached to the lifting handle (458). **DO NOT** damage electrical cables while raising and lowering unit.

Sliderail System

- The **OPTIONAL** Goulds Model A10-20 sliderail system is recommended for proper installation.

NOTICE: FOLLOW THE INSTALLATION AND OPERATION INSTRUCTIONS PROVIDED WITH THE SLIDERAIL SYSTEM.

- Installation of the sliderail system should locate the pump opposite the influent opening, preventing stagnate areas where solids can settle.
- The pit floor **MUST** be flat under the sliderail base and have sufficient loading capacity to support the entire weight of the assembly, including the sliderail base, sliderail guide, pump and all assorted piping.

Piping

- Discharge piping should be no smaller than 2" (51 mm) diameter and kept as short as possible, avoiding unnecessary fittings to minimize friction losses.
- Install an adequately sized check valve (suitable for handling ¾" (19 mm) solids for effluent applications and 2" (50 mm) solids for sewage applications) in the discharge pipe to prevent backflow. Follow the check valve manufacturer's installation instructions.
- Install an adequately sized gate valve **ABOVE** the check valve for pump, plumbing and check valve maintenance.
- To deter air locking, drill a 3/16" (4.8 mm) hole, 2" (50.8 mm) beyond the pump discharge connection.
- All piping must be adequately supported, so as not to impart any piping strain or loads on the pump.

Access Doors

- Access doors can be single or double leaf design. Doors should include a lifting handle and a lock provision for tamper resistant operation. Standard and heavy duty steel or aluminum doors are available.
- The pit access door must be of sufficient size to allow for inspection, maintenance and crane or hoist service.

Liquid Level Controls

- Single float operation can be used on ⅓ and ½ HP models. Mounting of the float switch must be checked by the installer to insure proper turn on and turn off. The pump may be plugged directly into the piggy back style plug located on the cord of the float switch.
- The recommended float operation sequence used with a control panel requires a three or four float system. In the three float system, the floats are designated SW-1 for the bottom float, SW-2 for the middle float and SW-3 for the top float. In a four float system the fourth float is designated SW-4.
    - Simplex Control – The rising liquid level raises float SW-2, turning on the pump. When the liquid level falls sufficiently, SW-1 will turn the pump off. If the influent is excessive, or if the pump fails to operate correctly, SW-3 will activate an alarm, which will remain on until manually reset.
    - Duplex Control – The duplex control will alternate the two pumps, causing the lead pump to change at each system cycle. When equipped with three floats, the system will cycle the same as the simplex control, described above, except that the SW-1 will cause the lead pump to alternate.
    - If the influent is excessive, or if the lead pump fails to operate correctly, the rising level will activate SW-3, turning on the lag pump and the alarm. As before the alarm must be manually reset.
    - Four Float Control – The four float system operates the same as the duplex control system, except that float SW-3 will not turn on the alarm. In this system SW-4 turns on the alarm, which again must be manually reset.
- Several different float controls are available from the Goulds Catalog.

NOTICE: POSITION THE FLOATS SO THAT THEY DO NOT SNAG OR TANGLE ON THE PUMP, DISCHARGE PIPING, OR OTHER EQUIPMENT.

- The lower most float turns the unit off and should be set as shown in the **"TYPICAL PLUMBING and INSTALLATION"** drawing provided in this manual.
- Increasing the distance between the SW-1 and SW-2 floats lengthens the running time. One (1) minute is the minimum recommended pump cycle time.

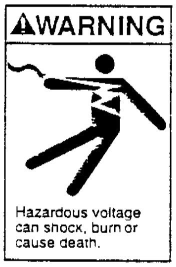
NOTICE: DURING PUMP OPERATION, INSURE THAT THE LIQUID LEVEL DOES NOT DROP BELOW THE PUMP MOTOR FOR EXTENDED PERIODS. THIS CAN CAUSE THE PUMP MOTOR TO OVERHEAT, CAUSING MOTOR DAMAGE AND VOIDING THE WARRANTY.

Pump Motor Control Panels

- Control panels shall be in accordance with local and National Electrical Code requirements.
- Single phase installations shall be equipped with a Goulds' "SES" or "A" Series panel, or **AS A MINIMUM**, a control panel with a properly sized magnetic contactor and a disconnect switch.
- Three phase installations shall be equipped with a Goulds' "SES" or "A" Series panel, or **AS A MINIMUM** with a 3 pole circuit breaker, an across the line magnetic starter NEMA rated for the appropriate horsepower, ambient compensated Quick Trip Class 10 overload relays.

Wiring and Grounding

- Use only stranded copper wire to motor and ground. The ground wire must be at least as large as the wires to the motor. Wires should be color coded for ease of maintenance.


⚠WARNING

Hazardous voltage can shock, burn or cause death.

⚠ Install, ground and wire according to local and National Electrical Code requirements.

⚠ Install an all leg disconnect switch near the pump.

⚠ Disconnect and lockout electrical power before installing or servicing pump.

⚠ Electrical supply **MUST** match pump's nameplate specifications. Incorrect voltage can cause fire, damage motor and voids warranty.

⚠ Single phase motors are equipped with automatic thermal protectors which open the motor's electrical circuit when an overload exists. This can cause the pump to start unexpectedly and without warning.

⚠ Some models are equipped with a 3-prong grounded plug and **MUST** be used in a grounded 3-wire receptacle. **DO NOT** modify the plug or remove the ground prong.

- Where cables must be spliced or connected to the motor leads, splices **MUST** be water tight. Commercially available potting or heat shrink kits may be used, if allowed by local or federal regulations.

NOTICE: FOLLOW THE SPLICE KIT MANUFACTURER'S INSTRUCTIONS.

- Where wire splices are used, follow one of these procedures:
  - Butt join the wires using properly sized and correctly crimped Sta-Kon™, or equivalent, connectors. Insulate and water proof each joint using heat shrink tubing equipped with a self contained sealer. Apply heat evenly from a torch until adequately sealed.

OR

  - Use plastic insulators and a neoprene gasket sleeve set with properly sized and correctly crimped Sta-Kon™ connectors. Place a cap and gasket on each wire end, center insulator body over splice, insert the sleeve into the body as far as possible, hand tighten caps.
- In the case of multiple conductors, stagger the joints.

⚠WARNING
Hazardous voltage

FAILURE TO PERMANENTLY GROUND THE PUMP, MOTOR AND CONTROLS BEFORE CONNECTING TO ELECTRICAL POWER CAN CAUSE SHOCK, BURNS OR DEATH.

Operation

- If the unit has been stored for an extended period, check the oil level in the motor and seal chamber, to insure that they are full, using the following procedures:
  - Motor Cover – With the pump in the upright position, remove the oil fill plug (358E), being careful that nothing enters the motor. The oil level should be above the top of the motor. With the correct oil fill as required. DO NOT over fill.
  - Cable Gland Assemblies – Re-torque both the power and sensor cable glands to values given in step 10 of "POWER CABLE REPLACEMENT".
- Before lowering the pump(s) into the containment area, three phase units should be jogged to insure correct rotation. See the motor rotation arrow on the motor cover (341). Check both pumps in a duplex operation.

NOTICE: MOTOR STARTUP TORQUE, "KICKBACK", WILL CAUSE THE MOTOR TO TWIST IN THE DIRECTION OPPOSITE ROTATION. INSURE THAT THE PUMP ASSEMBLY IS ADEQUATELY RESTRAINED.

⚠DANGER

Hazardous Machinery

DO NOT PLACE HANDS IN PUMP SUCTION WHILE CHECKING MOTOR ROTATION. TO DO SO WILL CAUSE SEVERE PERSONAL INJURY.

NOTICE: DO NOT SWITCH PRIMARY POWER LEADS COMING INTO A THREE PHASE DUPLEX CONTROL PANEL. THIS WILL REVERSE ROTATION OF BOTH PUMPS.

- If the three phase motor(s) rotation is backwards, reverse any two pump power cable leads at the pump control panel.

⚠WARNING
Hazardous machinery

MOTOR OVERHEAT/OVER CURRENT SENSING DEVICES AUTOMATICALLY RESTART THE MOTOR UNEXPECTEDLY AND WITHOUT WARNING. THIS CAN CAUSE SEVERE PERSONAL INJURY.

- After installing the pump into the containment area, with adequate submergence, open the discharge valve fully. Start the unit using manual controls. If flow is appreciably less than rated performance, pump may be air bound. To expel trapped air, jog the unit several times, using the manual controls.
- Have a qualified electrician take current measurements on the single or all three phases. Record these readings in the space provided in the "OWNER'S INFORMATION" section of this manual for future reference.
- The unit is now ready for normal operation. Place the controls in the automatic position.

Maintenance

⚠WARNING
Hazardous voltage

FAILURE TO DISCONNECT AND LOCKOUT ELECTRICAL POWER BEFORE ATTEMPTING ANY MAINTENANCE CAN CAUSE SHOCK, BURNS OR DEATH.

⚠WARNING

Biohazard can cause serious personal injury.

UNIT MUST BE FLUSHED AND DISINFECTED, INSIDE AND OUT, PRIOR TO SERVICING.

Periodic Maintenance

NOTICE: ROUTINE PERIODIC INSPECTIONS ARE REQUIRED AND SHOULD FOLLOW THE FREQUENCY AND MAINTENANCE SCHEDULE PROVIDED.

FREQUENCY	REQUIRED MAINTENANCE
MONTHLY	• Duplex Units – Check for even operating times. Uneven operation times indicate a defective unit, float switch or control. • Unimpeded float operation.

Disassembly/Assembly

⚠WARNING

Hazardous voltage

FAILURE TO DISCONNECT AND LOCKOUT ELECTRICAL POWER BEFORE ATTEMPTING ANY MAINTENANCE CAN CAUSE SHOCK, BURNS OR DEATH.

NOTICE: FOLLOW ALL SAFETY AND LIFTING INSTRUCTIONS PROVIDED IN THIS MANUAL.

- Following the slide rail instructions, remove the pumping unit from the sewage containment area.

⚠WARNING

Biohazard can cause serious personal injury.

UNIT MUST BE FLUSHED AND DISINFECTED, INSIDE AND OUT, PRIOR TO SERVICING.

MECHANICAL SEAL REPLACEMENT

1. Follow **ALL** instructions provided in the **"DISASSEMBLY"** section of this manual.
2. To gain access to the pump impeller and mechanical seal remove the four casing hex cap screws (372D). Remove casing (100) and casing gasket (351); discard the gasket.

⚠CAUTION

Hazardous pressure can cause personal injury or property damage.

FAILURE TO REMOVE DRAIN PLUG CAREFULLY CAN CAUSE HOT OIL TO ERUPT FROM OIL RESERVOIR CAUSING PERSONAL INJURY OR PROPERTY DAMAGE

3. Removal of the mechanical seal assembly (387) requires draining the special insulating oil from the motor cover. This is accomplished by removing the drain plug and draining the oil into an adequately sized clean receptacle. See **"ENGINEERING DATA"** section for required volume.
4. To remove the impeller (101), it may be necessary to heat the impeller and impeller locknut (304), three phase motors only, with a torch. Use no more heat that is necessary, as excess heat will damage the mechanical seal. Secure the impeller from rotation, and remove the impeller lock nut, by turning the lock nut **COUNTERCLOCKWISE**. Remove the impeller from the motor shaft by holding the motor shaft with a screw driver and turning the impeller **COUNTER-CLOCKWISE.**
5. Remove and discard the mechanical seal and stationary seat assembly. **DO NOT** damage the motor shaft or the stationary seat bore.
6. Inspect and wipe clean the stationary seat bore.
7. To install the new stationary seat into the seal housing, lubricate the stationary seat bore and motor shaft with clean motor insulating oil. Using Goulds mechanical seal installation tool (A02A013), slide the stationary seat fully and squarely into the seal housing.
8. With a clean, lint free cloth, wipe the stationary face clean of all lubricating oil or debris. **DO NOT** scratch or otherwise damage the seal face.
9. Lubricate the inside of the rotary elastomer with clean motor insulating oil. Using the Goulds installation tool, slide the seal rotary assembly onto the motor shaft and seat fully against the stationary seat. Remove the seal installation tool.
10. Install the impeller onto the motor shaft by turning the impeller on **CLOCKWISE**, tighten securely. Treat the impeller with Loctite™ #271 and securely install. When provided, securely install the impeller locknut.
11. Fill the motor cover with motor special insulating oil to within ½" (13 mm) of the seal chamber housing. Tape drain plug with Teflon™ tape and install plug securely.
12. Reassemble casing and new casing gasket to pump assembly by installing the four casing hex cap screws, torquing in sequence to 35 lbs ft (47 N m).

NOTICE: FOLLOW THE INSTRUCTIONS PROVIDED IN THE **"WIRING AND GROUNDING"** AND **"OPERATION"** SECTIONS OF THE MANUAL AFTER UNIT DISASSEMBLY, REASSEMBLY.

POWER CABLE REPLACEMENT

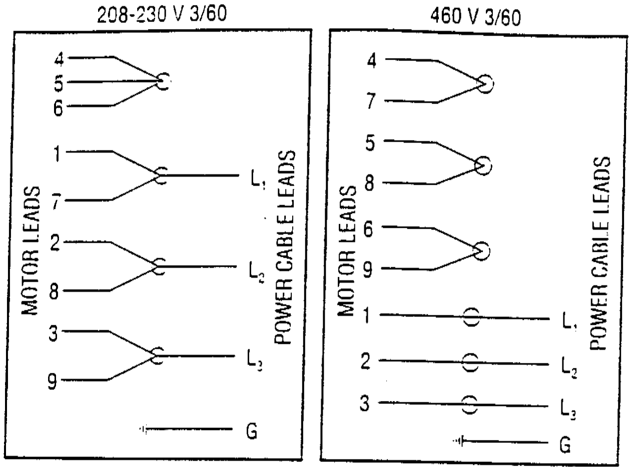
1. To gain access to the motor cover screws follow steps 1 through 6 in the **"MECHANICAL SEAL REPLACEMENT"** section of this manual.
2. Remove the power cable strain relief (484B) assembly from the motor cover and slide up the cable.
3. Remove the four bearing housing socket head screws (371C). Carefully slide the motor cover from the motor assembly. **DO NOT** damage the power cable.
4. Disconnect the power cable wires from the motor assembly (338).
5. Remove cable from motor cover, inspect and replace as required, following the procedures provided.

NOTICE: DISCARD STRAIN RELIEF ASSEMBLY. THEY CAN NOT BE REUSED.

6. Install new motor cable strain relief assembly onto cable, sliding the hex gland on first, then the washer and finally the packing. Insert the cables into the motor cover hole. Pull an appropriate amount of cable through the motor cover to allow for connecting the cable leads. **DO NOT** tighten the strain relief gland.

7. Connect the power cable leads to the motor assembly as follows:
   - Single Phase Motors – Connect the **BLACK** wire to motor terminal L_1. Connect the **WHITE** wire to motor terminal L_2. Connect the **GREEN** wire to the motor ground.
   - Three Phase Motors – See Figure 1.

⚠WARNING Hazardous voltage — **FAILURE TO CONNECT POWER AND SENSOR WIRES TO DESIGNATED WIRES CAN CAUSE SHOCK, BURNS OR DEATH.**



THREE PHASE MOTOR WIRING DIAGRAM

Figure 1

8. Wire tie the power cable to the motor assembly.
9. Slide the motor cover onto the motor assembly, while carefully pulling the power cable out through the motor cover hole. **DO NOT** damage cables. Install the four seal housing socket head screws, torquing to 90 lbs in (10 N m).
10. Install the power cable strain relief assembly torquing the nylon bushing to 75 lbs in (8.5 N m) and the steel bushing to 100 lbs in (11.3 N m).
11. Continue the assembly following steps 7 through 12 of the **"MECHANICAL SEAL REPLACEMENT"** section of this manual.
12. If the motor cover was replaced, it is necessary to transfer the Goulds nameplate. Using two stainless steel No. 2 round head metallic drive screws, install the Goulds nameplate.

NOTICE: FOLLOW THE INSTRUCTIONS PROVIDED IN THE **"WIRING AND GROUNDING"** AND **"OPERATION"** SECTIONS OF THE MANUAL AFTER UNIT DISASSEMBLY, REASSEMBLY.

START CAPACITOR REPLACEMENT

1. On single phase motors only, to gain access to the motor start capacitor (376), follow steps 1 through 5 in the **"POWER CABLE REPLACEMENT"** section of this manual.

NOTICE: DISCARD STRAIN RELIEF ASSEMBLY. IT CAN NOT BE REUSED.

⚠WARNING Hazardous voltage — **FAILURE TO DRAIN CAPACITOR OF STORED ELECTRICAL CHARGE BEFORE SERVICE CAN CAUSE A SEVERE SHOCK.**

2. Remove the capacitor retaining screw and retaining bracket from the motor assembly. Remove the two wires from the capacitor. Discard the capacitor.
3. Connect the two motor wires to the new capacitor and reassemble with the retaining bracket and retaining screw, tightening securely.
4. Reassemble unit following steps 6 through 12 in the **"POWER CABLE REPLACEMENT"** section of this manual.

NOTICE: FOLLOW THE INSTRUCTIONS PROVIDED IN THE **"WIRING AND GROUNDING"** AND **"OPERATION"** SECTIONS OF THE MANUAL AFTER UNIT DISASSEMBLY. REASSEMBLY.

MOTOR REPLACEMENT

1. To gain access to the motor assembly, follow steps 1 through 5 in the **"POWER CABLE REPLACEMENT"** section of this manual.

NOTICE: DISCARD STRAIN RELIEF ASSEMBLY. IT CAN NOT BE REUSED.

2. Remove the four motor thru bolts and carefully pull motor assembly from bearing housing. Further motor service **MUST** be provided by a qualified motor repair facility.
3. Insert the motor assembly into the bearing housing, visually aligning the motor thru bolts through the lower motor vent openings.
4. Install the four motor thru bolts, torquing to 35 lbs in (4 N m).
5. To complete the assembly follow steps 6 through 12 in the **"POWER CABLE REPLACEMENT"** section of this manual.

NOTICE: FOLLOW THE INSTRUCTIONS PROVIDED IN THE **"WIRING AND GROUNDING"** AND **"OPERATION"** SECTIONS OF THE MANUAL AFTER UNIT DISASSEMBLY. REASSEMBLY

Engineering Data

Maximum Diameter Solids		
3885	¾ in	19mm
3886 and 3887	2 in	50mm
Minimum Casing Thickness	5/16 in	8mm
Casing Corrosion Allowance	⅛ in	3mm
Minimum Working Pressure	55 psi	380kPa

Minimum Pump Submergence—Below Top of Motor Dome	6 in	152mm
Minimum Number of Evenly Distributed Starts per Hour	6	
Maximum Operating Temperature		
Continuous Operation	40° C	104° F
Intermittent Operation	60° C	140° F
Motor Cover Oil Capacity	4.5 qts.	4.3 L

ELECTRICAL DATA 3885

HP	RPM	Voltage	Phase /Hz	Amps	KVA Code	Winding Resistance Line to Line (Ohms)	Power Cable AWG	Fuse/Circuit Breaker Amps
⅓	1725	115	1/60	9.4	M	1.92	16/3	15
⅓	1725	230	1/60	4.7	N	7.58	16/3	10
½	3450	115	1/60	14.5	M	1.00	16/3	20
½	3450	230	1/60	7.3	M	4.03	16/3	10
½	3450	200	3/60	3.9	R	3.8	14/4	10
½	3450	230/460	3/60	3.4/1.7	R	5.81/23.24	14/4	10/10
¾	3450	230	1/60	10.0	J	2.99	14/3	15
¾	3450	200	3/60	6.2	L	5.7	14/4	10
¾	3450	230/460	3/60	5.4/2.7	L	4.04/16.15	14/4	10/10
1	3450	230	1/60	12.5	J	2.09	14/3	20
1	3450	200	3/60	8.1	M	2.6	14/4	10
1	3450	230/460	3/60	7.0/3.5	L	4.04/16.15	14/4	10/10
1½	3450	230	1/60	15.0	H	1.16	14/3	20
1½	3450	200	3/60	10.6	K	1.9	14/4	15
1½	3450	230/460	3/60	9.2/4.6	K	2.87/11.46	14/4	15/10
2	3450	230	1/60	18.0	F	M-1.1/S-2.2	14/3	20
2	3450	200-230/460	3/60	12.0-11.6/5.8	K	1.66/6.62	14/4	15/10

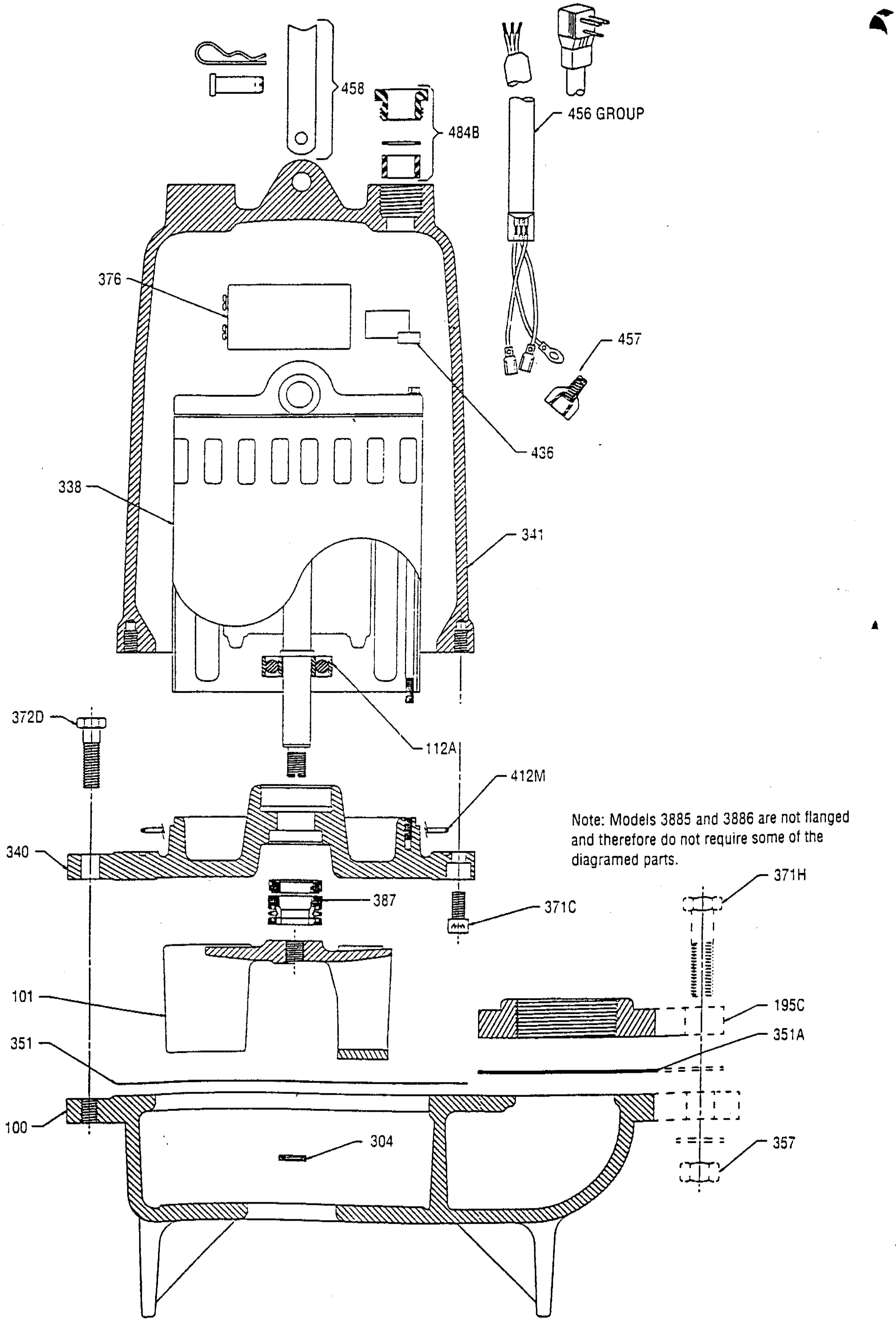
ELECTRICAL DATA 3886 AND 3887BF

⅓	1725	115	1/60	9.8	M	1.92	16/3	15
⅓	1725	230	1/60	4.9	N	7.58	16/3	10
½	1725	115	1/60	14.5	N	1.6	16/3	20
½	1725	230	1/60	7.3	K	6.4	16/3	10
½	1725	200	3/60	3.8	K	6.55	14/4	10
½	1725	230/460	3/60	3.3/1.7	K	9.9/39.4	14/4	10/10
¾	1725	230	1/60	9.4	J	5.9	14/3	15
¾	1725	200	3/60	4.1	H	4.3	14/4	10
¾	1725	230/460	3/60	3.6/1.8	J	5.6/22.4	14/4	10/10
1	1725	230	1/60	12.3	H	2.6	14/3	20
1	1725	200	3/60	6.0	H	4.3	14/4	10
1	1725	230/460	3/60	5.8/2.9	J	5.6/22.4	14/4	10/10

ELECTRICAL DATA 3887BHF

⅓	1725	115	1/60	12.4	M	1.00	16/3	15
⅓	1725	230	1/60	6.2	M	4.03	16/3	10
½	3450	115	1/60	14.5	M	1.00	16/3	20
½	3450	230	1/60	7.6	M	4.03	16/3	10
½	3450	200	3/60	4.1	R	3.8	14/4	10
½	3450	230/460	3/60	3.6/1.8	R	5.81/23.24	14/4	10/10
¾	3450	230	1/60	9.4	J	2.99	14/3	15
¾	3450	200	3/60	6.2	L	5.7	14/4	10
¾	3450	230/460	3/60	5.4/2.7	L	4.04/16.15	14/4	10/10
1	3450	230	1/60	14.5	J	2.1	14/3	20
1	3450	200	3/60	8.6	M	2.6	14/4	10
1	3450	230/460	3/60	7.5/3.8	L	4.0/16.2	14/4	10/10
1½	3450	230	1/60	18.0	F	M-1.1/S-2.2	14/3	20
1½	3450	200-230/460	3/60	10.0-9.6/4.8	K	1.66/6.62	14/4	15/10
2	3450	230	1/60	18.0	F	M-1.1/S-2.2	14/3	20
2	3450	200-230/460	3/60	12.0-11.6/5.8	K	1.66/6.62	14/4	15/10

Repair Parts Diagram for Models 3885, 3886 and 3887



Note: Models 3885 and 3886 are not flanged and therefore do not require some of the diagramed parts.

Model 3885 Repair Parts Table

Item No.	Part Name		Material	Qty. Reqd.	Repair Parts Order Number						Max. Wt. (lbs.)
					1725 RPM	3450 RPM					
					⅓ HP	½ HP	¾ HP	1 HP	1½ HP	2 HP	
0	Casing – ⅓ HP "L" model only		Cast Iron	1	1K171	N/A					13.0
	Casing – all others				1K170						
101	Impeller		Cast Iron	1	2K158	2K220	2K219	2K218	2K217	2K840	2.0
	Impeller		Bronze		2K271	2K272	2K273	2K274	2K275	2K841	2.5
	Impeller – high head		Cast Iron		N/A	2K225 HH	N/A	N/A	2K221HH	N/A	3.5
	Impeller – high head		Bronze		N/A	2K276 HH	N/A	N/A	2K277 HH	N/A	4.0
112A	Lower Ball Bearing		Steel	1	4K132					4K384	–
112B	Upper Ball Bearing		Steel	1	4K132						–
218	Insulating Oil (gallon)		Turbine Oil – Sunvis 932. Convis 150		4K432 (5 gallons)						7.5 lbs./ gal.
	Gallons required				1.2 gallons						
304	Impeller Locknut (3 PH only)		AISI 300 series SS	1	13K6						–
338	Motor	1 Phase. 115V	Stainless Steel Short Ext.	1	118-121R	118-1222R	N/A	N/A	N/A	N/A	13.0 to 24.0
		1 Phase. 230V			118-122R	118-1223R	118-1232R	118-1233R	118-1334R	120-845R	
		3 Phase. 230/460 V			N/A	118-1321R	118-1322R	118-1323R	118-1324R	120-8425R	
		3 Phase. 200 V			N/A	118-1333R	118-1334R	118-1335R	118-1336R	120-8425R	
340	Bearing Housing		Cast Iron	1	1K167					1K332	10.0
341	Motor Cover	1 PH	Cast Iron	1	1K207	1K207	1K208	1K208	1K208	1K208	23.0
		3 PH			1K208						
351	Casing Gasket		Composite	1	5K170						–
358E	Plug – motor cover ⅜" NPT		Steel	1	6K3						–
371C	Skt. Hd. Screw – brg. housing to motor cover		AISI 300 series SS	2	13K210						–
372D	Hex Screw – seal housing to casing		AISI 300 series SS	4	13K186						–
376	Capacitor (1 PH only)	Start	Varies	1	1K197	9K197	9K197	9K197	9K197	275470130	–
		Run			N/A	N/A	N/A	N/A	N/A	279342110	
387	Mechanical Seal – standard		Silicon Carbide	1	10K63 (John Crane Type 6)					10K71	–
	Mechanical Seal – optional		Tungsten Carbide	1	10K30 (John Crane Type 21)					10K72	–
2M	O-ring – motor cover		BUNA-N, AS 568A-166	1	4K252						–
36	Solid State Switch				N/A					294811980	
456	Power cable			1	See chart below						–
457	Wire nut (power cable)	3 PH. 200/230 V	Nylon Housing	4	9K145						–
		3 PH, 460 V		6	9K145						–
458	Handle Assembly		AISI 300 series SS	1	4K243						–
484B	Strain Relief Assembly (power cable)	1 PH	Varies	1	5K113	5K113	5K111	5K111	5K111	5K111	–
		3 PH		1	N/A	5K111					–
	Loctite #271			1	AL271121						–

Model 3885 Power and Sensor Cables Description	Type and AWG Size	Standard length*	Optional Lengths			Wt. (lbs./5 ft.)
		20'	30'	50'	100'	
Power Cables						
1 PH: ⅓ and ½ HP, 115 V: standard with plug, optional with bare leads	SJTOW – 16/3	9K165	9K214	9K215	N/A	0.5
1 PH: ⅓ and ½ HP, 230 V: standard with plug, optional with bare leads	SJTOW – 16/3	9K164	9K214	9K215	N/A	0.5
1 PH: ¾ – 1½ HP, 230 V with bare leads	STOW – 14/3	9K163	9K216	9K161	9K217	0.9
1 PH: 1½ – 2 HP, 230 V with bare leads	STOW – 14/3	9K266	9K267	9K268	9K269	0.9
3 PH: ½ – 2 HP, 208–230/460 V with bare leads	STOW – 14/4	9K153	9K218	9K154	9K219	1.1

Model 3886 and 3887 Repair Parts Table

Note: The 1K168 is the casing for the 3886 ½ HP. The 1K178 is the casing for the 3887 ⅓ – 1 HP.

Item No.	Part Name	Material	Qty.	Repair Parts Order Number							Max. Wt. (lbs.)
				1725 RPM				3450 RPM			
				⅓ HP	½ HP	¾ HP	1 HP	1 HP	1½ HP	2 HP	
100	Casing	Cast Iron	1	1K168 for NPT 3886		1K178 for flanged 3887			1K330		16.5
101	Impeller	Cast Iron	1	2K268	2K239	2K240	2K241	2K242	2K800	2K798	3.0
	Impeller	Bronze	1	2K279	2K280	2K281	2K282	2K283	2K801	2K799	3.5
112A	Lower Ball Bearing	Steel	1	4K132					4K384		–
112B	Upper Ball Bearing (Not Shown)	Steel	1	4K132							–
195C	Discharge Flange (2" NPT STD.)	Cast Iron	1	6K76							1.5
	Discharge Flange (3" NPT OPT.)	Cast Iron	1	A1-3							1.5
218	Motor Insulating Oil (Approx. 1 Gallon Required)	Turbine Oil	1	4K432							7.5 lbs./gal.
304	Impeller Locknut (3 PH only)	AISI 300 series SS	1	13K6							–
338	Motor – 1 Phase. 115V	Stainless Steel	1	118-121R	118-123R	N/A	N/A	N/A	N/A	N/A	13.0 to 24.0
	Motor – 1 Phase. 230V			118-122R	118-124R	118-1212R	118-1213R	118-1233R	120-844R	120-845R	
	Motor – 3 Phase. 230/460 V			N/A	118-132R	118-1304R	118-134R	118-1323R	N/A	N/A	
	Motor – 3 Phase. 200 V			N/A	118-1314R	118-1316R	118-1316R	118-1335R	N/A	N/A	
	Motor – 3 Phase. 200-230/460 V			N/A	N/A	N/A	N/A	N/A	120-8425R	120-8425R	
340	Bearing Housing	Cast Iron	1	1K167					1K332		10.0
341	Motor Cover – 1 Phase	Cast Iron	1	1K207	1K207	1K208	1K208	1K208	1K208	1K208	20.0
	Motor Cover – 3 Phase			1K208							
351	Casing Gasket	Composite	1	5K170							–
351A	Discharge Flange Gasket	Composite	1	5K150							–
357	Hex Nut – discharge flange	AISI 300 series SS	2	13K99							
358E	Plug – motor cover ¼" NPT	Steel	1	6K3							–
371C	Skt. Hd. Screw – brg. housing to motor cover	AISI 300 series SS	4	13K210							–
371H	Hex Screw – discharge flange	AISI 300 series SS	2	13K153							–
372D	Hex Screw – bearing housing to casing	AISI 300 series SS	4	13K186							–
376	Capacitor (1 PH only) Start	Varies	1	9K197	9K197	9K235	9K235	9K197	275469128	275470130	–
	Capacitor (1 PH only) Run			N/A	N/A	N/A	N/A	N/A	N/A	279342110	
387	Mechanical Seal – standard	Silicon Carbide	1	10K63 (John Crane Type 6)					10K71		–
	Mechanical Seal – optional	Tungsten Carbide	1	10K30 (John Crane Type 21)					10K72		–
412M	O-ring – motor cover	Nitrile	1	4K252							–
436	Solid State Switch (motor)	–	1	N/A					294612982	294811980	–
456	Power Cable	–	1	See chart below							–
457	Wire Nut 3 PH. 200/230 V	Nylon Housing	4	9K145							–
	Wire Nut 3 PH. 460 V		6	9K145							–
458	Handle Assembly	AISI 300 series SS	1	4K243							–
484B	Strain Relief Assembly (power cable) 1 PH	Varies	1	5K113	5K113	5K111	5K111	5K111	5K111	5K111	–
	Strain Relief Assembly (power cable) 3 PH		1	N/A	5K111						–
528	Washer – discharge flange	AISI 300 series SS	2	13K82							–
	Loctite #271	–	1	AL27121							–

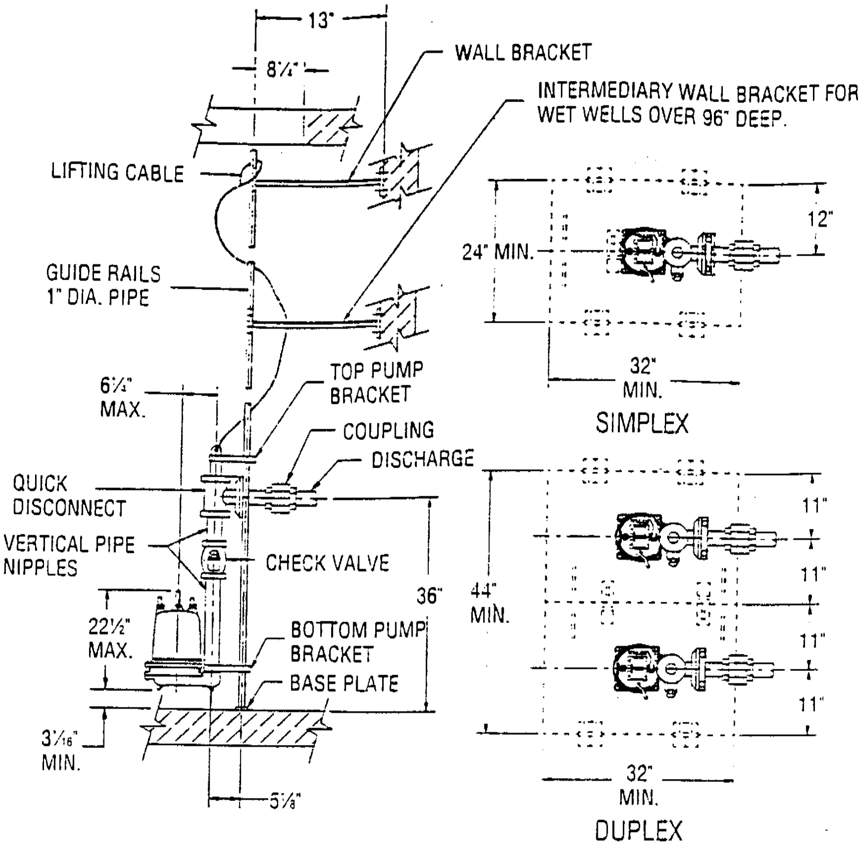
* Consult Factory

Model 3887 Power Cables Description	Type and AWG Size	Standard length*	Optional Lengths			Wt. (lbs./5 ft.)
		20'	30'	50'	100'	
Power Cables						
1 PH: ⅓ and ½ HP. 115 V: standard with plug, optional length with bare leads	SJTOW – 16/3	9K165	9K214	9K215	N/A	0.5
1 PH: ⅓ and ½ HP. 230 V: standard with plug, optional length with bare leads	SJTOW – 16/3	9K164	9K214	9K215	N/A	0.5
1 PH: ¾ – 1HP. 230 V with bare leads	STOW – 14/3	9K163	9K216	9K161	9K217	0.9
1 PH: 1½ – 2 HP. 230 V with bare leads	STOW – 14/3	9K266	9K267	9K268	9K269	0.9
3 PH: ½ – 2 HP. 208–230/460 V with bare leads	STOW – 14/4	9K153	9K218	9K154	9K219	1.1

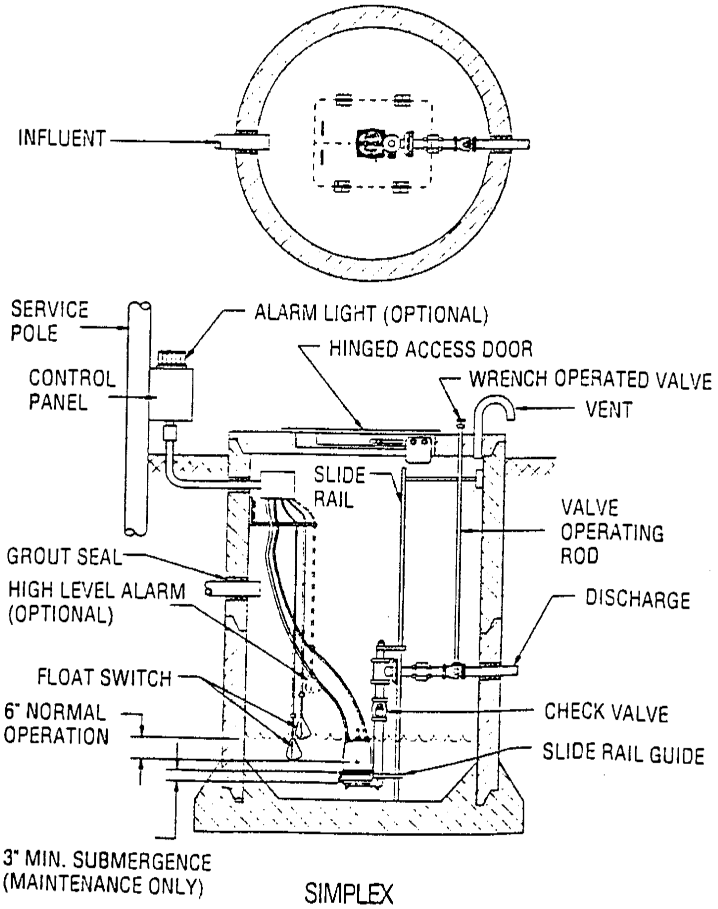
9K197 REF#615996 1 or 624751 1 MFD 110 VAC

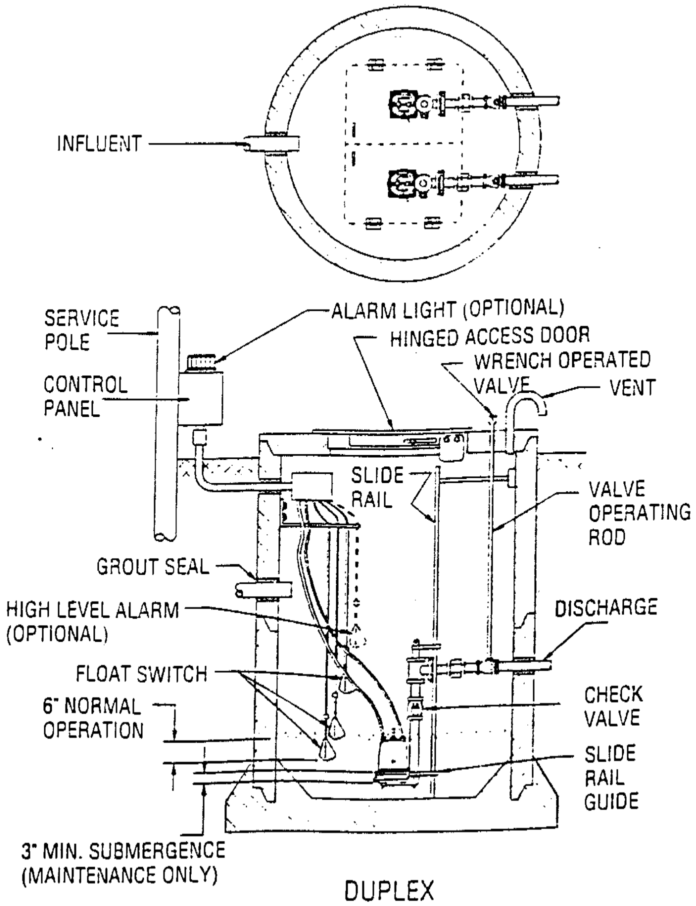
9K235 REF#615996 2 189/227 MFD 110 VAC

Typical 2" Slide Rail Installation



Typical Plumbing and Installation





Trouble Shooting

⚠WARNING

Hazardous voltage

FAILURE TO DISCONNECT AND LOCKOUT ELECTRICAL POWER BEFORE ATTEMPTING ANY SERVICE CAN CAUSE SHOCK, BURNS OR DEATH.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
MOTOR NOT RUNNING	Motor thermal protector tripped.	Allow motor to cool. Insure minimum pump submergence. Clear debris from casing and impeller.
NOTE: If circuit breaker "OPENS" repeatedly, DO NOT reset. Call qualified electrician.	Open circuit breaker or blown fuse.	Determine cause, call a qualified electrician.
	Pump impeller binding or jammed.	Check motor amp draw. If two or more times higher than listed in the "DESCRIPTION AND SPECIFICATIONS" section, impeller is locked, motor bearings or shaft is damaged. Clear debris from casing and impeller, consult with dealer.
a)Manual operation	Power cable is damaged.	Resistance between power leads must read as shown in "ENGINEERING DATA". Resistance between power leads and ground should read infinity. If any reading is incorrect, call a qualified electrician..
b) Automatic operation in control panel.	Inadequate electrical connection	Inspect control panel wiring. Call a qualified electrician.
NOTE: Check the pump in manual mode first to confirm operation. If pump operates, the automatic controls are at fault. If pump does not operate, see above.	Defective liquid level switch.	With switch disconnected, check continuity while activating liquid level switch. Replace switch, as required.
	Insufficient liquid level to activate controls.	Allow liquid level to rise 3" to 4" (76 mm - 101 mm) above turn-on level.
	Liquid level cords tangled.	Untangle cords and insure free operation.
PUMP WILL NOT TURN OFF	Liquid level cords tangled.	Untangle cords and insure free operation.
	Pump is air locked.	Shut off pump for approximately one minute, then restart. Repeat until air lock clears. If air locking persists in a system with a check valve pipe, a 0.188" (5 mm) hole may be drilled in the discharge pipe approximately 2" (51 mm) beyond the discharge connection.
	Influent flow is matching pump's discharge capacity.	Larger pump may be required.
LITTLE OR NO LIQUID DELIVERED BY PUMP	Check valve installed backwards, plugged or stuck closed.	Check flow arrow on valve and check valve operation.
	Excessive system head.	Consult with dealer.
	Pump inlet plugged.	Inspect and clear as required.
	Improper voltage or wired incorrectly.	Check pump rotation, voltage and wiring. Consult with qualified electrician.
	Pump is air locked.	See recommended action, above.
	Impeller is worn or damaged.	Inspect impeller, replace as required.
	Liquid level controls defective or improperly positioned.	Inspect, readjust or replace as required.
PUMP CYCLES CONSTANTLY	Discharge check valve inoperative.	Inspect, repair or replace as required.
	Sewage containment area too small.	Consult with dealer.
	Liquid level controls defective or improperly positioned.	Inspect, readjust or replace as required.
	Influent excessive for this size pump.	Consult with dealer.

GOULDS PUMPS LIMITED WARRANTY

This warranty applies to all water systems pumps manufactured by Goulds Pumps.

Any part or parts found to be defective within the warranty period shall be replaced at no charge to the dealer during the warranty period. The warranty period shall exist for a period of twelve (12) months from date of installation or eighteen (18) months from date of manufacture, whichever period is shorter.

A dealer who believes that a warranty claim exists must contact the authorized Goulds Pumps distributor from whom the pump was purchased and furnish complete details regarding the claim. The distributor is authorized to adjust any warranty claims utilizing the Goulds Pumps Customer Service Department.

The warranty excludes:

(a) Labor, transportation and related costs incurred by the dealer;
(b) Reinstallation costs of repaired equipment;
(c) Reinstallation costs of replacement equipment;
(d) Consequential damages of any kind; and,
(e) Reimbursement for loss caused by interruption of service.

For purposes of this warranty, the following terms have these definitions:

(1) "Distributor" means any individual, partnership, corporation, association, or other legal relationship that stands between Goulds Pumps and the dealer in purchases, consignments or contracts for sale of the subject pumps.
(2) "Dealer" means any individual, partnership, corporation, association, or other legal relationship which engages in the business of selling or leasing pumps to customers.
(3) "Customer" means any entity who buys or leases the subject pumps from a dealer. The "customer" may mean an individual, partnership, corporation, limited liability company, association or other legal entity which may engage in any type of business.

THIS WARRANTY EXTENDS TO THE DEALER ONLY.

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

ROSEDALE PRODUCTS, INC.

MODEL 8

150 PSIG RATED FILTER UNIT

Table of Contents

I. Installation

Please remove all shipping and crating materials carefully. Be sure to remove the plugs from the inlet and outlet openings. Dispose of all crating materials safely.

The Model 8 Filter unit is capable of having several different piping variations based upon the outlet style of your unit. The inlet service line should be connected to the inlet flange or NPT coupling located near the top of the unit (above the basket level).

The outlet service line should be connected to the outlet flange or coupling, located near the middle or bottom of the unit depending upon the style of your unit (below basket level).

There are two 1/4" NPT ports on the shell and one 1/4" NPT port on the cover of the Model 8 Filter unit. These ports can remain plugged or used for pressure gauges or special fittings as your application requires.

Some installations require electrical grounding of all equipment, be sure to provide adequate grounding where necessary.

After completing installation be sure to double check connections for integrity. Your Model 8 Filter unit has been factory pressure tested leak free, therefore, any seepage problems usually occur from improper installation connections.

You are now ready to install the filter basket and bag. Remove cover by loosening the cover eyenuts. The eyenuts in the slotted corners should be loosened sufficiently to swing free. Loosen the third eyenut sufficiently to allow the top cover and closure assembly to swing away from the top of the unit.

If your application requires a basket seal, insert the basket seal into the basket collar groove. Refer to Figure 1 or Figure 2 in the Spare Parts Diagram for installation position of your seal.

Place the basket into the filter housing, make sure the basket flange is firmly seated into the basket collar.

Insert bag into the bag basket making sure filter bag ring is firmly seated inside the basket flange. For best results, be sure filter bag is installed fully extended to the bottom of the basket.

Before replacing cover assembly, inspect cover seal gasket (replacing as necessary). Close cover and alternately tighten the three clamp assemblies evenly to ensure a leak proof seal between the cover and housing body. Torque closure assemblies to a minimum of $150^{\text{inch-lbs}}$. Higher torque may be required depending on your application and filter condition.

Your Rosedale Model 8 is now ready for operation!

II. Operation

Filter System Start-Up Procedure:

Prior to turning on the flow to the inlet service, please make the following checks:

1. Check inside filter unit to be sure basket and filter bag (if applicable) are in housing and do not require cleaning or replacement. If necessary install a clean filter basket and bag (if applicable).

2. Check that filter unit cover is securely fastened to housing. You are now ready to open the flow to the inlet service line. Slowly open the inlet service line approximately 25% of normal operational flow (open slowly as not to displace filter bag inside the housing). After filter unit is pressurized and vented, slowly open outlet service line unit valve until completely open. Complete opening of inlet service line until desired flow rate is reached.

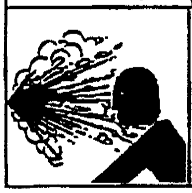
Once the desired service flow has been established, the filter will operate efficiently until dirty. However, under no circumstances should more than *15 PSI Differential Pressure* through the filter be obtained. Operating the filter unit with a high differential may cause filter bags to rupture and/or cause damage to filter system and downstream equipment.

To prevent excessive drop through the filter unit, regular inspection of the filter media is required. Monitoring of differential pressure through the housing can be utilized as a means of determining whether or not the filter media needs cleaning or replacement.

When it becomes necessary to clean or replace filter media, follow the procedure outlined below:

1. First close the flow from the inlet service line.
2. Close the flow to the outlet service line. (In some applications closing flow to outlet is not required.)
3. Relieve the pressure from the filter unit.

⚠ WARNING



CONTENTS UNDER PRESSURE
Relieve Pressure in accordance with Manufacturer's Instructions before opening Filter Vessel.
FAILURE TO DO SO MAY RESULT IN SERIOUS BODILY INJURY.

4. Drain housing sufficiently to access filter basket.
5. Remove cover by loosening the cover eyenuts. The eyenuts in the slotted corners should be loosened sufficiently to swing free. Loosen the third eyenut sufficiently to allow the top cover and closure assembly to swing away from the top of the unit.
6. Remove filter basket and clean thoroughly, remove the filter bag (if applicable) and throw away. (Cleaning and reusing the filter bag is not recommended.)

Rosedale Engineering Standards are the property of Rosedale Products, Inc. A Rosedale standard or copy thereof shall not be distributed (except with express approval of Rosedale Products, Inc.) to any individual or firm beyond the intended recipient firm or individual. Firms of individuals acting contrary to the above may be subject to suit, ineligibility for continued or future employment, or removal from Rosedale's "Approved Manufacturers and Specialty Contractors List".

7. Remove debris and sludge from inside the inlet portion of housing to avoid interference with cover seal or flow of fluid being filtered.
8. Remove basket seal and inspect, replace if necessary. Clean basket seal groove and replace basket seal (see spare parts diagram for location of basket seal).
9. Install clean filter basket and filter bag (if applicable). Place the basket into the filter housing, make sure the basket flange is firmly seated into the basket collar. If applicable, insert bag into the bag basket making sure filter bag ring is firmly seated inside the basket flange. For best results, be sure filter bag is installed fully extended to the bottom of the basket.
10. Inspect cover gasket for cuts or other signs of failure and make sure it is properly seated.
11. Move cover back into position, and alternately tighten the three clamp assemblies evenly to ensure a leak proof seal between cover and housing body. Torque closure assemblies to a minimum of 150$^{\text{inch-lbs}}$. Higher torque may be required depending on your application and filter condition.

Your Rosedale Model 8 Filter unit is now ready for operation. Refer to filter system start-up procedure.

III. Spare Parts List

Your Rosedale Model 8 Filter unit will give you many years of reliable service provided periodic inspections are made of various components and replacement of worn parts are made promptly. The following is meant to be a recommended spare parts list, these parts are illustrated on the following page.

SPARE PARTS LIST

Balloon	Description	Part Number	Time Frame
1	Cover Seal	8150CG-*	as needed
2	Basket Seal	8BG-*	as needed
3	Cover	8*150	as needed
4	Eye Nut	8ENNI	as needed
5	Rod End	8RENI	as needed
6	Clevis Pin Assembly	8CPNI	as needed
7	Filter Bag	(See Order)	as needed
8	Filter Basket	(See Order)	as needed
9	Tripod Legs	8T22*S	as needed

* Select Material Designation:

C=Carbon Steel
S=304 Stainless Steel
S316=316 Stainless Steel

B=Buna N
E=Ethylene Propylene
V=Viton
TEV=Teflon Encapsulated Viton
TSW=Teflon Solid White

IV. Spare Parts Diagram

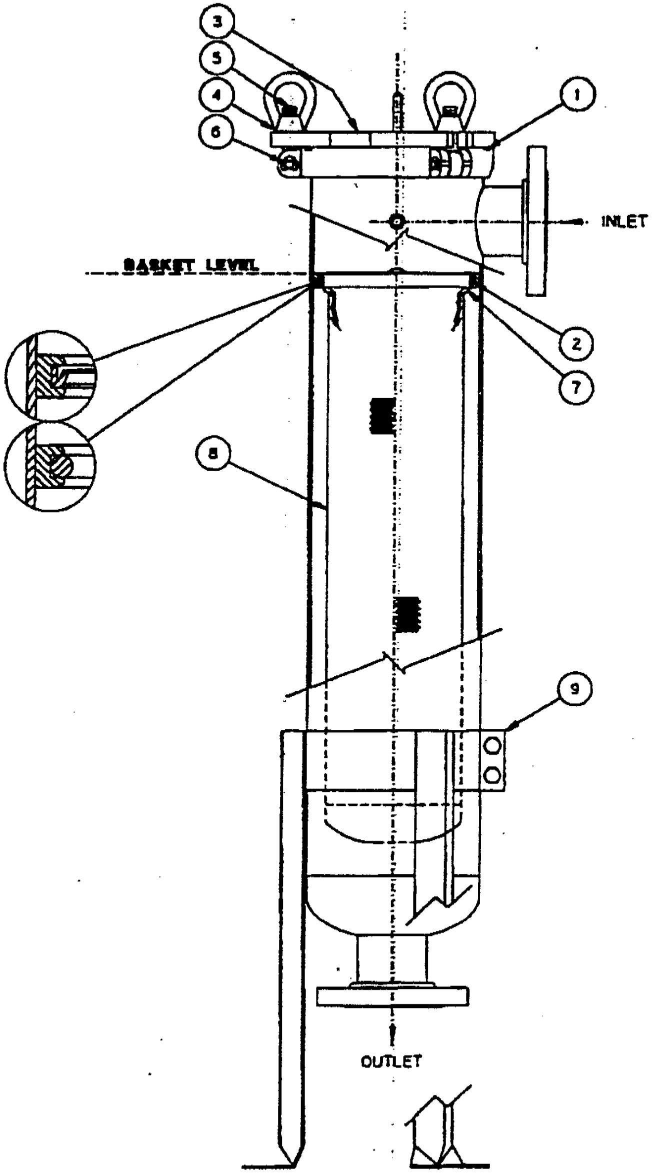


Figure 1
'V'-seal

Figure 2
O-ring

Important Notice

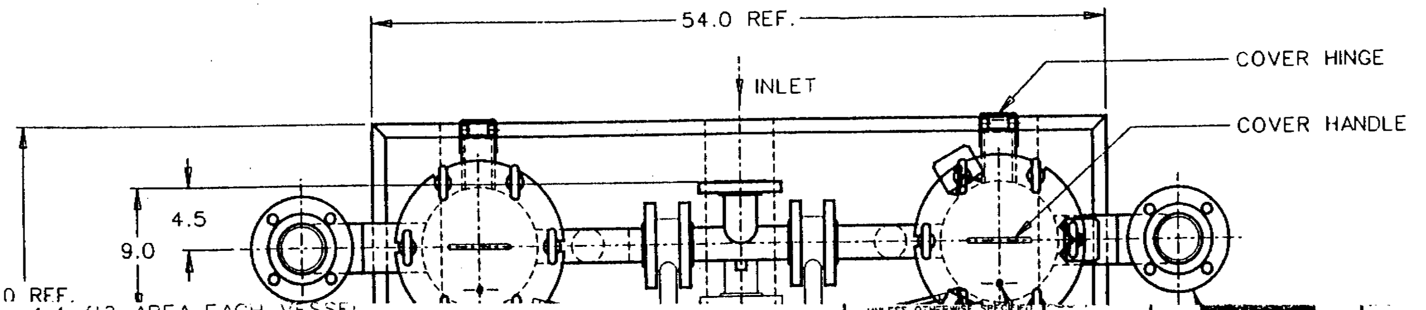
Warranty: In the event any Rosedale Products, Inc. filtration product is found to be defective in material, workmanship, or not in conformance with any express warranty for a specific purpose, Rosedale's only obligation and your exclusive remedy, shall be to repair, replace or refund the purchase price of such parts or products upon timely notification thereof and substantiation that the product has been stored, maintained and used in accordance with Rosedale's written instructions.

EXCLUSIONS TO WARRANTY: THIS WARRANTY IS EXCLUSIVE AND IS IN LIEU OF ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OTHER WARRANTY OF QUALITY, EXCEPT OF TITLE AND AGAINST PATENT INFRINGEMENT.

LIMITATION OF LIABILITY: Except as provided above, Rosedale shall not be liable or responsible for any loss or damage, whether direct, indirect, incidental, special or consequential, arising out of sale, use or misuse of Rosedale filtration products, or the user's inability to use such products.

THE REMEDIES SET FORTH HEREIN ARE EXCLUSIVE.

Rosedale Products, Inc.
3730 West Liberty Road
Ann Arbor, MI 48103 USA
734-665-8201
800-821-5373
Fax. 734-665-2214
Filters@mcimail.com
http://www.webcom.com/~filters/



4.4 ft2 AREA EACH VESSEL
$\frac{9}{64}$ DIA. HOLES ON $\frac{3}{16}$ ST. C S (51% OPEN)

6. FILTER BAG
(ORDER SEPARATELY)
7. O-RING MATERIAL
VITON
8. MODEL NUMBER
D8302F1150CVS-FB-D-C

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

TOLERANCES			
3 PLACE DEC	2 PLACE DEC	OTHER	ANGULAR
±	±	± 1/4	±

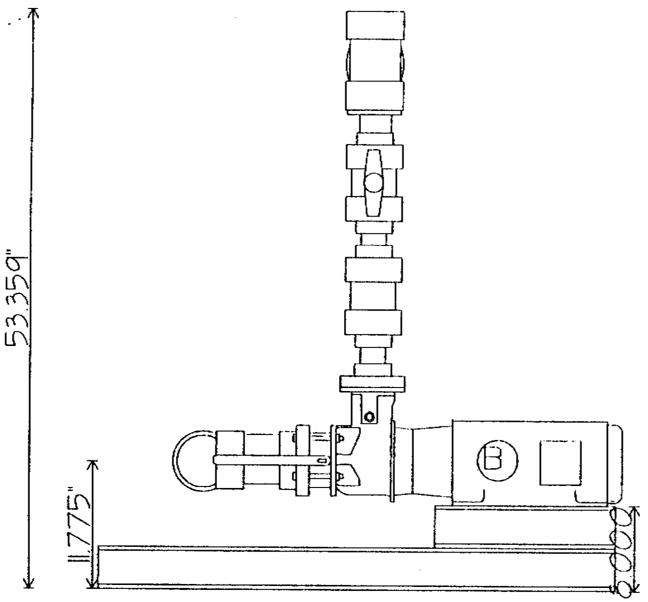
MACHINED SURFACES
DEBURR ALL EDGES:
FILLET RADIUS:

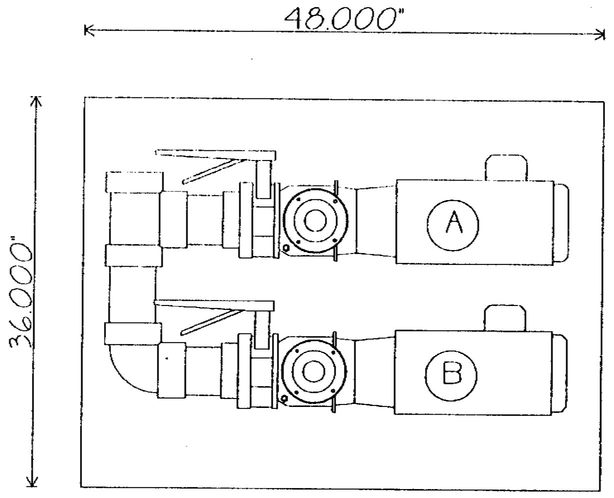
REF.
DR. MG
DATE 18JUL01
CH.
DATE
SCALE 1/8

ROSEDALE PRODUCTS, INC.
P.O. BOX 1085
ANN ARBOR, MI
48106

W/ INDIVIDUAL HANDLES
W/ SKID
FILTRATION UNLIMITED

ITEM NO.
SHEET 1 OF 1
DRAWING NO. C18838.10
REV.

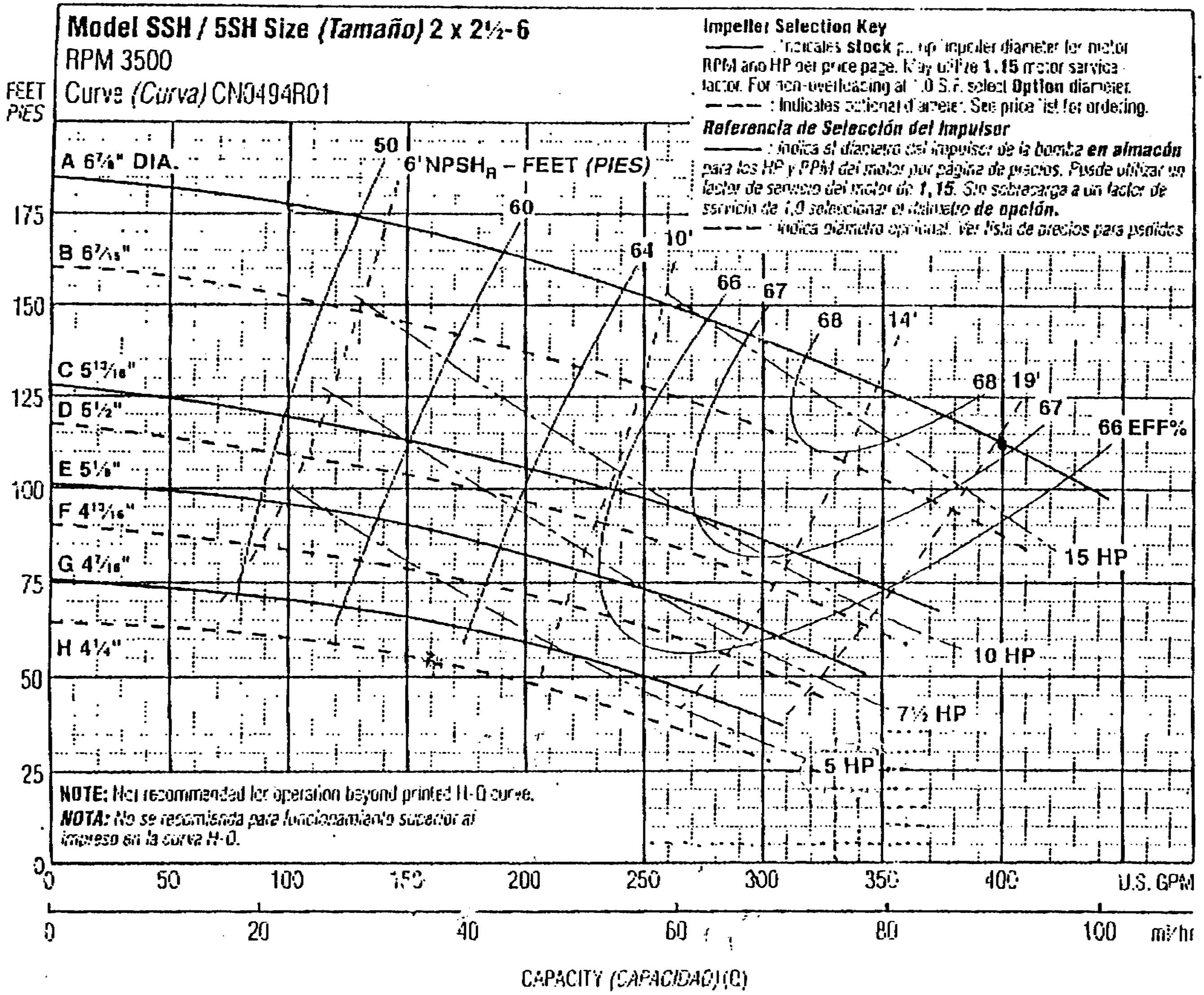




Ⓐ PUMP #1

Ⓑ PUMP #2

Ⓒ CARBON STEEL SKID



Model SSH / 5SH Size *(Tamaño)* 2 x 2½-6
RPM 3500
Curve *(Curva)* CN0494R01

Impeller Selection Key
——— : Indicates **stock** pump impeller diameter for motor RPM and HP per price page. May utilize **1.15** motor service factor. For non-overloading at 1.0 S.F. select **Option** diameter.
– – – : Indicates optional diameter. See price list for ordering.

Referencia de Selección del Impulsor
——— : *Indica el diámetro del impulsor de la bomba* ***en almacén*** *para los HP y RPM del motor por página de precios. Puede utilizar un factor de servicio del motor de* ***1,15****. Sin sobrecarga a un factor de servicio de 1,0 seleccionar el diámetro* ***de opción.***
– – – : *Indica diámetro opcional. Ver lista de precios para pedidos*

NOTE: Not recommended for operation beyond printed H-Q curve.
NOTA: *No se recomienda para funcionamiento sucesivo al impreso en la curva H-Q.*

Optional Impeller, *Impulsor Opcional*		
Impeller Code, *Código del Impulsor*	**Dia., *Diá.***	**Motor HP, *HP del motor***
A	6⅞'	15
B	6⁷⁄₁₆	15
C	5¹³⁄₁₆	10
D	5½	10
E	5⅛	7½
F	4¹³⁄₁₆	7½
G	4⁷⁄₁₆	5
H	4¼	5

NOTE: Pump will pass a sphere to ⁵⁄₃₂" diameter.

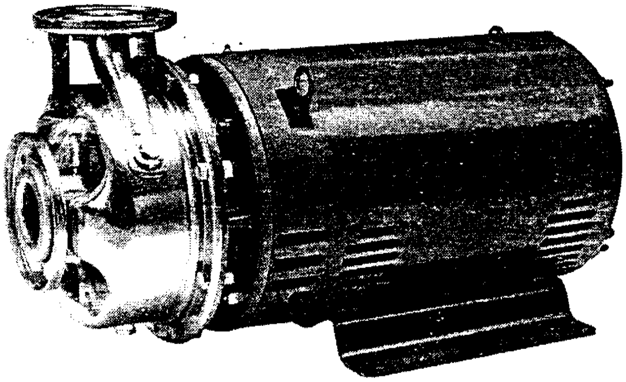
NOTA: *La bomba pasará una esfera a ⁵⁄₃₂" diámetro.*

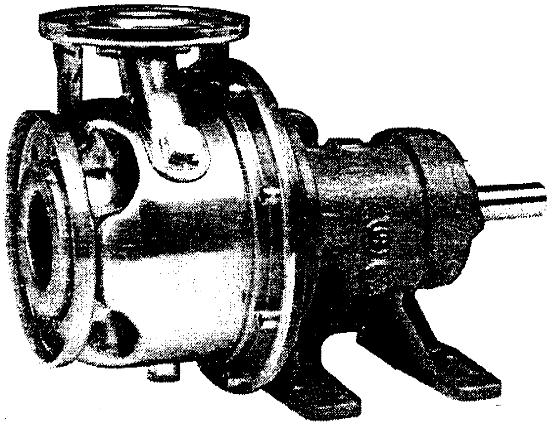
G&L Pumps

G&L Pumps

Installation, Operation and Maintenance Instructions

Models SSH-C and SSH-F





Owner's Information

Please fill in data from your pump nameplate.
Warranty information is on page 28.

Pump Model: ____________________

Serial Number: ____________________

Dealer: ____________________

Dealer's Phone Number: ____________________

Date of Purchase: ____________________

ıstallation Date: ____________________

Table of Contents

Goulds Pumps

ITT Industries

SAFETY INSTRUCTIONS

TO AVOID SERIOUS OR FATAL PERSONAL INJURY OR MAJOR PROPERTY DAMAGE, READ AND FOLLOW ALL SAFETY INSTRUCTIONS IN MANUAL AND ON PUMP.

THIS MANUAL IS INTENDED TO ASSIST IN THE INSTALLATION AND OPERATION OF THIS UNIT AND MUST BE KEPT WITH THE PUMP.

⚠ This is a **SAFETY ALERT SYMBOL.** When you see this symbol on the pump or in the manual, look for one of the following signal words and be alert to the potential for personal injury or property damage.

⚠ DANGER Warns of hazards that **WILL** cause serious personal injury, death or major property damage.

⚠WARNING Warns of hazards that **CAN** cause serious personal injury, death or major property damage.

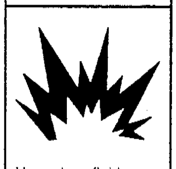
⚠ CAUTION Warns of hazards that **CAN** cause personal injury or property damage.

NOTICE: INDICATES SPECIAL INSTRUCTIONS WHICH ARE VERY IMPORTANT AND MUST BE FOLLOWED.

THOROUGHLY REVIEW ALL INSTRUCTIONS AND WARNINGS PRIOR TO PERFORMING ANY WORK ON THIS PUMP.

MAINTAIN ALL SAFETY DECALS.

⚠WARNING



Hazardous fluids can cause fire, burns or death.

UNIT NOT DESIGNED FOR USE WITH HAZARDOUS LIQUIDS OR FLAMMABLE GASES. THESE FLUIDS MAY BE PRESENT IN CONTAINMENT AREAS.

NOTICE: INSPECT UNIT FOR DAMAGE AND REPORT ALL DAMAGE TO THE CARRIER OR DEALER IMMEDIATELY.

1. Important Instructions

1. Inspect unit for damage. Report damage to carrier immediately.
2. Electrical supply must be a separate branch circuit with fuses or circuit breakers, wire sizes, etc., per National and Local electrical codes. Install an all-leg disconnect switch near pump.

⚠WARNING

Hazardous voltage can shock, burn or cause death.

ALWAYS DISCONNECT ELECTRICAL POWER WHEN HANDLING PUMP OR CONTROLS.

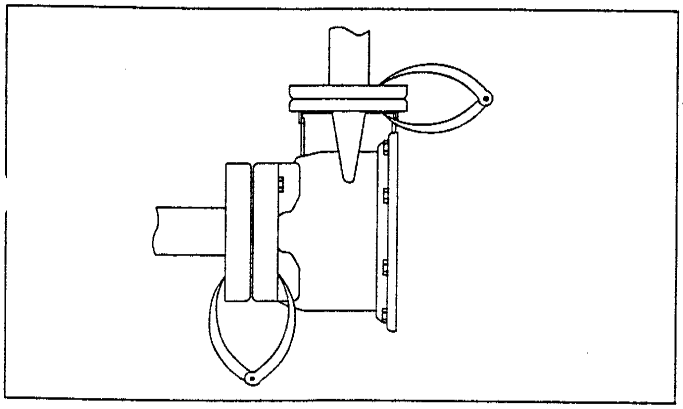
3. Motors must be wired for proper voltage (check nameplate). Wire size must limit maximum voltage drop to 10% of nameplate voltage at motor terminals, or motor life and pump performance will be lowered.
4. **Single-Phase:** Thermal protection for single-phase units is sometimes built-in (Check nameplate). If no built-in protection is provided, use a contactor with proper overload. Fusing is permissible if properly fused.
5. **Three-Phase:** Provide three-leg protection with proper size magnetic starter and thermal overloads.
6. Maximum Liquid Temperatures:
   212°F (100°C) with standard seal.
   250°F (120°C) with optional high-temperature seal.
7. Maximum allowable operating pressure: 230 PSI (15 bars).
8. Maximum number of starts per hour: 20, evenly distributed.
9. Regular Inspection and Maintenance will increase service life. Base schedule on operating time.

2. Installation

1. Close-coupled units may be installed inclined or vertical.

⚠ CAUTION **DO NOT INSTALL WITH MOTOR BELOW PUMP. CONDENSATION WILL BUILD UP IN MOTOR.**

2. Locate pump as near liquid source as possible (below level of liquid for automatic operation).
3. Protect from freezing or floods.
4. Allow adequate space for servicing and ventilation.
5. For close-coupled pumps, the foundation must be flat and substantial to eliminate strain when tightening bolts. Use rubber mounts to minimize noise and vibration. Tighten motor hold-down bolts before connecting piping to pump.
6. For frame-mounted pumps, permanent and solid foundation is required for smooth operation. Bedplate must be grouted to a foundation with solid footing.
7. Place unit in position on wedges located at four points (Two below approximate center of driver and two below approximate center of pump). Adjust wedges to level unit, bringing coupling halves into reasonable alignment. Level or plumb suction and discharge flanges.
8. Make sure bedplate is not distorted and final coupling alignment can be made within the limits of movement of motor and by shimming if necessary.
9. Tighten foundation bolts finger tight and build dam around foundation. Pour grout under bedplate making sure the areas under pump and motor feet are filled solid. Allow grout to harden 48 hours before further tightening foundation bolts.
10. All piping must be supported independently of the pump, and must "line-up" naturally. **Never draw piping into place by forcing the pump suction and discharge connections!**
11. Angular alignment of the flanges can best be accomplished using calipers at bolt locations (See illustration).



12. On frame-mounted units, tighten foundation, pump and driver hold-down bolts before connecting piping to pump.
13. Avoid unnecessary fittings. Select sizes to keep friction losses low.
14. After completing piping, rotate unit by hand to check for binding. **Note:** A screwdriver slot or flats are provided in end of motor shaft.

3. Alignment

1. No field alignment is necessary on close-coupled pumps.
2. Even though the pump-motor unit may have a factory alignment, in transit this alignment could be disturbed and must be checked prior to running.
3. Check the tightness of all hold-down bolts before checking the alignment.
4. If re-alignment is necessary, always move the motor. Shim as required.

. Final alignment is achieved when parallel and angular requirements are achieved with both pump and motor hold-down bolts tight.

⚠ CAUTION **ALWAYS RECHECK BOTH ALIGNMENTS AFTER MAKING ADJUSTMENTS.**

6. Parallel misalignment exists when the shafts are not concentric. Place dial indicator on one hub and rotate this hub 360° while taking readings on the outside diameter of the other hub. Parallel alignment occurs when Total Indicator Reading is .005" or less.
7. Angular misalignment exists when the shafts are not parallel. Place dial indicator on one hub and rotate this hub 360° while taking readings on the face of the other hub. Angular alignment is achieved when Total Indicator Reading is .005" or less.

4. Suction Piping

1. Low static lift and short, direct suction piping is desired. For suction lift over 15 feet, consult pump performance curve for ***Net Positive Suction Head Required***.
2. Suction pipe size must be at least equal to suction connection of pump.
3. If larger pipe is used, an eccentric pipe reducer (with straight side up) must be used at the pump.

. Installation with pump below source of supply:
   4.1. Install isolation valve in piping for inspection and maintenance.
   4.2. Do not use suction isolation valve to throttle pump!

5. Installation with pump above source of supply:
   5.1. To avoid air pockets, no part of piping should be higher than pump suction connection. Slope piping upwards from liquid source.
   5.2. All joints must be airtight.
   5.3. Foot valve to be used only if necessary for priming, or to hold prime on intermittent service.
   5.4. Suction strainer open area must be at least triple the pipe area.
6. Size of inlet from liquid source, and minimum submergence over inlet, must be sufficient to prevent air entering pump.

5. Discharge Piping

1. Arrangement must include a check valve located between a gate valve and the pump. The gate valve is for regulation of capacity, or inspection of pump or check valve.
2. If reducer is required, place between check valve and pump.

6. Rotation

⚠WARNING

Hazardous Machinery

DO NOT PLACE HANDS IN PUMP WHILE CHECKING MOTOR ROTATION. TO DO SO WILL CAUSE SEVERE PERSONAL INJURY.

1. Pumps are right-hand rotation (Clockwise when viewed from the driver end). Switch power on and off. Observe shaft rotation. On frame-mounted units, check rotation before coupling pump to motor.
2. **Single-Phase:** Refer to wiring diagram on motor if rotation must be changed.
3. **Three-Phase:** Interchange any two power supply leads to change rotation.

7. Operation

1. Before starting, pump must be primed (free of air and suction pipe full of liquid) and discharge valve partially open.

⚠ CAUTION PUMPED LIQUID PROVIDES LUBRICATION. IF PUMP IS RUN DRY, ROTATING PARTS WILL SEIZE AND MECHANICAL SEAL WILL BE DAMAGED.

2. Make complete check after unit is run under operating conditions and temperature has stabilized. Check for expansion of piping. Check coupling alignment.
3. **Do not operate at or near zero flow.** Energy imparted to the liquid is converted into heat. Liquid may flash to vapor. Rotating parts require liquid to prevent scoring or seizing.

8. Maintenance

⚠WARNING
Hazardous voltage

FAILURE TO DISCONNECT AND LOCKOUT ELECTRICAL POWER BEFORE ATTEMPTING ANY MAINTENANCE CAN CAUSE SHOCK, BURNS OR DEATH.

1. Bearings are located in and are part of the motor. For lubrication procedure, refer to manufacturer's instructions.
2. On frame-mounted units, regrease at 2,000 hours use or after 3 months. Use #2 Sodium or Lithium grease and fill until grease comes out of the relief fitting.

9. Disassembly

1. **Always turn power off.**
2. Drain system. Flush if necessary.
3. Remove motor hold-down bolts on close-coupled or disconnect coupling and remove spacer.
4. Remove casing bolts and pump hold-down bolts.
5. Remove motor and rotating element from casing.
6. Unscrew impeller bolt with a socket wrench. **Do not insert screwdriver between impeller vanes to prevent rotation.** It may be necessary to use a strap wrench around the impeller if impacting the socket wrench will not loosen the impeller bolt.
7. Remove impeller o-ring.
8. Insert two pry bars (180° apart) between impeller and seal housing. Pry off impeller.
9. Remove shaft sleeve, seal spring, cupwasher, seal rotary and impeller key.
10. Remove seal housing.
11. Place seal housing on flat surface. Press out stationary seal parts.
12. Remove deflector from shaft on frame-mounted units.
13. Remove bolts holding bearing cover to frame and remove bearing cover (frame-mount).
14. Remove lip seals from bearing frame and bearing cover (frame-mount).
15. Remove shaft and bearings from frame (frame-mount).
16. Remove bearing retaining ring (frame-mount).
17. Use bearing puller or arbor press to remove ball bearings (frame-mount).
18. Remove wear ring if excessively worn. Use pry bar and/or vicegrips.

10. Reassembly

1. All parts should be cleaned before assembly.
2. Refer to parts list to identify required replacement items.
3. Reassembly is the reverse of the disassembly procedure.
4. Replace lip seals if worn or damaged (frame-mount only).
5. Replace ball bearings if loose, rough or noisy when rotated (frame-mount only).
6. Check shaft for maximum runout of .005" TIR. Bearing seats and lip seal areas must be smooth and free of scratches or grooves. Replace if necessary (frame-mount only).
7. All mechanical seal components must be in good condition or leakage may result. Replacement of complete seal assembly, whenever seal has been removed, is good standard practice.
8. If wear ring is being replaced, do not use lubricants on the metal-to-metal fit when pressing in the replacement.
9. If the impeller is removed, as for example to effect a mechanical seal change, this procedure must be followed: Old impeller bolt and impeller o-ring cannot be re-used.
10. Install the mechanical seal stationary seat in the seal housing, using soapy water as a lubricant to ease insertion.
11. **S-Group** – Install the mechanical seal spring retainer, spring and rotary assembly on the shaft sleeve using soapy water to lubricate. Slide the shaft sleeve over the pump shaft, be sure that a new shaft sleeve o-ring is used.

NOTE: THE SHAFT SLEEVE O-RING AND IMPELLER WASHER O-RING ARE ALMOST IDENTICAL IN DIAMETER. BE SURE TO USE THE SQUARE CROSS-SECTION O-RING IN THE IMPELLER WASHER. THE ROUND CROSS-SECTION O-RING IS USED IN THE SHAFT SLEEVE.

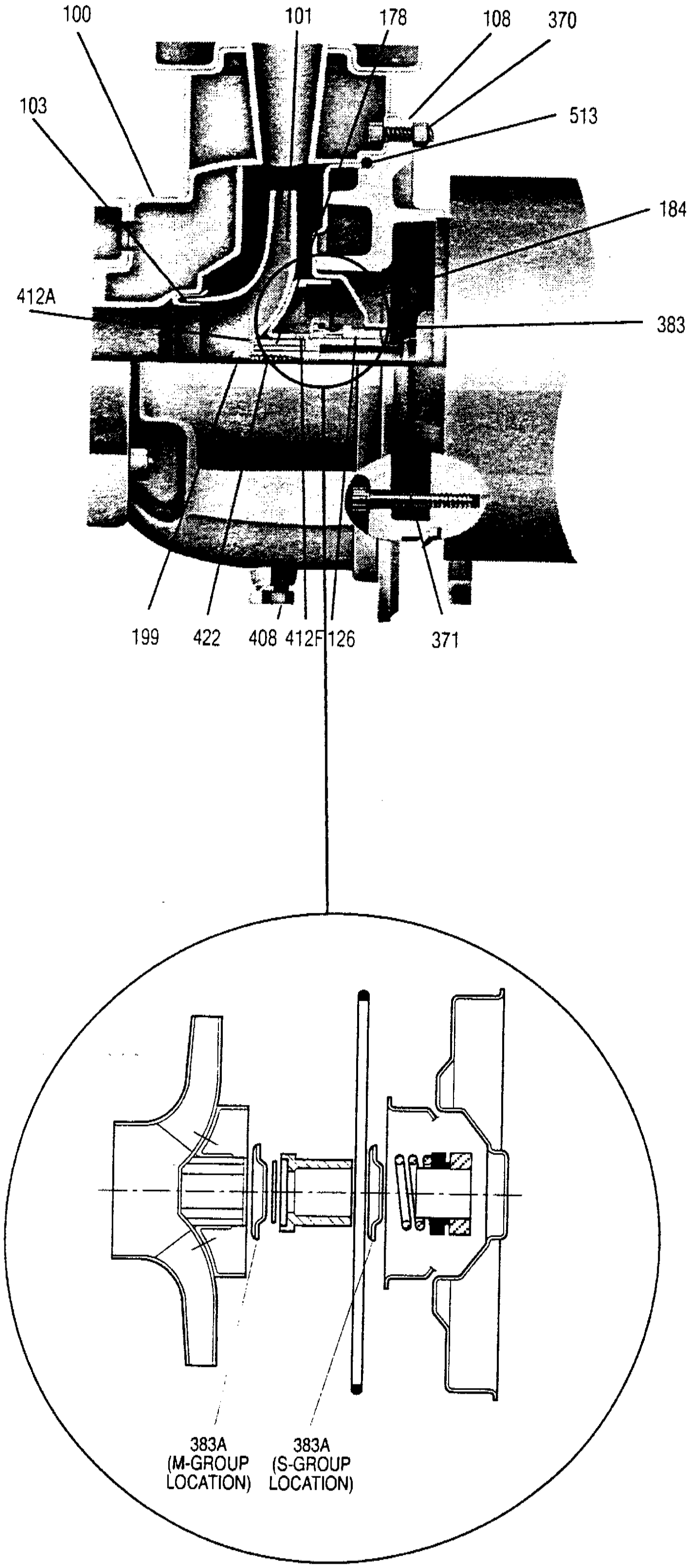
11\. **M-Group** – Install the mechanical seal spring and rotary on the shaft sleeve using soapy water to lubricate. Slide the shaft sleeve over the pump shaft. Be sure that a new shaft sleeve o-ring is used. Place the mechanical seal spring retainer over the impeller hub.

12\. Place the impeller key into the shaft keyway and slide the impeller in place. Install the impeller stud and impeller washer. Be sure that a new impeller o-ring is used. Tighten S-Group (⅜" thread) to 17 lb.ft. and M-Group (½" thread to 38 lb.ft.

11. Troubleshooting

1. Motor does not start, and no noise or vibration occurs:
   1.1. Power supply not connected.
   1.2. Fuses or protection device tripped or defective.
   1.3. Loose or broken electrical connections.
2. Motor will not start, but generates noise and vibration:
   2.1. Motor not wired as directed on diagram.
   2.2. Shaft locked due to mechanical obstructions in motor or pump.
   2.3. Low voltage or phase loss on three phase supply.
3. Pump does not deliver rated capacity:
   3.1. Pump not filled and primed.
   3.2. Pump has lost prime due to leaks in suction line.
   3.3. Direction of rotation incorrect. See Rotation.
   3.4. Head required is higher than that originally specified. (Valve may be partially closed.)
   3.5. Foot valve clogged.
   3.6. Suction lift too high.
   3.7. Suction pipe diameter too small.
4. Protection trips as unit starts:
   4.1. Phase loss on three-phase supply.
   4.2. Protection device may be defective.
   4.3. Loose or broken electrical connections.
   4.4. Check motor resistance and insulation to ground.
5. Protection device trips too often:
   5.1. Protection may be set to a value lower than motor full load.
   5.2. Phase loss due to faulty contacts or supply cable.
   5.3. Liquid is viscous or its specific gravity is too high.
   5.4. Rubbing occurs between rotating and stationary parts.
6. Shaft spins with difficulty:
   6.1. Check for obstructions in the motor or the pump.
   6.2. Rubbing occurs between rotating and stationary parts.
   6.3. Check bearings for proper conditions.
7. Pump vibrates, runs noisily, and flow rate is uneven:
   7.1. Pump runs beyond rated capacity.
   7.2. Pump or piping not properly secured.
   7.3. Suction lift too high.
   7.4. Suction pipe diameter too small.
   7.5. Cavitation caused by insufficient liquid supply or excessive suction losses.
   7.6. Impeller blockage.
8. When stopped, unit turns slowly in the reverse direction:
   8.1. Leaks on air locks in suction pipe.
   8.2. Partial blockage in check valve.
9. In pressure boosting applications, the unit starts and stops too often:
   9.1. Pressure switch settings are incorrect.
   9.2. Tank size may be incorrect.
10. In pressure boosting applications, the unit does not stop:
   10.1. Pressure switch maximum setting is higher than was specified.
   10.2. Direction of rotation incorrect. See **Rotation.**

SSH-C Components



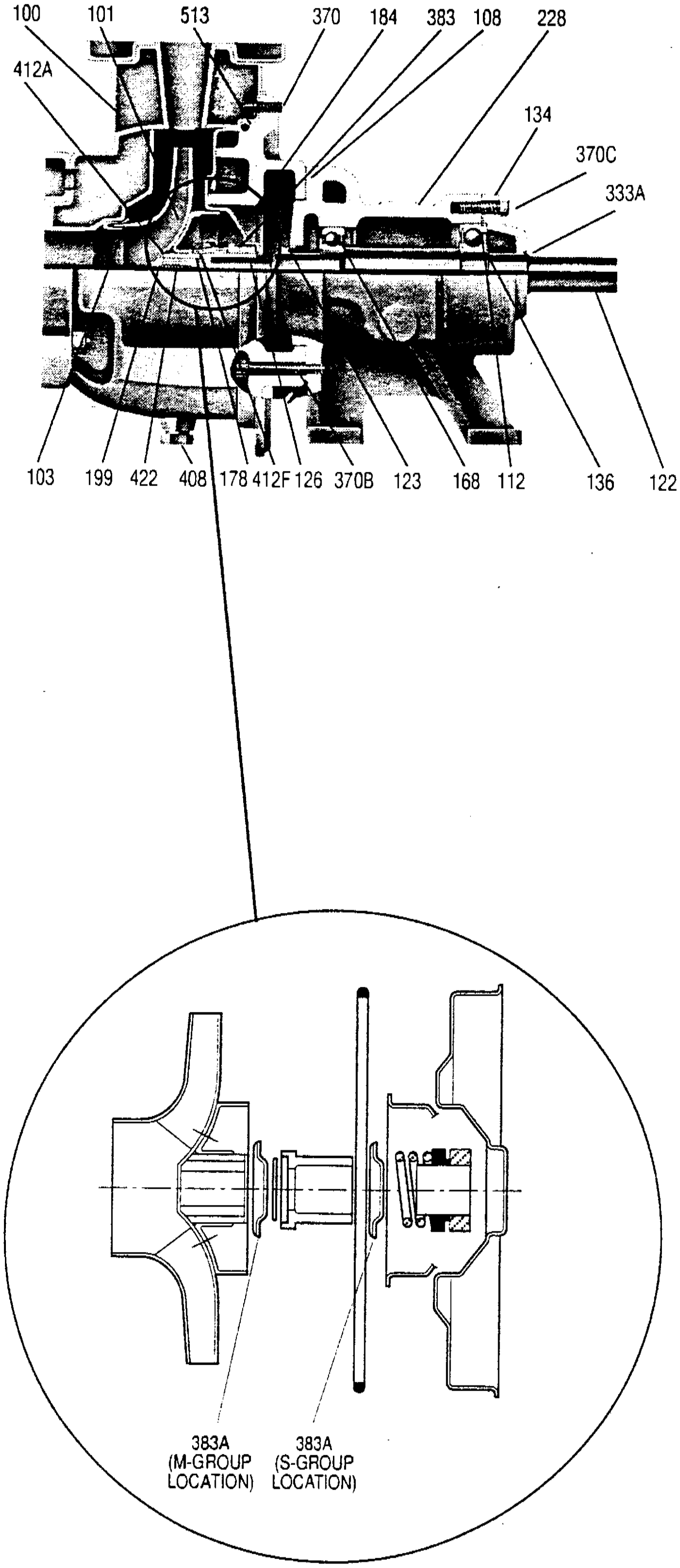
MATERIALS OF CONSTRUCTION

Item	Description	Material
100	Casing	AISI TYPE 316L Stainless Steel
101	Impeller	
103	Wear Ring	
184	Seal Housing	
370	Socket Head Cap Screw (Casing to Adapter)	
408	Drain Plug — ⅜ NPT	AISI TYPE 316 SS
126	Shaft Sleeve	316 SS
178	Impeller Key	Steel
422	Impeller Stud	Steel
199	Impeller Washer	316 SS
108	Adapter	Cast Iron ASTM A48CL20
371	Hex Head Cap Screw (Adapter to Motor)	Steel
412A	O-ring, impeller	BUNA-N
412F	O-ring, shaft sleeve	BUNA-N
513	O-Ring	BUNA-N
383	Mechanical Seal Part No. 10K13	Carbon/Ceramic Buna Elastomers 316 SS Metal Parts
383A	Spring Retainer	AISI Type 316 SS

OPTIONAL MECHANICAL SEALS

John Crane Type 21 Mechanical Seals						
Item	Part No.	Rotary	Stationary	Elastomers	Metal Parts	Intended Duty
383 Options	10K19	Carbon	Ni-Resist	EPR	316 SS	Hi-Temperature
	10K25		Ni-Resist	Viton		Chemical
	10K27		Tungsten Carbide	EPR		Hi-Temperature Mild Abrasive

SSH-F Components



MATERIALS OF CONSTRUCTION

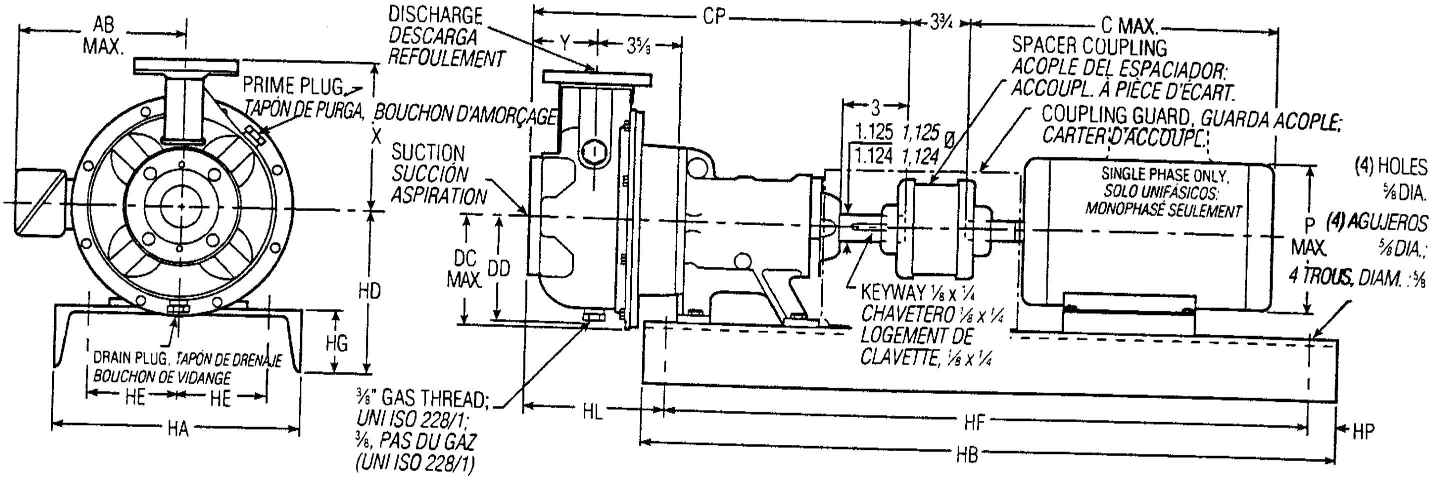
	Item	Description	Material
Pump End Components	100	Casing	AISI TYPE 316L Stainless Steel
	101	Impeller	
	103	Wear Ring	
	184	Seal Housing	
	370	Socket Head Cap Screw	
	408	Drain plug – ⅜ NPT	AISI TYPE 316 SS
	126	Shaft Sleeve	316 SS
	178	Impeller Key	Steel
	422	Impeller Stud	Steel
	199	Impeller Washer	316 SS
	412A	O-ring, impeller	BUNA-N
	412F	O-ring, shaft sleeve	BUNA-N
	513	O-Ring	BUNA-N
	383	Mechanical Seal Standard Part No. 10K13	Carbon/Ceramic BUNA-N Elastomers 316 SS Metal Parts
	383A	Spring Retainer	AISI Type 316SS
Power End Components	108	Adapter	Cast Iron ASTM A48 CL20
	228	Bearing Frame	
	134	Bearing Cover	
	122	Pump Shaft	Steel
	168	Ball Bearing (Inboard)	
	112	Ball Bearing (Outboard)	
	136	Retaining Ring	
	370B	Hex Head Cap Screw (Adapter to Bearing Frame)	
	370C	Hex Head Cap Screw (Bearing Frame to Cover)	
	333A	Lip Seal	BUNA-N
	193	Grease Fitting	Steel
	123	V-Ring Deflector	BUNA-N

OPTIONAL MECHANICAL SEALS

John Crane Type 21 Mechanical Seals						
Item	Part No.	Rotary	Stationary	Elastomers	Metal Parts	Intended Duty
383 Options	10K19	Carbon	Ni-Resist	EPR	316 SS	Hi-Temperature
	10K25		Ni-Resist	Viton		Chemical
	10K27		Tungsten Carbide	EPR		Hi-Temperature Mild Abrasive

SSH S-Group – Engineering Data, *Información Técnica, Données techniques – SSH, groupe S*

Channel Steel Bedplate, Clockwise Rotation Viewed from Drive End; *Fundación de Acero, Rotación en Dirección de las Agujas del Reloj Visto desde el Extremo del Motor; Plaque de base profilée en U et rotation en sens horaire (vue de l'extrémité du moteur)*



Dimensions and Weights – Determined by Pump, *Dimensiones y Pesos – Determinados por la Bomba; Dimensions et poids – pompe*

Pump, Bomba, Pompe		Suction Succión ① Aspir.	Discharge Descarga ① Refoul.	CP	DC Max., DC Máx. DC max.	DD	X	Y	Wt. (lbs.), Peso (lib.) Poids	Dimension "HL" Determined by Pump and Bedplate, Dimensión "HL" determinada la bomba y el motor, Dimensions HL – pompe et plaque de base — Motor Frame Size, Tamaño del bastidor del motor, Carcasse de moteur: 143/145, 183/184	213/215	254/256, 284/286
9SH	1 X 2–6	2	1	16⅜	5	4¾	6⅜	3⅛	56	9⅛	7⅝	3⅞
10SH	1 X 2–8				5⅝	5⅜	7⅛		64			
11SH	1 X 2–10			17¼	6⅞	6⅝	8⅞		86	10	8½	4¾
4SH	1½ X 2½–6	2½	1½	16½	5	4¾	6⅜	3¼	57	9¼	7¾	4
7SH	1½ X 2½–8			17¼	5⅝	5⅜	7⅛	4	66	10	8½	4¾
5SH	2 X 2½–6		2		5	4¾			57			
8SH	2 X 2½–8				6	5¾	7¹⁵⁄₁₆		68			
6SH	2½ X 3–6	3	2½						59			

① For use with ANSI class 150 mating flanges.
Para usar con bridas que casan ANSI clase 150.
À utiliser avec des contre-brides ANSI, classe 150.

NOTES:

1. All pumps shipped in vertical discharge position. May be rotated in 90° increments. Tighten ⅜ – 16 casing bolts to 12 ft./lbs. torque.
2. Dimensions in inches.
3. Motor dimensions may vary with motor manufacturer.
4. Not to be used for construction purposes.

NOTAS:

1. *Todas las bombas transportadas en posición de descarga vertical. Pueden rotarse en aumentos de 90°. Apretar ⅜ – 16 tornillos de carcasa a 12 pies/libras potencia.*
2. *Las dimensiones en pulgadas.*
3. *Las dimensiones puede que varíen con los fabricantes..*
4. *No para propósitos de construcción.*

NOTA :

1. *L'orifice de refoulement est orienté vers le haut. On peut le tourner de 90° en 90°. Serrer les vis ⅜ - 16 du corps de pompe à 12 lbf·pi.*
2. *Les dimensions sont en pouces, et le poids, en livres.*
3. *Les dimensions et le poids du moteur peuvent varier selon le fabricant.*
4. *Ne pas utiliser les dimensions pour la construction si elles ne sont pas certifiées à cette effet.*

Available Motor and Bedplate Dimensions and Weights, *Pesos y Dimensiones Disponibles de la Fundación y del Motor Dimensions et poids – moteur et plaque de base*

Motor Frame, Armazón del Motor, Carcasse de moteur	HP @ 3500 RPM, HP a 3500 RPM, hp à 3 500 tr/min — Single Phase, Monofásicos, 1 Ø: ODP	TEFC	Three Phase, Trifásicos, 3 Ø: ODP	TEFC	HP @ 1750 RPM, HP a 1750 RPM, hp à 1 750 tr/min — Single Phase, Monofásicos, 1 Ø: ODP	TEFC	Three Phase, Trifásicos, 3 Ø: ODP	TEFC	AB Max., AB Máx., AB max.	C Max., C Máx., C max.	P Max., P Máx., P max.	Wt. Max., Peso Máx., Poids max.	Bedplate Data, Datos de la Fundación, Plaque de base: HA	HB	HD*	HE	HF	HG	HP*	Wt. (lbs.), Peso (libras), Poids	Motor Shim, Plancha de relleno del motor Cale de moteur	Bearing Frame Shim, Plancha de relleno del bastidor del cojinete, Cale de palier
143T					1	1	1	1	5¼	13⅜	6⅝	45	10	28	8	3¾	24	2¾	¾	48	1¾	–
145T	2	2	2 or *ou* 3	2	1½	1½	1½ or *ou* 2	1½ or *ou* 2		14¼		53										
182T	3	3	5	3	2	2	3	3	5⅞	16⅝	7⅞	74										
184T	5	5	7½	5	3 or *ou* 5	3	5	3		18½		95										
213T			10	7½					7⅜	18	9⅝	116	12	31	8¼	4¼	29	3	1	65	–	–
215T			15	10						19⅛		136										
254T			20	15					10⅞	21⅝	13	266	13	42	9¼	5¼	38½	4	1¾	110	–	1
256T			25	20						23⅜		264										
284TS			30	25					12⅝	24⅓	15	392	15	44	10½	5¾	40½	3½		124	–	1¾
286TS			40	30						26⅝		432										

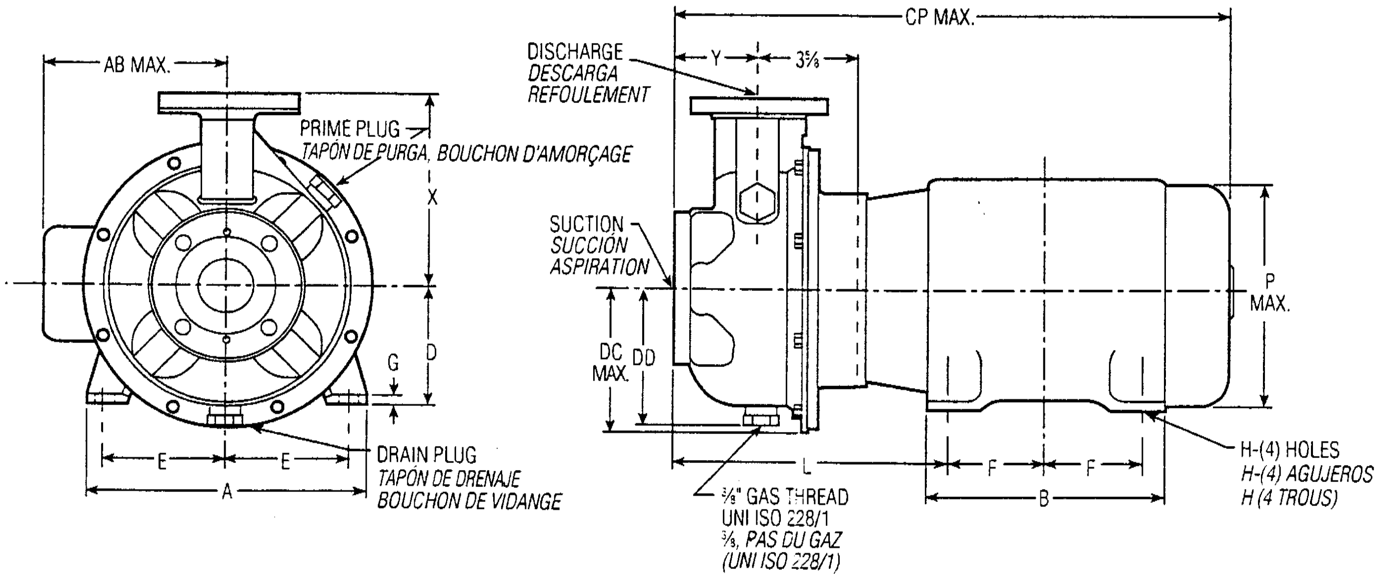
Dimensions and weights vary with manufacturers. Dimensions in inches and weights in lbs.
"HP" Dimensions at motor end only.
* "HD" Dimension for 254T/256T motor frame on 1 x 2-10 only is 11"; A ¾" motor shim and a 1¾" bearing frame shim are required.

Dimensiones y pesos varían con los fabricantes. Dimensiones en pulgadas y pesos en libras.
Dimensiones "HP" sólo en el extremo del motor.
** La dimensión "HD" para el bastidor del motor 254T/256T de 1 x 2 - 10 es sólo 11"; se requieren una cuña del motor de ¾" y una cuña del bastidor de apoyo de 1¾".*

ODP = carcasse abritée (à ouvertures de ventilation protégées) ; TEFC = carcasse fermée autoventilée.
**Dimensions HP à l'extrémité du moteur seulement. La dimension HD pour la carcasse 254T ou 256T, version 1X2-10 seulement, est de 11 po ; une cale de moteur de ¾ po et une cale de palier de 1¾ po sont requises.*

SSH S-Group Close Coupled – Dimensions and Weights, *SSH Acople Cerrado – Dimensiones y Pesos, Dimensions et poids – SSH montée sur moteur, groupe S*

(All dimensions in inches and weights in lbs. Do not use for construction purposes.)
(Todas las dimensiones en pulgadas y pesos en libras. No usar para propósitos de construcción.)



Dimensions "L" Determined by Pump and Motor, Dimensiones "L" Determinadas por la Bomba y el Motor, Dimensions L – pompe et moteur

Pump, Bomba, Pompe		150 lb. Flange, Brida de 150 lib., Bride, 150 lb/po ²		CP Max., CP Máx., CP max.	DC Max., DC Máx., DC max.	DD	X	Y	Motor Frame Size, Tamaño del Armazón del Motor, Carcasse de moteur				Wt. (lbs.), Pesos (libras), Poids
		Suct. Succ. ① Aspir.	Disch. Desc. ① Refoul.						143/145	182/184	213/215	254/256	
9SH	1 x 2 – 6	2	1	25⅜	5	4¾	6⅝	3⅞	9⅝	10¼	11¼	–	24
10SH	1 x 2 – 8				5⅝	5⅜	7⅛						32
11SH	1 x 2 – 10			27⅞	6⅞	6⅝	8⅞	4	10½	11⅞	12⅞	12⅜	54
4SH	1½ x 2½ – 6	2½	1½	25½	5	4¾	6⅝	3¼	9¾	10⅝	11⅝	—	25
7SH	1½ x 2½ – 8			27⅞	5⅝	5⅜	7⅛	4	10½	11⅞	12⅞	12⅜	34
5SH	2 x 2½ – 6		2		5	4¾	6⅝						25
8SH	2 x 2½ – 8				6	4¾	7¹⁵⁄₁₆						36
6SH	2½ x 3 – 6	3	2½										27

① For use with ANSI class 150 mating flanges.
Para usar con bridas que casan ANSI clase 150.
À utiliser avec des contre-brides ANSI, classe 150.

NOTE:
1. Pumps shipped in vertical discharge as standard. For other orientations, remove casing bolts, rotate discharge to desired position, and tighten ⅜ – 16 bolts to 12 ft./lbs., ⁷⁄₁₆ – 14 bolts to 20 ft./lbs.
2. ALL dimensions in inches.
3. Motor dimensions may vary with motor manufacturer.
4. Not for construction purposes.

NOTA:
1. *Las bombas se transportarán en descarga vertical como estándar. Para otras orientaciones, retirar los tornillos de la carcasa, rotar la descarga a la posición deseada, y apretar ⅜ – 16 tornillos a 12 pies/libras, ⁷⁄₁₆ – 14 tornillos a 20 pies/libras.*
2. *TODAS las dimensiones en pulgadas.*
3. *Las dimensiones puede que varíen con los fabricantes.*
4. *No para propósitos de construcción.*

NOTA :
1. *L'orifice de refoulement est orienté vers le haut. Pour l'orienter autrement, enlever les vis de fixation du corps de pompe, placer l'orifice dans le sens voulu, puis reposer et serrer les vis ⅜ - 16 à 12 lbf·pi et ⁷⁄₁₆ - 14 à 20 lbf·pi.*
2. *Les dimensions sont en pouces, et le poids, en livres.*
3. *Les dimensions et le poids du moteur peuvent varier selon le fabricant.*
4. *Ne pas utiliser les dimensions pour la construction si elles ne sont pas certifiées à cette effet.*

Dimensions Determined by JM Motor Frame, *Dimensiones Determinadas por el Armazón del Motor JM, Dimensions – carcasse de moteur JM*

JM Frame, JM Armazón, Carcasse	A	AB	B	D	E	F	G	H Dia., H Diám., H (diam.)	P Max., P Máx., P max.	Motor Wt. (lbs.) Peso Motor (lib.), Poids du moteur
143JM	6½	5¼	6	3½	2¾	2	⅛	¹¹⁄₃₂	6⅝	41
145JM						2½				57
182JM	8½	5⅞	6½	4½	3¾	2¼	³⁄₁₆	¹³⁄₃₂	7⅞	77
184JM						2¾				97
213JM	9½	7⅜	8	5¼	4¼		⁷⁄₃₂		9⅝	122
215JM						3½				155
254TCZ	11¼	9	9½	6¼	5	4⅛	¼	¹⁷⁄₃₂	11½	265
256TCZ			11¾			5				320

Motor Frame Selections, *Selecciones del Armazón del Motor, Choix de carcasses de moteur*

Motor Frame, Armazón del Motor, Carcasse	Motor Horsepower, Potencia del Motor, Puissance (hp)							
	3500 RPM, 3500 RPM, 3 500 tr/min				1750 RPM, 1750 RPM, 1 750 tr/min			
	1Ø, Monofásicos 1 Ø		3Ø, Trifásicos 3 Ø		1Ø, Monofásicos 1 Ø		3Ø, Trifásicos 3 Ø	
	ODP	TEFC	ODP	TEFC	ODP	TEFC	ODP	TEFC
143JM	–	–	–	–	–	–	1	1
145JM	2	2	2-3	2	1-1½	1-1½	1½-2	1½-2
182JM	3	3	5	3	2	2-3	3	3
184JM	5	5	7½	5	3	–	5	5
213JM	7½	–	10	7½	5	–	7½	7½
215JM	10	–	15	10-15	–	–	–	–
254TCZ	–	–	20	–	–	–	–	–
256TCZ	–	–	25	20-25	–	–	–	–

ODP = carcasse abritée (à ouvertures de ventilation protégées) ;
TEFC = carcasse fermée autoventilée.

G&L Pumps

GOULDS PUMPS LIMITED WARRANTY

This warranty applies to all water systems pumps manufactured by Goulds Pumps.

Any part or parts found to be defective within the warranty period shall be replaced at no charge to the dealer during the warranty period. The warranty period shall exist for a period of twelve (12) months from date of installation or eighteen (18) months from date of manufacture, whichever period is shorter.

A dealer who believes that a warranty claim exists must contact the authorized GouldsPumps distributor from whom the pump was purchased and furnish complete details regarding the claim. The distributor is authorized to adjust any warranty claims utilizing the Goulds Pumps Customer Service Department.

The warranty excludes:

(a) Labor, transportation and related costs incurred by the dealer;
(b) Reinstallation costs of repaired equipment;
(c) Reinstallation costs of replacement equipment;
(d) Consequential damages of any kind; and,
(e) Reimbursement for loss caused by interruption of service.

For purposes of this warranty, the following terms have these definitions:

(1) "Distributor" means any individual, partnership, corporation, association, or other legal relationship that stands between Goulds Pumps and the dealer in purchases, consignments or contracts for sale of the subject pumps.
(2) "Dealer" means any individual, partnership, corporation, association, or other legal relationship which engages in the business of selling or leasing pumps to customers.
(3) "Customer" means any entity who buys or leases the subject pumps from a dealer. The "customer" may mean an individual, partnership, corporation, limited liability company, association or other legal entity which may engage in any type of business.

THIS WARRANTY EXTENDS TO THE DEALER ONLY.

GARANTÍA LIMITADA DE GOULDS PUMPS

Esta garantía es aplicable a todas las bombas para sistemas de agua fabricadas por Goulds Pumps. Toda parte o partes que resultaren defectuosas dentro del período de garantía serán reemplazadas, sin cargo para el comerciante, durante dicho período de garantía. Tal período de garantía se extiende por doce (12) meses a partir de la fecha de instalación, o dieciocho (18) meses a partir de la fecha de fabricación, cualquiera se cumpla primero.

Todo comerciante que considere que existe lugar a un reclamo de garantía deberá ponerse en contacto con el distribuidor autorizado de Goulds Pumps del cual adquiriera la bomba y ofrecer información detallada con respecto al reclamo El distribuidor está autorizado a liquidar todos los reclamos por garantía a través del Departamento de Servicios a Clientes de Goulds Pumps.

La presente garantía excluye:

(a) La mano de obra, el transporte y los costos relacionados en los que incurra el comerciante;
(b) los costos de reinstalación del equipo reparado;
(c) los costos de reinstalación del equipo reemplazado;
(d) daños emergentes de cualquier naturaleza; y
(e) el reembolso de cualquier pérdida causada por la interrupción del servicio

A los fines de esta garantía, los términos "Distribuidor", "Comerciante" y "Cliente" se definen como sigue:

(1) "Distribuidor" es aquel individuo, sociedad, corporación, asociación u otra persona jurídica que opera en relación legal entre Goulds Pumps y el comerciante para la compra, consignación o contratos de venta de las bombas en cuestión.
(2) "Comerciante" es todo individuo, sociedad, corporación, asociación u otra persona jurídica que en el marco de una relación legal realiza negocios de venta o alquiler-venta (leasing) de bombas a clientes.
(3) "Cliente" es toda entidad que compra o que adquiere bajo la modalidad de leasing las bombas en cuestión de un comerciante. El término "cliente" puede significar un individuo, sociedad, corporación, sociedad de responsabilidad limitada, asociación o cualquier otra persona jurídica con actividades en cualquier tipo de negocios.

LA PRESENTE GARANTÍA SE EXTIENDE AL COMERCIANTE ÚNICAMENTE.

GARANTIE LIMITÉE DE GOULDS PUMPS

La présente garantie s'applique à chaque pompe de système d'alimentation en eau fabriquée par Goulds Pumps.

Toute pièce se révélant défectueuse sera remplacée sans frais pour le détaillant durant la période de garantie suivante expirant la première : douze (12) mois à compter de la date d'installation ou dix-huit (18) mois à partir de la date de fabrication.

Le détaillant qui, aux termes de cette garantie, désire effectuer une demande de règlement doit s'adresser au distributeur Goulds Pumps agréé chez lequel la pompe a été achetée et fournir tous les détails à l'appui de sa demande. Le distributeur est autorisé à régler toute demande par le biais du service à la clientèle de Goulds Pumps.

La garantie ne couvre pas :

a) les frais de main-d'œuvre ou de transport ni les frais connexes encourus par le détaillant ;
b) les frais de réinstallation de l'équipement réparé ;
c) les frais de réinstallation de l'équipement de remplacement ;
d) les dommages indirects de quelque nature que ce soit ;
e) ni les pertes découlant de la panne.

Aux fins de la présente garantie, les termes ci-dessous sont définis comme suit :

1) « Distributeur » signifie une personne, une société de personnes, une société de capitaux, une association ou autre entité juridique servant d'intermédiaire entre Goulds Pumps et le détaillant pour les achats, les consignations ou les contrats de vente des pompes en question.
2) « Détaillant » veut dire une personne, une société de personnes, une société de capitaux, une association ou autre entité juridique dont les activités commerciales sont la vente ou la location de pompes à des clients.
3) « Client » signifie une entité qui achète ou loue les pompes en question chez un détaillant. Un « client » peut être une personne, une société de personnes, une société de capitaux, une société à responsabilité limitée, une association ou autre entité juridique se livrant à quelque activité que ce soit.

CETTE GARANTIE SE RAPPORTE AU DÉTAILLANT SEULEMENT.

Goulds Pumps

ITT Industries

ShallowTray®
low profile air strippers

MODEL NUMBER

SERIAL NUMBER

31242-04-5667

Part Number 500-200-00560

North East Environmental Products, Inc.
17 Technology Drive West Lebanon New Hampshire 03784
Tel: 603-298-7061 Fax: 603-298-7063 Email: sales@neepsystems.com

ShallowTray®

low profile air strippers

Installation, Operation,
&
Maintenance Manual

North East Environmental Products, Inc.
17 Technology Drive West Lebanon New Hampshire 03784
Tel: 603-298-7061 Fax: 603-298-7063 Email: sales@neepsystems.com

TABLE OF CONTENTS

Special Cautions!

Prior to start-up:

- ***Connect the Interlock Switches.***

  Connect the High Water Level Interlock, the Low Air Pressure/Vacuum Interlock, and the High Air Pressure/Vacuum Interlock (if required).

  It is important that a qualified, licensed electrician perform these installations.

- ***Fill the Sump Tank and Stripper Tray Inlet Chambers.***

  Fill the sump tank to a depth of at least 5 inches (12.7cm), and fill the seal pots on each tray. Use clean water only.

  Please see Equipment Set-up in the Operating Instructions section of this manual.

NEEP Systems
17 Technology Drive
West Lebanon, NH 03784
603-298-7061 Fax: 603-298-7063
www.neepsystems.com info@neepsystems.com

Shallow Tray Technology is protected under U.S. Patent No. RE,35,074; 5,240,595 and 5,585,976. Other international patents pending.

Section 1: Components List

ShallowTray® Low Profile Air Stripper Specification Sheet - Stainless Steel Systems

ShallowTray Serial #: 31242-04-5667 Customer: National Ship date: 3/13/02

Engineered By: ______ Order Date: ______

Design Review: Engineering ______ Sales 2/14/02

Additional Treatment Equipment:

EconoPump Serial #: ______

I. Special Components / Requirements / Information / Comments

-two blowers(shipped loose)

II. Design Criteria

Design Water Flow Rate	150 gpm
Maximum Water Flow Rate	150 gpm, which is considered a ✓ Low Water Flow Design, or ____ a High Water Flow Design, and is based on the blower model selection.
Weir Height	4" Inlet, 2" Outlet
Equipment Power Requirements	3 Ø, 460 volts, 60 Hz

INSTALL ALL EQUIPMENT PER APPLICABLE NATIONAL AND LOCAL CODES.
CUSTOMER TO PROTECT EXPLOSION-PROOF MOTORS FROM RAIN.

III. Basic System Components

CAUTION: MAXIMUM PRESSURE OR VACUUM ACROSS STAINLESS STEEL SYSTEM = 32" WC

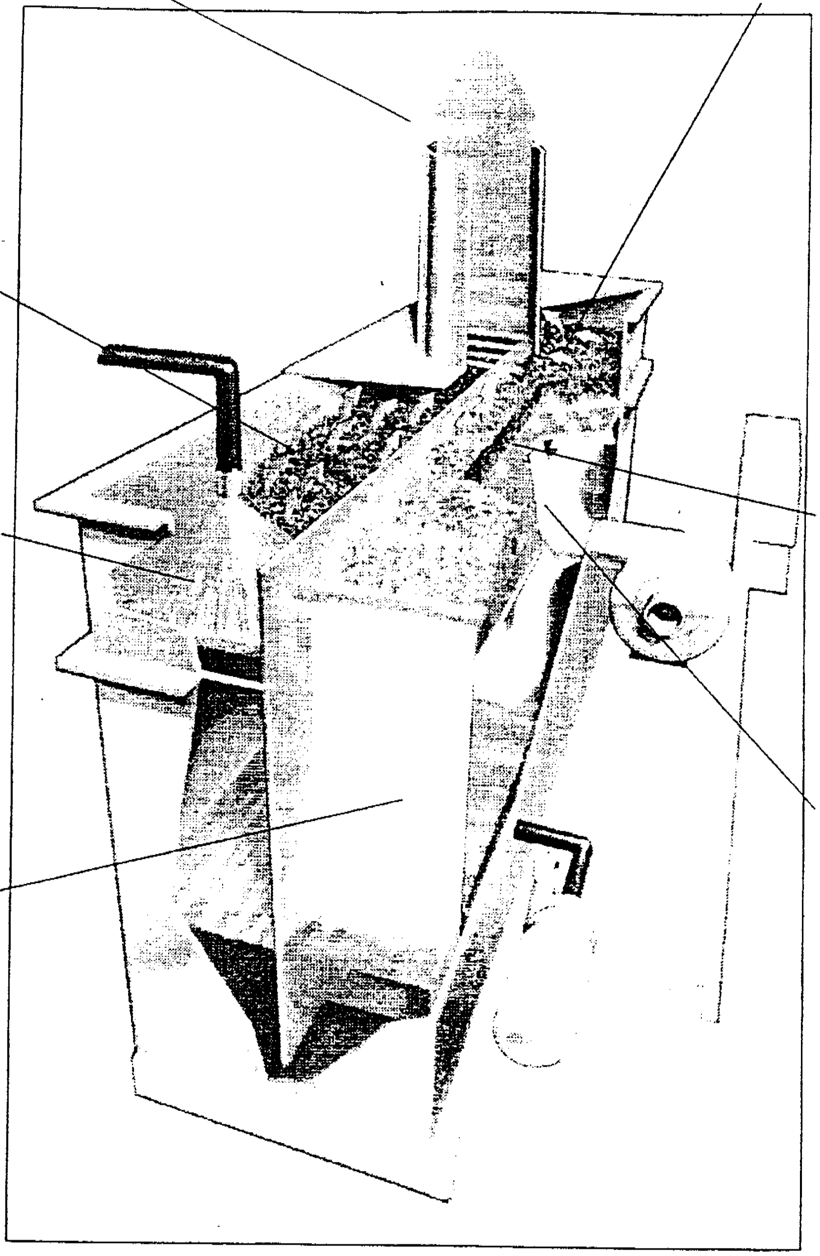
✓ Sump Tank, Cover	✓ 304L stainless steel ____ 316L stainless steel
4 Aeration Trays (quantity)	✓ 304L stainless steel ____ 316L stainless steel
✓ Latches	304L stainless steel
✓ Main Blower (with inlet screen and damper)	American Fan Model # VP6-08-25B
Minimum Required Blower Performance	1800 cfm @ 44 " wc Blower P/N 5667
	25 hp, 3 Ø, 460 volts, 3450 rpm Coupling P/N ______
	60 Hz, ✓ TEFC or ____ EXP Riser P/N ______
	8 "Blower Inlet Size, 8 "Blower Outlet Size
____ Blower on Inlet (Pressure system)	Main Blower Sized For:
✓ Blower on Outlet (Vacuum system)	18 "wc required for ShallowTray Air Stripper
____ Blowers on In & Out (Combo system)	26 "wc additional available for airstream equipment
✓ Demister Pad	Koch style 4310, 4" thick, 304 ss
✓ Spray Nozzle	Hollow cone, 90° pattern, sized for 15 psi, brass
✓ Sight Tube	Brass, Nalgene tubing
✓ Aeration Tray Gaskets	High density nitrile sponge rubber
✓ Inlet Piping Connection	Schedule 80 PVC, Brass
✓ Blower and Vent Line Connections	Flexible rubber couplings

IV. Optional Equipment

___Frame	3 in. and 4 in. welded steel, C-Channel
___Air Pressure Gauge (0 - _____"wc)	Dwyer Magnehelic 2000 series
___Gravity Discharge Riser	PVC 80 Piping, with vacuum relief valve
✓Additional Blower (with inlet screen and damper) Required Performance	__________________ Fan Model #__________________ ________cfm @ ______" wc Blower P/N 5667 _____hp, ____Ø, ________volts, ________rpm, _____ Hz, ____TEFC or ____EXP ____"Blower Inlet Size, ____"Blower Outlet Size
___Feed Pump Required Performance	__________________ Pump Model #____________ _____ gpm @ _____' TDH Feed Pump P/N__________________ _____hp, ____Ø, ________volts, ________rpm, _____ Hz, ____TEFC or ____EXP Port Sizes: _______ inch inlet, _____ inch outlet. Impellor Size _______ inches
___Discharge Pump Required Performance	__________________ Pump Model #____________ _____ gpm @ _____' TDH Discharge Pump P/N__________________ _____hp, ____Ø, ________volts, ________rpm, _____ Hz, ____TEFC or ____EXP Port Sizes: _______ inch inlet, _____ inch outlet. Impellor Size _______ inches
___ Main Disconnect Switch	Integral with electrical enclosure, rotary style
___Control Panel	Motor starters, system alarm interlock circuit, operator switches, alarm light, NEMA _____ Enclosure, ________ Amps, _____Ø, _________Volts, ______Hz, _____ wire and ground
___Control Panel w/ Pump Level Control	Motor starters, system alarm interlock circuit, pump level control circuit, operator switches, alarm light, NEMA _____ Enclosure, ________ Amps, _____Ø, _________Volts, ______Hz, _____ wire and ground
___PurgePanel ™	NEMA 7 Main Disconnect switch, NEMA 4 enclosure, air pressure gauge, Low air pressure switch, Blower (100 cfm @ 2" w.c.)
___Autodialer	Manufacturer__________________
___Control Circuit Transformer	_____:120vac
___Intrinsically-Safe Relay	_______ Pepperl+Fuchs, WE77/Ex2-UL repeater relay Dual Channel, SPDT relay output ______Warrick 27A1E0 latching relay Single Channel, SPDT relay output
___Intermittent Operation	Blower time-delay circuit added to panel design. Blower shuts off 5 minutes after inlet water flow stops.
___Auto Operation	# of wells _____
___Well Probes	Warrick, series 3W
___Blower Start/Stop Switch	Local blower switch mounted near blower
___Power Lapse Indicator	Black-out / Brown-out indicating light, switch and circuit added to panel design
___Individual Alarm Light	Light and relay circuit added to panel design
___Strobe Alarm Light	___Red, ___ Blue, Federal Signal, NEMA 4, UL listed
___Alarm Horn	Federal Signal
___Low Air ___Press. ___Vacuum Switch	Dwyer 1950-1, preset at 1.6" wc (range=0.3"wc to1.6" wc), Explosion-proof
___High Air ___Press. ___Vacuum Switch	Dwyer 1950, _______"wc to _______"wc, Explosion-proof
✓Low Water Level Alarm Float Switch	Mechanical, SJ Electro, (qty)1___N.O., (qty)____N.C.
✓High Water Level Alarm Float Switch	Mechanical, SJ Electro, (qty)____N.O., (qty)1___N.C.
✓Discharge Pump Float Switch	Mechanical, SJ Electro, (qty)1___N.O., (qty)____N.C.
___Water Flow Meter	Manufacturer__________________
___Air Flow Meter	Dwyer 2000-0 meter, single-point insertion pitot tube, mounting kit
___Water Press. Gauge,___inlet, ___outlet	Dial gauge, liquid-filled
___Water Temp. Gauge,___inlet, ___outlet	Dial gauge
___Line Sampling Port, ___inlet, ___outlet	Schedule 80 PVC
___Air Blower Silencer	Manufacturer__________________
___Washer Wand	Nozzle, Elbow, 1/4" steel pipe
___Viewport Set - ___4"Ø, ___8"Ø	Lexan viewports with rubber coupling

Section 2: ShallowTray System

The ShallowTray Process



Air is vented to the atmosphere or to vapor phase treatment of choice.

Water travels around the full length of the baffled tray, becoming progressively cleaner.

Turbulent frothing maximizes volatilization and scours the stripper tray.

Contaminated water inlet.

3⁄16" (4.8mm) holes resist fouling.

Fan blows fresh air up through hundreds of holes into the water.

Treated water falls into holding tank.

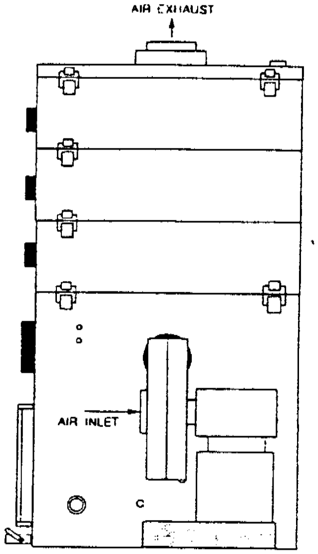
The Treatment Process

The purpose of air stripping is to treat contaminated groundwater for the removal of certain dissolved volatile organic compounds (VOC). The ShallowTray low profile air stripper is a compact, low-maintenance solution to groundwater treatment.

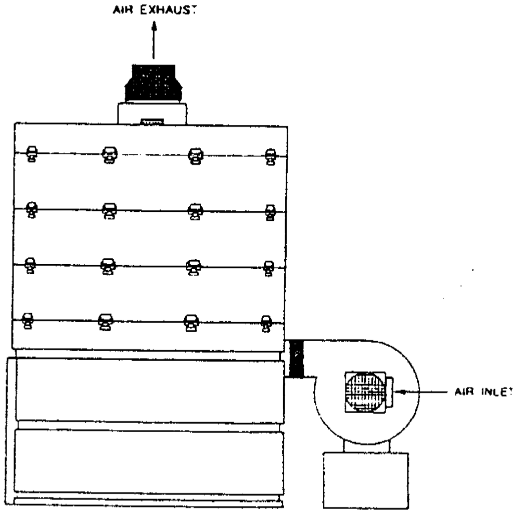
The active components of a ShallowTray low profile air stripper are patent-protected tray-type stripper trays. (The ShallowTray process is protected under U.S. Patent #5,045,215 and 5,240,595; other international patents pending.) Fresh air is blown up through hundreds of 3/16" (5mm) diameter holes in each stripper tray. The air forms a froth of bubbles approximately six inches deep on the stripper tray, generating a large mass transfer surface area where the contaminants are volatilized. The necessary contact or residence time to reach required volatilization is achieved through model size, addition of trays, and flow rate selection.

Typically constructed of corrosion resistant type 304L stainless steel or polyethylene, the tray unit utilizes countercurrent air and water flow through an array of baffled stripper trays. Sizing and design of a ShallowTray low profile air stripper are determined by a variety of factors that include water flow rate, contaminant concentration, temperature, required removal efficiency, and the physical/chemical properties of the contaminants that govern their solubility in water.

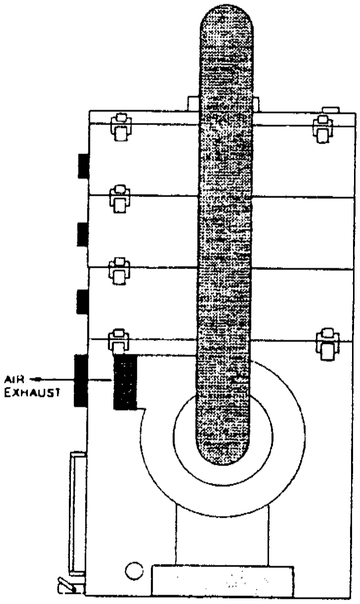
The ShallowTray Basic System



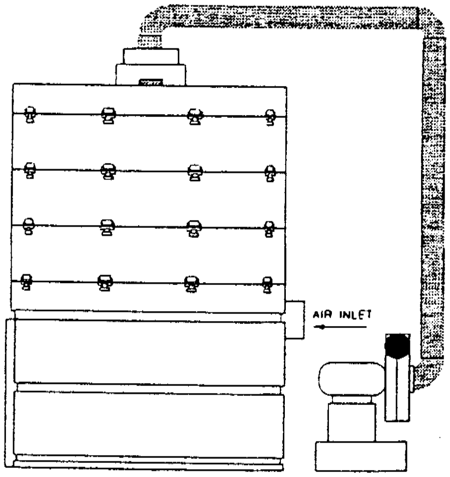
1. 2331 STAINLESS PRESSURE SYSTEM (FORCED DRAFT)



2. 2331-P LLDPE PRESSURE SYSTEM (FORCED DRAFT)



3. 2331 STAINLESS VACUUM SYSTEM (INDUCED DRAFT)



4. 2331-P LLDPE PRESSURE SYSTEM (INDUCED DRAFT)

BASIC SYSTEM

ShallowTray systems are fabricated from rugged 304L stainless steel, 316L stainless steel, or molded polyethylene, and are typically supplied with all the components listed in this section. Read through each component description for a better understanding of its function.

Pressure Versus Vacuum Set-up

There are two versions of the basic system referred to in this manual. They are defined as follows:

1. **Pressure System** – The blower is installed so that the stripper tank and stripper trays are pressurized. This arrangement can be used when the maximum total system pressure (air stripper plus other downstream air equipment) does not exceed 26 inches (56cm) water column (W.C.) pressure or vacuum for plastic strippers, and 32 inches (82cm) W.C. for stainless steel strippers.

2. **Vacuum System** – The blower is installed so that the stripper cover and stripper trays are under a vacuum. Removal efficiency is the same as for a pressure system. This is the proper arrangement when total system pressure exceeds the values listed above. In this setup, the blower induces the required vacuum on the stripper, and also provides the required additional pressure for downstream air equipment.

High Water Flow Versus Low Water Flow Systems

There are two water flow range options for the basic system. They are referred to in this manual as **Low Flow** and **High Flow** systems. The high flow system requires a blower that produces an additional 4 inches (10.2cm) W.C. pressure/vacuum compared to the low flow system blower. The low and high water flow ranges for each ShallowTray series are listed in the table below:

ShallowTray Series	Low Water Flow Range	High Water Flow Range
1300P	0.5 - 15 gpm	N/A
1300	0.5 - 15 gpm	16 - 24 gpm
2300P	1 - 30 gpm	31 - 50 gpm
2300	1 - 30 gpm	31 - 45 gpm
2600	2 - 60 gpm	61 - 115 gpm
3600	3 - 90 gpm	91 - 160 gpm
31200	4 - 150 gpm	151 - 425 gpm
41200	6 - 200 gpm	201 - 550 gpm

Basic System Components

Component manufacturer information sheets ("cutsheets") are included in the Components Information Section (Section 7) at the back of this manual.

Blower

The blowers on the ShallowTray low profile air stripper units are typically type B spark resistant with a cast aluminum wheel, direct driven @ 3450 rpm with motor options of Totally Enclosed Fan Cooled (TEFC) or Explosion Proof (EXP). Each blower is selected by our engineering staff to exceed the minimum cubic feet per minute (CFM) air flow requirements at the nominal working pressure (inches of W.C.) of each system. It is critical that the blower damper be opened wide enough to provide the unit with the designated minimum fresh air flow.

It is also critical that water does not enter the blower housing while the blower is in operation; this will damage your blower and void the warranty. The high water level alarm switch prevents this from happening. Make sure it is installed properly.

The motor horsepower is selected to provide a reasonable operating range. However, there is potential for the blower motor to overload if it is not working against sufficient pressure drop. Therefore, the blower must be protected with a thermal overload switch. Also, the blower damper should be set so that the blower produces at least the minimum air flow requirement (see table below), and does not exceed the nameplate amperage limit of the motor.

Damper

There is a damper on the blower, used to make air flow rate (SCFM) adjustments to your system. Open the damper to increase air flow rate, and close the damper to decrease air flow rate. Note that air pressure may vary as the air flow rate is changed.

To get the most accurate air flow measurement, we recommend installing an air flow meter in the air piping.

If this is not possible, then an estimated air flow can be obtained by measuring the stripper pressure or vacuum. For initial start-up, simply adjust the damper until the air pressure is at least the minimum required for your system. (Refer to the pressure gauge description for minimum pressure readings).

The table below gives the minimum, recommended, and maximum required air flow rates for each ShallowTray series.

ShallowTray Model	**Requirements Air Flow Minimum**		**Recommended**	**Maximum**
1300 & 1300P	150 cfm	(250m^3/hr)	195	225
2300 & 2300P	300 cfm	(500m^3/hr)	390	450
2600	600 cfm	(1020m^3/hr)	780	900
3600	900 cfm	(1530m^3/hr)	1170	1350
31200	1800 cfm	(3060m^3/hr)	2340	2700
41200	2400 cfm	(4080m^3/hr)	3120	3600

Beware when making damper adjustments after initial start-up. Fouling may occur in the system which may reduce the air flow rate, and may increase the air pressure reading.

Demister

A wire mesh mist eliminator pad is installed beneath the air exhaust port, located on the top cover of the unit. The purpose of the mist eliminator pad is to remove water droplets that would have blown through the vent line. It is possible, though unlikely, that the mist eliminator pad may become plugged or fouled. If this occurs the mist eliminator pad is easily removed for cleaning. Disconnect the vent line, take off the top cover, and remove the retaining plates on the bottom side of the cover. The mist eliminator pad can be cleaned with a pressure washer, or replaced with a new one.

Gasket

A black nitrile (or neoprene on the 2300P) sponge gasket is used to form an airtight/watertight seal around the sump tank and stripper trays. If there are any problems with the gaskets, please contact North East Environmental Products. A replacement gasket can be glued to the sealing flange using an industrial contact adhesive. We recommend using Rubatex adhesive # R-27780. Please contact North East Environmental Products prior to making any gasket repairs or adjustments.

Sight Tube

The sight tube provides a means of easily viewing the water level in the sump tank. Make sure the valve to the sight tube is open during stripper operation.

Spray Nozzle

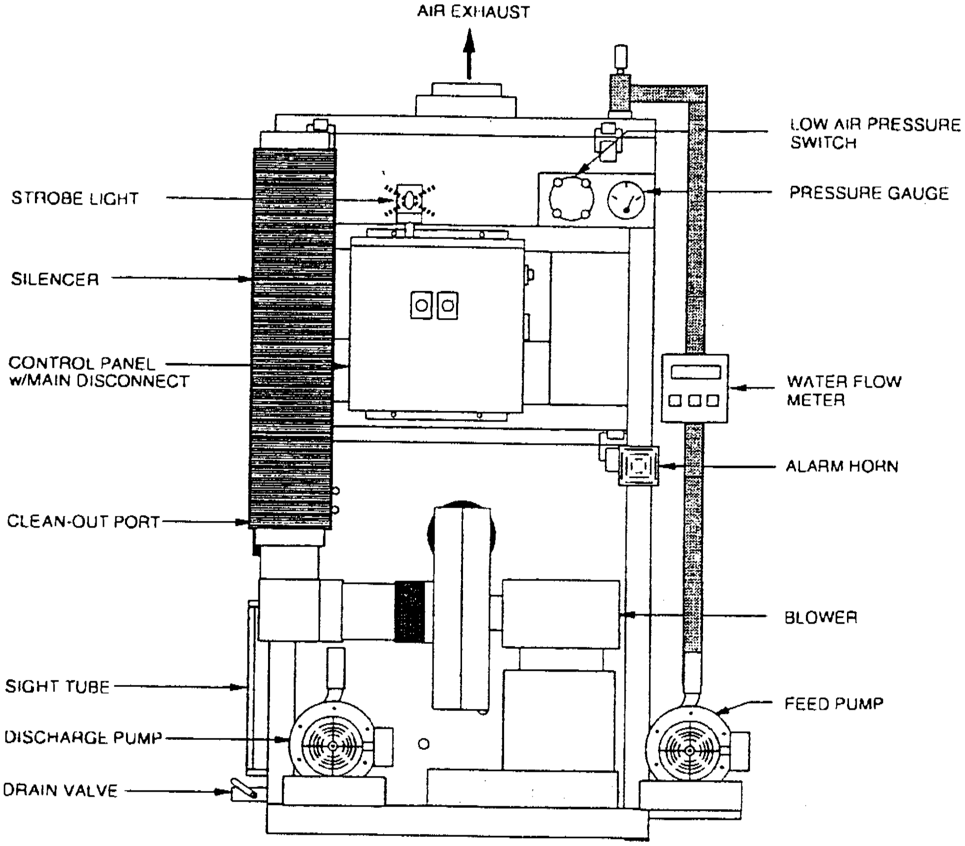
A spray nozzle is installed in all units except those with a gravity feed option. The nozzle directs the contaminated water to the first inlet chamber and begins the volatilization process. The nozzle is typically rated for 15 psig at the system's maximum water flow rate.

It is recommended that a strainer be installed somewhere in the inlet process water line, especially during initial start-up, to prevent sediment from plugging the nozzle.

If the nozzle becomes plugged, it is easily removed by first removing the top cover and then unscrewing the nozzle from the inlet piping. Clean it with a wire brush or a pipe cleaner. If the nozzle causes too much back pressure or becomes plugged too often, it can be removed without any serious effects on the system's performance. Units that have a gravity feed system should not use a spray nozzle – it causes too much back pressure. In these cases, the inlet piping should extend below the water level of the inlet chamber to provide a water seal.

Note: System performance is based on ShallowTray operation without a nozzle, and warranty is valid whether a nozzle is installed or not.

ShallowTray System Options



2331 STAINLESS PRESSURE SYSTEM WITH OPTIONS

NOT ALL OPTIONS SHOWN

SHALLOWTRAY OPTIONS

ShallowTray System Options

ShallowTray low profile air strippers are custom built to meet site and project specifications. Please refer to the components list insert (Section 1) to see which options were selected for your system. Component information cutsheets are included in Section 7 of this manual.

Air Blower Silencer

The air blower silencer reduces the dynamic noise level of the blower. The size of the silencer and the type of connection used to mount are dictated by the size of the blower, and whether the silencer is mounted horizontally or vertically. Silencers should be supported to avoid over-stressing the connections, and should be secured if exposed to high wind loads.

Air Flow Meter

The air flow meter measures the amount of air flowing through the system. It consists of a pitot tube mounted in the air line and a differential pressure gauge. The measured velocity pressure is then converted to an air flow rate. The pitot tube must be located at least 8½ pipe diameters of straight pipe after any pipe fitting or transition, and at least 1½ diameters of straight pipe before the end of the pipe or any elbow. The best pitot tube location is before the stripper because the air is less humid and the gauge hose is less likely to fill with condensate.

The air flow meter typically gives readings in inches of water column (W.C.), which is then converted to feet per minute (FPM) using the provided chart. You then multiply the feet per minute by the interior cross sectional area (square feet) of the vent line. This gives cubic feet per minute (CFM). As stated in the damper section, the air flow meter in conjunction with the pressure gauge provides the most accurate damper adjustments, especially after initial start-up.

The table below lists the minimum, recommended, and maximum flows for each stripper model, and the minimum exhaust pipe diameters. Note that the airflow must be at least the minimum for proper stripping efficiency.

Stripper Model	**Minimum**	**Required Air Flow Recommended**	**Max.**	**Recommended Exhaust Pipe Diameter**
1300	150 cfm (250m^3/hr)	195 cfm (330m^3/hr)	300 cfm (510m^3/hr)	6 in.(16cm)
2300	300 cfm (510m^3/hr)	390 cfm (660m^3/hr)	600 cfm (1020m^3/hr)	6 in.(16cm)
2600	600 cfm (1020m^3/hr)	780 cfm (1320m^3/hr)	1200 cfm (2040m^3/hr)	8 in.(20cm)
3600	900 cfm (1530m^3/hr)	1170 cfm (1990m^3/hr)	1350 cfm (2290m^3/hr)	10 in.(25cm)
31200	1800 cfm (3060m^3/hr)	2340 cfm (3980m^3/hr)	2700 cfm (4590m^3/hr)	16 in.(40cm)
41200	2400 cfm (4080m^3/hr)	3210 cfm (5450m^3/hr)	3600 cfm (6120m^3/hr)	18 in.(45cm)

Note: Low airflow is the most common reason for poor removal efficiencies. Thus, an airflow meter is highly recommended to help ensure adequate air flow.

Air Pressure Gauge

The air pressure gauge reads the pressure differential in inches of water column (W.C.) between the point of highest pressure in the air stripper and the atmosphere. The gauge is connected to the system via an air hose that attaches to a pressure port on the system. Instructions to connect the gauge for the two types of systems are as follows:

Pressure System – Using tubing, connect the "High" pressure port on the gauge to the ⅛" (3mm) shutoff valve/hose barb located on the air stripper sump tank. The matching "Low" pressure port is to be open to the atmosphere. Highest pressure is in the sump tank.

Vacuum System – Using tubing, connect the "Low" pressure port on the gauge to the hose barb located on the exhaust vent line of the air stripper. The matching "High" pressure port is to be open to the atmosphere. Highest vacuum is in the cover air exhaust pipe.

Note: There are two pairs of pressure ports on the gauge. One pair should be used to measure the differential pressure, and the other set must be plugged.

At initial start-up, the pressure gauge can be used to make proper blower damper adjustments. Adjustments should be made according to the following nominal air pressure/vacuum table:

	Nominal Air Pressure/Vacuum	
Number of trays	**Low Water Flow System**	**High Water Flow System**
1 tray system	4 - 6 inches W.C. (10 - 15cm)	7 - 10 inches W.C. (18 - 25cm)
2 tray system	7 - 10 inches W.C. (18 - 25cm)	11 - 14 inches W.C. (28 - 36cm)
3 tray system	11 - 14 inches W.C. (28 - 36cm)	16 - 18 inches W.C. (40 - 46cm)
4 tray system	16 - 18 inches W.C. (40 - 46cm)	20 - 22 inches W.C. (50 - 56cm)
5 tray system	20 - 22 inches W.C. (50 - 56cm)	24 - 26 inches W.C. (60 - 66cm)

Note: The nominal pressures or vacuums shown are for the air stripper only, and do not include additional air stream equipment pressure requirements. Fouling may occur in the system, which may increase the nominal air pressure reading, and may decrease the air flow rate.

Control Panel

The control panel serves two basic functions required for the safe operation of the system. The first is to provide the required electrical safety components for each motor (blowers and pumps) per NEC standards. These components consist of fuses, motor starters, and overload relays.

The second function is to provide the required process control and alarm components. The alarm circuit monitors the low air pressure switch and the high water level alarm switch. If either of these alarms occur, then the alarm contacts will shut off the incoming water source (feed or well pumps) if the appropriate connections have been made. Other alarm options are also available.

SHALLOWTRAY OPTIONS

Control Panel Intrinsically Safe Components

ShallowTray low profile air stripper systems that operate in or near potentially explosive concentrations of vapors may require intrinsically safe (IS) signals to all electrical components housed in non-explosion proof enclosures. The IS signal is not capable of creating a spark or a temperature rise great enough to ignite any concentration of any NEC classified explosive vapor. Typical components that need IS signals are the float switches and well probes. Determination of when IS signals are required is generally the responsibility of the groundwater remediation engineer who is specifying a system.

Digital Water Flow Indicator

The digital water flow indicator, typically installed in the water feed piping to the stripper, reads the rate of flow (gpm) and the totalized flow (gallons). The flow meter is selected to exceed the maximum flow of your system while providing a wide working range. The digital face plate is battery operated and intrinsically safe (typically Halliburton brand). The only moving meter component is the turbine rotor, which spins around a shaft axial to the flow of water.

It is possible to plug the turbine rotor with particles and sediment. An ⅛" (3mm) screen filter should be installed somewhere in the incoming process water line prior to the meter. If the meter becomes plugged it can be disassembled and cleaned. Please disassemble per the manufacturer's instructions, if necessary.

Feed and Discharge Pumps

The pumps on each system have been selected by our engineering staff to meet the appropriate flow and pressure requirements. The pumps are typically cast iron and bronze, with either EXP or TEFC motors. The pumps are not self-priming. Prior to initial start-up, the pumps must be primed by filling the pump impeller housing with clean water. Throttle valves are typically installed on the discharge lines. If the pump is running wide open and it is not pumping against the required head, the pump may cavitate. This is the nature of centrifugal pumps; they must be throttled back if they are not pumping against the required head. Also, the valve should be throttled back until the motor draws less than the nameplate amps current rating.

If the pump is wired by someone other than North East Environmental Products, please **double check the rotation**. A pump rotating in the wrong direction could cause the pump impeller to spin off, causing serious damage to the pump.

Systems using pumps should have the flow rates tuned so that the discharge flow rate is greater than the inlet flow rate. This will prevent blower flooding.

High Water Level Float Alarm Switch

The high water level float alarm switch is one of the alarm interlocks that must be properly connected, by a licensed electrician, prior to the system's initial start-up. Please see *Special Cautions* at the beginning of Operating Instructions section for more information. The purpose of the high water level float alarm switch is to prevent water from flooding the system. It does this by shutting off the incoming contaminated water once clean water has reached a designated level in the sump tank. The high water level float switch will send an alarm signal when it rises approximately 3½ inches (9cm) above the coupling it is installed in.

Line Sampling Ports

The line sampling ports provide a quick and easy way to take water samples of both incoming contaminated water and outgoing clean water. The sampling ports are the typically ½" (1cm) ball valves located on both the inlet and outlet piping.

When taking a water sample, open the valve and let the water flow for at least 1 minute prior to bottling the sample. This purges the sample port of any stagnant water.

When purging the sample ports be sure to capture the water and properly dispose of it. When starting the unit for the first time double check that the valves on the sample ports are closed.

Low Air Pressure/Vacuum Alarm Switch

The low air pressure/vacuum alarm switch monitors the blower for continuous water treatment. This switch is one of the alarm interlocks that must be properly connected by a licensed electrician prior to the system's initial start-up. Please see *Special Cautions* at the beginning of Operating Instructions section for more information.

Should the blower fail, the low air pressure switch should be wired to shut off all incoming water. Using tubing, connect the switch to the hose barb on the tank (pressure system) or in the cover exhaust pipe (vacuum system).

Pressure system – The air hose is connected from the sump tank ⅛" (3mm) hose barb (without valve) to the "high" pressure port on the switch using the provided hose barb. The "low" pressure port must be open to the atmosphere. The switch measures the differential pressure between the sump tank and the atmosphere.

Vacuum system – The air hose is connected from the exhaust piping ⅛" (3mm) hose barb to the "low" pressure port on the switch using the provided hose barb. The "high" pressure port must be open to the atmosphere.The switch measures the differential pressure between the top tray and the atmosphere.

Periodically inspect the air hose for water build-up which will affect the switch's operation. The tubing must remain open at all times.

Test the switch at initial start-up by removing the air hose from the hose barb on the sump tank or exhaust pipe once the system is in full operation. This should set the system into an alarm condition and shut off the incoming contaminated water.

High Air Pressure/Vacuum Alarm Switch

The high air pressure/vacuum alarm switch prevents the system from exceeding its highest rated pressure/vacuum value. If the blower has the ability to produce pressure/vacuum higher than 32 inches (82cm) W.C. for stainless units or 26 inches (56cm) W.C. for plastic units then it should have a high pressure/vacuum alarm switch. Be sure to check that the setpoint for alarm shutdown is at the proper setting for the system.

Main Disconnect Switch

The main disconnect switch removes power from the ShallowTray low profile air stripper. A disconnect is required by the National Electric Code (NEC) and must be installed. North East Environmental Product's panels typically contain a disconnect integral with the control panel to remove power, but may also use disconnects external to the control panel depending on the situation. Make sure a qualified licensed electrician installs the power line into the disconnect switch. Be sure to ground the switch to the main service ground.

Water Temperature Gauge

Water temperature gauges can be installed on both the inlet and outlet piping. Influent water temperature is an important variable affecting the system's removal efficiency.

Water Pressure Gauge

Water pressure gauges can be installed on both the inlet and outlet water piping. Excessively high readings could signal that something in the piping system is plugged. Large pressure fluctuations could be a sign that the water flow rate is varying.

Section 3: Operating Instructions

Special Cautions!

The following operations must be carried out prior to initial system start-up:

Step 1

Connect the Interlock Switches.

1. To avoid damaging the blower and flooding the equipment with contaminated feed water, install the high water level and low air pressure/vacuum interlock switches.

It is important that a qualified licensed electrician perform these installations.

High water level interlock

If the water level in the sump tank rises beyond the maximum level, it could flood the blower. This may damage the blower and void the warranty. The high water level interlock switch will also shut off the feed water pump in an emergency situation.

Low Air Pressure/ Vacuum Interlock

If the blower fails, untreated water could flow directly to the discharge line. The low air pressure/vacuum interlock switch will shut off the feed water pump to prevent this from occurring.

High Air Pressure/ Vacuum Interlock

If a system has a blower capable of producing more than 32 inches (82cm) W.C. for stainless units or 26 inches (56cm) W.C. for polyethylene units then it requires a high pressure/vacuum switch. If a unit fouls or pressure increases due to off-gas treatment, it may exceed the maximum pressure rating of the system and cause damage to the gaskets, sump, or trays.

Note: **These recommended interlock options might not have been provided as part of North East Environmental Product's scope of supply.**

Step 2

Fill the Sump Tank and each tray's Inlet Chamber.

On initial start-up, the sump tank must be filled with **clean water** to a height of about 5 inches (13cm). Make sure the valve to the sight tube is open. The sump tank can be filled via the clean-out ports on the end of the stainless units, or through the inlet water port located on the cover. The inlet chamber on each tray (referred to as seal pots) can be filled manually by pouring **clean water** through the 1 inch (3cm) inlet chamber filling ports or the 4 inches (10cm) clean out ports located on the ends of the stainless units, or by disassembling the plastic units and filling the seal pots as you reassemble. The seal pots on both the plastic and stainless systems can also be filled at initial start-up by connecting a **clean water** line to the inlet water port and running the system for ten minutes with the blower on and the damper 1/4 open. For complete instructions on this method, please follow initial Start-up procedures later in this section.

Do Not Run Free-Product Through the ShallowTray Air Stripper.

Free product will contaminate the unit by coating the sidewalls with a film of free-product. ShallowTray units are designed to remove dissolved VOCs only.

Always provide fresh, clean air for the system air intake. Air that is heavily contaminated with VOC's will significantly reduce the Shallow Tray's performance.

Equipment Set-up

Drawings

Drawings referred to in the following sections are located in Section 6.

Please follow codes.

The plumbing and electrical installations must be performed by qualified personnel, and must be done in accordance with local, state, and national codes.

Protect critical items from the environment.

In areas that could be below freezing, the stripper should be installed in a heated building. Plastic units, control panels, and motors should be protected from direct sun. Explosion proof motors should be protected from rain due to the absence of motor gaskets.

Install adequate supports.

Since **none** of the external piping associated with the ShallowTray unit is designed to support process water lines or air piping, adequate supports must be installed.

Assemble Unit.

All ShallowTray units are assembled and hydraulically tested at the factory. However, to safeguard the units from shipping damage, some components are removed prior to shipping and will require re-assembling. Follow all relevent steps in this section to properly set-up your ShallowTray unit.

Check for loose fittings.

Shipping your system to the site may have caused piping joints or assembly hardware to loosen. Please re-tighten as necessary.

Step 1

Bolt your unit together.

For shipping purposes, the ShallowTray unit may come in two sections; the blower frame assembly and the sump and tray assembly. Bolt the base frames together using the bolts and spacers provided. (This step is done at the factory for the 1300 and 2300 series.)

Step 2

Connect Blower.

For positive pressure systems install the rubber coupling provided from the blower outlet to the air inlet nozzle on the sump tank. (See Section 6 coupling layout drawing for air inlet nozzle location.) For vacuum systems, install a vent line from the stripper air exhaust located on the top cover to the blower intake. North East Environmental Products may not have provided this piping. Make sure the pipe diameter is large enough to maintain the required air flow without adding a pressure drop, and be sure the pipe has a suitable vacuum rating to prevent collapse.

Caution: Blower must draw clean air. Do not vent storage tanks that contain substances that will contaminate the air in the same room the blower draws air from. Do not duct intake air from an area that has contaminated air. Contaminated air will contaminate the water.

Step 3

Assemble trays and level the ShallowTray unit.

Some of the larger units may have the top tray and cover shipped separately. Install trays shipped separately by lining up the arrows and numbers on the trays and cover. To prevent damaging the gasket, do not drag the trays or cover across the gasket during assembly. Fasten all latches properly. The tray being installed must have the downcomer line up with the sealpot on the tray below it. Check all the trays to make sure they are installed correctly, and not backwards. If the system is not set up properly the water could bypass a tray allowing water to miss a large portion of the treatment path. Refer to the "base subassembly" exploded view drawing in Section 6.

Level the ShallowTray unit. This is a critical step in the proper assembly of the equipment. If not level, the water depth on the trays will be uneven, causing the water to seep through the tray holes untreated.

Step 4

For a gravity discharge unit

Install the outlet pipe.

For a gravity discharge unit (no discharge pump): Refer to the Section 6 outlet piping drawings to assemble the plumbing components, which are typically shipped in a separate carton. Positive pressure systems require a riser pipe to compensate for the pressure generated by the blower. It is important that the riser pipe height is adjusted to create a 5 inch (13cm) water depth in the sump tank during normal operating conditions. The provided vacuum relief valve must be installed to prevent the sump from siphoning below the 5 inch depth.

It is essential that the riser pipe be mounted in the vertical direction, and that it be properly supported.

Note: Some systems have an internal trap. Please refer to the plumbing drawing.

The purpose of having the 5 inch (13cm) water depth in the sump tank is twofold. First, it is to keep the downcomer (from the bottom tray) and the water discharge port (which elbows down internally) submerged. Both are set to a height of 2 inches (5cm) from the bottom of the sump. Keeping them submerged forms a water seal which prevents air from escaping up the downcomer pipe or out the discharge trap.

Second, the 5 inch (13cm) depth is low enough to allow our high water level switch to reset. The switch, located in its typical position, has an approximate reset deadband of six inches, meaning the water level must drop 6 inches (15cm) below the alarm trip point before it resets. Consult with North East Environmental Products for additional options or questions about float switch location or normal operating water depth.

Use proper pipe sealant and PVC cement when needed. We recommend running the system and adjusting the riser pipe before permanently bonding the fitting.

Caution: The vertical height of the trap should create a 5 inch (13cm) water depth in the sump tank during normal operating conditions. Depths lower than 5 inches (13cm) may allow air to escape through the water discharge line or up through the downcomer. This may result in untreated water falling into the sump tank.

Step 5

For a unit with a discharge pump

Install the outlet pipe.

For a pumped discharge unit: Refer to the Section 6 outlet piping drawing to assemble the water line from the sump tank to the pump suction, using components supplied in a separate carton.

Install outlet piping to the pump's discharge port. A ball valve is typically provided and should be used to adjust flow and prevent the pump from cavitating. Use proper pipe sealant and PVC cement when needed. To reduce pressure losses, it is recommended that the connected pipe size remain at least as large as the fitting provided.

Prime the pump. Pour clean water in the pump's inlet port until it has filled the entire pump chamber. A check valve is supplied to keep the pump primed. Remove the top air bleed plug on the pump housing to let air bleed out, then replace plug tightly.

Step 6

Install the inlet piping manifold.

Install the inlet piping manifold (typically shipped in a separate carton). Follow the Section 6 inlet piping diagram for proper installation. The spray nozzles are installed on the inside of the cover, or may have been shipped separately. The nozzles are typically selected to produce a 15 psig pressure drop at the highest anticipated water flow rate.

During start-up, a strainer should be installed in the water inlet line to prevent the spray nozzle and process water line components from plugging with sand and sediment. If necessary, the strainer can be permanently installed.

Use proper pipe sealant and PVC cement when needed.

Caution: For all systems other than 31200 and 41200, there are two inlet port locations on the cover; one is plugged, the other is used. The 31200 and 41200 series, have three and four ports respectively, and all are used. *You must use the port located above the sealpot of the top tray.* Otherwise contaminated water will bypass the treatment path of the first tray and fall directly into the downcomer to the next tray. This will result in poor removal efficiency.

Step 7

Install the sump drain valve and the sight tube.

Install the sump drain valve and the sight tube. Refer to the Section 6 coupling layout drawing for port locations. Be sure to open the valve to the sight tube during start-up and operation. The valve should be closed only to replace a damaged sight tube.

Step 8

Connect the water lines.

If the seal pots have not yet been filled with *clean water*, connect a *clean water* line to the inlet port or piping manifold and fill the seal pots according to the steps outlined in the initial start-up section.

If the seal pots are filled with clean water, connect the process water line to the inlet piping manifold.

Connect the discharge water line.

Firmly support the process water lines to prevent stress on the piping and ports. **The system is not designed to support the weight of the process water lines.**

Use proper pipe sealant and PVC cement when needed.

Step 9

Connect the tubing.

Connect the tubing from the ShallowTray to the optional low air pressure/vacuum switch, optional high air pressure/vacuum switch, and the optional pressure/vacuum gauge. Read the component descriptions on each for detailed connection information, and also refer to the Section 6 drawings. For the air pressure gauge, be sure to install the tubing to the 1/8" (3mm) shutoff valve. Open the valve only when a reading is required. This will reduce condensation build-up in the gauge. The air pressure switch tubing should always be open for continuous sensing. The switch is designed to drain excess condensation.

Step 10

Connect the air discharge line.

Connect an air vent line on the top of the unit.

Caution: Do not use a vent line with a smaller diameter than the air exhaust port. A smaller diameter may cause a pressure drop larger than the blower was designed for, resulting in low air flow and poor removal efficiency.

Connect the air vent line to the exhaust port using the flexible rubber coupling provided. Support the vent line independently of the air stripper so that it can be easily disconnected when the cover is removed for maintenance purposes.

Step 11

Wire the electrical components.

Have a qualified licensed electrician wire the electrical components in compliance with local, state, and national codes.

Make sure the safety interlocks, described in the Special Cautions section, are connected properly!

(If North East Environmental Products is supplying your control panel, see Section 6 wiring diagrams.)

Step 12

Install optional items.

Air flow meter

Mount the pitot tube on the vent line per Dwyer bulletin # H-11 (located in the separate shipping box) or per the Section 6 air flow meter assembly drawings using the mounting hardware provided. Connect pitot tube to the 0-0.5 or 0-1.0 inches W.C. air pressure gauge using the tubing provided. (See pitot tube mounting diagram in Section 6.) There are two air hoses required, one connects to the high pressure port on the gauge and on the pitot tube, and measures internal static pressure plus velocity pressure. The other connects to the low pressure ports on the gauge and on the pitot tube, and measures the internal static pressure only. The optimum pitot tube location is before the stripper, because the air is less humid and the tubing will be less prone to filling with condensate.

Air blower silencer

Pressure systems – Install the silencer on the inlet side of the blower.

If the silencer is to be in the vertical position, install the piping and elbow as shown on the Section 6 silencer diagram.

If the silencer is in the horizontal position, attach it directly to the blower inlet using a rubber coupling.

Vacuum systems – Install the silencer on the blower. The standard silencer's maximum pressure/vacuum rating is 20 inches (50cm) W.C. Be sure not to exceed the silencer's limit.

Water flow meter

Install the water flow meter into the inlet piping per the Section 6 water inlet piping diagrams.

The flow meter owner's manual was sent with the unit. Be sure to refer to it when installing the meter.

Please install an 1/8" (3mm) strainer in the incoming process water line prior to the water flow meter. This will prevent rotor jamming.

Note: There may be other optional equipment that requires installation or assembly. Please refer to the Section 6 specification sheet and drawings for more information.

Initial Start Up

Upon completion of the equipment set-up and mechanical/electrical installation, proceed with the following steps:

Step 1

Check all connections, and close drain and sample valves.

Double check that all electrical, water, and vent connections are properly made. Close drain and sample valves.

Note: Be sure that the sight tube valve is open.

Step 2

With other switches 'OFF', turn 'ON' the main power disconnect switch.

Turn all panel control switches to the 'OFF' position, then turn 'ON' the main power disconnect switch.

Note: Turn all panel control switches to the 'OFF' position before applying power. Systems with intermittent operation will show an alarm condition (low air pressure) five seconds after power is applied because the blower is not operating. Once the blower is supplying proper pressure, the alarm low air pressure condition will reset. Some systems may require pushing an 'Alarm Reset' button.

Step 3

Check the blower rotation.

Check the blower rotation by momentarily switching 'ON' (bumping) the blower switch and observing whether the blades turn in the direction of the arrow on the blower casing. You can also observe the motor's cooling fan blades for proper rotation.

Note: If system panel has the intermittent operation feature, the blower motor must be bumped in the 'HAND' position. Refer to the Routine Operation Section for a description of "intermittent operation".

Step 4

Attach clean water line to the inlet.

If you did not fill the seal pots on each tray manually, please fill them now by attaching a (clean) water line to the water inlet piping manifold or port, and then follow Step 5.

If you have filled the seal pots manually, please skip Step 5 and go to Step 6.

Step 5

Fill the seal pots (inlet chamber) with clean water.

Special Caution: **Make sure to use** ***clean water*** **when filling the seal pots. If contaminated water is used it will go through the system untreated.**

To fill the seal pots (inlet chambers), set the blower damper to ¼ open, and start the blower and the clean water flow to the unit. Let the blower and clean water run for about five to ten minutes, then shut them off. Setting the damper at ¼ open reduces the air flow enough to allow the water to flow through the downcomers and into the seal pots.

Note: If your system has the intermittent operation feature, you must start the blower in the 'HAND' position for this procedure.

If you have trouble filling the seal pots by this method you can fill them manually, either by using the one inch sealpot filling ports (if provided), or by spraying a stream of clean water through the clean-out ports (not provided on plastic systems). The stream of water must be directed into the sealpot on the far side of the unit, until the sealpot is full.

For plastic systems and older model stainless systems, you must remove the trays and fill the sealpots manually.

Step 6

Connect contaminated feed water line.

Connect contaminated feed line. Install all piping to allow for future removal for maintenance or repair. Make sure it is supported independently of the ShallowTray. Start system with the blower damper ½ open.

Note: For systems with intermittent operation, you must turn 'OFF' the power at the main disconnect, turn all control switches to the auto position, and then reapply main power. All motors will start automatically based on control functions.

Note: Each control panel is custom designed for each site. Become familiar with the panel logic and proper operation before attempting to start the system. The panel might have been provided by a panel manufacturer other than North East Environmental Products.

Step 7

Check the air pressure readings and set damper.

Run the unit for 5 minutes, and then adjust the blower damper setting to produce the required air pressure/vacuum reading on the pressure gauge. Since the blowers provided by NEEP are selected and tested to exceed the minimum flow requirements of the system, you can use the following table to set the damper during initial start-up.

	Nominal Air Pressure/Vacuum	
Number of trays	**Low Water Flow System**	**High Water Flow System**
1 tray system	4 - 6 inches W.C. (10 - 15cm)	7 - 10 inches W.C. (18 - 25cm)
2 tray system	7 - 10 inches W.C. (18 - 25cm)	11 - 14 inches W.C. (28 - 36cm)
3 tray system	11 - 14 inches W.C. (28 - 36cm)	16 - 18 inches W.C. (40 - 46cm)
4 tray system	16 - 18 inches W.C. (40 - 46cm)	20 - 22 inches W.C. (50 - 56cm)
5 tray system	20 - 22 inches W.C. (50 - 56cm)	24 - 26 inches W.C. (60 - 66cm)

Note: Double check pressure reading after system has been running for about ½ hour. Adjust damper again if needed. Also check the airflow meter for proper airflow rate.

Pressure readings may vary somewhat depending on your venting system. See the components list in Section 1 for the minimum air flow requirements for your system.

The system is ready for operation.

The system is now ready for normal operation. It is not necessary to perform initial start-up procedures each time the system is shut down.

However, note that anytime water is completely removed from the seal pots or sump tank, the initial start-up procedure must be done again. For example, after the system has been taken apart for cleaning, or after an extended shutdown where the water may have evaporated from the tank or seal pots.

Routine Operation

Air Flow

The table below lists the minimum, recommended, and maximum airflow for each stripper model and the minimum exhaust pipe diameters.

Note: The airflow must be at least the minimum shown for proper stripping efficiency.

Stripper Model		Required Air Flow		Minimum Air Pipe Diameter
	Minimum	Recommended	Maximum	
1300	150 cfm	195 cfm	300 cfm	6 in. (15cm)
2300	300 cfm	390 cfm	600 cfm	6 in. (15cm)
2600	600 cfm	780 cfm	1200 cfm	8 in. (20cm)
3600	900 cfm	1170 cfm	1350 cfm	10 in. (25cm)
31200	1800 cfm	2340 cfm	2700 cfm	16 in. (40cm)
41200	2400 cfm	3210 cfm	3600 cfm	18 in. (46cm)

Adjust water flow rate by setting the water throttle valves.

Now that the system has been primed per the initial start-up procedures, it is ready for fine tuning. Adjust throttle valves on inlet and outlet piping to obtain the desired water flow rates. Refer to the Section 6 specification sheet for your system's design and maximum water flow rates. To prevent a high water level alarm, it is critical that the discharge pump flow rate exceed the influent water flow rate.

Pumps provided by NEEP have throttle valves on the discharge side of the pump. Once the desired water flow rate is achieved, check the amp draw of the motor.
It must not exceed the pump nameplate amp draw. If the pump is cavitating, it is not pumping against the required head, and should be throttled back.

Alarm switches

High water level switch – The switch is typically installed in the middle of three half inch switch ports located on the front of the unit (refer to the Section 6 coupling layout drawings). If more sump capacity is required, the high level float switch can be moved to the top port location.

Caution: If the float is moved to the higher port and the discharge line plugs or the discharge pump fails, the water level could rise above the air inlet port, allowing water to drain into the blower housing or onto the floor. The blower may become damaged if it is running while water is in the blower housing. Be sure to check that the 1/8" (3mm) hole in the bottom of the blower housing is open to allow for drainage of water that may get into the housing.

Section 4: Cleaning Proceedures

Intermittent Operation

If continuous blower operation is a concern, ShallowTray low profile air stripper systems can be designed to run intermittently. When the feed water is flowing into the system, the blower will be in operation and the outlet pump (if provided) will maintain proper sump tank levels. When the feed water is shut down, the blower will run for an additional five minutes to treat the water already in the trays, then it will also shut down. When the feed water is restored, the blower will automatically start up to treat the new batch of water.

If there is an alarm condition that lasts longer than five minutes the blower will shut down and the alarm circuit light will remain on. Once the blower shuts off, the system will sense a low air pressure condition. To reset the alarm circuit or light once the blower has shut off, you must disconnect power at the main disconnect. Some systems may also have a "reset" push button on the control panel door.

System Shut Down

Shut feed water off.

Shut off the water feed to the system.

Wait 5 minutes, then shut off the blower.

Wait 5 minutes to allow the water in the stripper trays to be completely treated, then shut off the blower. Treated water in the trays will drain into the sump tank, so it is important to keep the outlet pump in "auto" to remove this extra water.

Shut main power off.

Shut off the power at the main disconnect switch if the shutdown is more than temporary.

Caution: If proper shut down procedures are not followed, contaminated water will drain into the sump tank. This will contaminate the water that has been collected in the tank. Therefore, always allow the blower to run an additional 5 minutes after the feed water is shut-off.

Equipment Maintenance Instructions

Cleaning Instructions

Minerals dissolved in high concentrations tend to precipitate out of groundwater during air stripping processes. These minerals form insoluble deposits commonly referred to as 'fouling.' Although the ShallowTray low profile air stripper system is designed to be fouling resistant, proper steps must be taken when treating water with high mineral concentrations. Deposits from iron-rich feed water can be reduced by pre-treating it with **sequestering agents.** For more information, please call Remede Products, Inc., 802-365-7200. The recommended cleaning procedure is pressure washing. Please follow the detailed instructions in this section.

Equipment Required

Pressure Washer

2 gpm minimum flow at 900 psig minimum. Equipment rental companies can usually supply such a unit on a daily rental basis.

Washer Wand

Washer wand with spray nozzle, (obtainable from North East Environmental Products as an option) and an adapter to connect the wand to the pressure washer hose end. All washer wand connections are ¼" (6mm) NPT.

Clean Water Supply

Clean water supply with a capacity of at least 2 gpm at 20 psig. Connect to the pressure washer using an ordinary garden hose.

Cleaning the Unit

Step 1

Turn off equipment.

Turn off the feed water to the stripper.

Step 2

Provide for waste disposal.

Make provisions for disposing of the sludge and waste generated during cleaning. A wet/dry vacuum may be required, or possibly the outlet pump (if provided) can pump out to a storage tank. Be aware that large pieces of debris might possibly clog the outlet pump or check valve.

Step 3

Remove cleanout port covers.

Remove all cleanout port covers.

Step 4

Turn on water and pressure washer.

Turn on the water supply to the pressure washer. Then, turn on the pressure washer. Wear protective goggles or face shield while spraying.

Step 5

Insert wand and start pressure washer water flow.

Insert the wand all the way into the 8" (20cm) cleanout port on the sump tank. Have the spray nozzle pointed up toward the bottom of the lowest tray. Holding the wand tightly, pull the trigger to start the pressurized water flow. Expect the wand to kick back as flow starts.

Step 6

Move wand side to side.

Move the wand side to side at a rate of about 1 inch (3cm) per second. Be sure to cover the entire tray bottom area. Recommended cleaning times for one side of one tray are given below:

Model 1300	2 min
Model 2300	4 min
Model 2600	8 min
Model 3600	12 min
Model 31200	24 min
Model 41200	32 min

Step 7

Inspect cleaned area.

Periodically stop the cleaning operation and inspect the cleaned area by shining a light into the unit. The area is clean when there are no deposits in or around the stripper tray holes.

Caution: Check the water level in the sump tank periodically, and drain it when necessary.

Step 8

Clean top side of tray.

When the bottom surface appears clean, move the wand to the top side of the same tray by inserting it in the next highest cleanout port. Continue spraying with the nozzle pointed down onto the top surface of the tray. Remove all visible deposits from the tray baffles and the walls of the unit.

Step 9

Repeat for all trays.

Repeat the procedure for the bottom of the next higher tray, etc., working up to the top tray.

Step 10

Rinse.

After the cleaning operation is finished, rinse the trays, baffles, and walls with the pressure sprayer. Work down from the top tray to the sump tank. Make sure the surfaces are clean and the holes are not blocked by loosened debris.

Step 11

Remove the top cover, flip it over, and wash the bottom side. Inspect spray nozzle and the wire mesh mist eliminator pad for fouling.

Clean the spray nozzle.

If the spray nozzle shows evidence of deposits, it should be removed and cleaned with a wire brush. Some systems have more than one spray nozzle.

Check the mist eliminator pad.

Clean the mist eliminator pad.

Use the pressure sprayer to remove debris, deposits, and gummy residues on the mist eliminator pad.

Replace the mist eliminator pad.

Mist eliminator pads that are excessively plugged should be replaced. The old pad is removed by loosening the retainer plates on the corners of the pad. Reinstall the new pad in the same orientation as the old one.

Section 5: Trouble Shooting

Caution: A competent electrician should perform any work inside the electrical control panel. Do not perform troubleshooting if you are not familiar with the procedures or the equipment.

Problem Blower Won't Start Or Run

No power to blower

Check that all switches are in "ON" or "AUTO" position.

Position main disconnect switch to "ON" position. Turn control switches to "ON" or "AUTO."

Blown Fuse

Check to see if fuses are ok. Check fuses in main disconnect switch and in control panel.

If blown, replace with fuse of the same size and rating to avoid the risk of fire or electrical shock.

Overload relay trips

Locate reset button on blower overload relay.

Push reset button in. Reasons for tripping: incorrect line voltage, motor wired incorrectly, inadequate ventilation, worn bearings.

Tubing to air pressure switch plugged with water or debris.

Remove tubing from air pressure switch and blow into it towards tank.

Clean or replace tubing if plugged or kinked.

Blower does not rotate freely.

TURN OFF ALL power to the system. Try to spin wheel by hand. Wheel should rotate freely.

If not, call North East Environmental Products.

Problem Outlet Pump Won't Shut Off

Suction or discharge piping for pump is clogged.

Check water flow from discharge pipe. Piping should be clean inside. Look for narrowing caused by scale or iron accumulation.

Remove piping. Inspect, clean, or replace as necessary.

Float switch in tank is stuck in down position.

Remove 8 inch (20cm) inspection cap and check that all floats are floating on the water.

Clean all deposits from float. Replace float if necessary.

Normal Operation – Water level in sump is OK.

Pump will stop when water level reaches pre-determined height in tank.

Allow water level to decrease until pump turns off.

Let water level reach predetermined lower level, which will cause outlet pump to turn off. Water level may be just below the bottom of clear sight tube before pump shuts off – this is normal.

Problem Outlet Pump Won't Run Or Pump Water

No power to pump

Check that all switches are in "ON" or "AUTO" position.

Position main disconnect switch to "ON" position. Turn control switches to "ON" or "AUTO."

Blown fuse.

Check to see if fuses are ok. Check fuses in main disconnect switch and in control panel.

If blown, replace with fuse of the same size and rating to avoid the risk of fire or electrical shock.

Overload relay trips.

Locate reset button on pump overload relay.

Push reset button in. Reasons for tripping: incorrect line voltage, motor wired incorrectly, inadequate ventilation, worn bearings.

Normal operation – Water level in sump is OK.

Pump will start when water level reaches predetermined height in tank.

Allow water level to increase until pump turns on. Be sure pump switch is in "Auto" position.

Let water level reach predetermined upper level, which will cause outlet pump to turn on.

Level switch in tank is wired incorrectly in control panel.

Check wiring circuit against diagram. See that all connections are tight and no short circuits exist because of worn insulation, crossed wires, etc.

Rewire any incorrect circuits. Tighten connections, replace defective wires.

Pump does not rotate freely.

TURN OFF ALL POWER TO THE SYSTEM. Try to turn impeller by hand.

If impeller won't turn, remove housing and locate source of binding. It could be due to impeller, seal, or bearing damage, or excessive fouling.

Impeller or check valve is fouled.

TURN OFF POWER.

Remove pump outer housing and inspect impeller for blocked openings. Be sure to have a new housing gasket kit available before removing housing. Remove check valve from line and inspect for stuck or fouled valve. Clean or replace impeller or check valve as necessary.

Problem Low Air Pressure/Vacuum In Stripper Tank

Blower damper closed.

Visually check position of damper on inlet of blower.

Open damper to get proper reading on pressure gauge. Firmly tighten damper set screw.

Motor rotation backwards.

Watch rotation of blower wheel at slow speed. It must match direction of the rotation arrow on the blower housing.

Reconnect wiring for proper rotation as per motor diagram.

Gravity discharge trap installed incorrectly.

Trap should be positioned vertically, as an "upside down U."

Install discharge trap per outlet plumbing drawings located in Section 6.

Inlet chamber (sealpot) in each tray is not full of water.

Remove "4 inch" (10cm) rubber caps or slide tray aside and look at water level in chambers.

Remove 4 inch (10cm) rubber caps on end of trays. Fill up inlet chambers with a hose. Or, follow the sealpot fill procedure as described in the Initial Start Up section.

Rubber clean out caps not in place.

All cleanout ports must have a rubber cap installed.

Tighten clamp on all rubber caps.

Tubing to pressure gauge plugged with water or debris.

Remove tubing from pressure gauge and blow into it towards tank.

Clean or replace tubing if plugged or kinked.

Unit has gravity feed, and inlet pipe on inside of ShallowTray cover is not submerged in inlet chamber water.

Remove cover and measure length of piping hanging from inside of cover. Length is to be about 10½ inches (27cm) from cover surface.

Adjust length of inlet pipe on inside of cover until total length is about 10½ inches (27cm). DO NOT INSTALL NOZZLE ON A GRAVITY FEED UNIT.

Debris blocking blower intake.

Look at blower intake screen.

Remove debris from screen.

Normal operation for automatic unit.

When inlet pump starts, the blower will start and air pressure will increase to required operational level.

No action necessary.

Problem High Pressure/Vacuum In Stripper

Air exhaust piping is restricted.

Check vent piping for bird nests or other obstructions. Check that vent pipe diameter does not decrease.

Intake or exhaust air pipe diameter must be at least as big as the cover vent or blower intake diameters.

Air holes in bottom of trays are plugged.

Remove inspection and cleanout caps and visually inspect aeration holes.

For iron fouling, clean out the unit with a pressure washer. For scaling, scrape or bang the scale from all surfaces, then use a pressure washer to open the 3/16 inch (5mm) diameter holes. Consider using a sequestering agent to prevent scaling.

Mist eliminator pad is plugged.

Remove cover from ShallowTray and inspect the bottom of the mist eliminator pad in the cover.

Remove mist eliminator pad from cover and clean. If fouled, replace with a new mist eliminator.

Problem Water Won't Flow Into Unit

Inlet/well pump functioning properly.

Allow water level to rise in well pump, which will turn on the inlet pump and start water flow to system.

No action necessary.

Stripper Sump Tank air pressure is low. System is in alarm condition.

Read sump tank air pressure from pressure gauge. System should be in alarm condition if pressure is below about 2 inches (5cm) W.C.

Check that blower is operating properly, and has correct rotation. Check that all rubber caps are in place on end of trays.

Spray nozzle or inlet piping is plugged.

Remove cover and inspect nozzle and piping for debris and buildup.

Clean or replace clogged parts.

Problem Iron Fouling Is A Problem

Iron precipitates out of water when treated with an air stripper, causing iron build up in unit.

Remove cleanout caps and inspect inside of tray for buildup/fouling.

- Clean out unit with pressure washer on a routine basis.
- Pretreat incoming water to reduce fouling problems in stripper.
- Meter a sequestering agent into the inlet water.

Problem VOC Removal Is Less Than Expected

There are many possible reasons for poor stripper efficiency. Please review the following list of questions to determine what the problem might be.

1. Have the trays been taken apart? Are they put back together as supplied from the factory, i.e., nozzle over sealpot, downcomers from each tray underwater in the sealpot of the tray below?
2. What is the sump tank air pressure reading? Is it steady, slowly changing over time, or rapidly fluctuating?
3. What is the air flow rate through the stripper? How is it measured? Where is the sensor mounted?
4. What is the air intake and exhaust piping design (size of ducts, number of elbows, length of pipe run, GAC, heaters, other restrictions)?
5. Are sample ports installed on each tray to verify per-tray removal efficiency?
6. Is sump tank contaminated? Where are effluent samples taken from?
7. Are sample ports purged for 30 seconds-1minute before taking sample?
8. Are samples being taken, stored, and tested per approved methods?
9. Are seal pots on each tray full of water?
10. Does the sump tank have at least 4 inches (10cm) of water at all times?
11. Is the water suction elbow in the tank pointing down and always underwater?
12. What is the inlet water temperature?
13. What else is in the water besides the contaminants in question?
14. Are there occasional slugs of free product, or much higher than normal contaminant concentrations that could enter the stripper?

15. Is inlet water supplied as a continuous stream (as from an electric pump), or is the flow pulsed (as from a pneumatic pump)?
16. Are there surfactants, detergents, greases, fats, etc. in the water that are causing foaming in the stripper?
17. Is there equipment near the blower intake that could be contaminating the air?
18. Has the air entering the blower been tested for VOCs?
19. How far away from each other are the air intake and air exhaust points? Is the air intake downwind or upwind from the exhaust? Is it possible for contaminated air to be sucked back into the stripper air intake?
20. Is the blower spinning in the correct direction (top of blower wheel spinning towards tank)? Watch wheel when it is almost stopped.
21. Is there air coming out of the discharge piping?
22. Is outlet piping siphoning all water out of the sump tank, until it sucks air from tank?
23. What is the outlet plumbing design (gravity discharge, pumped discharge, uphill, downhill, other equipment in-line, size of piping, etc.)?
24. What do the bubbles look like in each tray? Install view ports to see.
25. Are the undersides of the trays free of drips and drizzles?
26. Are tray holes closed or plugged? Is there any scaling or fouling on the trays?
27. Is the system level?
28. When shutting system down, is inlet water shut off, blower allowed to operate for an additional 5 minutes, then blower shut off?

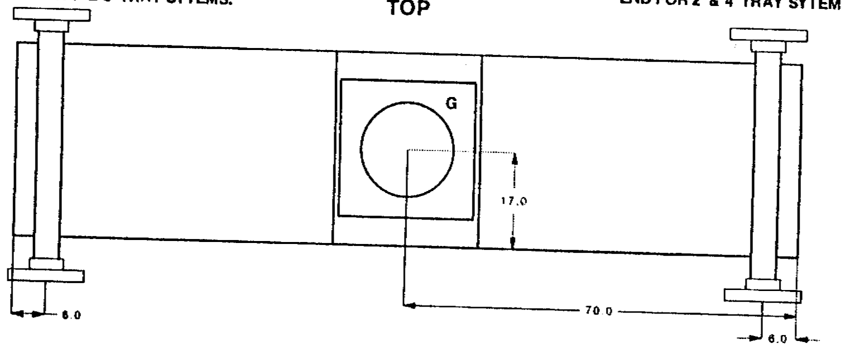
Section 6: Drawings

31200 COUPLING LAYOUT

	PORT DESCRIPTION	SIZE
A	WATER INLET PORTS	4.0" FLANGE
B	WATER OUTLET PORT	8.0" FLANGE
C	AIR INLET PORT	10.0" SLIP FIT RING FOR RUBBER COUPLING
D	SUMP DRAIN PORT	2.0" FEMALE NPT HALF COUPLING
E	FLOAT SWITCH PORTS	0.5" FEMALE NPT FULL COUPLING
F	SIGHT TUBE PORTS	0.5" FEMALE NPT FULL COUPLING
G	AIR EXHAUST PORT	16.0" SLIP FIT RING FOR RUBBER COUPLING
H	SUMP TANK VIEW PORT	8.0" SLIP FIT RING FOR RUBBER CAP
J	AERATION TRAY VIEW PORT	4.0" SLIP FIT RING FOR RUBBER CAP
K	PRESSURE PORTS	0.5" FEMALE NPT FULL COUPLING
L	AERATION TRAY 1" PORTS	1.0" FEMALE NPT HALF COUPLING

INLET PORTS LOCATED ON TOP LEFT END FOR 1 & 3 TRAY SYTEMS.

INLET PORTS LOCATED ON TOP RIGHT END FOR 2 & 4 TRAY SYTEMS.

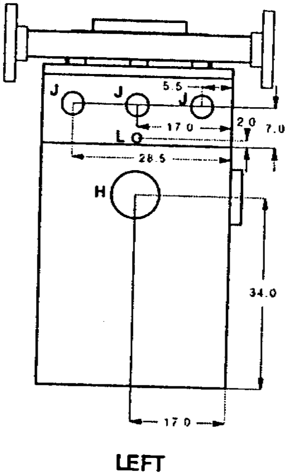


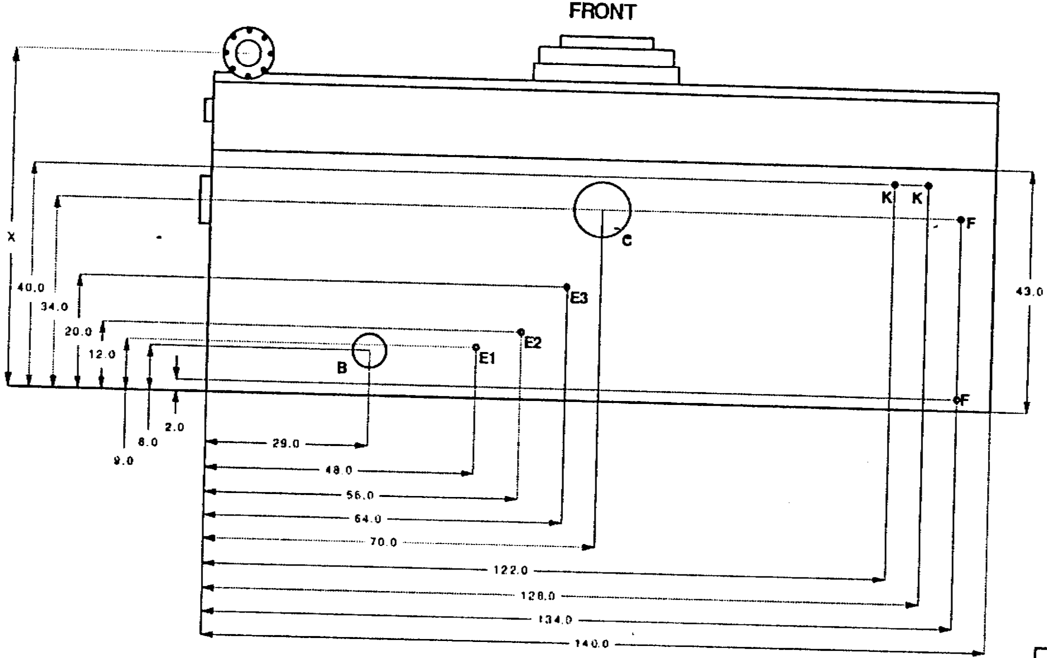
DIMENSION CHART (INCHES)

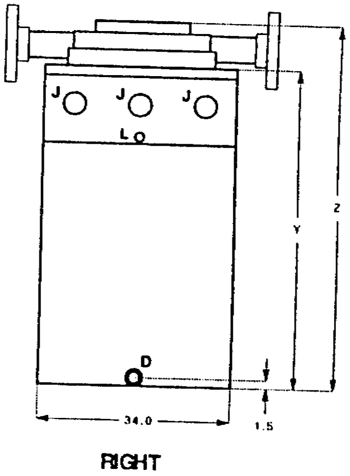
	X	Y	Z
31211	61.5	58.5	66.5
31221	73.5	70.5	78.5
31231	85.5	82.5	90.5
31241	97.5	94.5	102.5
31251	109.5	106.5	114.5

NOTE:

INCLUDES ADDITIONAL HEIGHT OF GASKET BETWEEN TRAYS AND COVER.







SWITCH LOCATION

E1	E2	E3	
✓	✓		FLOAT SWITCH, NORMALLY OPEN
		✓	FLOAT SWITCH, NORMALLY CLOSED
			0.5" NPT PLUG

✓ CHECK INDICATES ITEM INSTALLED ON PORT

*HEYCO FITTINGS TO BE INSTALLED ON THE INSIDE WALL OF SUMP TANK FOR EXP UNITS.

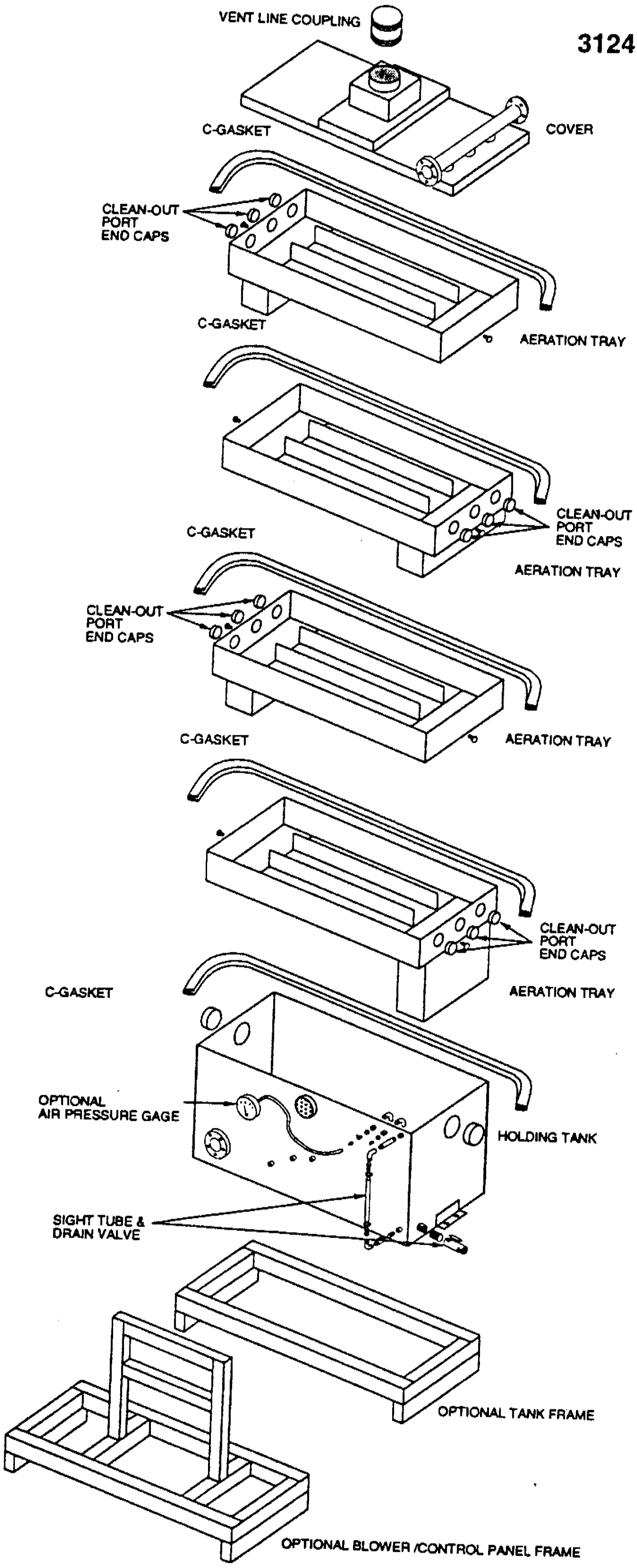
REVISION

LTR	DESCRIPTION	DATE	APPROVED
A	5 TRAY DIM	7/25/97	MD
B	FLG+INLET+HGHT	4/28/98	MD

NORTH EAST ENVIRONMENTAL PRODUCTS, INC.
17 TECHNOLOGY DRIVE
WEST LEBANON, NH 03784
(603)-298-7061

TOLERANCES UNLESS OTHERWISE SPECIFIED ±.060 in.	DRAWING NAME: COUPLING LAYOUT, 31200		
DRAWN BY: MS	DRAWING #: 900-160-00075		
DATE 7/13/94	SHEET: 1 OF: 1	SIZE A	REV B
	DRAWING SCALE 20 TO 1		

31241 BASE SUBASSEMBLY



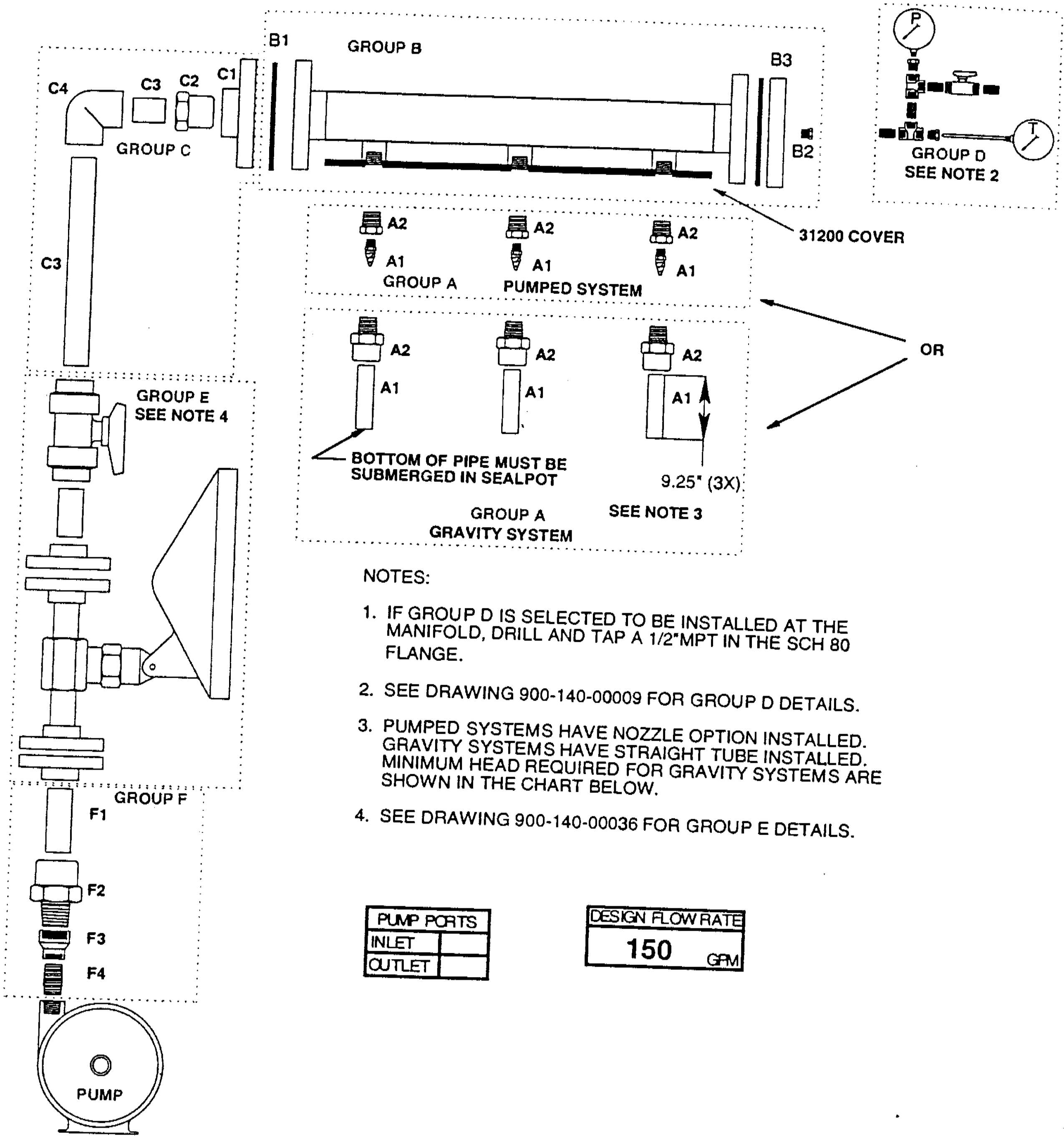
1 - (200-160-00180), COVER ASSEMBLY
1 - (200-160-00165), AERATION TRAY ASSEMBLY, 41" DC
3 - (200-160-00160), AERATION TRAY ASSEMBLY, 11" DC
1 - (200-160-00170), HOLDING TANK ASSEMBLY
1 - (200-140-00020), SIGHT TUBE ASSEMBLY
1 - (500-140-03250), NIPPLE FOR DRAIN VALVE
1 - (500-140-02760), DRAIN VALVE
8 - (500-140-02020), PLUG,1",THREAD,PVC40
1 - (500-160-00080), DEMISTER PAD, 31200
1 - (500-150-00189), FERNCO RUB. COUPLING 1055-1515
12-(500-150-00220), CAP, RUBBER 4"
2 - (500-150-00200), CAP, RUBBER 8"
2 - (500-140-02880), 1/8" HOSE BARB
2 - (500-140-02520), 1/2"Mx1/2"F STREET EL, BRASS
2 - (500-140-02205), 1/2"Mx1/8"F BUSHING, BRASS
1 - (500-140-02735), 1/8"Mx1/8"F VALVE, BRASS
150 ft. - (500-150-00230), C-SHAPED GASKET

SELECT OPTIONAL FRAME COMPONENTS AS REQUIRED:

☐ 1 - (500-170-00080), TANK FRAME, 31200
☐ 1 - (500-170-00091), BLOWER FRAME, 31200
☐ 1 - (500-170-00045), CONTROL PANEL MOUNT

NORTH EAST ENVIRONMENTAL PRODUCTS, INC.
17 TECHNOLOGY DRIVE
WEST LEBANON, NH 03784
(603) 298-7061

TOLERANCES UNLESS OTHERWISE SPECIFIED ± 1 in.	DRAWING NAME: 31241 BASE SUBASSEMBLY		
	DRAWING #: 200-160-00523		
DRAWN: MS 10/6/93	CUSTOMER:		
REV: F GC 6/12/00	SCALE:	SIZE: A	SHEET: OF:



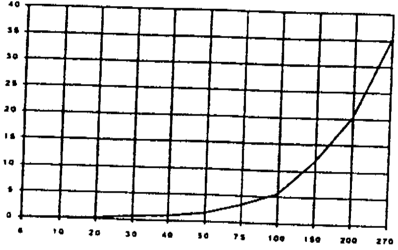
NOTES:

1. IF GROUP D IS SELECTED TO BE INSTALLED AT THE MANIFOLD, DRILL AND TAP A 1/2"MPT IN THE SCH 80 FLANGE.
2. SEE DRAWING 900-140-00009 FOR GROUP D DETAILS.
3. PUMPED SYSTEMS HAVE NOZZLE OPTION INSTALLED. GRAVITY SYSTEMS HAVE STRAIGHT TUBE INSTALLED. MINIMUM HEAD REQUIRED FOR GRAVITY SYSTEMS ARE SHOWN IN THE CHART BELOW.
4. SEE DRAWING 900-140-00036 FOR GROUP E DETAILS.

PUMP PORTS	
INLET	
OUTLET	

DESIGN FLOW RATE
150 GPM

GROUP A & B GRAVITY FEED



FLOW RATE (GPM)

NORTH EAST ENVIRONMENTAL PRODUCTS, INC.
17 TECHNOLOGY DRIVE
WEST LEBANON, NEW HAMPSHIRE 03784

TITLE

31200 INLET PLUMBING SYSTEM
PVC 80

SIZE	DWG NO.	SHEET	REV
A	900-140-00037	1 OF 2	A

SCALE		DRAWN	DATE
NONE	DO NOT SCALE DRAWING	RC	11-11-94

GROUP A

☐ **200-140-01305 GRAVITY (THREE 2" TUBES)**
A1 3 500-140-01120 Adapter,2.0Mx2.0F,TxS,PVC80
A2 28" 500-140-01690 Pipe,2.0",PVC 80

☐ **200-140-01306 NOZZLE (6 TO 40 GPM) TOTAL FLOW**
A1 3 500-140-00170 Nozzle,14.5gpm@15psi,.5,Brass
A2 3 500-140-00500 Bushing,2.0Mx.5F,TxT,PVC80

☐ **200-140-01308 NOZZLE (41 TO 75 GPM) TOTAL FLOW**
A1 3 500-140-00190 Nozzle,25.5gpm@15psi,.75,Brass
A2 3 500-140-00510 Bushing,2.0Mx.75F,TxT,PVC80

☐ **200-140-01309 NOZZLE (76 TO 120 GPM) TOTAL FLOW**
A1 3 500-140-00200 Nozzle,41.0gpm@15psi,1.0,Brass
A2 3 500-140-00530 Bushing,2.0Mx1.0F,TxT,PVC 80

☑ **200-140-01310 NOZZLE (121 TO 170 GPM) TOTAL FLOW**
A1 3 500-140-00210 Nozzle,57.0gpm@15psi,1.0,Brass
A2 3 500-140-00530 Bushing,2.0Mx1.0F,TxT,PVC 80

☐ **200-140-01311 NOZZLE (171 TO 225 GPM) TOTAL FLOW**
A1 3 500-140-00220 Nozzle,78.5gpm@15psi,1.5,Brass
A2 3 500-140-00570 Bushing,2.0Mx1.5F,TxT,PVC80

☐ **200-140-01312 NOZZLE (226 TO 270 GPM) TOTAL FLOW**
A1 3 500-140-00230 Nozzle,102.0gpm@15psi,1.5,Bras
A2 3 500-140-00570 Bushing,2.0Mx1.5F,TxT,PVC80

GROUP D

☐ SEE DRAWING NUMBER 900-140-00009
FOR GROUP D SELECTION DETAILS

GROUP E

☐ SEE DRAWING NUMBER 900-140-00036
FOR GROUP E SELECTION DETAILS

GROUP B

☒ **200-140-01318 ENTRY MANIFOLD**
2 500-140-01763 Gasket, 4",rubber,1/8",for fla
1 500-140-03460 Plug Pipe,.5"M,Thread,316SST
1 500-140-01745 Flange, Blind,4.0", solid, PVC

GROUP C

☐ **200-140-01314 TRAY EXTENDER (1 TRAY)**
C1 1 500-140-01750 Flange Vanstone,4",PVC 80
C2 1 500-140-00660 Bushing,4.0Mx3.0F,SxS,PVC80
C3 14.5" 500-140-01700 Pipe,3.0",PVC 80
C4 1 500-140-00890 Elbow,90,3.0Fx3.0F,SxS,PVC 80

☐ **200-140-01315 TRAY EXTENDER (2 TRAY)**
C1 1 500-140-01750 Flange Vanstone,4",PVC 80
C2 1 500-140-00660 Bushing,4.0Mx3.0F,SxS,PVC80
C3 17.75" 500-140-01700 Pipe,3.0",PVC 80
C4 1 500-140-00890 Elbow,90,3.0Fx3.0F,SxS,PVC 80

☐ **200-140-01316 TRAY EXTENDER (3 TRAY)**
C1 1 500-140-01750 Flange Vanstone,4",PVC 80
C2 1 500-140-00660 Bushing,4.0Mx3.0F,SxS,PVC80
C3 30" 500-140-01700 Pipe,3.0",PVC 80
C4 1 500-140-00890 Elbow,90,3.0Fx3.0F,SxS,PVC 80

☐ **200-140-01317 TRAY EXTENDER (4 TRAY)**
C1 1 500-140-01750 Flange Vanstone,4",PVC 80
C2 1 500-140-00660 Bushing,4.0Mx3.0F,SxS,PVC80
C3 42.25" 500-140-01700 Pipe,3.0",PVC 80
C4 1 500-140-00890 Elbow,90,3.0Fx3.0F,SxS,PVC 80

GROUP F

☐ **200-140-01320 PUMP (1.5" OUTLET PORT)**
F1 24" 500-140-01700 Pipe,3.0",PVC 80
F2 1 500-140-01130 Adapter,3.0Mx3.0F,TxS, PVC 80
F3 1 500-140-02467 Coupling,reducer,3.0Fx1.5F,TxT
F4 1 500-140-01530 Nipple,1.5xClose,TxT,PVC 80

☐ **200-140-01321 PUMP (2" OUTLET PORT)**
F1 24" 500-140-01700 Pipe,3.0",PVC 80
F2 1 500-140-01130 Adapter,3.0Mx3.0F,TxS, PVC 80
F3 1 500-140-02468 Coupling,Reducer,3.0Fx2.0F,TxT
F4 1 500-140-03210 Nipple,2.0xClose,TxT,Brass

☐ **200-140-01322 PUMP (2.5" OUTLET PORT)**
F1 24" 500-140-01700 Pipe,3.0",PVC 80
F2 1 500-140-01130 Adapter,3.0Mx3.0F,TxS, PVC 80
F3 1 500-140-02470 Coupling,Reducer,3.0x2.5,TxT,B
F4 1 500-140-03260 Nipple,2.5xClose,TxT,Brass

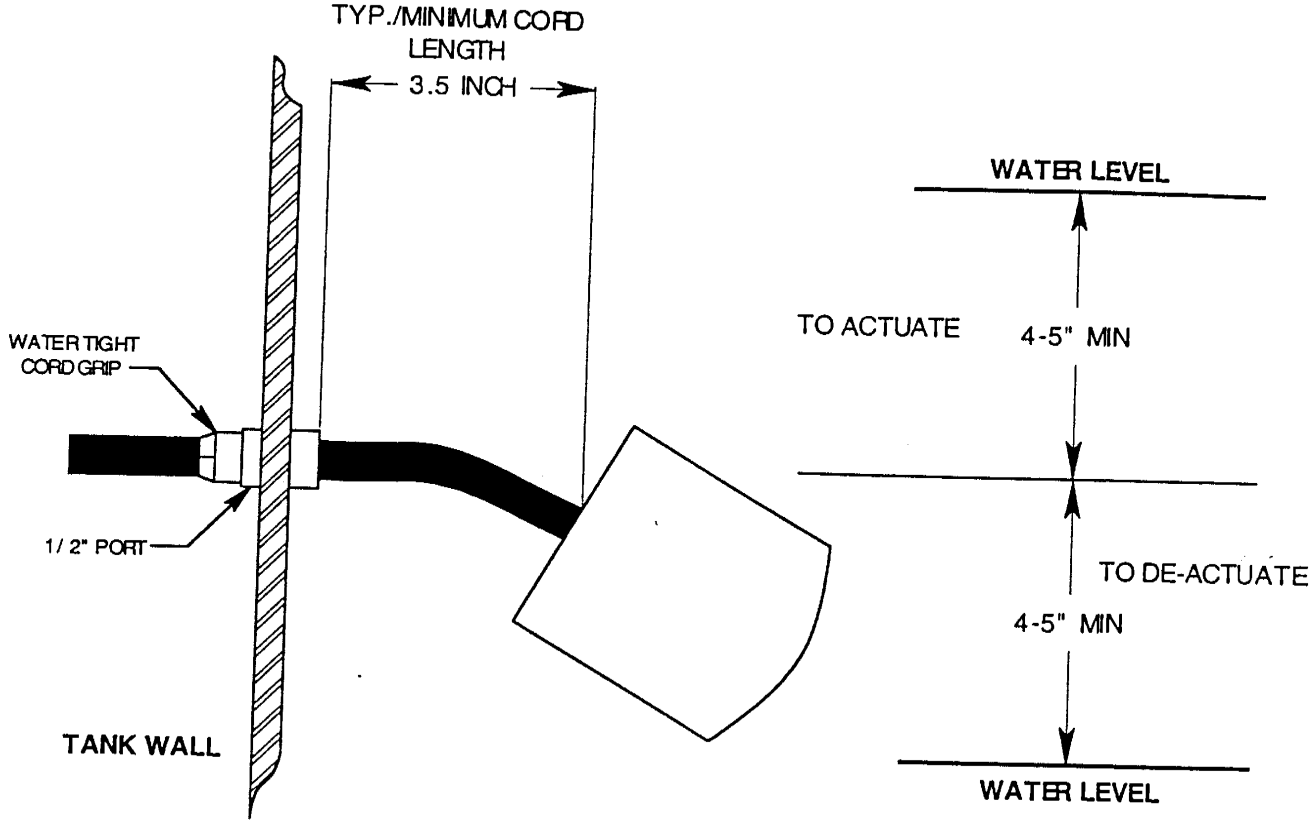
NORTH EAST ENVIRONMENTAL PRODUCTS, INC.
17 TECHNOLOGY DRIVE
WEST LEBANON, NEW HAMPSHIRE 03784

TITLE
31200 INLET PLUMBING SYSTEM
PVC 80

SIZE	DWG NO.	SHEET	REV
A	900-140-00037	2 of 2	A

SCALE		DRAWN	DATE
NONE	DO NOT SCALE DRAWING	RC	11-11-94

FLOAT SWITCH



MECHANICAL FLOATS (FOR 120VAC ONLY)

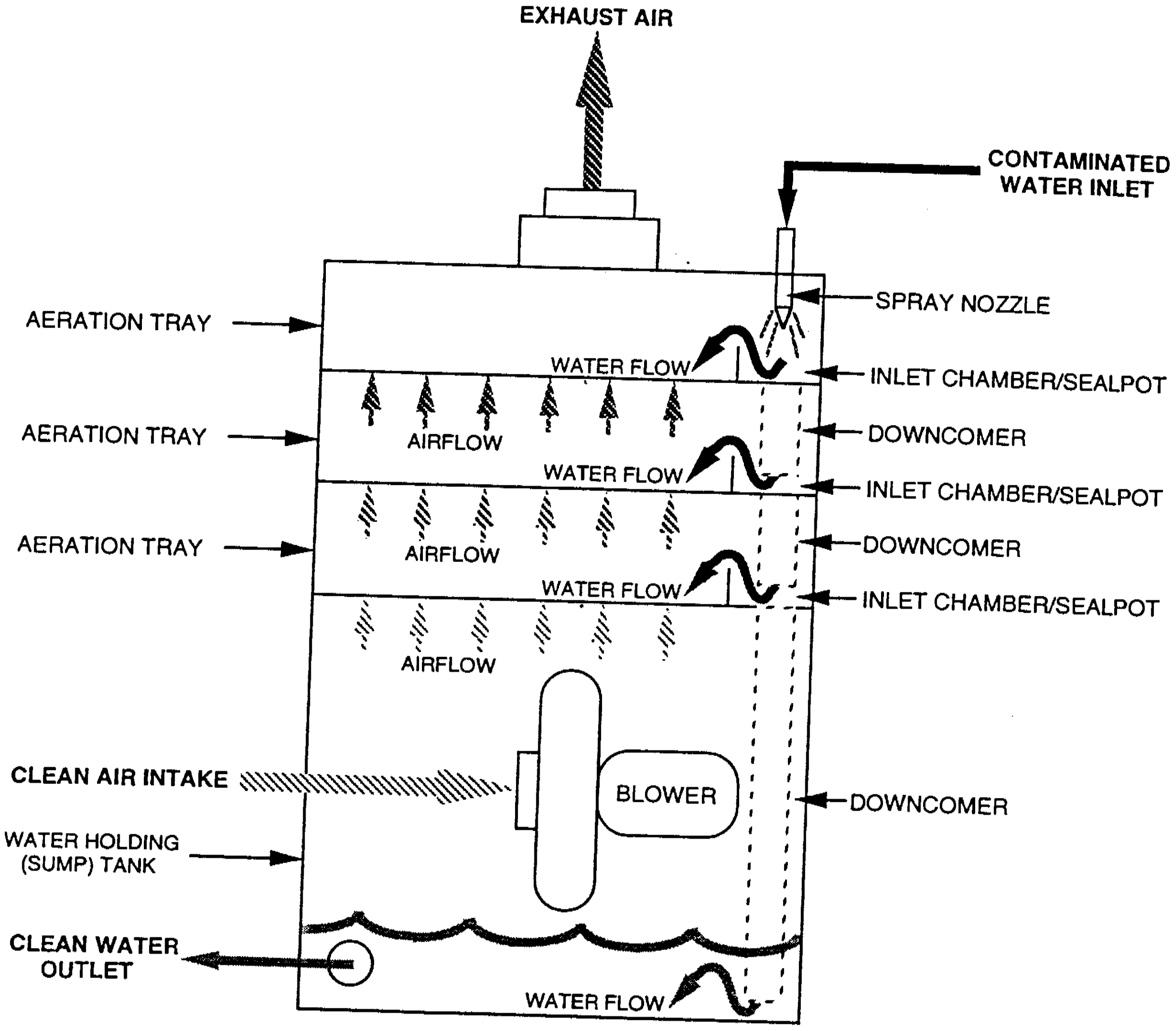
QTY	
2	**200-120-00310 FLOAT SWITCH, N.O., 10' CORD, PVC** 1 500-120-02521 Switch,float,N.O.,mech,10ft cord 1 500-120-02490 Cord,Watertight,1/2",Bulkhead
1	**200-120-00311 FLOAT SWITCH, N.C., 10' CORD, PVC** 1 500-120-02522 Switch,float,N.C.,mech,10ft cord 1 500-120-02490 Cord,Watertight,1/2",Bulkhead
☐	**200-130-00312 FLOAT SWITCH NO/NC, 10' CORD, POLYOPRO** 1 500-120-02497 Switch,Float,NO or NC,polypro 1 500-120-02490 Cord,Watertight,1/2",Bulkhead

MERCURY FLOATS (FOR ALL VOLTAGES INCLUDING I.S.)

QTY	
☐	**200-120-00314 Float Switch, NO, 10',merc** 1 500-120-02490 Cord,Watertight,1/2",Bulkhead 1 500-120-02500 Switch,Float,merc ,N.O.,10ft cord
☐	**200-120-00315 Float Switch, NC, 10',merc** 1 500-120-02490 Cord,Watertight,1/2",Bulkhead 1 500-120-02510 Switch,Float,merc ,N.C.,10ft cord

NORTH EAST ENVIRONMENTAL PRODUCTS, INC.	DOCUMENT 900-120-00029	PAGE 1 OF 1	REV B
TITLE FLOAT SWITCH		DATE 12/19/01	BY RC

AERATION PROCESS, COUNTER-CURRENT AIR AND WATER FLOW



FOR REFERENCE ONLY !

DO NOT ASSEMBLE PER THIS DRAWING. SEE DRAWINGS THAT ARE SPECIFIC TO THIS UNIT.

NORTH EAST ENVIRONMENTAL PRODUCTS, INC. 17 TECHNOLOGY DRIVE WEST LEBANON, NH 03784 (603) 298-7061	
TOLERANCES UNLESS OTHERWISE SPECIFIED ±1 in.	DRAWING NAME: AERATION PROCESS DRAWING #: 900-200-00003
DRAWN: MS DATE: 1/11/93	CUSTOMER:
REV: A 3/9/94	SCALE: SIZE: A SHEET : OF:

Troubleshooting Guide for Poor Removal

WATER ISSUES

1. What is the water flow rate through the stripper?

2. Is there foam in the air stripper caused by surfactants, greases, fats , etc.?

3. What else is in the water besides the contaminates in question?

4. Are there occasional slugs of free product that could contaminate the sump of the air stripper?

5. Does the sump tank have at least 4 inches of water at all times?

6. Are the seal pots on each tray full of water?

7. Are the samples being taken, stored, and tested per approved methods?

AIR ISSUES

1. What is the air flow rate through the stripper?
    - How is it measured?
    - How does it compare with the shop tests?

2. Is there water blowing out the exhaust stack?

3. Is there air blowing out the water discharge piping?

4. What is the design of the air intake and exhaust?
    - Is there any constriction of the flow of air?

14. is there any way contaminated air can get into the blower intake?

MECHANICAL AND OTHER ISSUES

1. Is the blower spinning in the correct direction? i.e.Top of blower wheel spinning towards blower outlet. (The blower will blow air even if running backwards.)

2. Is the system level?

3. When system shuts down, does blower continue to run for 5 minutes after influent water stops?

4. Have there been any power outages that would cause untreated water to fall into the sump?

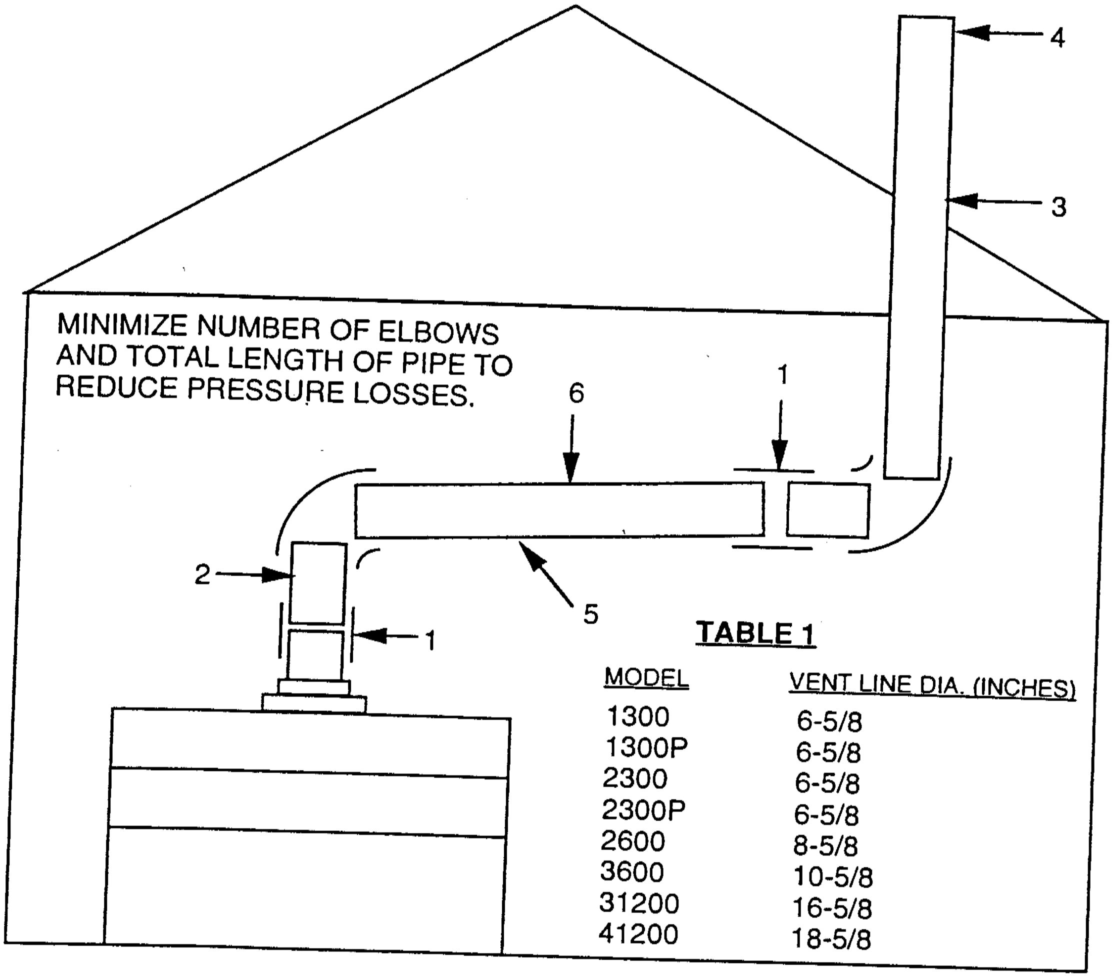
5. Are trays properly stacked so that the downcomers are in seal pots?

FOULING ISSUES

1. Is there any scaling or fouling on the trays? The holes in the trays should be 3/16 of an inch in diameter.

2. What is the sump tank pressure reading? Has it changed over time?

TYPICAL VENT LINE INSTALLATION



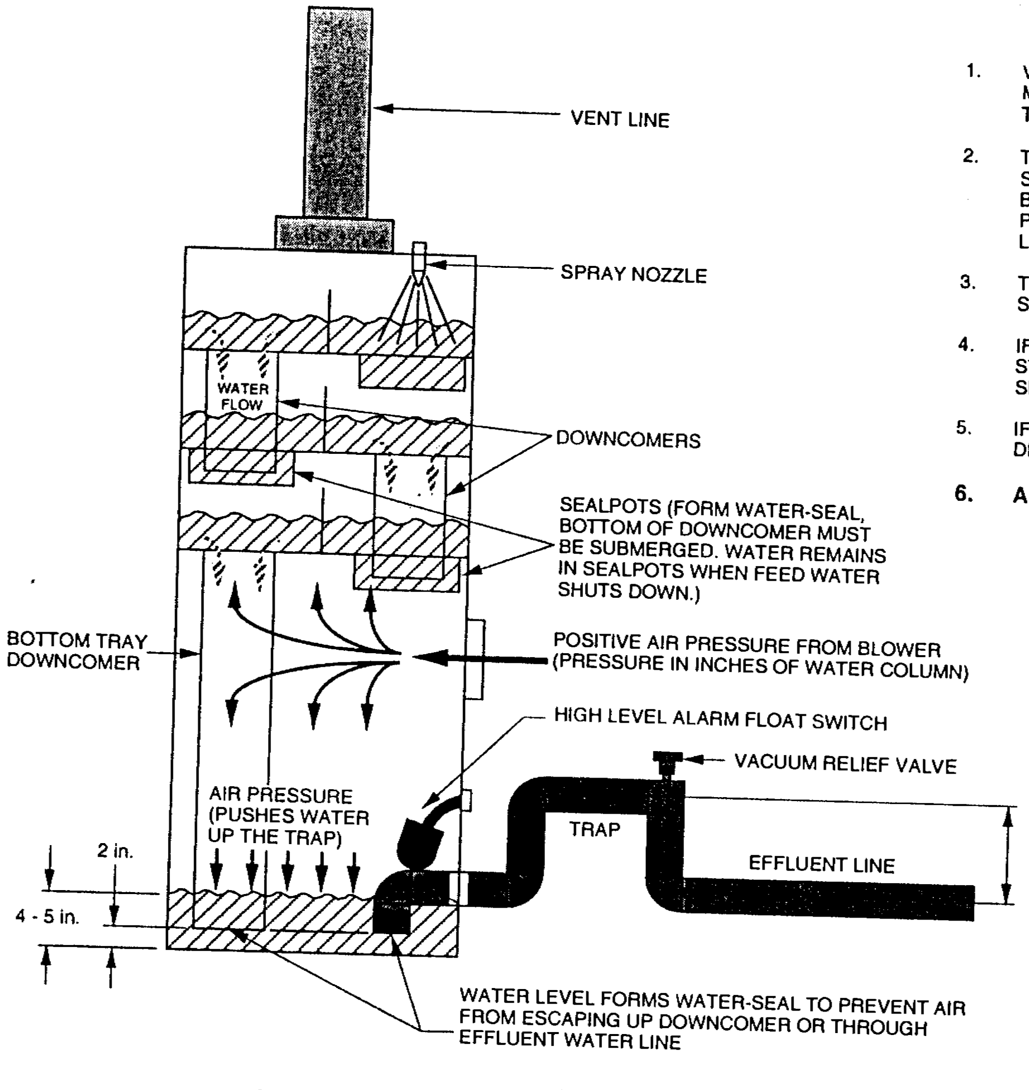
MINIMIZE NUMBER OF ELBOWS AND TOTAL LENGTH OF PIPE TO REDUCE PRESSURE LOSSES.

TABLE 1

MODEL	VENT LINE DIA. (INCHES)
1300	6-5/8
1300P	6-5/8
2300	6-5/8
2300P	6-5/8
2600	8-5/8
3600	10-5/8
31200	16-5/8
41200	18-5/8

NOTES:

1. RUBBER COUPLING WITH STAINLESS STEEL RING CLAMPS.
2. VENT LINE PIPE DIAMETER MUST BE EQUAL TO OR GREATER THAN THE AIR EXHAUST VENT DIAMETER ON THE AIR STRIPPER COVER.
3. FIRMLY SUPPORT PIPE AT ROOF PENETRATION.
4. FOR INTERMITTENT OPERATION, INSTALL WIRE MESH OF 1/4" (OR LARGER). FOR DRINKING WATER SUPPLY, INSTALL ELBOW WITH WIRE MESH.
5. ALLOW CLEARANCE FOR REMOVING SECTION OF VENT LINE FOR EASY ACCESS TO AERATION TRAYS.
6. PITCH VENT LINE TOWARD SHALLOW TRAY UNIT.
7. USE PIPING THAT HAS ADEQUATE STRENGTH (PRESSURE OR VACUUM) SPECIFICATIONS, AND THAT IS OF SUITABLE MATERIAL.



SIDE VIEW

DO NOT USE THIS TRAP WHEN PUMPING OUT OF ShallowTray OR WITH INDUCED DRAFT SYSTEMS

GRAVITY DISCHARGE TRAP SET-UP (SEE NOTE 6)

1. VERTICAL TRAP HEIGHT SHOULD BE SET SO THAT THE SYSTEM MAINTAINS A SUMP TANK WATER LEVEL OF 4-5 INCHES (FROM THE BOTTOM OF THE SUMP TANK) DURING NORMAL OPERATION.
2. THE 4-5 INCH WATER LEVEL ALLOWS THE HIGH LEVEL ALARM SWITCH TO RESET AND ALSO FORMS A WATER SEAL AROUND THE BOTTOM TRAY DOWNCOMER AND THE EFFLUENT WATER LINE. THIS PREVENTS AIR FROM ESCAPING THROUGH THE EFFLUENT WATER LINE AND BOTTOM TRAY DOWNCOMER.
3. THE VACUUM RELIEF VALVE PREVENTS THE WATER FROM SIPHONING OUT THE EFFLUENT WATER LINE.
4. IF THE SUMP TANK WATER IS DEEPER THAN 4-5 INCHES WHEN THE STRIPPER IS IN OPERATION, THEN EITHER THE LINE SIZE IS TOO SMALL OR THERE IS SOME TYPE OF RESTRICTION IN THE LINE.
5. IF THE EFFLUENT LINE BECOMES FOULED, IT WILL REDUCE THE DIAMETER OF THE LINE AND CAUSE THE WATER LEVEL TO RISE.
6. **A TRAP IS NOT NEEDED IF THERE IS A DISCHARGE PUMP.**

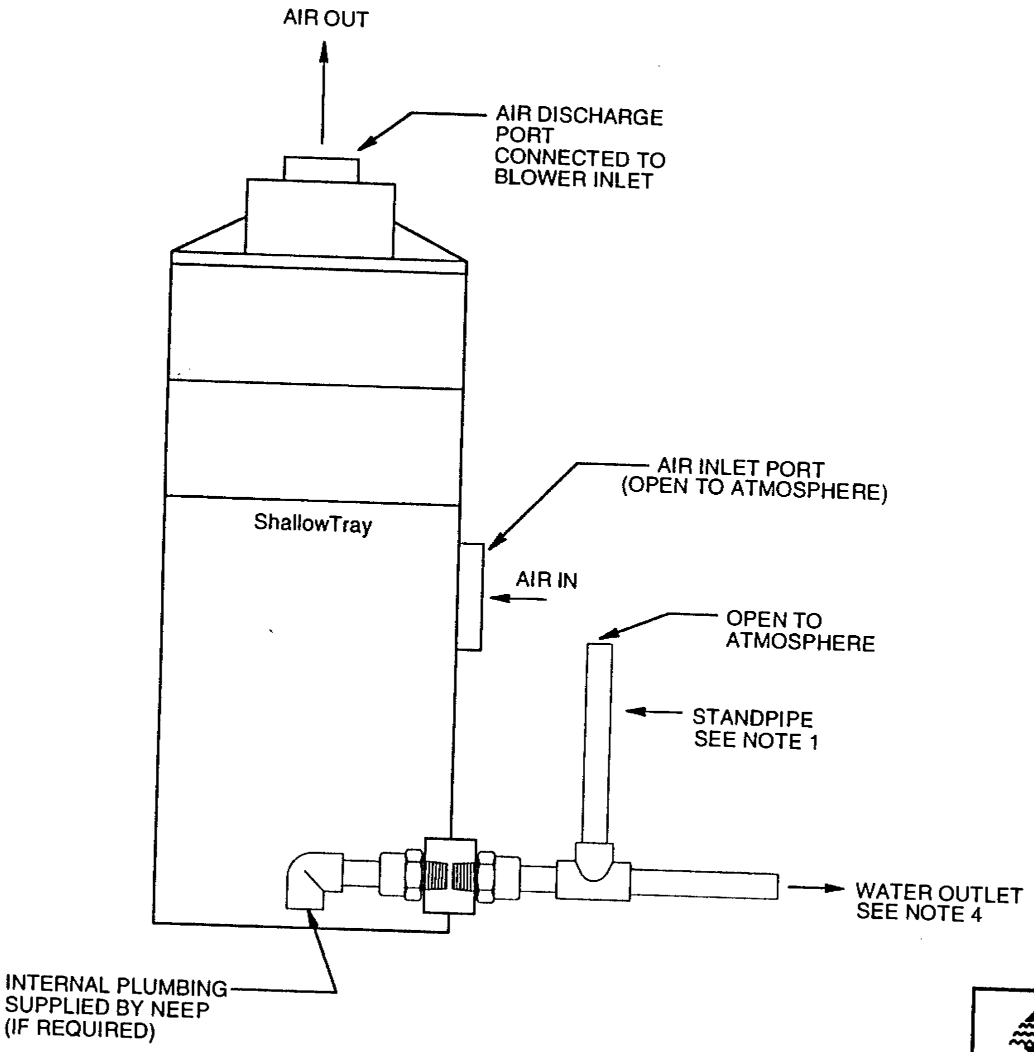
FOR REFERENCE ONLY !

DO NOT ASSEMBLE PER THIS DRAWING. SEE DRAWINGS THAT ARE SPECIFIC TO THIS UNIT.

SET HEIGHT OF INVERTED U-TRAP TO MAINTAIN 4-5 in. WATER LEVEL IN SUMP TANK DURING STRIPPER OPERATION

NORTH EAST ENVIRONMENTAL PRODUCTS, INC.
17 TECHNOLOGY DRIVE
WEST LEBANON, NH 03784
(603) 298-7061

TOLERANCES UNLESS OTHERWISE SPECIFIED ± 1 In.	DRAWING NAME: GRAVITY DISCHARGE TRAP HEIGHT DRAWING #: 900-140-00001		
DRAWN: MS	CUSTOMER:		
DATE: 11/8/93	SCALE:	SIZE: A	SHEET : OF :



NOTES

1. HEIGHT TO TOP OF STANDPIPE SHOULD BE 1" HIGHER THAN LOWEST POINT ON AIR INLET PORT.
2. DO NOT USE THIS SETUP IF PUMPING OUT OF ShallowTray.
3. DISHARGE PIPING SHALL BE GREATER THAN OR SAME SIZE AS WATER DISCHARGE PORT.
4. PIPING RUN MUST PITCH AWAY FROM STRIPPER.

**DRAWING FOR REFERENCE ONLY
DO NOT ASSEMBLY PER THIS DRAWING.
SEE DRAWINGS THAT ARE SPECIFIC TO THIS UNIT.**

**NORTH EAST ENVIRONMENTAL PRODUCTS, INC.
17 TECHNOLOGY DRIVE
WEST LEBANON, NEW HAMPSHIRE 03784**

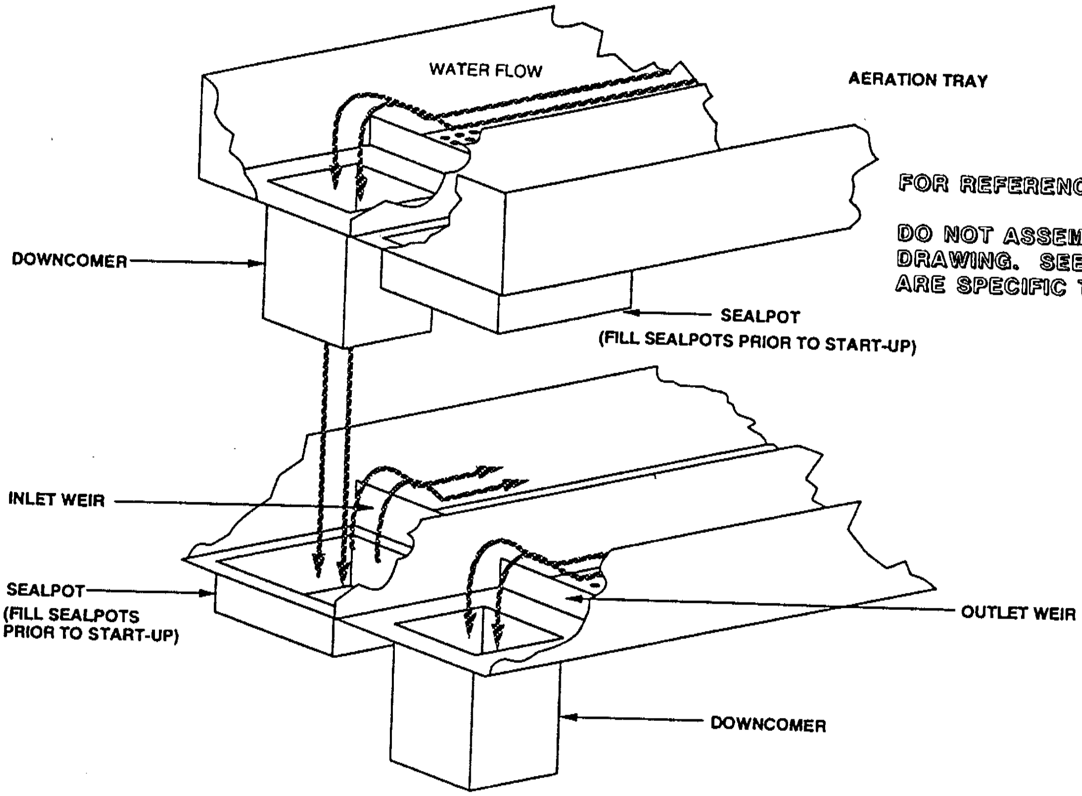
TITLE

RECOMMENDED GRAVITY DISCHARGE SETUP
FOR INDUCED DRAFT SYSTEMS

SIZE	DWG NO.	SHEET	REV
A	900-140-00003	1 OF 1	Ø

SCALE		DRAWN	DATE
NONE	DO NOT SCALE DRAWING	RC	7-7-95

SEALPOT FUNCTION - WATER SEAL

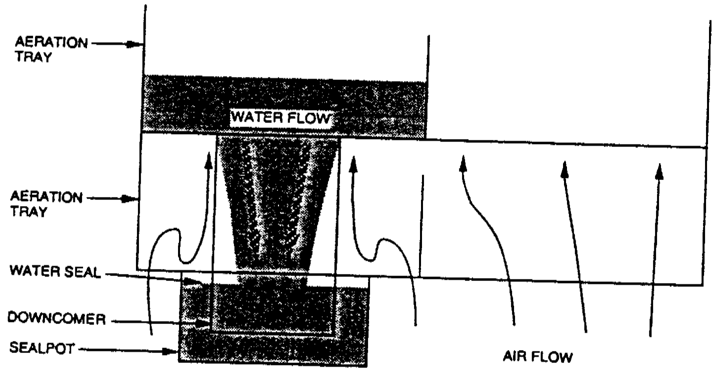


FOR REFERENCE ONLY !

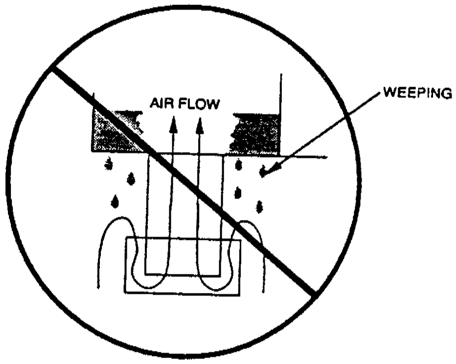
DO NOT ASSEMBLE PER THIS DRAWING. SEE DRAWINGS THAT ARE SPECIFIC TO THIS UNIT.

CAUTION!

SEALPOT MUST BE FILLED WITH WATER TO CREATE WATER SEAL.



FILLED SEALPOT



UNFILLED SEALPOT

1. EACH AERATION TRAY CONTAINS A SEALPOT. ALL SEALPOTS MUST BE FILLED WITH WATER TO FORM A WATER SEAL AROUND THE DOWNCOMERS.
2. IF SEALPOTS ARE NOT FILLED, AIR WILL TRAVEL UP THE DOWNCOMER AND PREVENT WATER FROM FLOWING DOWN THEM. THIS WILL CAUSE THE WATER TO WEEP THROUGH THE 3/16" AERATION HOLES ON THE BOTTOM OF EACH TRAY, RESULTING IN POOR REMOVAL EFFICIENCY.
3. THE SUMP TANK WATER LEVEL ACTS AS A WATER SEAL FOR THE BOTTOM TRAY DOWNCOMER. MAINTAIN AT LEAST 3" OF WATER IN THE SUMP TANK AT ALL TIMES.
4. SEALPOTS CAN BE FILLED MANUALLY, OR BY FOLLOWING THE PROCEDURES LISTED IN THE OPERATION AND MAINTENANCE MANUAL.

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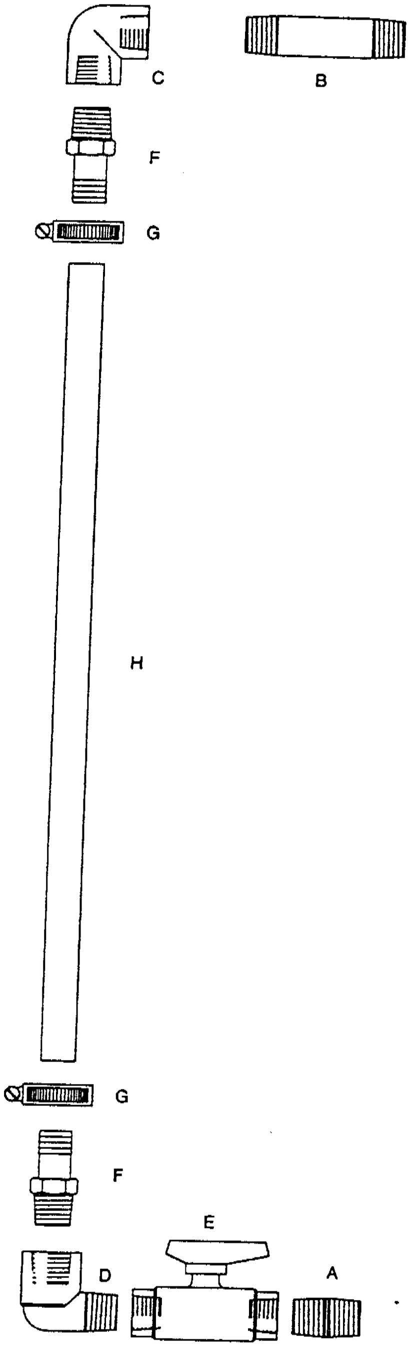
17 TECHNOLOGY DRIVE
WEST LEBANON, NH 03784
(603) 298-7061

TOLERANCES UNLESS OTHERWISE SPECIFIED ± 1 in.	DRAWING NAME: SEALPOTS		
	DRAWING #: 900-160-00061		
DRAWN: MS DATE: 11/19/92	CUSTOMER:		
REV: A 3/9/94	SCALE:	SIZE: A	SHEET: OF:



CHOOSE ONE SIGHT TUBE.
(NOTE THAT BRASS SIGHT TUBES ARE ALREADY PART OF THE BASE SUBASSEMBLY, AND THE STAINLESS SIGHT TUBE SUBS ARE AN OPTION).

BRASS
(STANDARD)

☐ **200-140-00010**
SIGHT TUBE, BRASS, FOR 1300 /2300/ 2600/ 3600

1	A	500-140-02980, NIPPLE, .5XCLOSE, TXT, BRASS
1	B	500-140-03030, NIPPLE, .5X3.5L, TXT, BRASS
1	C	500-140-02510, ELBOW, 90°, .5FX.5F, TXT, BRASS
1	D	500-140-02520, ELBOW, STREET, 90°, .5FX.5M, TXT, BRASS
1	E	500-140-02740, VALVE, BALL, .5FX.5F, TXT, BRASS
2	F	500-140-02890, HOSE BARB, .5MX.5M, TXB, BRASS
2	G	500-140-00030, HOSE CLAMP, .41-.88, SS
21"	H	500-200-00150, TUBE, CLEAR, .5 ID, TYGON

☑ **200-140-00020**
SIGHT TUBE, BRASS, FOR 31200/ 41200

1	A	500-140-02980, NIPPLE, .5XCLOSE, TXT, BRASS
1	B	500-140-03030, NIPPLE, .5X3.5L, TXT, BRASS
1	C	500-140-02510, ELBOW, 90°, .5FX.5F, TXT, BRASS
1	D	500-140-02520, ELBOW, STREET, 90°, .5FX.5M, TXT, BRASS
1	E	500-140-02740, VALVE, BALL, .5FX.5F, TXT, BRASS
2	F	500-140-02890, HOSE BARB, .5MX.5M, TXB, BRASS
2	G	500-140-00030, HOSE CLAMP, .41-.88, SS
29"	H	500-200-00150, TUBE, CLEAR, .5 ID, TYGON

STAINLESS STEEL
(OPTIONAL)

☐ **200-140-00011**
SIGHT TUBE, 316 ST. STEEL, FOR 1300 /2300/ 2600/ 3600

1	A	500-140-04010, NIPPLE, .5XCLOSE, TXT, 316SS
1	B	500-140-04012, NIPPLE, .5X3.5L, TXT, 316SS
1	C	500-140-03995, ELBOW, 90°, .5FX.5F, TXT, 316SS
1	D	500-140-03996, ELBOW, STREET, 90°, .5FX.5M, TXT, 316SS
1	E	500-140-04030, VALVE, BALL, .5FX.5F, TXT, 316SS
2	F	500-140-04000, HOSE BARB, .5MX.5M, TXB, 316SS
2	G	500-140-00030, HOSE CLAMP, .41-.88, SS
21"	H	500-200-00151, TUBE, CLEAR, .5 ID, TEFLON

☐ **200-140-00021**
SIGHT TUBE, 316 ST. STEEL, FOR 31200/ 41200

1	A	500-140-04010, NIPPLE, .5XCLOSE, TXT, 316SS
1	B	500-140-04012, NIPPLE, .5X3.5L, TXT, 316SS
1	C	500-140-03995, ELBOW, 90°, .5FX.5F, TXT, 316SS
1	D	500-140-03996, ELBOW, STREET, 90°, .5FX.5M, TXT, 316SS
1	E	500-140-04030, VALVE, BALL, .5FX.5F, TXT, 316SS
2	F	500-140-04000, HOSE BARB, .5MX.5M, TXB, 316SS
2	G	500-140-00030, HOSE CLAMP, .41-.88, SS
29"	H	500-200-00150, TUBE, CLEAR, .5 ID, TYGON

NORTH EAST ENVIRONMENTAL PRODUCTS, INC.
17 TECHNOLOGY DRIVE
WEST LEBANON, NEW HAMPSHIRE 03784

TITLE
SIGHT TUBE SUBASSEMBY

SIZE	DWG NO.	SHEET	REV
A	900-140-00044	1 of 1	B
SCALE NONE	DO NOT SCALE DRAWING	DRAWN RC	DATE 9/16/96

CHOOSE ONE DRAIN VALVE.

(NOTE THAT BRASS DRAIN VALVES ARE ALREADY PART OF THE BASE SUBASSEMBLY, AND THE STAINLESS DRAIN VALVE SUBS ARE AN OPTION).

BRASS
(STANDARD)

☐ **200-140-00142**
DRAIN VALVE, BRASS, 1", FOR 13/23/26/36
1 A 500-140-03060, NIPPLE, 1.0XCLOSE, TXT, BRASS
1 B 500-140-02780, VALVE, BALL, 1.0FX1.0F, TXT, BRASS

☑ **200-140-00141**
DRAIN VALVE, BRASS, 2", FOR 312/412
1 A 500-140-03250, NIPPLE, 2.0XCLOSE, TXT, BRASS
1 B 500-140-02760, VALVE, BALL, 2.0FX2.0F, TXT, BRASS

316 STAINLESS STEEL
(OPTIONAL)

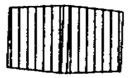
☐ **200-140-00145**
DRAIN VALVE, 316 ST. STEEL, 1/2", FOR 1300P
1 A 500-140-04010, NIPPLE, .5XCLOSE, TXT, 316SS
1 B 500-140-04030, VALVE, BALL, .5FX.5F, TXT, 316SS

☐ **200-140-00148**
DRAIN VALVE, 316 ST. STEEL, 3/4", FOR 2300P
1 A 500-140-04011, NIPPLE, .75XCLOSE, TXT, 316SS
1 B 500-140-04031, VALVE, BALL, .75FX.75F, TXT, 316SS

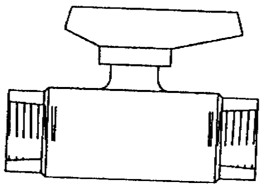
☐ **200-140-00140**
DRAIN VALVE, 316 ST. STEEL, 1", FOR 13/23/26/36
1 A 500-140-04014, NIPPLE, 1.0XCLOSE, TXT, 316SS
1 B 500-140-04032, VALVE, BALL, 1.0FX1.0F, TXT, 316SS

☐ **200-140-00147**
DRAIN VALVE, 316 ST. STEEL, 2", FOR 312/412
1 A 500-140-04022, NIPPLE, 2.0XCLOSE, TXT, 316SS
1 B 500-140-04035, VALVE, BALL, 2.0FX2.0F, TXT, 316SS

A



B



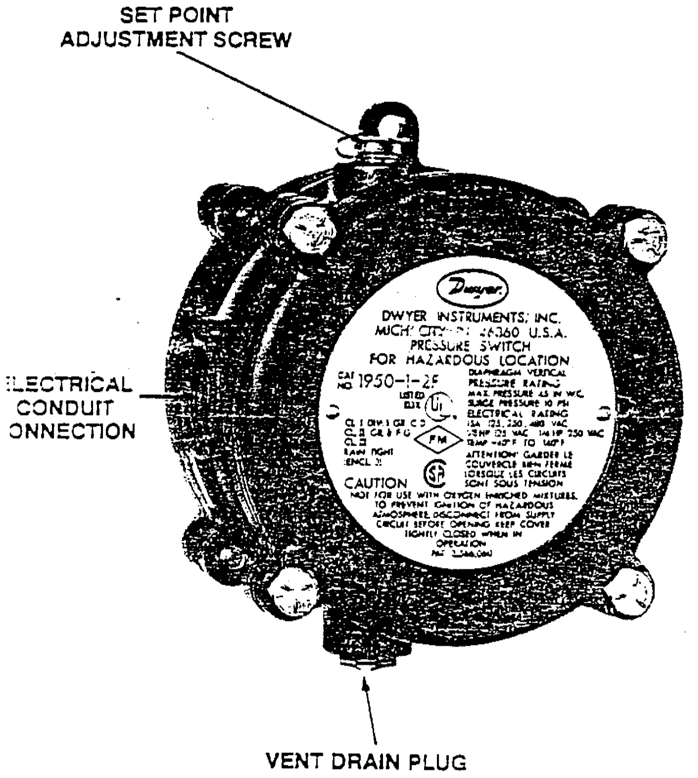
NORTH EAST ENVIRONMENTAL PRODUCTS, INC.
17 TECHNOLOGY DRIVE
WEST LEBANON, NEW HAMPSHIRE 03784

TITLE	DRAIN VALVE SUBASSEMBY
SIZE	A
DWG NO.	900-140-00045
SHEET	1 of 1
REV	A
SCALE	NONE
	DO NOT SCALE DRAWING
DRAWN	RC
DATE	9/16/96

Section 7: Component Information

EZ-HIGHP Kit Includes: stripper pressure switch
Pressure Switch (QED p/n EZPHIGH – Dwyer p/n 1950P-2), Fitting, Barb and Tubinc

INTEGRAL EXPLOSION-PROOF PRESSURE SWITCHES
Specifications - Installation and Operating Instructions



The New Model 1950 Explosion-Proof Switch combines the best features of the popular Dwyer Series 1900 Pressure Switch with a compact explosion-proof housing.

The unit is U.L. and CSA listed, FM approved for use in Class I, Groups C & D, Class II, Groups E, F, & G and Class III atmospheres. It is also totally rain-tight for outdoor installations. Twelve models allow set-points from .03 to 20 inches W.C. and from .5 to 50 PSI.

Easy access to the SPDT switch for electrical hook-up is provided by removing the top plate of the three-part aluminum housing. Adjustment to the set point of the switch can be made without disassembly of the housing. The unit is very compact, about half the weight and bulk of equivalent conventional explosion-proof switches.

CAUTION: For use only with air or compatible gases. Use of the Model 1950 switch with explosive media connected to the **Low** pressure port (including differential pressure applications in such media) is not recommended. Switch contact arcing can cause an explosion inside the switch housing which, while contained, may render the switch inoperative. If switch is being used to sense a single positive pressure relative to atmosphere, run a line from the low pressure port to a non-hazardous area free of combustible gases. This may rease response time on -0 and -00 models.

UL and CSA Listed, FM Approved For
CL. I GR. C,D – CL. II GR. E,F,G – CL. III

Model 1950 Switches: Operating ranges and dead bands.

To order specify Model Number	Operating Range Inches, W.C.	Approximate Dead Band	
		At Min. Set Point	At Max. Set Point
1950-02	0.03 to 0.10	0.025	0.05
1950-00	0.07 to 0.15	0.04	0.05
1950-0	0.15 to 0.5	0.10	0.15
1950-1	0.4 to 1.6	0.15	0.20
1950-5	1.4 to 5.5	0.3	0.4
1950-10	3.0 to 11.0	0.4	0.5
1950-20	4.0 to 20.0	0.4	0.6

Model Number	Operating Range PSI	Approximate Dead Band	
		Min. Set Point	Max. Set Point
1950P-2	.5 to 2.0	0.3 PSI	0.3 PSI
1950P-8	1.5 to 8.0	1.0 PSI	1.0 PSI
1950P-15	3.0 to 15.0	0.9 PSI	0.9 PSI
1950P-25	4.0 to 25.0	0.7 PSI	0.7 PSI
1950P-50	15.0 to 50	1.0 PSI	1.5 PSI

PHYSICAL DATA

Temperature Limits: –40° to 140°F (–40° to 60°C), 1950P-8, 15, 25 & 50: 0° to 140°F (–17.8° to 60°C), 1950-02: –30° to 130°F (–34.4° to 54.4°C).

Rated Pressure: 1950 — 45 IN. W.C., 1950P — 35 PSI, 1950P-50 only — 70 PSI.

Maximum surge pressure: 1950 — 10 PSI, 1950P — 50 PSI, 1950P-50 only — 90 PSI.

Pressure Connections: 1/8" NPT.

Electrical Rating: 15 amps, 125, 250,480 volts, 60 Hz. A.C. Resistive 1/8 H.P. @ 125 volts, 1/4 H.P. @ 250 volts, 60 Hz. A.C.

Wiring connections: 3 screw type; common, norm. open and norm. closed.

Conduit connections: 1/2" NPT.

Set point adjustment: Screw type on top of housing. Field adjustable.

Housing: Anodized cast aluminum.

Diaphragm: Molded fluorosilicone rubber. 02 model, silicone on nylon.

Calibration Spring: Stainless Steel.

Installation: Mount with diaphragm in vertical position.

Weight: 3 1/4 lbs. 02 model, 4 lbs., 7 oz.

Response Time: Because of restrictive effect of flame arrestors, switch response time may be as much as 10-15 seconds where applied pressures are near set point.

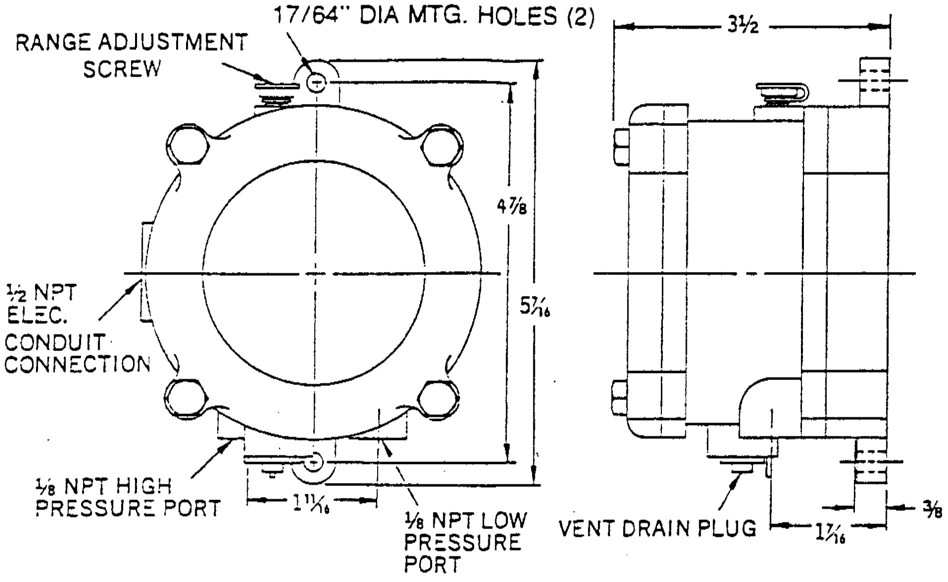
NOTE: The last number-letter combination in the 1950 model number identifies the switch electrical rating (number) and diaphragm material (letter). The 2F combination is standard as described in the physical data above. In the case of special models, a number 1 rating is the same as 2; a number 3 or 4 rating is 10A 125, 250, 480 VAC - ⅛ HP 125 VAC, ¼ HP 250 VAC; and a number 5 or 6 rating is 1A 125 VAC. A letter B indicates a Buna-N diaphragm, N; Neoprene, S; Silicone, and V; Viton.

DWYER INSTRUMENTS, INC.
P. O. BOX 373 • MICHIGAN CITY, INDIANA 46360, U.S.A.
Telephone 219/879-8000
Fax 219/872-9057

SERIES 1950

stripper pressure switch

INTEGRAL EXPLOSION-PROOF PRESSURE SWITCHES
Installation and Operating Instructions



1950-02: 7-3/4" dia. × 4-11/32" depth. For complete dimensions request drawing 28-700175-00 from our Customer Service Department.

1950 SWITCH OUTLINE DIMENSIONS

INSTALLATION

1. Select a location free from excess vibration and corrosive atmospheres where temperatures will be within the limits noted under Physical Data on page 1. Switch may be installed outdoors or in areas where the hazard of explosion exists. See page 1 for specific types of hazardous service.
2. Mount standard switches with the diaphragm in a vertical plane and with switch lettering and Dwyer nameplate in an upright position. Some switches are position sensitive and may not reset properly unless they are mounted with the diaphragm vertical. Special units can be furnished for other than vertical mounting arrangements if required.
3. Connect switch to source of pressure, vacuum or differential pressure. Metal tubing with 1/4" O.D. is recommended, but any tubing which will not restrict the air flow can be used. Connect to the two 1/8" NPT female pressure ports as noted below:
   - A. Differential pressures - connect pipes or tubes from source of greater pressure to high pressure port marked HIGH PRESS. and from source of lower pressure to low pressure port marked LOW PRESS.
   - B. Pressure only (above atmospheric) - connect tube from source of pressure to high pressure port. The low pressure port is left open to atmosphere. See CAUTION on page 1.
   - C. Vacuum only (below atmospheric pressure) - connect tube from source of vacuum to low pressure port. The high pressure port is left open to atmosphere.
4. To make electrical connections, remove the three hex head screws from the cover and after loosening the fourth captive screw, swing the cover aside. Electrical connections to the standard single pole, double throw snap switch are provided by means of screw terminals marked "common," "norm open," and "norm closed." The normally open contacts close and the normally closed contacts open when pressure increases beyond the setpoint. Switch loads for standard models should not exceed the maximum specified current rating of 15 amps resistive. Switch capabilities decrease with an increase in ambient temperature, load inductance, or cycling rate. Whenever an application involves or more of these factors, the user may find it desirable to limit the swi current to 10 amps or less in the interest of prolonging switch life.

ADJUSTMENT

To change the setpoint:

- A. Remove the plastic cap and turn the slotted Adjustment Screw at the top of the housing clockwise to raise the setpoint pressure and counter-clockwise to lower the setpoint. After calibration, replace the plastic cap and re-check the setpoint.
- B. The recommended procedure for calibrating or checking calibration is to use a "T" assembly with three rubber tubing leads, all as short as possible and the entire assembly offering minimum flow restriction. Run one lead to the pressure switch, another to a manometer of known accuracy and appropriate range, and apply pressure through the third tube. Make final approach to the setpoint very slowly. Note that manometer and pressure switch will have different response times due to different internal volumes, lengths of tubing, fluid drainage, etc. Be certain the switch is checked in the position it will assume in use, i.e. with diaphragm in a vertical plane and switch lettering and Dwyer nameplate in an upright position.
- C. For highly critical applications check the setpoint adjustment and if necessary, reset it as noted in step A.

MAINTENANCE

The moving parts of these switches need no maintenance or lubrication. The only adjustment is that of the setpoint. Care should be taken to keep the switch reasonably clean. Periodically the vent drain plug should be rotated then returned to its original position. This will dislodge deposits which could accumulate in applications where there is excessive condensation within the switch.

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Control #
SM844: 993

AMERICAN
FAN
COMPANY ®

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AMERICAN FAN CO. INSTALLATION, OPERATION, AND MAINTENANCE MANUAL, SM 844

This general manual has been prepared to assist you in installing maintaining your American Fan equipment. By following the general instructions presented, you will prolong the life of the equipment while preventing unexpected downtime.

The scope of this manual covers our standard product line and is not intended to cover specially engineered equipment.

INDEX

Section I **Page No.**

Section II

Section III

Section IV

Section V

amca
MEMBER

DESIGNERS / MANUFACTURERS OF HIGH EFFICIENCY
INDUSTRIAL FANS / BLOWERS / DUST COLLECTORS

SECTION I

RECEIVING

All shipments are F.O.B. factory, Fairfield, Ohio. It is, therefore, in the interest of the buyer to carefully inspect all shipments before they are accepted from the freight carrier. Upon delivery, be sure that all items listed on the bill of lading and packing list (inserted in the plastic envelope attached to the shipment) have been received. Partial shipments are sometimes made.

Units are usually completely assembled except when specifications call for unit less motor. They are then skidded, boxed or crated to fully comply with rail or trucking requirements for shipment.

Accessories are sometimes shipped separately due to handling space requirements.

Even though all equipment is carefully inspected and prepared for shipment at the factory, rough handling enroute may cause damage to fan and/or drive parts.

Any shortage, breakage or damage noticed at time of deliver should be indicated to the carrier's representative. Damage noticed after delivery should be reported to the carrier at once. Request their inspection of the shipment and fill out a concealed damage inspection report.

EXTENDED STORAGE

Units shipped to customer which will be held in storage for a period of up to two years should have special provisions so operation-readiness can be maintained. Motors should be equipped with internal space heaters kept on continuously. Units should be crated and covered with polyethylene film. In addition, impellers should be hand-rotated once a month. For best results, keep units sheltered in a cool, dry location.

HANDLING

Small units should be handled carefully and lifted only by the base, never by the shaft, coupling, motor or housing. Larger units should also be lifted by the base or by lifting eyes, if provided. Precaution should taken to avoid dropping or jarring equipment as this can cause damage to the shaft or wheel which is not visibly noticeable, but can cause vibration problems.

INSTALLATION

Fans and motors should be mounted on structurally sound foundations. Concrete is the best, however, other types designed properly are acceptable. Equipment should be leveled on the foundation and shimmed or grouted in place. This will prevent putting the fan structure into a bind by bolting down on an uneven surface.

As a general rule, if vibration isolators are used, the fan should first bolted to a structural steel base and the isolation take place between the structural steel base and the foundation. This prevents the fan base from floating due to uneven weight distribution and/or drive forces when mounted directly to vibration isolators.

ARRANGEMENT 8 BLOWER MOUNTING PROCEDURE

1. Motor and coupling should be mounted with blower resting on level, flat surface, but not bolted to surface.

2. After blower is situated in its final mounting location, feeler gauges should be used between blower mounting feet and mounting surface at each bolt hole location to determine thickness of shims required. Since the blower base is a weldment it will be warped to some degree. If it is not shimmed to the foundation properly when bolted down, a bind in the frame will result. This may cause a bent shaft, coupling, motor and/or bearing misalignment resulting in high vibration levels and premature failure of drive components.

3. After shimming is done, each frame mounting bolt should be finger snugged. Then going from bolt to bolt, progressively tighten each one with a torque wrench until the proper torque value is achieved for the size foundation bolt being used.

4. After the unit is completely tightened down to foundation, coupling alignment should be rechecked. If coupling is now misaligned, loosen foundation bolts and recheck coupling alignment. If after loosening foundation bolts, coupling is aligned, then a bind was introduced in the bolt-down procedure. It will then be necessary to reshim so that the bind is no longer present.

5. Once the unit is tightened down to foundation and coupling alignment is maintained, replace guards and check duct work, etc. Unit is now ready for start-up.

6. Jog motor to make sure unit is rotating in proper direction. If so, bring up to speed and check amperage to motor to make sure enough static pressure is present in system to prevent motor from overloading.

7. Vibration levels should be checked and if they are above 1.0 MIL @ 3600 RPM or 1.5 MILS @ 1800 RPM, a qualified balancing technician should trim balance the unit to achieve these levels.

SECTION II

BEFORE START-UP

1. Fasteners - all foundation bolts, wheel hub set screws, wheel locking bolts and bearing locking collars must be tight.
2. Bearings - check bearing alignment and make certain they are properly lubricated.
3. Fan Wheel - turn over rotating assembly by hand to see that it runs free and does not bind or strike fan housing. If wheel strikes housing the wheel may have to be moved on the shaft or the bearing pillow blocks moved and reshimmed.
4. Motor - check electrical wiring to motor. The current characteristics of the supply line must agree with the motor nameplate rating. Motor should be wired and fused in accordance with the National Electric Code and local codes.
5. V-belt drive must be in alignment with belts at proper tension.
6. Duct Connections (if required) from fan to duct work must not be distorted. Ducts should never be supported by the fan. Expansion joints between duct connections should be used where expansion is likely to occur or where fan is mounted on vibration isolators. All duct joints should be sealed to prevent air leaks. All debris should be removed from duct work and fan.

START UP

1. "Jog" the motor to check for proper wheel rotation. The motor should be started in accordance with the manufacturer's recommendations. Arrows on fan indicate the proper direction of rotation and air flow.
2. Fan may now be brought up to speed. Watch for anything unusual such as vibration, overheating of bearings and motor, etc. Check fan speed on V-belt driven units and adjust motor sheave (on adjustable drives) to give desired RPM.
3. Check motor amperage against nameplate amperage to make sure motor is not overloading.

START-UP OF HIGH TEMPERATURE CONSTRUCTION FANS AND BLOWERS

In addition to normal start-up procedure described above, certain measures must be taken against thermal expansion deformation.

1. Fan or blower should be brought to speed between 50°F and 120°F. It may be necessary to throttle back air entering fan or blower and slowly bleeding in heated air to accomplish this. (Note: if motor horsepower is sized for high temperature operating condition and not cold start-up, throttling inlet air will be mandatory to prevent motor overloading. It is recommended motor amperage be monitored during this procedure.)
2. The maximum rate of temperature rise allowable is 15°F per minute.
3. The reverse situation of fan or blower shut-off also applies. That is the temperature must be lowered slowly before turning fan or blower off to prevent damage.

SECTION III

GENERAL MAINTENANCE

1. A definite time schedule for inspecting all rotating parts and accessories should be established. The frequency of inspection depends on the severity of operation and the locality. Inspections might be weekly at first in order to set up the schedule.
2. Alignment - shaft must not be cocked in the bearings. Misalignment can cause overheating, wear to dust seals, bearing failure an unbalance.
3. Hardware - check tightness of all bolts and set screws.
4. Lubrication - check fan and motor bearings and add lubricant if necessary. Be careful not to overgrease as this can damage bearing seals .
5. Air flow - make sure there are no obstructions to air flow in outlet or inlet duct work.
6. Bearings on high speed fans tend to run hot. Therefore, do not replace a bearing because it feels hot to the touch. Place a pyrometer or contact thermometer against the pillow block and check the temperature.

   Ball pillow blocks can have total running temperatures of 165°F (74°C) before the cause of overheating be investigated.

7. Wheel - inspect wheel blades for accumulation of dust and dirt. Clean thoroughly with stream of water jet, compressed air or a wire brush. This will help prevent an unbalanced condition. If blades are aluminum, be careful not to damage them. Cover the bearings so water won't enter the pillow block. The wheel should be centered to prevent the blades from striking the housing. Make sure wheel is rotating in proper direction. Never run the fan at a higher speed than it was designed for unless you check with American Fan first.

FAN BEARING MAINTENANCE

For most applications, a lithium base grease conforming to a NLGI grade 2 consistency should be used. This type of grease inhibits rust, is water resistant, and has a temperature range of -30°F to 200°F with intermittent highs of 250°F.

Because oil lubricated bearings are usually used on high-speed or high temperature applications, refer to American Fan for the type of oil you should use in your particular application.

When greasing bearings it is important not to overgrease. This is especially true if the bearings are equipped with extended grease lines and the bearings are not visible. In this case, more bearing failures occur due to overgreasing than undergreasing. It is best to give the bearing just one "shot" of grease periodically, when the bearings are not visible. When the bearings are visible, pump in grease until a small bead of grease forms around the bearing seals. It is very important that fan bearing greasing take place while the fan is operating. Caution should be taken while working on and near rotating equipment to avoid personal injury.

When oiling oil-lubricated bearings, oil should be poured into cup at top of bearing until it reaches the overflow point at the lower oil cup.

MOTOR MAINTENANCE

Lubricate motor bearings to the manufacturer's recommendations. Lubrication recommendations are printed on tags attached to the motor. Should these tags be missing, the following will apply:

A. Fractional Horsepower Sleeve Bearing Motors:

Under normal operation at ordinary temperatures and clean surroundings, these motors will operate for three years without relubrication. Then lubricate annually with electric motor oil or SAE 10 oil. Under continuous operation at higher temperatures (but not to exceed 104°F ambient) relubricate annually.

B. Fractional Horsepower Ball Bearing Motors:

Under normal conditions, ball bearing motors will operate for five years without relubrication. Under continuous operation at higher temperatures (but not to exceed 104°F ambient) relubricate after one year. To relubricate where motors are not equipped with pressure fittings, disassemble motor and clean the bearings thoroughly. Repack each bearing one-third full with ball bearing grease.

C. Integral Horsepower Ball Bearing Motors:

Motors having pipe plugs or grease fittings should be relubricated while warm and at stand-still. Replace one pipe plug on each end shield with grease fitting. Remove other plug for grease relief. On low pressure, grease, run and lubricate until new grease appears at grease relief. Allow motor to run for ten minutes to expel excess grease. Replace pipe plugs. Motors not having pipe plugs or grease fittings can be relubricated by removing end shields, cleaning grease cavity and refilling three-fourths of circumference of cavity.

Recommended relubrication intervals-general guide only.

H.P. Range	Standard Duty 8 Hr./Day	Severe Duty 24 Hr./Day Dirty-Dusty	Extreme Duty Very Dirty High Ambients
1 ½-7 ½	5 Yrs.	3 Yrs.	9 Mos.
10-40	3 Yrs.	1 Yrs.	4 Mos.
50-150	1 Yrs.	9 Mos.	4 Mos.

These ball bearing greases or their equivalents are satisfactory for ambients from -15°F.
For Motors:

Mobilplex EP#1—Socony Mobil Oil Company
Alvania Grease #2 —Shell Oil Company
Andox B Grease—Esso Standard Oil Company
Prestige #42 Grease—Sun Oil Company

V-BELT DRIVE MAINTENANCE

If belts squeal at start-up, they are too loose and should be tightened. Periodically, check belt and sheave wear, alignment, and tension. When belts show wear, replace all belts at once with a new matched set of belts. New belts will not work properly in conjunction with used belts due to difference in length. Belts and sheaves should be clean and free from grease. After installing new belts, check tension midway between sheaves. Belts should deflect about 1/64" per inch of span length with approx. 20 lb. force. Allow unit to run for 4-6 hours, then it will be necessary to re-tighten belts again because new belts tend to stretch initially.

SECTION IV

PROBLEM TROUBLESHOOTING

In the event that trouble is experienced in the field, listed below are the most common fan difficulties. These points should be checked in order to prevent needless delay and expense of factory service.

1. CAPACITY OR PRESSURE RATING
   - A. Total resistance of system higher than anticipated.
   - B. Speed too low.
   - C. Dampers or variable inlet vanes not properly adjusted.
   - D. Poor fan inlet or outlet conditions.
   - E. Air leaks in system.
   - F. Damaged wheel.
   - G. Incorrect direction of rotation.
   - H. Wheel mounted backwards on shaft.

2. VIBRATION & NOISE
   - A. Misalignment of bearings, couplings, wheel, or V-belt drive.
   - B. Unstable foundation, fan bolted to uneven foundation, not shimmed or grouted.
   - C. Foreign material in fan causing unbalance.
   - D. Worn bearings.
   - E. Damaged wheel or motor.
   - F. Broken or loose bolts and set screws.
   - G. Bent shaft.

H. Worn coupling.
I. Fan wheel or driver unbalanced.
J. 120 cycle magnetic hum due to electrical input. Check for high or unbalanced voltage.
K. Fan delivering more than rated capacity.
L. Loose dampers or variable inlet vanes.
M. Speed too high or fan rotation in wrong direction.
N. Vibration transmitted to fan from some other source.

3. OVERHEATED BEARINGS
   A. Too much grease.
   B. Poor alignment.
   C. Damaged wheel or driver.
   D. Bent shaft.
   E. Abnormal end thrust.
   F. Dirt in bearings.
   G. Excessive belt tension.

ORDERING SPARE PARTS

Contact the local American Fan representative or the factory and supply the following information:

1. Fan serial number stamped on nameplate.
2. Fan code and model stamped on nameplate.
3. Fan arrangement.
4. Description of part required.
5. Part number if part is a casting.
6. Special paints or coatings.

WHEEL—Be sure to indicate direction of rotation as viewed from drive side, type of wheel and the operating speed.

SHAFT—Length and diameter.

MOTORS—The name of the motor manufacturer and the motor model number from the motor nameplate must be supplied to the factory for repairs or replacement.

BEARINGS—The following information should be indicated when ordering various types of bearings:

ANTI-FRICTION BEARINGS

1. State whether ball or roller.
2. Manufacturer
3. Size and number
4. Fixed or floating

RECOMMENDED SPARES:

1. V-belts on V-belt driven fans
2. Fan bearings
3. Wheel (s)
4. Motor (if blower is critical to your operation.)

SECTION V

AMERICAN FAN COMPANY WARRANTY

1) "The Seller hereby warrants the equipment to be free from defects in materials and workmanship under normal use and service, the obligations hereunder being limited to making good at Seller's plant F.O.B. any part or parts thereof manufactured by Seller which shall, within twelve (12) months from the date of shipment to the original purchaser be returned to Seller with transportation charges prepaid and which on examination by Seller shall disclose to Seller's satisfaction defects. This warranty shall be the only warranty by Seller covering this equipment or the parts thereof and shall be lieu of all other warranties either expressed or implied. Buyer waives all claims for defects in material and workmanship unless said claim be made in writing and received by Seller within ten (10) days after the discovery thereof. This warranty shall cover only the cost of correcting defects in the equipment or parts thereof and Seller shall not be responsible for damages either proximate or consequential arising out of use, operation or possession of said equipment or the parts thereof by Buyer or any other parties. The Seller shall not be responsible for work done, equipment or parts furnished or repairs made by others, for any loss or expense arising from such work, equipment parts or other repairs unless the same is done or furnished with the prior written consent and approval of the Seller. Seller shall under no circumstances be liable for the cost of raw materials used or lost in testing or experimental operations of any equipment sold or other such testing or experimentation to be done under the supervision of a representative of the Seller or of any employee or other representative of the Buyer."

2) Warranties on purchased material are limited to terms of warranty furnished by our suppliers.

3) We do not guarantee against abrasion, corrosion or erosion.

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC.

Recommended

SAFETY PRACTICES

For Users and Installers of Industrial and Commercial Fans

AMCA Publication 410-96

FOREWORD

i. This publication has been prepared by the Air Movement Division of the Air Movement and Control Association International, Inc. (AMCA). The information contained in this publication has been derived from many sources. The suggestions made necessarily should be general in their meaning and cannot be applied literally to all specific situations or conditions.

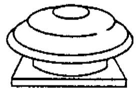
ii. ***The safe installation and operation of fans is the responsibility of the system designer, installer, maintainer, and user.*** From the initial system design through the life of the equipment, safety should be a foremost consideration. Some areas which require some special attention include system design, layout and construction, fan performance specifications, foundation and installation details, storage procedures, start-up and commissioning procedures, operation, maintenance, and repair. Specific safety requirements are mandated by federal, state, and local codes. *Recommended Safety Practices for Users and Installers of Industrial and Commercial Fans* is published by AMCA for assistance. System designers, installers, maintainers, and users should consult and properly comply with all applicable codes and guidelines.

iii. The safety recommendations contained herein are intended to assist designers, installers, maintainers, or other users of air moving devices in the safe operation and use of the devices mentioned. These recommendations do not represent the only methods, procedures, or devices appropriate for the situations discussed. Caution should be used at all times when working in or around moving parts.

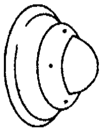
iv. AMCA disclaims any and all warranties, expressed or implied, regarding the products sold by the manufacturer with which this booklet has been provided. Further, AMCA recommends that competent personnel be consulted in deciding what is the preferred or recommended safety procedure in a particular instance where the guidelines contained in this booklet are unclear or in any way incomplete.

v. AMCA has offered the information within this booklet to assist in the safe operation, maintenance, and use of the products sold by members of AMCA. In so doing, AMCA does not assume any legal duties of the designer or manufacturer to instruct or warn about their product. AMCA expressly disclaims liability for any injury or damage arising out of the operation or use of the product or the guidelines contained herein.

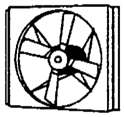
vi. These recommended safety practices were adopted by the AMCA membership on April 28, 1996.



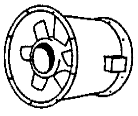
Power Roof Ventilator



Wall Exhauster



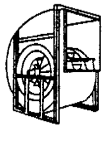
Propeller Fan



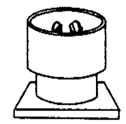
Axial Fan

1. INTRODUCTION

1.1 Fans and other air moving devices are made in a wide variety of types, sizes, and arrangements. This publication addresses the proper use and installation of industrial and commercial fans. It is not intended to address residential and consumer fans.



Centrifugal Fan



Upblast Roof Exhauster

1.2 Various "size" factors are important when assessing potential for injury; some factors are: diameter of impeller (wheel, rotor, propeller), rotational inertia, voltage, and current.

1.3 This guide is intended to assist in the safe installation of air moving equipment and to warn operating and maintenance personnel of the commonly recognized hazards associated with this equipment.

1.4 ***Handling and installation should always be performed only by experienced and trained personnel who are aware of the hazards associated with rotating equipment. Failure to comply with these practices may result in death or serious bodily injury.*** In addition to following the manufacturer's installation instructions, care should be taken to ensure compliance with specific safety requirements mandated by federal, state, and local codes. Industry safety standards and practices published by AMCA and by other recognized agencies and associations should be consulted and followed where applicable.

2. PERSONNEL SAFETY ACCESSORIES

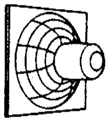
2.1 GENERAL

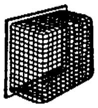
2.1.1 Protective devices are incorporated as standard construction on some types of fans but on many fans, these devices are offered as optional accessories. This is done because the need for the devices and the design required will frequently depend upon the type of system, fan location, and operating procedures being employed. Proper protective safety devices; company safety standards; specific safety requirements mandated by federal, state, and local codes; and industry safety standards and practices published by AMCA and by other recognized agencies and associations should be determined by the user, who should specify and obtain the appropriate devices from the fan manufacturer or others, and should not allow operation of the equipment without them. Examples of available devices include the following:

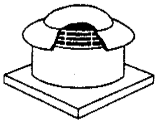
2.2 FAN GUARDS

2.2.1 All fans have moving parts which require guarding in the same way as other moving machinery. Fans located less than seven (7) feet above the floor require special consideration. Specific safety requirements should comply with mandated federal, state, and local codes; and industry safety standards and practices published by AMCA and by other recognized agencies and associations should be followed.

2.2.2 Roof-mounted fans and other fans which are not generally accessible may not require safety guards which might otherwise be appropriate. Where accessibility to these fans is occasional or infrequent, the expense of permanent guarding may be reduced through the use of lockout switches and suitable warnings. In such cases, maintenance personnel should engage the lockout switch before undertaking any maintenance or repairs. As is the case with other machinery involving moving parts, common sense and caution will preserve personal safety.

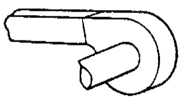

Industrial Type Guard For Propeller Fan

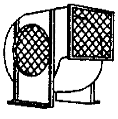

Maximum Safety Guard for Propeller Fan

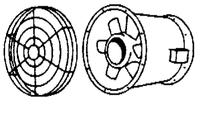

Screen on Roof Ventilator

2.3 INLET AND OUTLET GUARDS

2.3.1 Axial and centrifugal fans are often connected directly to ductwork which will prevent contact with the internal moving parts; when an exposed inlet or outlet represents a hazard, a suitable guard should be installed.

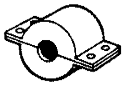

Centrifugal Fan Protected by Ductwork

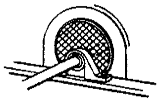

Inlet or Outlet Guard on Centrifugal Fan

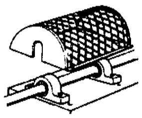

Guard for Axial Fan With Non-Ducted Inlet or Outlet

2.4 DRIVE GUARDS

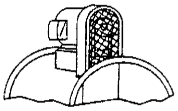
2.4.1 Fans may be driven directly from the motor shaft or through a belt drive. Where the bearing assembly, rotating shaft, sheaves, or belts are exposed, a suitable guard may need to be provided. Some example guards are shown below.


Drive Coupling Guard

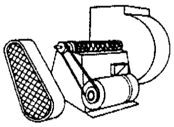

Heat Slinger Guard (Shaft and bearing guard omitted for clarity)


Shaft and Bearing Guard

2.4.2 Drive guards may be required for tubular centrifugal or axial fans to cover the exposed drive sheave and belts outside the fan housing.


Drive Guard - Axial Fan

2.4.3 A typical centrifugal fan drive guard may vary with the arrangement. Safety guards should be used when drive systems are accessible to personnel. In restricted areas, omission of the back cover may be acceptable.


Drive Guard - Centrifugal Fan

2.4.4 Dampers and their linkage may operate suddenly without warning at high speeds. Dampers and their linkage contain pinch points which should be identified and guarded.

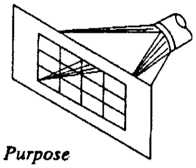
3. HIDDEN DANGERS

3.1 GENERAL

3.1.1 In addition to the obvious hazards associated with the moving parts of rotating machinery, fans present additional potential hazards that are not so obvious and should be considered by the system designer and user for safe operation.

3.2 SUCTION AND AIR PRESSURE

3.2.1 Fans operate by creating suction and air pressure which can be hazardous. Solid objects can be drawn into a fan's inlet and then become dangerous projectiles when they are exhausted through the fan's outlet. ***Solid objects can also cause fan failure or impeller failure due to imbalance or damage to the impeller blades.*** Personnel in close proximity to a fan inlet can be overcome by the suction, and drawn into the fan.

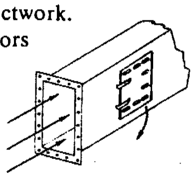

Special Purpose Intake Screen

3.2.2 Whenever there is a possibility that solid objects can be drawn into a remote intake, the intake should be guarded at all times. Before a guard is removed, the fan should be disconnected and the power supply locked out.

3.2.3 Where fans are installed over an occupied area, safety guards should be provided to prevent dropped objects from entering this area during installation and maintenance.

3.2.4 Access doors to a fan or duct system should never be opened while the fan is operating or coasting to a stop. On the downstream (or pressure) side of the system, releasing the door with the system in operation may result in an explosive opening. On the upstream (or suction) side, the inflow may be sufficient to draw in tools, clothing, and other materials. The power supply should always be locked out prior to accessing a fan or ductwork.

3.2.5 Fan design sometimes requires access doors to be supplied with internal components such as a plug to fill a hole in the fan casing. These doors can often be heavy and difficult to handle. Care should be exercised when opening, removing, and installing these components.


Bolted Access Door in Duct

3.3 WINDMILLING

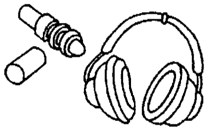
3.3.1 Even when the power supply is locked out, fans may cause injury or damage if the impeller is subject to "windmilling" which is the turning of the impeller and drive components due to a draft in the system. To guard against this hazard, the impeller should be secured to physically restrict rotational movement.

3.4 TEMPERATURE

3.4.1 Many fans, fan motors, and fan components run at temperatures that could burn someone who comes in contact with the hot areas, including discharged or leaking gases. If this potential hazard is present, steps should be taken so that personnel working near the fan are aware of the danger and can exercise caution.

3.5 FAN NOISE AND ENVIRONMENT

3.5.1 Some fans can generate sound that could be hazardous to exposed personnel. Sound pressure can be measured in the field, but obtaining accurate data is difficult. The environment in which the fan operates can impact the ability to obtain accurate fan sound readings. Consult the manufacturer for fan sound data. It is the responsibility of the system designer, installer, user, and maintainer to comply with specific safety requirements mandated by federal, state, and local codes; and to follow industry safety standards and practices published by AMCA and by other recognized agencies and associations, regarding personnel safety from exposure to fan noise associated with use and exposure to the equipment.


Hearing Protection

3.6 STROBOSCOPIC EFFECT

3.6.1 The stroboscopic effect of certain lights in combination with certain fan speeds may cause a rotating assembly to appear stopped. In these cases, irregular markings can be placed on the moving parts to prevent this type of effect. Personnel should be warned that the fan may be in motion even if it appears not to be.

3.7 SPECIAL PURPOSE FANS AND SYSTEMS

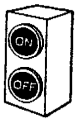
3.7.1 The hidden dangers associated with Special Purpose Fans used in special systems are covered in Section 6.

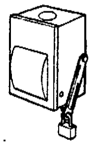
4. POWER ISOLATION

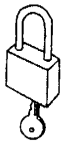
4.1 Every fan should be installed with a suitable device allowing it to be completely disconnected or isolated from the power supply.

4.2 Many fans are started by remote switches or push-buttons, by interlocks with other equipment, or by automatic controls. Before performing any maintenance, inspection, or other activity hich will require removal of guards, ductwork, access doors, etc., or exposure of moving parts, the fan power supply should be locked out and the fan tagged out of service.

4.3 In some installations other equipment, such as gas burners, may be interlocked with the fan so that disconnecting the fan will automatically shut off the burner or other device. Maintenance on systems of this type should be performed only under the supervision of competent engineering personnel and in accordance with applicable codes and standards.


Remote Switch


Disconnect Switch


Lock Carried by Maintenance Personnel

4.4 In cases where the fan is power driven by a source other than an electric motor, appropriate provisions should be made for the isolation or disengagement of the power supply.

5. START-UP CHECK LIST

5.1 GENERAL

5.1.1 Before putting any fan into initial operation, the manufacturer's instructions should be followed. Transportation, handling, and installation can cause fasteners to loosen, and cause misalignment of fan components. Carefully follow this check list when commissioning equipment.

5.1.2 Lock out the primary and all secondary power sources.

5.1.3 A complete inspection should be made of all of the ductwork nd the interior of the fan. Make certain there is no foreign material ich can be drawn into or blown through the fan or ductwork. Appropriate protective measures and safety practices should be observed when entering or working within these areas. These measures might include the use of goggles, respirators, or other personal protective devices.

5.1.4 Make sure the foundation or mounting arrangement and the duct connections are adequately designed and installed per drawings and in accordance with recognized acceptable engineering practices and with the fan manufacturer's recommendations.

5.1.5 Check and tighten all bolts, fasteners, and set screws as necessary.

5.1.6 Check the fan assembly and bearings for proper grounding to prevent static electricity discharge.

5.1.7 Ensure power and drive components such as motor starter, variable frequency drive, or hydraulic power unit are properly sized, matched, and connected to the fan.

5.1.8 Check bearings for recommended lubricant and lubrication amount.

5.1.9 Spin the rotating assembly to determine whether it rotates freely, without hitting anything, and is not grossly out of balance.

5.1.10 Inspect impeller for proper rotation for the fan design.

5.1.11 Check alignment of drives and all other components.

5.1.12 Check the belt drive for proper sheave selection and installation and make sure the sheaves are not reversed (excessive speeds could develop).

5.1.13 Check for recommended belt tension.

5.1.14 Properly secure all safety guards.

5.1.15 Assure that all appropriate warnings have been put in place.

5.1.16 Secure all access doors to the fan and ductwork.

5.1.17 Momentarily energize the fan to check the direction of rotan. Listen as the fan coasts to a stop for any unusual noise, identify e source, and take corrective action as necessary.

5.1.18 Switch on the electrical supply and allow the fan to reach full speed. Check carefully for:
(1) Excessive vibration
(2) Unusual noise
(3) Proper belt alignment
(4) Proper lubrication
(5) Proper amperage, voltage, or power values.
(6) If any problem is indicated, SWITCH OFF IMMEDIATELY.
(7) Lock out the power supply. Secure the fan impeller if there is a potential for windmilling. Check carefully for the cause of the trouble, correct as necessary, and repeat check list procedure.

5.2 Even if the fan appears to be operating satisfactorily, shut down after a brief period, lock out the power supply, and recheck items 5.1.5 through 5.1.17 as the initial start-up may have loosened the bolts, fasteners, and set screws.

5.3 The fan may now be put into operation, but during the first eight hours of running, it should be closely observed and checked for excessive vibration and noise. At this time checks should also be made of motor input current and motor and bearing temperatures to ensure that they do not exceed manufacturer's recommendations.

5.4 After eight hours of operation, the fan should be shut down and the power locked out. Check list items 5.1.5 through 5.1.17 should be inspected and adjusted, if necessary.

5.5 After twenty-four (24) hours of satisfactory operation, the fan should be shut down (locked out) and the drive belt tension should be readjusted to recommended tension.

5.6 After commissioning and start-up, the fan should be operated and maintained in accordance with the manufacturer's and component manufacturer's recommendations. Some basic guidelines for WARNING SIGNS and ROUTINE MAINTENANCE are included in Sections 7 and 8 of this publication. These sections are meant as a supplement to other publications and are not intended to replace the manufacturer's instructions.

6. SPECIAL PURPOSE FANS

6.1 Most fans are designed to handle clean air at standard temperatures between 32°F and 120°F. These fans should not be placed in systems or used for other than their design intended use. *Special Purpose Fans* are designed for use in systems that may include extreme temperatures, explosive, toxic, or special gases, material handling, corrosive environments, or other special hazards which should be carefully considered. Specific safety requirements should comply with mandated federal, state, and local codes; and industry safety standards and practices published by AMCA and by other recognized agencies and associations should be followed.

6.2 Where the system will handle explosive or flammable materials (i.e., dust, fumes, vapors or gases), fans of spark-resistant construction should be used.

6.3 Fans connected by ductwork or other piping may contain gases other than air which are hazardous. In these cases, procedures should be established to prevent exposure of personnel working on or near the fan, and by maintenance personnel who may need to enter the fan. Appropriate personal protective equipment as determined by the material safety data sheet, and system operators should be utilized. Appropriate environmental protective measures should also be taken.

6.4 Fan inlet boxes, housings, ductwork, and other system components which are large enough to permit entry should be considered confined spaces. System areas may also serve as low points where heavy gases, liquids, or other substances may accumulate and present explosive, fire, health, or suffocation hazards. Appropriate protective measures and safety practices should be observed when entering or working within these areas.

6.5 Material-handling fans are specially designed to allow the fan to handle a specific type of material without excessive accumulation of material on the fan impeller. Fans handling corrosive gases or erosive materials should be checked periodically. If loss of material is evident, the fan should be shut down, power supply locked out, and tagged out of service. The manufacturer or other qualified personnel should be consulted to determine if the fan is within safety limits for operation. To ensure satisfactory operation it is essential to observe the manufacturer's limitations concerning the type of material to be handled by the fan.

6.6 Fan ratings and maximum speed limits are typically based on the use of air at 70°F. At temperatures above the normal range (specified by the manufacturer), a reduction should be made in the maximum speed limit. Information on this reduction and on other precautions to be taken for high temperature applications should be obtained from the fan manufacturer. Personnel working near high temperature fans should be aware that coming in contact with the fan's housing, ductwork, or handled gases could result in serious burns. Where the danger of burns is not apparent, appropriate warnings should be posted. Appropriate protective apparel should be worn whenever working in close contact with heated housings or ductwork.

6.7 Corrosive contaminants can be formed when moisture combines with an active airborne chemical. Fans subjected to corrosive contaminants will corrode; however, suitable protective coatings or material, if used in the fan construction, can delay corrosion. Protected fans should be regularly inspected to ensure that the protection remains effective. Personnel working in environments with airborne chemicals may require personal protective apparel equipment.

6.8 Where liquid can accumulate within the fan, provide for the installation of adequately sized drains.

6.9 In those applications where there is a potential for chemical build-up (such as grease, creosote, etc.), periodic cleaning and proper drainage are necessary to avoid a fire hazard.

7. WARNING SIGNS

7.1 GENERAL

7.1.1 A change in the operating characteristics of a fan may indicate the need for maintenance. Sudden changes may indicate severe problems or dangerous conditions developing. Investigate any changes in the operational characteristics or unusual symptoms of the fan. Refer to AMCA Publication 202, *Troubleshooting*, for a more detailed explanation of investigating procedures. Consult your manufacturer or other qualified consultant with questions concerning changes observed.

7.2 EXCESSIVE VIBRATION

7.2.1 Operational vibration levels are one of the best indicators of the condition of the blower. Careful observation and monitoring of vibration levels can detect a minor problem in the early stages of development when correction is less costly and easier. Recommended maximum vibration levels should be obtained from the equipment manufacturer.

7.2.2 If excessive vibration is observed, stop the fan and lock it out until the cause is corrected. Check for material build-up on the impeller. Generally this will show up as material flaking off the fan impeller and causing an imbalance which may lead to catastrophic failure of the fan or its components. Excessive vibration can also be caused by looseness in the drive train, loose fasteners, misalignment or impeller damage. Contact the fan manufacturer or other qualified consultant to determine the maximum vibration level if it is not included in maintenance instructions.

7.3 NOISE

7.3.1 Changes to the sound level may indicate maintenance is needed. Some unusual noises often heard include: bearing noise indicating the bearings need lubricant or replacement; scraping or ticking noise indicating the rotating parts are hitting the stationary parts; squealing indicating the belt drive needs tensioning; repeated changing pitch of the blower indicating operation of the blower at too low a flow. If any of these noises or any other unusual noises are detected, their cause should be determined and corrective action taken as necessary.

7.4 HIGH MOTOR TEMPERATURES

7.4.1 Check that cooling air to the motor has not been diverted or blocked by dirty guards or similar obstacles. Check the input amperage. An increase in amperage may indicate that some major change has occurred in the system.

7.5 HIGH BEARING TEMPERATURES

7.5.1 This condition is usually caused by improper lubrication; this can be either "over," "under," or "unsuitable" lubrication. In every case, if the cause of the trouble is not easily seen, experienced personnel should examine the equipment before it is put back in operation.

7.6 POOR PERFORMANCE

7.6.1 Too much flow or pressure or too little flow or pressure is often a symptom of a change in the operating system. A fan will typically operate at the same performance in a static system. Some typical causes include: operating of the fan backwards after maintenance procedures; filters dirty or not in place; change or blockage in the ductwork; change in speed of the fan (switching the sheaves); loss or failure of the impeller. All of these causes and many others will affect the flow and pressure produced by the fan.

8. ROUTINE MAINTENANCE

8.1 A preventive maintenance program is an important aspect of an effective safety program. Consult your manufacturer or other qualified consultant with questions concerning changes observed during periodic inspections and routine maintenance.

8.2 The fan manufacturer's operating and maintenance recommendations, as well as the components manufacturer's instructions (such as motor, bearing, drives, etc.) should be strictly followed.

8.3 *Maintenance should always be performed by experienced and trained personnel who are aware of the hazards associated with rotating equipment.* Do not attempt any maintenance on a fan unless the fan power supply has been locked out and tagged out and the impeller has been secured.

8.4 When performing maintenance functions which include disassembly of the fan, careful consideration should be given to the size, weight, center of gravity, and lifting means of the fan components. It should also be noted that the outboard bearing on some fans such as arrangements 1, 8, 9, and 10 is often cap-loaded. Removal of the securing means may result in a sudden change in impeller position.

8.5 Historical data is often the best indicator for determining the operational condition of the fan. Maintenance logs which include relubrication, vibration levels, temperature levels, power requirements, inspections, and other pertinent records should be maintained and consulted as necessary when assessing the condition of the fan.

8.6 Under normal circumstances, handling clean air, the system should require cleaning only once a year. However, the fan and system should be checked at regular intervals to detect any unusual accumulation.

8.7 The fan impeller should be specially checked for build-up of material or dirt which may cause an imbalance with resulting undue wear on bearings and belt drives. A regular maintenance program should be established as needed to prevent material build-up.

8.8 Periodic inspection of the rotating assembly should be made to detect any indication of weakening of the rotor because of corrosion, erosion, or metal fatigue. Where signs of deterioration are found, lock out and tag out the impeller until the unit has been inspected and approved by a qualified consultant.

AMERICAN FAN FINAL INSPECTION JOB# 02094

******** ACCESSORIES ********

/	Flanged Inlet 8" recessed
/	Flanged Outlet
	Slip Inlet
	Slip Outlet
	Access Door @______
/	Hsg. Drain
	Inlet Guard
	Outlet Guard
/	Teflon Shaft Seal
	Hi-Temp Seal NA-750 ☐ Graphoil ☐
	Other Shaft Seal ______
	tary Base
	Ext. Grease
	Flex Conn. Outlet ☐ Inlet ☐ Draw Bands ☐
	Flex Conn. Assembly Inlet ☐ Outlet ☐
	Disconnect Switch Mounted ☐ Wired ☐
	Vibration Isolators Qty/Size______ ______
/	Spark Resist. Type B
	Stainless Steel Type_____ Airstream ☐ All ☐
	Hi-Temp Construction ____°F to ______°F

	Companion Flange Inlet ☐ Qty_____ Outlet ☐ Qty_____
/	Damper INTERNAL Inlet ☐ Outlet ☒ Parallel ☐ Opposed ☐ Class 1 & 2 ☐ Class 3 ☐
	Silencer______
	Inlet Box

	~~C.~~ Alum. Base
/	Steel Base
	Less Base
	Cutoff Damper Full ☐ Half ☐ Inlet ☐ Outlet ☐
	Inlet Filter______
	Sound Attenuator______
	Weathercover/Belt Guard
	Weathercoated Fan Shaft
	Pre-Wired ______Volts
\	Inlet Transition _____In.
	Outlet Transition _____In.

	Guard System______ ______		
	Indoor		
	Outdoor		
	Belt		Coupling
	Shaft		Heat Slinger

	Mounting Feet ______ Floor ☐ Susp. ☐
	Vert. Mtg. Clips
	Horiz. Mtg. Clips
	Inlet Bell
	Inlet Screen
	Outlet Screen
	Companion Flange Qty_____ Per Fan ______
	Ext. Grease
	Belt Guard
	Weathercover
	Roof Curb
	Vibration Isolators Qty/Size______ ______
	Outlet Cone Type_____ Acoustical ☐ Non-Acoustical ☐ W/Pod ☐ W/Feet ☐ W/Clips ☐
	Stainless Steel Hardware

Documents With Shipment	
/	Final Inspection Sheet
/	Vibration Analysis Sheet
	Certificate of Compliance

FI3-1100

AMERICAN FAN COMPANY®

VIBRATION ANALYSIS

WOODS
AIR MOVEMENT DIV.

2933 SYMMES ROAD • FAIRFIELD, OHIO 45014
PHONE (513) 874-2400
FAX (513) 870-5577

CUSTOMER: NORTHEAST
DATE: 3-5-02
EQUIPMENT: ②UP-6
JOB NO: 020974
LOCATION:
ATTN:

CHECK LIST:

volts	230/460	tip clearance	✓
hz.	60	airstream clear	✓
hp.	25	inlet cover	✓
rpm	3600	unit stable?	✓
wiring correct?	✓	balanced?	✓
run amps	✓	pitch range	—
run volts	460	max pitch amps	—
station no.	1	leak test 25 psi	—

sketch shows pickup locations

PICK-UP LOCATION	DISPLACEMENT (mils peak to peak)			NOTES:
	HORIZONTAL	VERTICAL	AXIAL	AMPS
INB	.20	.26		#1 27.1
OUTB	.19	.30	.12	
INB	.35	.55		#2 27.4
OUTB	.34	.54	.35	

TESTED BY:

DESIGNERS / MANUFACTURERS OF HIGH EFFICIENCY FANS

AMERICAN FAN FINAL INSPECTION JOB# 020974

MBLED BY: INSPECTED BY: DATE: 3/5/02

ACCESSORY CARD ☐

******** FAN ********

QUANTITY 2 | MODEL ☑ | BEARINGS

CLASS – ARR'T -- % WIDTH -- PAINT ☑

ROTATION CW ☑ CCW ☐

FORM/DISCHARGE TH

MOTOR POSITION/T BOX @ STD ☑

AIRFLOW

HORIZ ☐ VERT/UP ☐ VERT/DN ☐

PILOT POSITIONER @

MAX RPM 3600

******** WHEEL/IMPELLER ********

TYPE – MATERIAL – CLASS – BORE – P/A ☑ | BUSHING Q1 HUBCAP ☐ NOSE CONE ☐

******** MOTOR ********

MTR BY: AFC ☑ CUST ☐ LESS ☐ | MFR Baldor | USABLE ON 208V @ AMPS

HP – RPM – FRAME – PHASE – HERTZ – VOLTS – METHOD OF START – ENCL – OTHER – EFF. ☑

MODEL No. M4107T | SERIAL No C0109110043 | AMPS 58/29

******** DRIVES ********

DRIVES BY: AFC ☐ CUST ☐ LESS ☑ | FIXED ☐ ADJUSTABLE ☐

FAN SHEAVE – MOTOR SHEAVE – BUSHINGS – BELTS – CENTER DISTANCE ☐

******** ADDITIONAL MOTOR SERIAL NUMBERS/ACCESSORIES/NOTES ********

1. C0109110053	8.
2.	9.
3.	10.
4.	11.
5.	12.
6.	13.
7.	14.

******** FINAL ********

NAMEPLATE ☑

TAGGED PER ORDER ☑ | CUSTOMER INTERFACE ☐

SAFETY DECALS ☑

VIBRATION ANALYSIS SHEET VERIFIED ☐

******** RUN TEST – SMB/C. ALUM ONLY ********

)	RUNNING RPM	RUNNING AMPS	BALANCE

FAN(S) TESTED @ ____ HZ ______ VOLTS

TESTED BY:

BALDOR
MOTORS AND DRIVES

AC Motor Installation – Maintenance Instructions

Handling

The weight of the motor and shipping container will vary. Use correct material handling equipment to avoid injury.

Receiving

Inspect the motor for damage before accepting it. The Motor shaft should rotate freely with no rubs. Report any damage immediately to the commercial carrier that delivered your motor.

Safety Notice

Only qualified personnel trained in the safe installation and operation of this equipment should install this motor. When improperly installed or used, rotating equipment can cause serious or fatal injury. Equipment must be installed in accordance with the National Electrical Code (NEC), local codes and NEMA MG2 Safety Standards for Construction and Guide for Selection, Installation and Use of Electric Motors and Generators. Observe the following guidelines:

1. When eyebolts are provided, they must be fully tightened and are intended to lift the motor and its included accessories only.
2. Ground the motor according to NEC and local codes.
3. Provide a permanent guard to prevent accidental contact of body parts or clothing with rotating or moving parts or burns if motor is hot.
4. Shaft key must be secured before starting motor.
5. Do not apply power to the motor until the motor is securely mounted by its mounting holes.
6. This motor must only be connected to the proper line voltage, line frequency and load size.
7. If a motor mounted brake is installed, provide proper safeguards for personnel in case of brake failure.
8. Disconnect all power services and stop the motor before servicing.
9. For single phase motors, discharge the start and/or run capacitors before servicing.
10. Do not by-pass or render inoperative any safety device.
11. When using AC motors with frequency inverters, be certain that the Maximum Speed rating (on nameplate) is not exceeded.
12. Mounting bolts should be high tensile steel. Be sure to use a suitable locking device on each bolt (spring washer or thread lock compound).

Motor Enclosure

ODP, Open drip proof motors are intended for use in clean, dry locations with adequate supply of cooling air. These motors should not be used in the presence of flammable or combustible materials. Open motors can emit flame and/or molten metal in the event of insulation failure.

TEFC, totally enclosed motors are intended for use where moisture, dirt and/or corrosive materials are present in indoor and outdoor locations.

Explosion proof motors, as indicated by the Underwriters Laboratories, Inc. label are intended for use in hazardous areas as specified by the NEC.

Mounting

Foot mounted machines should be mounted to a rigid foundation to prevent excessive vibration. Shims may be used if location is uneven.

Flange mounted machines should be properly seated and aligned. Note: If improper rotation direction is detrimental to the load, check rotation direction prior to coupling the load to the motor shaft.

For V-belt drive, mount the sheave pulley close to the motor housing. Allow clearance for end to end movement of the motor shaft. Do not overtighten belts as this may cause premature bearing failure or shaft breakage.

Mounting Continued

Direct coupled machines should be carefully aligned and the shaft should rotate freely without binding.

Wiring

Connect the motor as shown in the connection diagram. The wiring, fusing and grounding must comply with the National Electrical Code and local codes. When the motor is connected to the load for proper direction of rotation and started, it should start quickly and run smoothly. If not, stop the motor immediately and determine the cause. Possible causes are: low voltage at the motor, motor connections are not correct or the load is too heavy. Check the motor current after a few minutes of operation and compare the measured current with the nameplate rating.

Lubrication

This is a ball bearing motor. The bearings have been lubricated at the factory. Motors that do not have regrease capability are factory lubricated for the normal life of the bearings.

Relubrication Intervals (For motors with regrease capability)

New motors that have been stored for a year or more should be relubricated. Lubrication is also recommended at these intervals:

Relubrication Intervals

NEMA (IEC) Frame Size	Rated Speed (RPM)			
	3600	1800	1200	900
Up to 210 incl. (132)	5500Hrs.	12000Hrs.	18000Hrs.	22000Hrs.
Over 210 to 280 incl. (180)	3600Hrs.	9500Hrs.	15000Hrs.	18000Hrs.
Over 280 to 360 incl. (225)	*2200Hrs.	7400Hrs.	12000Hrs.	15000Hrs.
Over 360 to 5000 incl.(300)	*2200Hrs.	3500Hrs.	7400Hrs.	10500Hrs.

* Lubrication interval for 6313 or 6314 bearings that are used in 360 through 5000 frame, 2 pole motors. If roller bearings are used, bearings must be lubricated more frequently, divide the interval by 2.

Lubricant

Baldor motors are pregreased, normally with Polyrex EM (Exxon Mobil). If other greases are preferred, check with a local Baldor Service Center for recommendations.

Procedure

Clean the grease fitting (or area around grease hole, if equipped with slotted grease screws). If motor has a purge plug, remove it. Motors can be regreased while stopped (at less than 80°C) or running.

Apply grease gun to fitting (or grease hole). Too much grease or injecting grease to quickly can cause premature bearing failure. Slowly apply the recommended amount of grease, taking 1 minute or so to apply. Operate motor for 20 minutes, then reinstall purge plug if previously removed.

Caution: Keep grease clean. Mixing dissimilar grease is not recommended.

Amount of Grease to Add

Frame Size NEMA (IEC)	Weight of grease to add ounce (gram)	Volume of grease to add	
		inches^3	teaspoon
Up to 210 incl. (132)	0.30 (8.4)	0.6	2.0
Over 210 to 280 incl. (180)	0.61 (17.4)	1.2	3.9
Over 280 to 360 incl. (225)	0.81 (23.1)	1.5	5.2
Over 360 to 5000 incl.(300)	2.12 (60.0)	4.1	13.4

BALDOR
MOTORS AND DRIVES

P.O. Box 2400
Fort Smith, AR 72902–2400 U.S.A.
(501) 646–4711

1/01

LB5001

BULLETIN NO. A-27

OPERATING INSTRUCTIONS and PARTS LIST

Magnehelic® Differential Pressure Gage

SPECIFICATIONS

Dimensions: 4-3/4" dia. X 2-3/16" deep.

Weight: 1 lb. 2 oz.

Finish: Baked dark gray enamel.

Connections: 1/8 N.P.T. high and low pressure taps, duplicated, one pair side and one pair back.

Accuracy: Plus or minus 2% of full scale, at 70°F. (Model 2000-0, 3%; 2000-00, 4%).

Pressure Rating: 15 PSI.

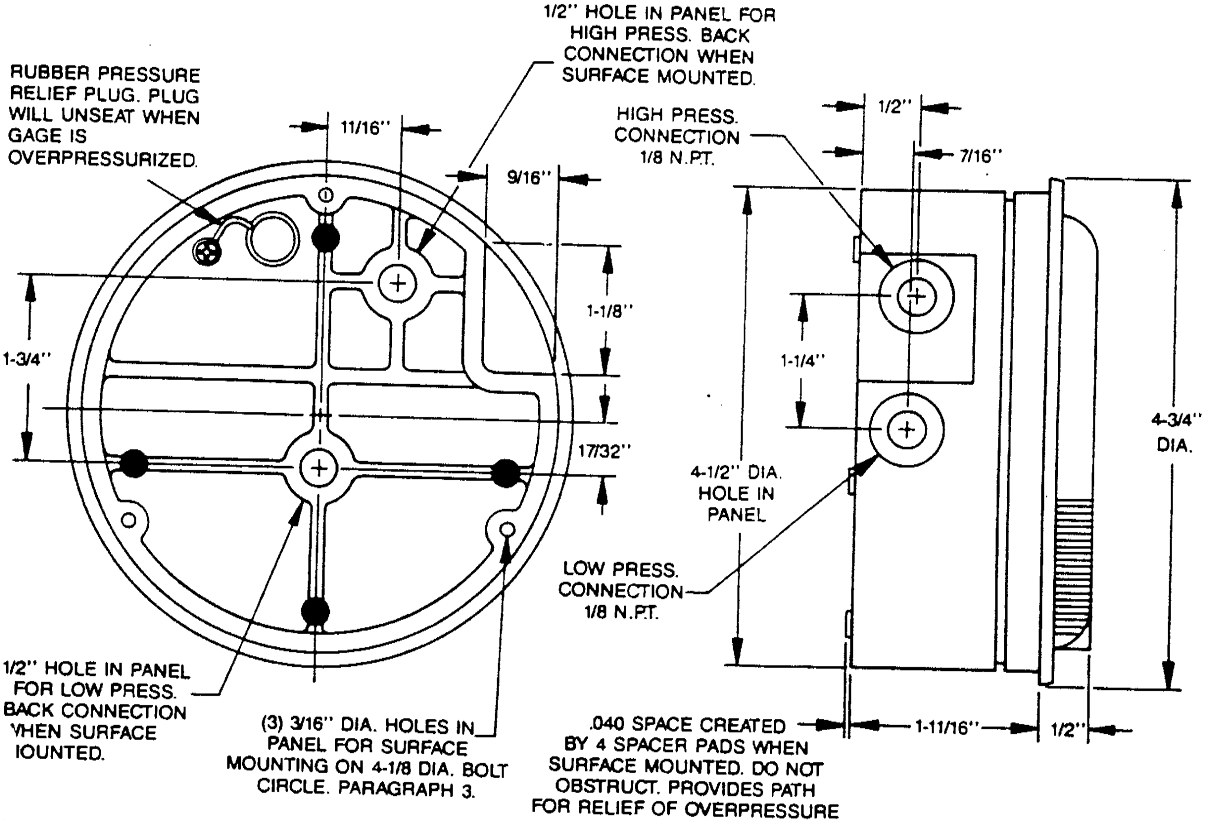
Ambient Temperature Range: 20° to 140°F.

Standard gage accessories include two 1/8" N.P.T. plugs for duplicate pressure taps, two 1/8" pipe thread to rubber tubing adapters, and three flush mounting adapters with screws.

Caution: For use with air or compatible gases only.

For repeated over-ranging or high cycle rates, contact factory.

Hydrogen Gas Precautionary Note: The rectangular rare earth magnet used in the standard gage may not be suitable for use with hydrogen gas since a toxic and explosive gas may form. For hydrogen service, consult the factory for an alternate gage construction.



DWYER INSTRUMENTS, INC.
P. O. BOX 373 • MICHIGAN CITY, INDIANA 46360, U.S.A.
Telephone 219/879-8000
Fax 219/872-9057

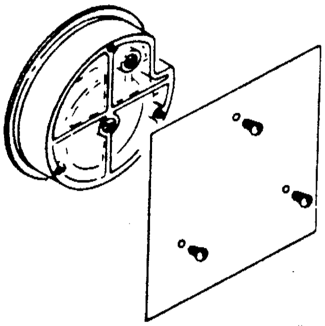
MAGNEHELIC' INSTALLATION

Overpressure Protection: Standard Magnehelic gages are rated for a maximum pressure of 15 PSIG and should not be used where that limit could be exceeded. Newer models employ a rubber plug on the rear which functions as a relief valve by unseating and venting the gage interior when overpressure reaches approximately 25 PSIG. To provide a free path for pressure relief, there are four spacer pads which maintain .040" clearance when gage is surface mounted. Do not obstruct the gap created by these pads.

1. Select a location free from excessive vibration and where the ambient temperature will not exceed 140°F. Also, avoid direct sunlight which accelerates discoloration of the clear plastic cover. Sensing lines may be run any necessary distance. Long tubing lengths will not affect accuracy but will increase response time slightly. Do not restrict lines. If pulsating pressures or vibration cause excessive pointer oscillation, consult the factory for ways to provide additional damping.

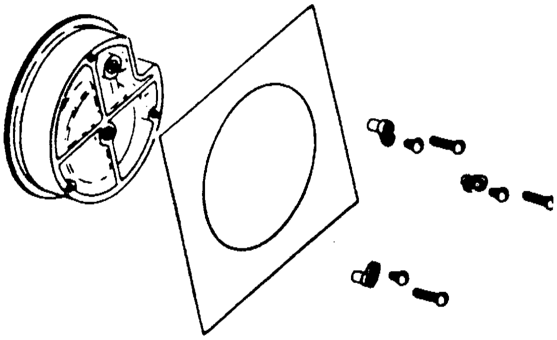
2. All standard Magnehelic gages are calibrated with the diaphragm vertical and should be used in that position for maximum accuracy. If gages are to be used in other than vertical position, this should be specified on the order. Many higher range gages will perform within tolerance in other positions with only rezeroing. Low range Model 2000-00 and metric equivalents must be used in the vertical position only.

3. Surface Mounting



Locate mounting holes, 120° apart on a 4-1/8" dia. circle. Use No. 6-32 machine screws of appropriate length.

4. Flush Mounting



Provide a 4½" dia. opening in panel. Insert gage and secure in place with No. 6-32 machine screws of appropriate length, with adaptors, Part No. 360c, firmly secured in place. To mount gage on 1¼"-2" pipe, order optional A-610 pipe mounting kit.

5. To zero the gage after installation

Set the indicating pointer exactly on the zero mark, using the external zero adjust screw on the cover at the bottom. Note that the zero check or adjustment can only be made with the high and low pressure taps both open to atmosphere.

Operation

Positive Pressure: Connect tubing from source of pressure to either of the two high pressure ports. Plug the port not used. Vent one or both low pressure ports to atmosphere.

Negative Pressure: Connect tubing from source of vacuum or negative pressure to either of the two low pressure ports. Plug the port not used. Vent one or both high pressure ports to atmosphere.

Differential Pressure: Connect tubing from the greater of two pressure sources to either high pressure port and the lower to either low pressure port. Plug both unused ports.

When one side of gage is vented in a dirty, dusty atmosphere, we suggest an A-331 Filter Vent Plug be installed in the open port to keep inside of gage clean.

a. For portable use or temporary installation, use 1/8" pipe thread to rubber tubing adapter and connect to source of pressure with rubber or Tygon tubing.

b. For permanent installation, 1/4" O.D., or larger, copper or aluminum tubing is recommended. See accessory bulletin S-101 for fittings.

MAINTENANCE

Maintenance: No lubrication or periodic servicing is required. Keep case exterior and cover clean. Occasionally disconnect pressure lines to vent both sides of gage to atmosphere and re-zero. Optional vent valves, (bulletin S-101), should be used in permanent installations.

Calibration Check: Select a second gage or manometer of known accuracy and in an appropriate range. Using short lengths of rubber or vinyl tubing, connect the high pressure side of the Magnehelic gage and the test gage to two legs of a tee. Very slowly apply pressure through the third leg. Allow a few seconds for pressure to equalize, fluid to drain, etc., and compare readings. If accuracy unacceptable, gage may be returned to factory for recalibration. To calibrate in the field, use the following procedure.

Calibration:

1. With gage case, P/N 1, held firmly, loosen bezel. P/N 4 by turning counterclockwise. To avoid damage, a canvas strap wrench or similar tool should be used.
2. Lift out plastic cover and "O" ring.
3. Remove scale screws and scale assembly. Be careful not to damage pointer.
4. The calibration is changed by moving the clamp, P/N. 70-b. Loosen the clamp screw(s) and move slightly toward the helix if gage is reading high, and away if reading low. Tighten clamp screw and install scale assembly.
5. Place cover and 0-ring in position. Make sure the hex shaft on inside of cover is properly engaged in zero adjust screw, P/N 230-b.
6. Secure cover in place by screwing bezel down snug. Note that the area under the cover is pressurized in operation and therefore gage will leak if not properly tightened.
7. Zero gage and compare to test instrument. Make further adjustments as necessary.

Caution: If bezel binds when installing, lubricate threads sparingly with light oil or molybdenum disulphide compound.

Warning: Attempted field repair may void your warranty. Recalibration or repair by the user is not recommended. For best results, return gage to the factory. Ship prepaid to:

Dwyer Instruments, Inc.
Attn. Repair Dept.
55 Ward St.
Wakarusa, IN 46573

Trouble Shooting Tips:

- *Gage won't indicate or is sluggish.*

1. Duplicate pressure port not plugged.
2. Diaphragm ruptured due to overpressure.
3. Fittings or sensing lines blocked, pinched, or leaking.
4. Cover loose or "O" ring damaged, missing.
5. Pressure sensors, (static tips. Pitot tube, etc.) improperly located.
6. Ambient temperature too low. For operation below 20°F, order gage with low temperature, (LT) option.

- *Pointer stuck-gage can't be zeroed.*

1. Scale touching pointer.
2. Spring/magnet assembly shifted and touching helix.
3. Metallic particles clinging to magnet and interfering with helix movement.
4. Cover zero adjust shaft broken or not properly engaged in P/N 230-b adjusting screw.

We generally recommend that gages needing repair be returned to the factory. Parts used in various sub-assemblies vary from one range of gage to another, and use of incorrect components may cause improper operation or failure. Gages repaired at the factory are carefully calibrated and tested to assure "like-new" operation. After receipt and inspection, we will be happy to quote repair costs before proceeding.

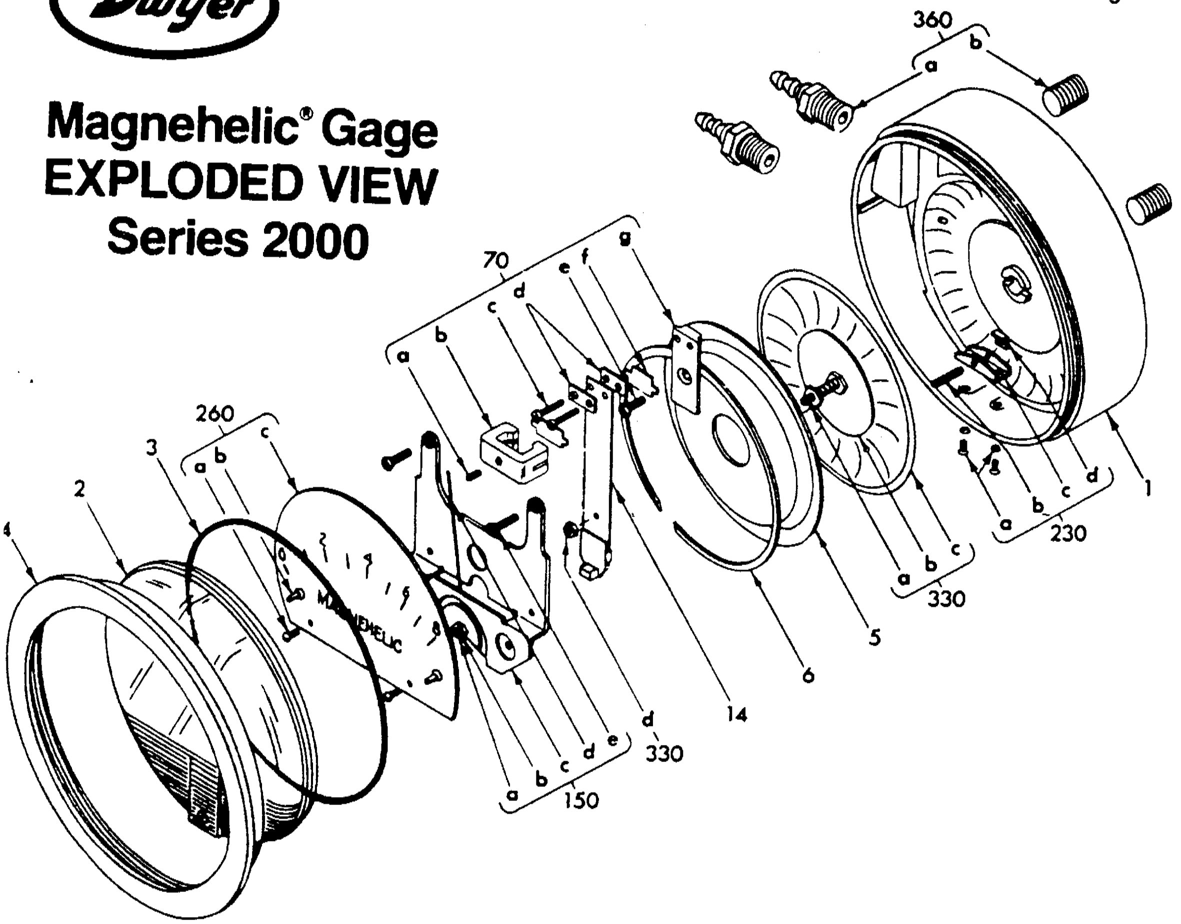
Consult factory for assistance on unusual applications or conditions.

Use with air or compatible gases only.

Dwyer

Magnehelic® Gage EXPLODED VIEW

Series 2000



1. Case
2. Cover with zero adjust assy.
3. "O" ring seal
4. Bezel
5. Diaphragm sealing plate
6. Retaining ring
70. Range Spring assembly
    a. Clamp set screw
    b. Clamp
    c. Mounting screws (2 req'd)
    d. Clamping shoe (2 req'd)
    e. Clamp plate screw
    f. Spacer (2 req'd)
    g. Clamp plate
14. Range Spring with magnet
50. Wishbone Assembly-consists of:
    a. Front jewel
    b. Locking nut
    c. Wishbone
    d. Pointer
    e. Mounting screws (2 req'd)
    f. Helix assembly (not shown)
    g. Pivots (2 req'd) (not shown)
    h. Rear jewel (not shown)

230. Zero adjust assembly-consists of:
    a. Foot screws with washers (2 req'd)
    b. Adjust screw
    c. Foot
    d. Finger
260. Scale Assembly-consists of:
    a. Mounting screws (2 req'd)
    b. Bumper pointer stop (2 req'd)
    c. Scale
330. Diaphragm Assembly-consists of:
    (Arbor press needed to install)
    a. Linkage assy., complete
    b. Front plate
    c. Diaphragm
    d. Rear plate (not shown)
    e. Plate washer (not shown)
360. Mounting Hardware Kit
    a. Adapter-pipe plug ⅛" NPT to rubber tubing-(2 req'd)
    b. Pipe plug ⅛" NPT-(2 req'd)
    c. Mounting lug (3 req'd)
    d. Long screw (3 req'd)
    e. Short screw (3 req'd)

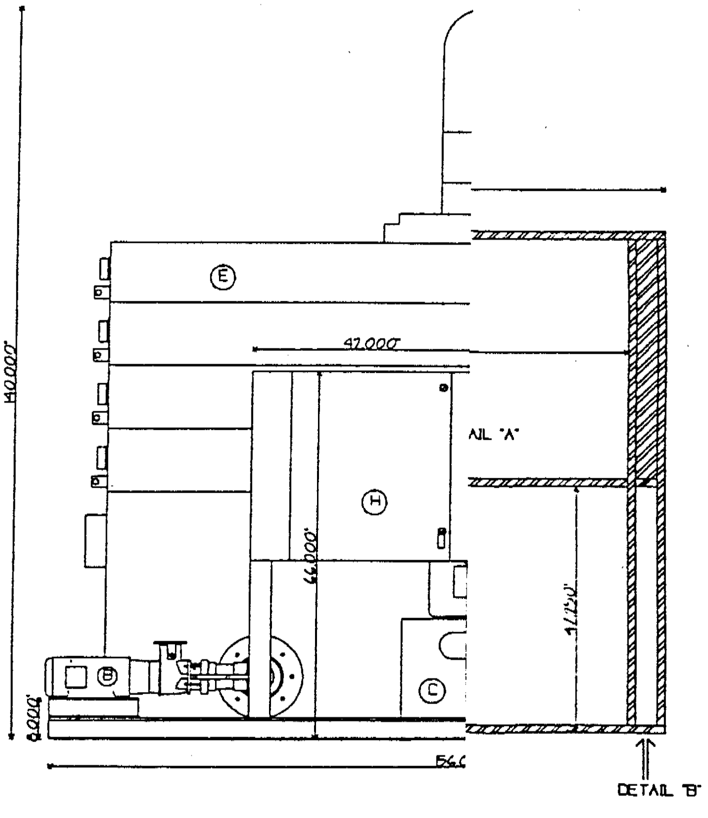
Ordering Instructions:

When corresponding with the factory regarding Magnehelic® gage problems, refer to the call-out numbers in this view. Be sure to include model number, pressure range, and any special options. Field repair is not recommended; contact the factory for repair service information.

Litho in U.S.A. 2/92

NOTES:
1. TOP VIEW PLUMBING OMMITED FOR CLARITY O
PURPOSES.
CONTROL PANEL HEIGHT IS 6 FEET FROM FINIS
FLOOR.
3. INLET AND OUTLET DUCTING IS 16 INCH PVC.
4. TRANSFER PUMP PLUMBING CONSIST OF 4 IN
AND 2 INCH PVC PIPING.
5. FLOW METER IS SHIPPED LOOSE FOR INSTALL
6. FEED PUMPS ARE MOUNTED ON A SEPERATE
SHIPPED LOOSE FOR INSTALLATION BY OTHE
7. DIMENSIONS GIVEN ARE ESTIMATED AND MAY
DURING CONSTRUCTION
8. CONDUIT WILL BE ELECTRICAL PVC WITH LIQU
NO MORE THAN 6 FEET FROM MOTOR JUNCTI

#1
#2
JT PORT
AIR INLET PORT
PANEL
LANGED WATER INFLUENT
STEEL SKID

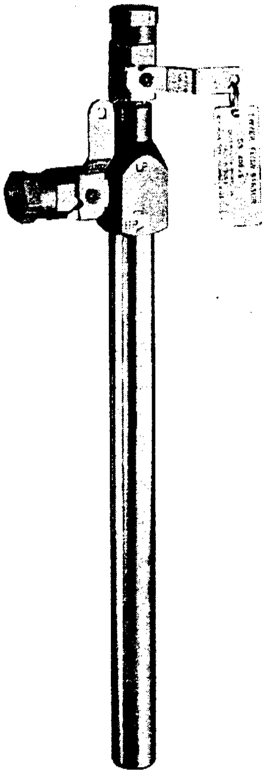


BULLETIN F-50-400

Dwyer®

SERIES DS-400 FLOW SENSORS

Installation and Operating Instructions, Flow Calculations



INSPECTION

Inspect the sensor upon receipt of shipment to be certain it is as ordered and not damaged. If damaged, contact carrier.

INSTALLATION

General – The sensing ports of the flow sensor must be correctly positioned for measurement accuracy. The instrument connections on the sensor indicate correct positioning. The side connection is for total or high pressure and should be pointed upstream. The top connection is for static or low pressure.

Location – The sensor should be installed in the flowing line with as much straight run of pipe upstream as possible. This will provide a flow profile as ideal as possible. A rule of thumb is to allow 10-15 pipe diameters upstream and 5 down. The table below lists recommended up and down piping:

PRESSURE AND TEMPERATURE

Maximum 200 psig at 200°F.

UPSTREAM AND DOWNSTREAM DIMENSIONS IN TERMS OF INTERNAL DIAMETER OF PIPE

*SEE NOTE #1

UPSTREAM CONDITION	MINIMUM DIAMETER OF STRAIGHT PIPE		
	UPSTREAM		DOWNSTREAM
	IN-PLANE	OUT-OF-PLANE	
One Elbow or Tee	7	9	5
Two 90° Bends in Same Plane	8	12	5
Two 90° Bends in Different Plane	18	24	5
Reducers or Expanders	8	8	5
All Valves *See Note 2	24	24	5

*Note #1: Values shown are recommended spacing, in terms of internal diameter for normal industrial metering requirements. For laboratory or high accuracy work, add 25% to values.

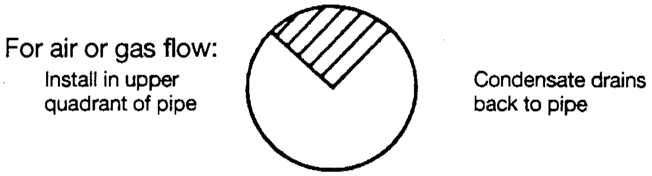
*Note #2: Includes gate, globe, plug and other throttling valves that are only partially opened. If valve is to be fully open, use values for pipe size change. CONTROL VALVES SHOULD BE LOCATED AFTER THE FLOW SENSOR.

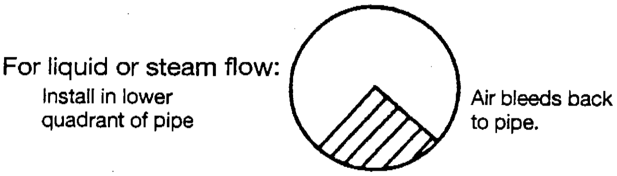
DWYER INSTRUMENTS, INC.
P.O. BOX 373 • MICHIGAN CITY, INDIANA 46361, U.S.A.
Telephone 219/879-8000
Fax 219/872-9057

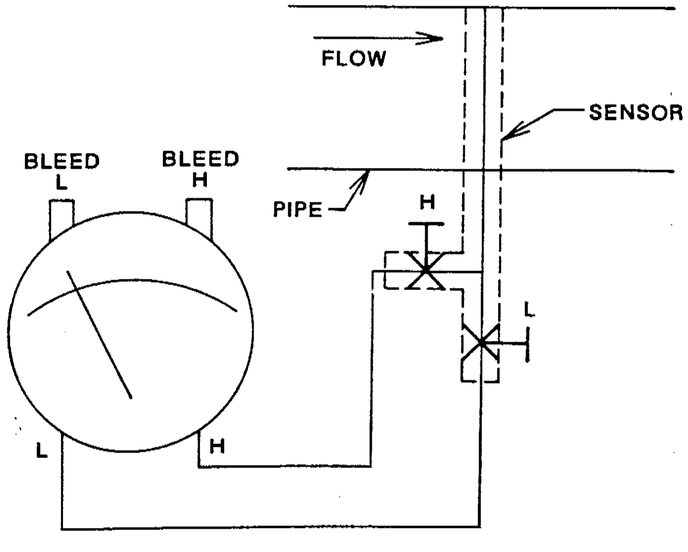
POSITION

Be certain there is sufficient clearance between the mounting position and other pipes, walls, structures, etc, so that the sensor can be inserted through the mounting unit once the mounting unit has been installed onto the pipe.

Flow Sensors should be positioned to keep air out of the instrument connecting lines on liquid flows and condensate out of the lines on gas flows. The easiest way to assure this is to install the sensor into the pipe so that air will bleed into, or condensate will drain back to, the pipe.







WATER FLOW

INSTALLATION

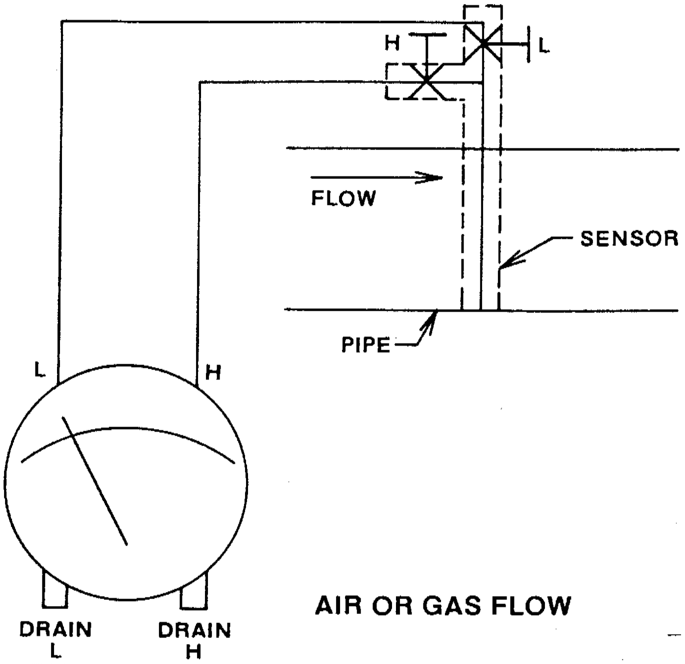
1. Attach a ¾" NPT female fitting, such as a thred-o-let or saddle clamp, to the piping in which flow will be measured. Note the required upstream and downstream conditions on page one which should be observed.
2. Drill a hole through the center of the attached fitting into the pipe with a bit that is slightly larger than the flow sensor diameter.
3. Install the packing gland using proper pipe sealant. If the packing gland is disassembled, note that the tapered end of the ferrule goes inside the fitting body.
4. Insert the sensor until it contacts the opposite wall of the pipe and then withdraw it 1⁄16" for models -6 through -12 or ⅛" for models -14 through -24. This is to allow for thermal expansion.
5. Tighten packing gland nut finger tight. Then tighten the nut with a wrench an additional 1¼ turns. Be sure to hold the sensor body with a second wrench to prevent the sensor from turning.

INSTRUMENT CONNECTION

Connect the side pressure tap to the high pressure port of the Magnehelic (air only) or Capsuhelic gage or transmitting instrument and the top connection to the low pressure port. See the connection schematics below.

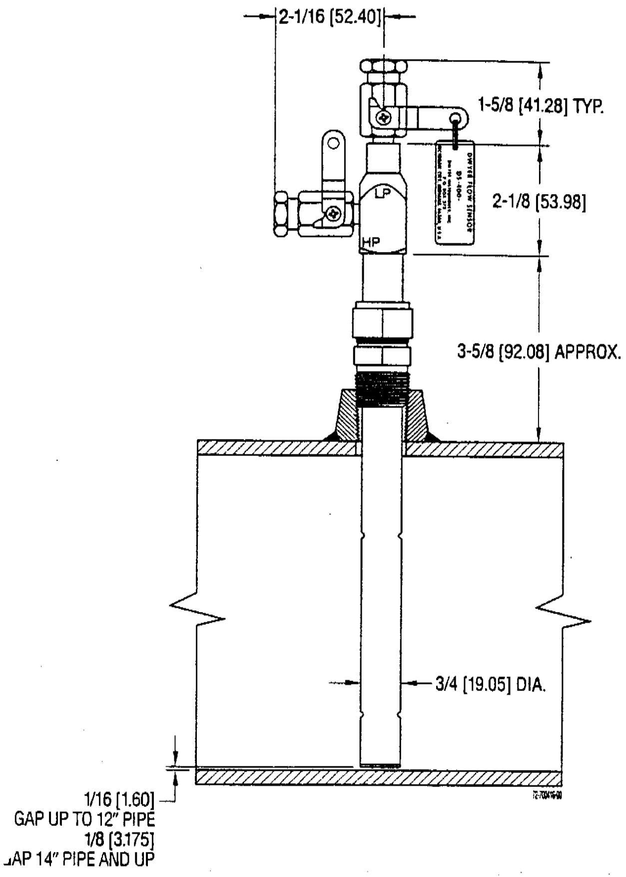
Bleed air from instrument piping on liquid flows. Drain ar condensate from the instrument piping on air and gas flov.

Open valves to instrument to place flow meter into service. For permanent installations, a 3-valve manifold is recommended to allow the gage to be zero checked without interrupting the flow. The Dwyer A-471 Portable Test Kit includes such a device.



AIR OR GAS FLOW

SERIES DS-400 FLOW SENSORS



FLOW CALCULATIONS AND CHARTS

The following information contains tables and equations for determining the differential pressure developed by the DS-400 Flow Sensor for various flow rates of water, steam, air or other gases in different pipe sizes.

This information can be used to prepare conversion charts to translate the differential pressure readings being sensed into the equivalent flow rate. Where direct readout of flow is required, use this information to calculate the full flow differential pressure in order to specify the exact range of Dwyer Magnehelic or Capsuhelic gage required. Special ranges and calculations are available for these gages at minimal extra cost. See bulletin A-30 for additional information on Magnehelic and Capsuhelic gages.

For additional useful information on making flow calculations, the following reference is recommended: Crane Valve Co. Technical Paper No. 410 "Flow of Fluids Through Valves, Fittings and Pipe." It is available from Crane Valve Co., 104 N. Chicago St., Joliet, IL 60431. Phone 815/727-2600. Price including shipping is $20.00

Using the appropriate differential pressure equation from page 4, calculate the differential pressure generated by by the sensor under **normal** operating conditions of the system. Check the chart below to determine if this value is within the recommended operating range for the sensor. Note that the data in this chart is limited to standard conditions of air at 60°F (15.6°C) and 14.7 psia static line pressure or water at 70°F (21.1°C). To determine recommended operating ranges for other gases, liquids and/or operating conditions, consult the factory.

Note the column on the right side of the chart which defines velocity ranges to avoid. Continuous operation within these can result in damage to the flow sensor caused by excess vibration.

Pipe Size (Schedule 40 up to 20". Std. wt. for 24")	**Flow Coefficient "K"**	**Operating Ranges Air @ 60°F & 14.7 psia (D/P Inches W.C.)**	**Operating Ranges Water @ 70°F (D/P Inches W.C.)**	**Velocity Ranges Not Recommended (Feet per Second)**
6	.706	0.70 to 51	2.54 to 187	83 to 124
8	.675	0.64 to 28	2.31 to 102	53 to 79
10	.676	1.12 to 37	4.05 to 136	36 to 54
12	.683	0.19 to 20	0.70 to 72	26 to 40
14	.698	0.17 to 13	0.60 to 46	22 to 33
16	.688	3.78 to 56	13 to 203	17 to 26
18	.689	0.04 to 5.48	0.14 to 19	14 to 21
20	.686	0.39 to 4.93	1.40 to 17	11 to 17
24	.789	0.05 to 11	0.20 to 40	8 to 12

FLOW EQUATIONS

1. Any Liquid

$$Q\ (\text{GPM}) = 5.668 \times K \times D^2 \times \sqrt{\Delta P / S_f}$$

2. Steam or Any Gas

$$Q\ (\text{lb/Hr}) = 359.1 \times K \times D^2 \times \sqrt{p \times \Delta P}$$

3. Any Gas

$$Q\ (\text{SCFM}) = 128.8 \times K \times D^2 \times \sqrt{\frac{P \times \Delta P}{(T+460) \times S_s}}$$

DIFFERENTIAL PRESSURE EQUATIONS

1. Any Liquid

$$\Delta P\ (\text{in. WC}) = \frac{Q^2 \times S_f}{K^2 \times D^4 \times 32.14}$$

2. Steam or Any Gas

$$\Delta P\ (\text{in. WC}) = \frac{Q^2}{K^2 \times D^4 \times p \times 128{,}900}$$

3. Any Gas

$$\Delta P\ (\text{in. WC}) = \frac{Q^2 \times S_s \times (T+460)}{K^2 \times D^4 \times P \times 16{,}590}$$

TECHNICAL NOTATIONS

The following notations apply:

ΔP = Differential pressure expressed in inches of water column.
Q = Flow expressed in GPM, SCFM or PPH as shown in equation.
K = Flow coefficient — See Values Tabulated on page 3.
D = Inside diameter of line size expressed in inches. For square & rectangular ducts use $D = \sqrt{\frac{4 \times \text{Height} \times \text{Width}}{\pi}}$

P = Static Line pressure (psia) = 14.7
T = Temperature in degrees Fahrenheit (plus 460=°Rankin)
p = Density of medium in pounds per cubic foot
S_f = Sp Gr at flowing conditions
S_s = Sp Gr at 60°F = [illegible] 1

SCFM TO ACFM EQUATION

$$\text{SCFM} = \text{ACFM} \times \left(\frac{14.7 + \text{PSIG}}{14.7}\right)\left(\frac{520^*}{460 + {}^\circ\text{F}}\right)$$

$$\text{ACFM} = \text{SCFM} \times \left(\frac{14.7}{14.7 + \text{PSIG}}\right)\left(\frac{460 + {}^\circ\text{F}}{520}\right)$$

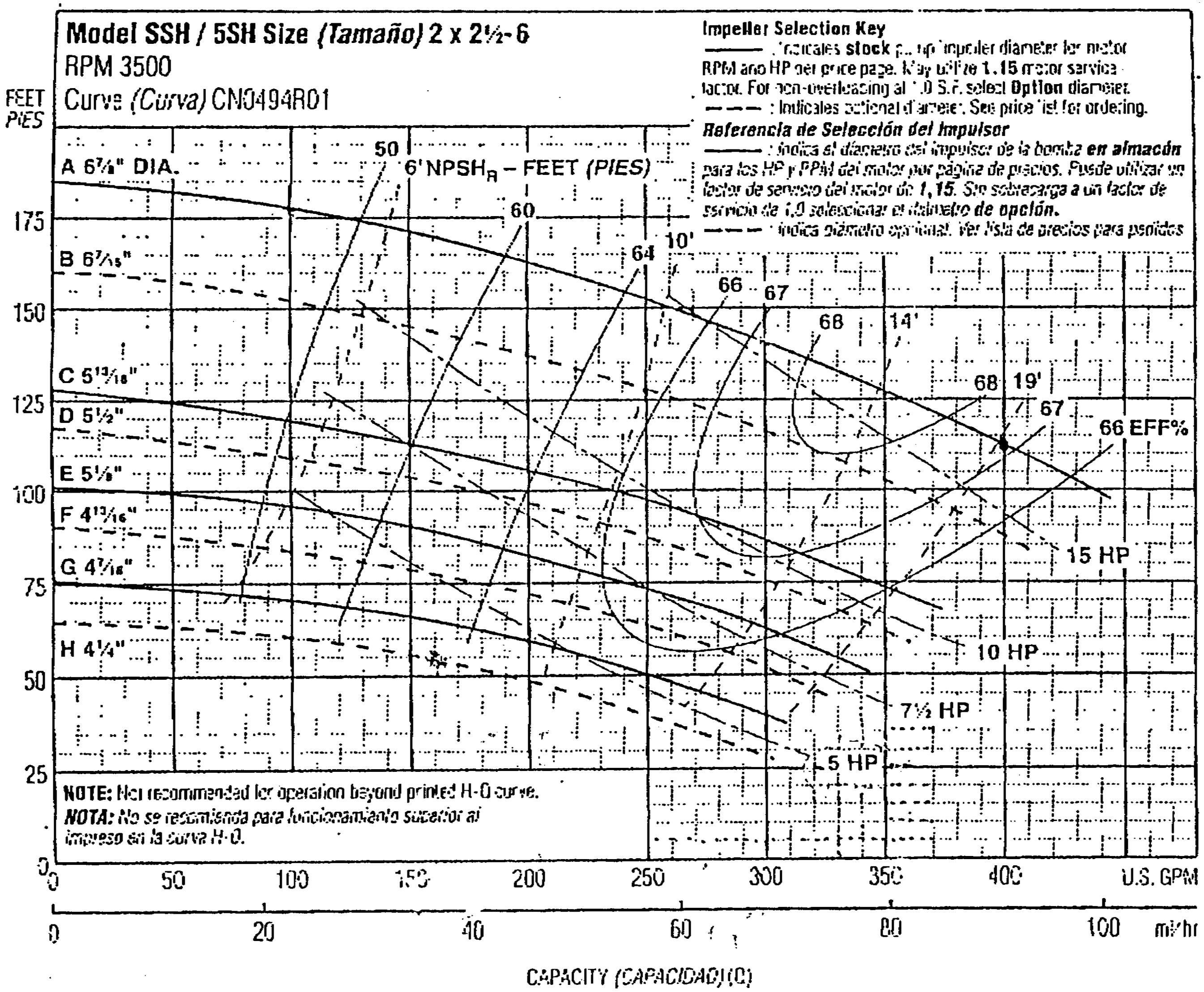
$$\text{POUNDS PER CUBIC FOOT STD.} = \text{POUNDS PER CUBIC FOOT ACT.} \times \left(\frac{14.7}{14.7 + \text{PSIG}}\right)\left(\frac{460 + {}^\circ\text{F}}{520}\right)$$

$$\text{POUNDS PER CUBIC FOOT ACT.} = \text{POUNDS PER CUBIC FOOT STD.} \times \left(\frac{14.7 + \text{PSIG}}{14.7}\right)\left(\frac{520}{460 + {}^\circ\text{F}}\right)$$

1 CUBIC FOOT OF AIR = 0.076 POUNDS PER CUBIC FOOT AT 60°F AND 14.7 PSIA

*(520 = 460 + 60°) Std. Temp. Rankine

Printed in U.S.A. 1/97



Model SSH / 5SH Size *(Tamaño)* 2 x 2½-6
RPM 3500
Curve *(Curva)* CN0494R01

Impeller Selection Key

——— : Indicates **stock** pump impeller diameter for motor RPM and HP per price page. May utilize **1.15** motor service factor. For non-overloading at 1.0 S.F. select **Option** diameter.

– – – : Indicates optional diameter. See price list for ordering.

Referencia de Selección del Impulsor

——— : *Indica el diámetro del impulsor de la bomba* ***en almacén*** *para los HP y RPM del motor por página de precios. Puede utilizar un factor de servicio del motor de* ***1,15****. Sin sobrecarga a un factor de servicio de 1,0 seleccionar el diámetro* ***de opción.***

– – – : *Indica diámetro opcional. Ver lista de precios para pedidos*

NOTE: Not recommended for operation beyond printed H-Q curve.
NOTA: *No se recomienda para funcionamiento superior al impreso en la curva H-Q.*

Impeller Code, ***Código del Impulsor***	**Dia.,** ***Diá.***	**Motor HP,** ***HP del motor***
A	6⅞'	15
B	6⁷⁄₁₆	15
C	5¹³⁄₁₆	10
D	5½	10
E	5⅛	7½
F	4¹³⁄₁₆	7½
G	4⁷⁄₁₆	5
H	4¼	5

Optional Impeller, ***Impulsor Opcional***

NOTE: Pump will pass a sphere to ⁵⁄₃₂' diameter.

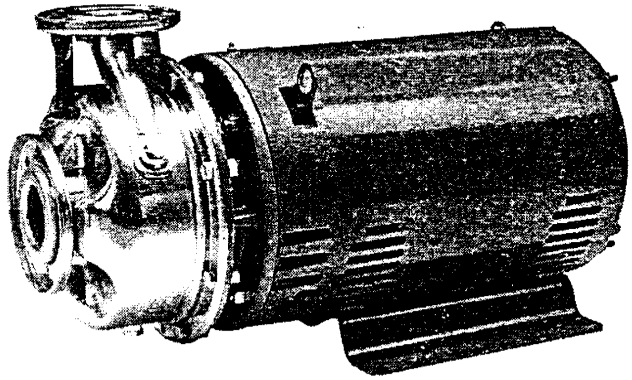
NOTA: *La bomba pasará una esfera a ⁵⁄₃₂" diámetro.*

G&L Pumps

G&L Pumps

Installation, Operation and Maintenance Instructions

Models SSH-C and SSH-F



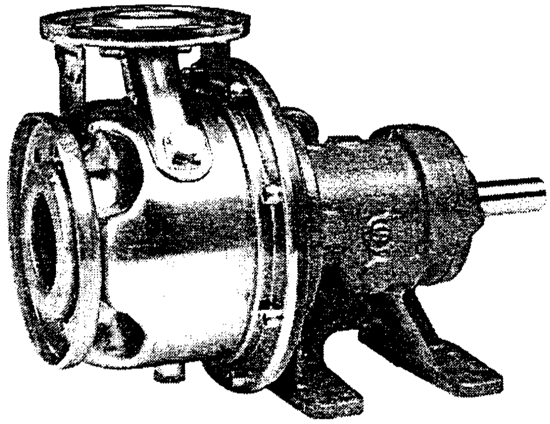


Table of Contents

Owner's Information

Please fill in data from your pump nameplate.
Warranty information is on page 28.

Pump Model: ____________________

Serial Number: ____________________

Dealer: ____________________

Dealer's Phone Number: ____________________

Date of Purchase: ____________________

Installation Date: ____________________

Goulds Pumps

ITT Industries

SAFETY INSTRUCTIONS

TO AVOID SERIOUS OR FATAL PERSONAL INJURY OR MAJOR PROPERTY DAMAGE, READ AND FOLLOW ALL SAFETY INSTRUCTIONS IN MANUAL AND ON PUMP.

THIS MANUAL IS INTENDED TO ASSIST IN THE INSTALLATION AND OPERATION OF THIS UNIT AND MUST BE KEPT WITH THE PUMP.

⚠ This is a SAFETY ALERT SYMBOL. When you see this symbol on the pump or in the manual, look for one of the following signal words and be alert to the potential for personal injury or property damage.

⚠ DANGER Warns of hazards that WILL cause serious personal injury, death or major property damage.

⚠ WARNING Warns of hazards that CAN cause serious personal injury, death or major property damage.

⚠ CAUTION Warns of hazards that CAN cause personal injury or property damage.

NOTICE: INDICATES SPECIAL INSTRUCTIONS WHICH ARE VERY IMPORTANT AND MUST BE FOLLOWED.

THOROUGHLY REVIEW ALL INSTRUCTIONS AND WARNINGS PRIOR TO PERFORMING ANY WORK ON THIS PUMP.

MAINTAIN ALL SAFETY DECALS.

⚠ WARNING

Hazardous fluids can cause fire, burns or death.

UNIT NOT DESIGNED FOR USE WITH HAZARDOUS LIQUIDS OR FLAMMABLE GASES. THESE FLUIDS MAY BE PRESENT IN CONTAINMENT AREAS.

NOTICE: INSPECT UNIT FOR DAMAGE AND REPORT ALL DAMAGE TO THE CARRIER OR DEALER IMMEDIATELY.

1. Important Instructions

1. Inspect unit for damage. Report damage to carrier immediately.
2. Electrical supply must be a separate branch circuit with fuses or circuit breakers, wire sizes, etc., per National and Local electrical codes. Install an all-leg disconnect switch near pump.

⚠ WARNING

Hazardous voltage can shock, burn or cause death.

ALWAYS DISCONNECT ELECTRICAL POWER WHEN HANDLING PUMP OR CONTROLS.

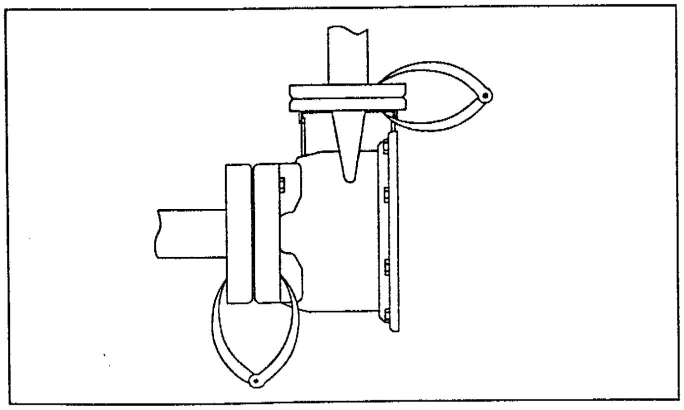
3. Motors must be wired for proper voltage (check nameplate). Wire size must limit maximum voltage drop to 10% of nameplate voltage at motor terminals, or motor life and pump performance will be lowered.
4. **Single-Phase:** Thermal protection for single-phase units is sometimes built-in (Check nameplate). If no built-in protection is provided, use a contactor with proper overload. Fusing is permissible if properly fused.
5. **Three-Phase:** Provide three-leg protection with proper size magnetic starter and thermal overloads.
6. Maximum Liquid Temperatures:
   212°F (100°C) with standard seal.
   250°F (120°C) with optional high-temperature seal.
7. Maximum allowable operating pressure: 230 PSI (15 bars).
8. Maximum number of starts per hour: 20, evenly distributed.
9. Regular Inspection and Maintenance will increase service life. Base schedule on operating time.

2. Installation

1. Close-coupled units may be installed inclined or vertical.

⚠ CAUTION DO NOT INSTALL WITH MOTOR BELOW PUMP. CONDENSATION WILL BUILD UP IN MOTOR.

2. Locate pump as near liquid source as possible (below level of liquid for automatic operation).
3. Protect from freezing or floods.
4. Allow adequate space for servicing and ventilation.
5. For close-coupled pumps, the foundation must be flat and substantial to eliminate strain when tightening bolts. Use rubber mounts to minimize noise and vibration. Tighten motor hold-down bolts before connecting piping to pump.
6. For frame-mounted pumps, permanent and solid foundation is required for smooth operation. Bedplate must be grouted to a foundation with solid footing.
7. Place unit in position on wedges located at four points (Two below approximate center of driver and two below approximate center of pump). Adjust wedges to level unit, bringing coupling halves into reasonable alignment. Level or plumb suction and discharge flanges.
8. Make sure bedplate is not distorted and final coupling alignment can be made within the limits of movement of motor and by shimming if necessary.
9. Tighten foundation bolts finger tight and build dam around foundation. Pour grout under bedplate making sure the areas under pump and motor feet are filled solid. Allow grout to harden 48 hours before further tightening foundation bolts.
10. All piping must be supported independently of the pump, and must "line-up" naturally. **Never draw piping into place by forcing the pump suction and discharge connections!**
11. Angular alignment of the flanges can best be accomplished using calipers at bolt locations (See illustration).



12. On frame-mounted units, tighten foundation, pump and driver hold-down bolts before connecting piping to pump.
13. Avoid unnecessary fittings. Select sizes to keep friction losses low.
14. After completing piping, rotate unit by hand to check for binding. **Note:** A screwdriver slot or flats are provided in end of motor shaft.

3. Alignment

1. No field alignment is necessary on close-coupled pumps.
2. Even though the pump-motor unit may have a factory alignment, in transit this alignment could be disturbed and must be checked prior to running.
3. Check the tightness of all hold-down bolts before checking the alignment.
4. If re-alignment is necessary, always move the motor. Shim as required.
5. Final alignment is achieved when parallel and angular requirements are achieved with both pump and motor hold-down bolts tight.

⚠CAUTION **ALWAYS RECHECK BOTH ALIGNMENTS AFTER MAKING ADJUSTMENTS.**

6. Parallel misalignment exists when the shafts are not concentric. Place dial indicator on one hub and rotate this hub 360° while taking readings on the outside diameter of the other hub. Parallel alignment occurs when Total Indicator Reading is .005" or less.
7. Angular misalignment exists when the shafts are not parallel. Place dial indicator on one hub and rotate this hub 360° while taking readings on the face of the other hub. Angular alignment is achieved when Total Indicator Reading is .005" or less.

4. Suction Piping

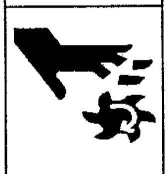
1. Low static lift and short, direct suction piping is desired. For suction lift over 15 feet, consult pump performance curve for *Net Positive Suction Head Required*.
2. Suction pipe size must be at least equal to suction connection of pump.
3. If larger pipe is used, an eccentric pipe reducer (with straight side up) must be used at the pump.
4. Installation with pump below source of supply:
   4.1. Install isolation valve in piping for inspection and maintenance.
   4.2. Do not use suction isolation valve to throttle pump!
5. Installation with pump above source of supply:
   5.1. To avoid air pockets, no part of piping should be higher than pump suction connection. Slope piping upwards from liquid source.
   5.2. All joints must be airtight.
   5.3. Foot valve to be used only if necessary for priming, or to hold prime on intermittent service.
   5.4. Suction strainer open area must be at least triple the pipe area.
6. Size of inlet from liquid source, and minimum submergence over inlet, must be sufficient to prevent air entering pump.

5. Discharge Piping

1. Arrangement must include a check valve located between a gate valve and the pump. The gate valve is for regulation of capacity, or inspection of pump or check valve.
2. If reducer is required, place between check valve and pump.

6. Rotation

⚠WARNING



Hazardous Machinery

DO NOT PLACE HANDS IN PUMP WHILE CHECKING MOTOR ROTATION. TO DO SO WILL CAUSE SEVERE PERSONAL INJURY.

1. Pumps are right-hand rotation (Clockwise when viewed from the driver end). Switch power on and off. Observe shaft rotation. On frame-mounted units, check rotation before coupling pump to motor.
2. **Single-Phase:** Refer to wiring diagram on motor if rotation must be changed.
3. **Three-Phase:** Interchange any two power supply leads to change rotation.

7. Operation

1. Before starting, pump must be primed (free of air and suction pipe full of liquid) and discharge valve partially open.

⚠CAUTION PUMPED LIQUID PROVIDES LUBRICATION. IF PUMP IS RUN DRY, ROTATING PARTS WILL SEIZE AND MECHANICAL SEAL WILL BE DAMAGED.

2. Make complete check after unit is run under operating conditions and temperature has stabilized. Check for expansion of piping. Check coupling alignment.
3. **Do not operate at or near zero flow.** Energy imparted to the liquid is converted into heat. Liquid may flash to vapor. Rotating parts require liquid to prevent scoring or seizing.

8. Maintenance

⚠WARNING
Hazardous voltage

FAILURE TO DISCONNECT AND LOCKOUT ELECTRICAL POWER BEFORE ATTEMPTING ANY MAINTENANCE CAN CAUSE SHOCK, BURNS OR DEATH.

1. Bearings are located in and are part of the motor. For lubrication procedure, refer to manufacturer's instructions.
2. On frame-mounted units, regrease at 2,000 hours use or after 3 months. Use #2 Sodium or Lithium grease and fill until grease comes out of the relief fitting.

9. Disassembly

1. **Always turn power off.**
2. Drain system. Flush if necessary.
3. Remove motor hold-down bolts on close-coupled or disconnect coupling and remove spacer.
4. Remove casing bolts and pump hold-down bolts.
5. Remove motor and rotating element from casing.
6. Unscrew impeller bolt with a socket wrench. **Do not insert screwdriver between impeller vanes to prevent rotation.** It may be necessary to use a strap wrench around the impeller if impacting the socket wrench will not loosen the impeller bolt.
7. Remove impeller o-ring.
8. Insert two pry bars (180° apart) between impeller and seal housing. Pry off impeller.
9. Remove shaft sleeve, seal spring, cupwasher, seal rotary and impeller key.
10. Remove seal housing.
11. Place seal housing on flat surface. Press out stationary seal parts.
12. Remove deflector from shaft on frame-mounted units.
13. Remove bolts holding bearing cover to frame and remove bearing cover (frame-mount).
14. Remove lip seals from bearing frame and bearing cover (frame-mount).
15. Remove shaft and bearings from frame (frame-mount).
16. Remove bearing retaining ring (frame-mount).
17. Use bearing puller or arbor press to remove ball bearings (frame-mount).
18. Remove wear ring if excessively worn. Use pry bar and/or vicegrips.

10. Reassembly

1. All parts should be cleaned before assembly.
2. Refer to parts list to identify required replacement items.
3. Reassembly is the reverse of the disassembly procedure.
4. Replace lip seals if worn or damaged (frame-mount only).
5. Replace ball bearings if loose, rough or noisy when rotated (frame-mount only).
6. Check shaft for maximum runout of .005" TIR. Bearing seats and lip seal areas must be smooth and free of scratches or grooves. Replace if necessary (frame-mount only).
7. All mechanical seal components must be in good condition or leakage may result. Replacement of complete seal assembly, whenever seal has been removed, is good standard practice.
8. If wear ring is being replaced, do not use lubricants on the metal-to-metal fit when pressing in the replacement.
9. If the impeller is removed, as for example to effect a mechanical seal change, this procedure must be followed: Old impeller bolt and impeller o-ring cannot be re-used.
10. Install the mechanical seal stationary seat in the seal housing, using soapy water as a lubricant to ease insertion.
11. **S-Group** – Install the mechanical seal spring retainer, spring and rotary assembly on the shaft sleeve using soapy water to lubricate. Slide the shaft sleeve over the pump shaft, be sure that a new shaft sleeve o-ring is used.

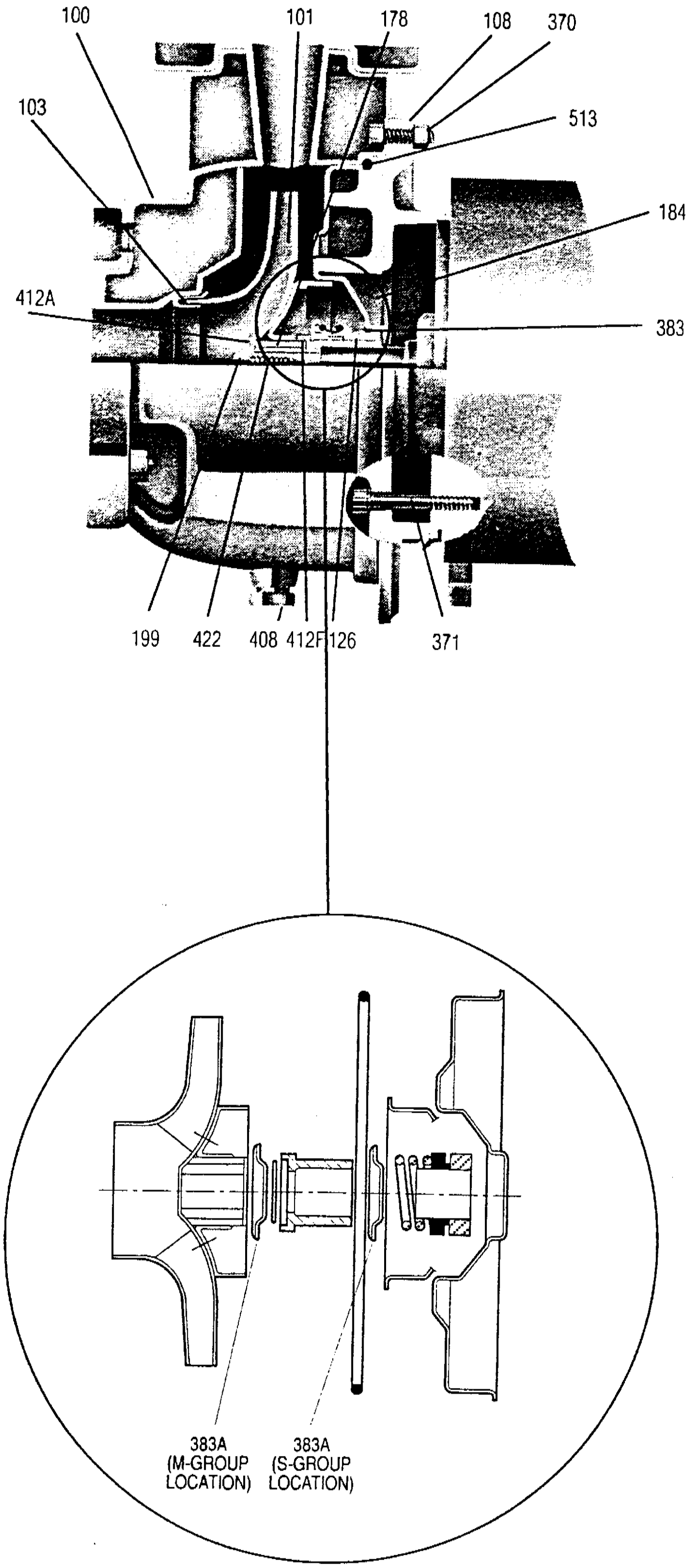
NOTE: THE SHAFT SLEEVE O-RING AND IMPELLER WASHER O-RING ARE ALMOST IDENTICAL IN DIAMETER. BE SURE TO USE THE SQUARE CROSS-SECTION O-RING IN THE IMPELLER WASHER. THE ROUND CROSS-SECTION O-RING IS USED IN THE SHAFT SLEEVE.

11. **M-Group** – Install the mechanical seal spring and rotary on the shaft sleeve using soapy water to lubricate. Slide the shaft sleeve over the pump shaft. Be sure that a new shaft sleeve o-ring is used. Place the mechanical seal spring retainer over the impeller hub.
12. Place the impeller key into the shaft keyway and slide the impeller in place. Install the impeller stud and impeller washer. Be sure that a new impeller o-ring is used. Tighten S-Group (⅜" thread) to 17 lb.ft. and M-Group (½" thread to 38 lb.ft.

11. Troubleshooting

1. Motor does not start, and no noise or vibration occurs:
   1.1. Power supply not connected.
   1.2. Fuses or protection device tripped or defective.
   1.3. Loose or broken electrical connections.
2. Motor will not start, but generates noise and vibration:
   2.1. Motor not wired as directed on diagram.
   2.2. Shaft locked due to mechanical obstructions in motor or pump.
   2.3. Low voltage or phase loss on three phase supply.
3. Pump does not deliver rated capacity:
   3.1. Pump not filled and primed.
   3.2. Pump has lost prime due to leaks in suction line.
   3.3. Direction of rotation incorrect. See Rotation.
   3.4. Head required is higher than that originally specified. (Valve may be partially closed.)
   3.5. Foot valve clogged.
   3.6. Suction lift too high.
   3.7. Suction pipe diameter too small.
4. Protection trips as unit starts:
   4.1. Phase loss on three-phase supply.
   4.2. Protection device may be defective.
   4.3. Loose or broken electrical connections.
   4.4. Check motor resistance and insulation to ground.
5. Protection device trips too often:
   5.1. Protection may be set to a value lower than motor full load.
   5.2. Phase loss due to faulty contacts or supply cable.
   5.3. Liquid is viscous or its specific gravity is too high.
   5.4. Rubbing occurs between rotating and stationary parts.
6. Shaft spins with difficulty:
   6.1. Check for obstructions in the motor or the pump.
   6.2. Rubbing occurs between rotating and stationary parts.
   6.3. Check bearings for proper conditions.
7. Pump vibrates, runs noisily, and flow rate is uneven:
   7.1. Pump runs beyond rated capacity.
   7.2. Pump or piping not properly secured.
   7.3. Suction lift too high.
   7.4. Suction pipe diameter too small.
   7.5. Cavitation caused by insufficient liquid supply or excessive suction losses.
   7.6. Impeller blockage.
8. When stopped, unit turns slowly in the reverse direction:
   8.1. Leaks on air locks in suction pipe.
   8.2. Partial blockage in check valve.
9. In pressure boosting applications, the unit starts and stops too often:
   9.1. Pressure switch settings are incorrect.
   9.2. Tank size may be incorrect.
10. In pressure boosting applications, the unit does not stop:
    10.1. Pressure switch maximum setting is higher than was specified.
    10.2. Direction of rotation incorrect. See **Rotation.**

SSH-C Components



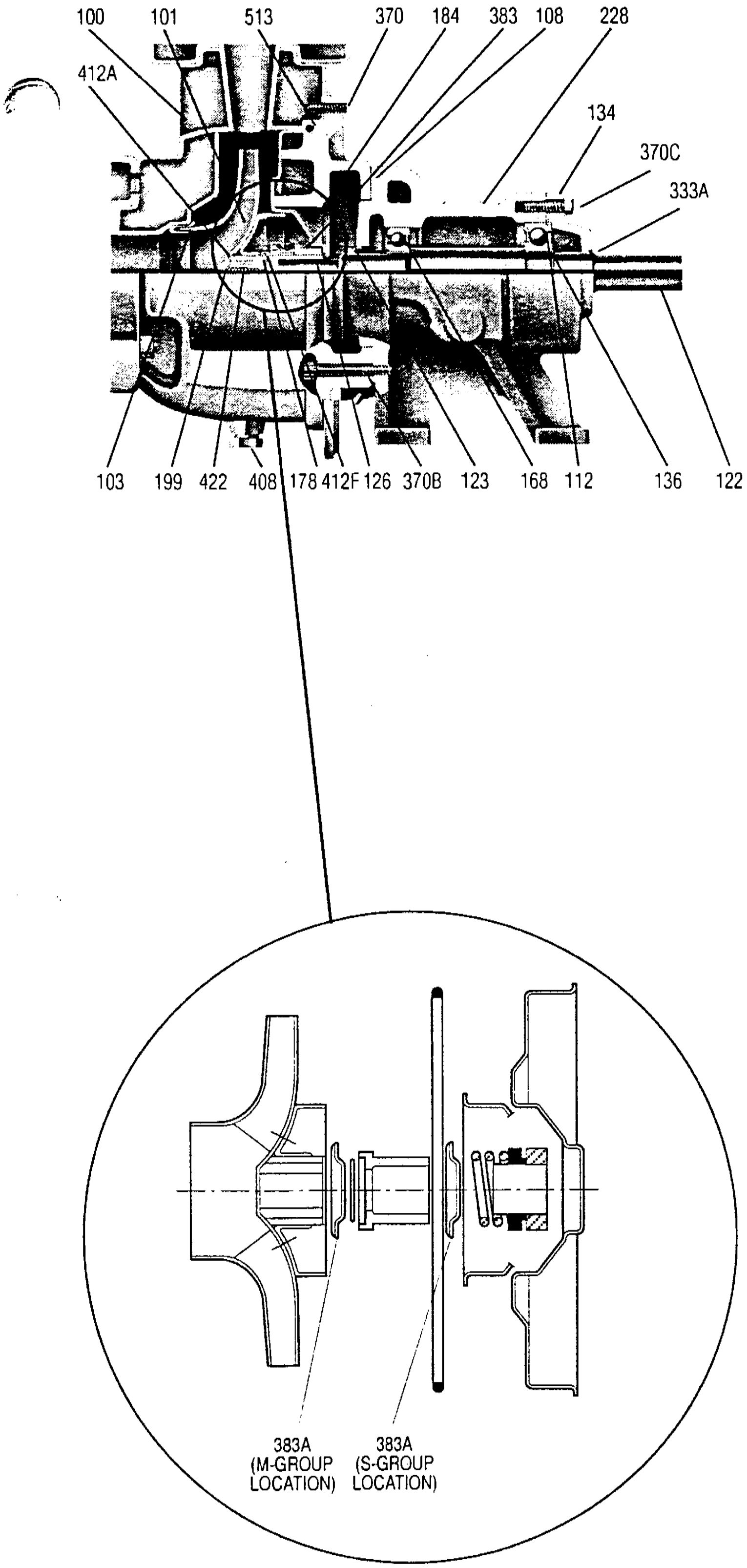
MATERIALS OF CONSTRUCTION

Item	Description	Material
100	Casing	AISI TYPE 316L Stainless Steel
101	Impeller	
103	Wear Ring	
184	Seal Housing	
370	Socket Head Cap Screw (Casing to Adapter)	
408	Drain Plug — ⅜ NPT	AISI TYPE 316 SS
126	Shaft Sleeve	316 SS
178	Impeller Key	Steel
422	Impeller Stud	Steel
199	Impeller Washer	316 SS
108	Adapter	Cast Iron ASTM A48CL20
371	Hex Head Cap Screw (Adapter to Motor)	Steel
412A	O-ring, impeller	BUNA-N
412F	O-ring, shaft sleeve	BUNA-N
513	O-Ring	BUNA-N
383	Mechanical Seal Part No. 10K13	Carbon/Ceramic Buna Elastomers 316 SS Metal Parts
383A	Spring Retainer	AISI Type 316 SS

OPTIONAL MECHANICAL SEALS

John Crane Type 21 Mechanical Seals						
Item	Part No.	Rotary	Stationary	Elastomers	Metal Parts	Intended Duty
383 Options	10K19	Carbon	Ni-Resist	EPR	316 SS	Hi-Temperature
	10K25		Ni-Resist	Viton		Chemical
	10K27		Tungsten Carbide	EPR		Hi-Temperature Mild Abrasive

SSH-F Components



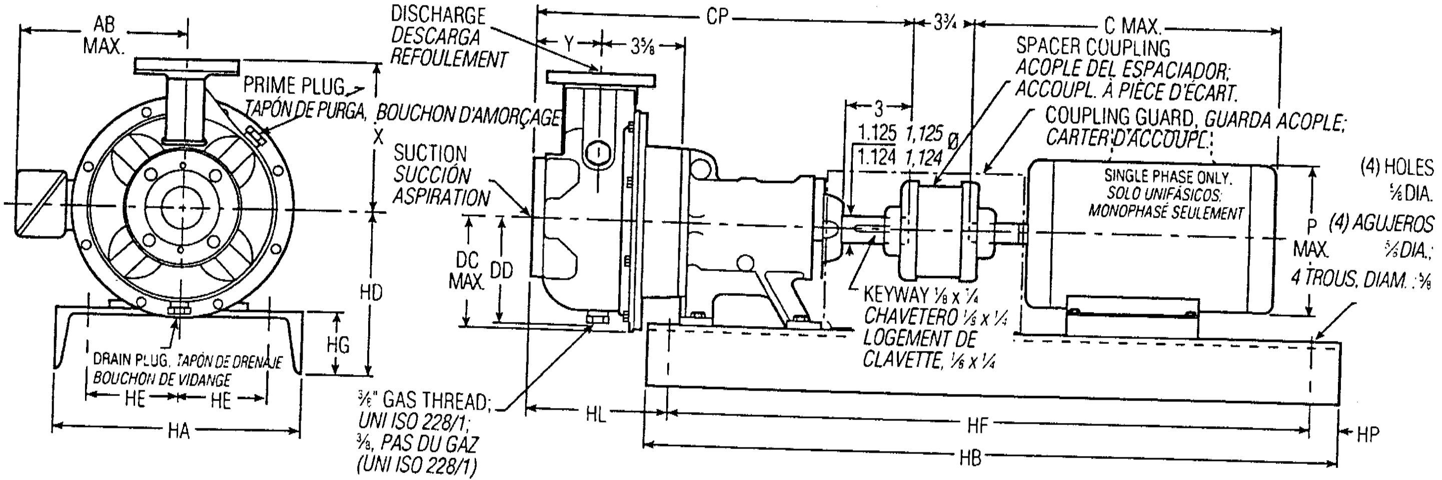
MATERIALS OF CONSTRUCTION

Item		Description	Material
Pump End Components	100 101 103 184 370	Casing Impeller Wear Ring Seal Housing Socket Head Cap Screw	AISI TYPE 316L Stainless Steel
	408	Drain plug – ⅜ NPT	AISI TYPE 316 SS
	126	Shaft Sleeve	316 SS
	178	Impeller Key	Steel
	422	Impeller Stud	Steel
	199	Impeller Washer	316 SS
	412A	O-ring, impeller	BUNA-N
	412F	O-ring, shaft sleeve	BUNA-N
	513	O-Ring	BUNA-N
	383	Mechanical Seal Standard Part No. 10K13	Carbon/Ceramic BUNA-N Elastomers 316 SS Metal Parts
	383A	Spring Retainer	AISI Type 316SS
Power End Components	108 228 134	Adapter Bearing Frame Bearing Cover	Cast Iron ASTM A48 CL20
	122 168 112 136 370B 370C	Pump Shaft Ball Bearing (Inboard) Ball Bearing (Outboard) Retaining Ring Hex Head Cap Screw (Adapter to Bearing Frame) Hex Head Cap Screw (Bearing Frame to Cover)	Steel
	333A	Lip Seal	BUNA-N
	193	Grease Fitting	Steel
	123	V-Ring Deflector	BUNA-N

OPTIONAL MECHANICAL SEALS

John Crane Type 21 Mechanical Seals						
Item	Part No.	Rotary	Stationary	Elastomers	Metal Parts	Intended Duty
383 Options	10K19	Carbon	Ni-Resist	EPR	316 SS	Hi-Temperature
	10K25		Ni-Resist	Viton		Chemical
	10K27		Tungsten Carbide	EPR		Hi-Temperature Mild Abrasive

Channel Steel Bedplate, Clockwise Rotation Viewed from Drive End; *Fundación de Acero, Rotación en Dirección de las Agujas del Reloj Visto desde el Extremo del Motor; Plaque de base profilée en U et rotation en sens horaire (vue de l'extrémité du moteur)*



Dimensions and Weights – Determined by Pump, *Dimensiones y Pesos – Determinados por la Bomba; Dimensions et poids – pompe*

Pump, Bomba, Pompe		Suction Succión ① Aspir.	Discharge Descarga ① Refoul.	CP	DC Max., DC Máx. DC max.	DD	X	Y	Wt. (lbs.), Peso (lib.) Poids	Dimension "HL" Determined by Pump and Bedplate, Dimensión "HL" determinada la bomba y el motor, Dimensions HL – pompe et plaque de base — Motor Frame Size, Tamaño del bastidor del motor, Carcasse de moteur: 143/145	183/184	213/215	254/256	284/286
9SH	1 X 2–6	2	1	16⅜	5	4¾	6⅜	3⅛	56	9⅛		7⅝	3⅞	
10SH	1 X 2–8				5⅝	5⅜	7⅛		64					
11SH	1 X 2–10			17¼	6⅞	6⅝	8⅞		86	10		8½	4¾	
4SH	1½ X 2½–6	2½	1½	16½	5	4¾	6⅜	3¼	57	9¼		7¾	4	
7SH	1½ X 2½–8			17¼	5⅝	5⅜	7⅛	4	66	10		8½	4¾	
5SH	2 X 2½–6		2		5	4¾			57					
8SH	2 X 2½–8				6	5¾	7¹⁵⁄₁₆		68					
6SH	2½ X 3–6	3	2½						59					

① For use with ANSI class 150 mating flanges.
Para usar con bridas que casan ANSI clase 150.
À utiliser avec des contre-brides ANSI, classe 150.

NOTES:
1. All pumps shipped in vertical discharge position. May be rotated in 90° increments. Tighten ⅜ – 16 casing bolts to 12 ft./lbs. torque.
2. Dimensions in inches.
3. Motor dimensions may vary with motor manufacturer.
4. Not to be used for construction purposes.

NOTAS:
1. *Todas las bombas transportadas en posición de descarga vertical. Pueden rotarse en aumentos de 90°. Apretar ⅜ – 16 tornillos de carcasa a 12 pies/libras potencia.*
2. *Las dimensiones en pulgadas.*
3. *Las dimensiones puede que varíen con los fabricantes..*
4. *No para propósitos de construcción.*

NOTA :
1. *L'orifice de refoulement est orienté vers le haut. On peut le tourner de 90° en 90°. Serrer les vis ⅜ - 16 du corps de pompe à 12 lbf-pi.*
2. *Les dimensions sont en pouces, et le poids, en livres.*
3. *Les dimensions el le poids du moteur peuvent varier selon le fabricant.*
4. *Ne pas utiliser les dimensions pour la construction si elles ne sont pas certifiées à cette effet.*

Available Motor and Bedplate Dimensions and Weights, *Pesos y Dimensiones Disponibles de la Fundación y del Motor Dimensions et poids – moteur et plaque de base*

Motor Frame, Armazón del Motor, Carcasse de moteur	HP @ 3500 RPM, HP a 3500 RPM, hp à 3 500 tr/min				HP @ 1750 RPM, HP a 1750 RPM, hp à 1 750 tr/min				AB Max., AB Máx., AB max.	C Max., C Máx., C max.	P Max., P Máx., P max.	Wt. Max., Peso Máx., Poids max.	Bedplate Data, Datos de la Fundación, Plaque de base									
	Single Phase, Monofásicos, 1 Ø		Three Phase, Trifásicos, 3 Ø		Single Phase, Monofásicos, 1 Ø		Three Phase, Trifásicos, 3 Ø						HA	HB	HD*	HE	HF	HG	HP*	Wt. (lbs.), Peso (libras), Poids	Motor Shim, Plancha de relleno del motor Cale de moteur	Bearing Frame Shim, Plancha de relleno del bastidor del cojinete. Cale de palier
	ODP	TEFC	ODP	TEFC	ODP	TEFC	ODP	TEFC														
143T					1	1	1	1	5¼	13⅜	6⅝	45	10	28	8	3¾	24	2¾	¾	48	1¾	–
145T	2	2	2 or *ou* 3	2	1½	1½	1½ or *ou* 2	1½ or *ou* 2		14¼		53										
182T	3	3	5	3	2	2	3	3	5⅞	16⅝	7⅞	74										
184T	5	5	7½	5	3 or *ou* 5	3	5	3		18⅞		95										
213T			10	7½					7⅜	18	9⅝	116	12	31	8¼	4¼	29	3	1	65	–	–
215T			15	10						19⅞		136										
254T			20	15					10⅛	21⅝	13	266	13	42	9¼	5¼	38½	4	1¾	110	–	1
256T			25	20						23⅜		264										
284TS			30	25					12⅝	24⅛	15	392	15	44	10½	5¾	40½	3½		124	–	1¾
286TS			40	30						26⅝		432										

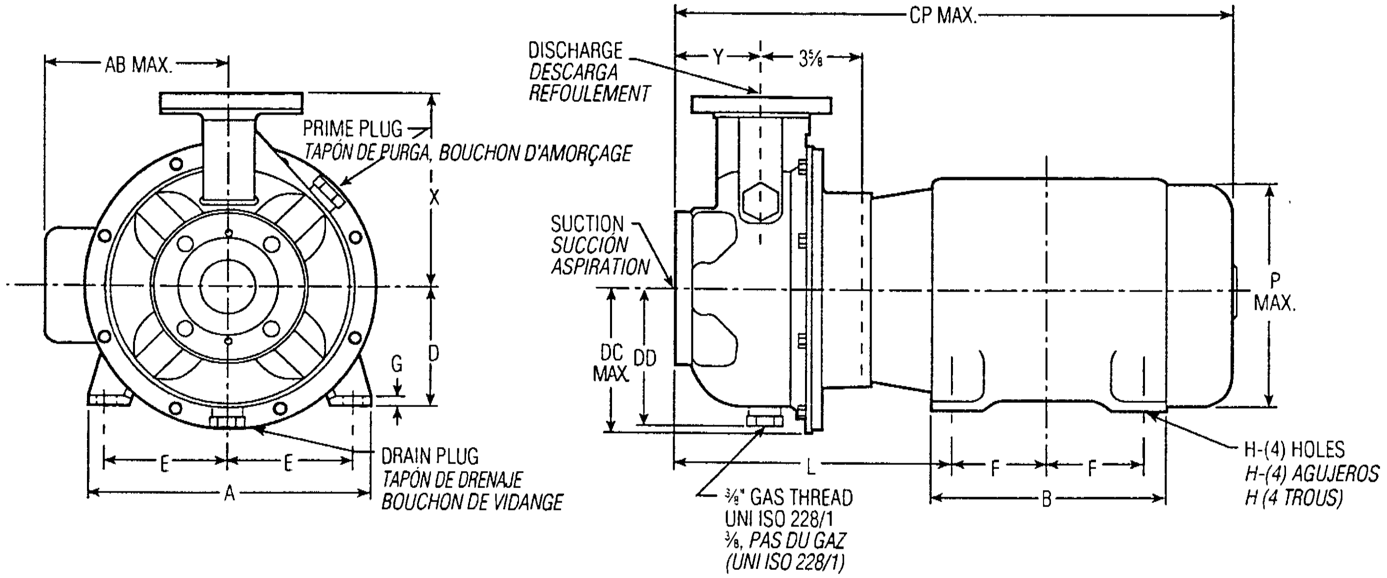
Dimensions and weights vary with manufacturers. Dimensions in inches and weights in lbs.
"HP" Dimensions at motor end only.
* "HD" Dimension for 254T/256T motor frame on 1 x 2-10 only is 11"; A ¾" motor shim and a 1¾" bearing frame shim are required.

Dimensiones y pesos varían con los fabricantes. Dimensiones en pulgadas y pesos en libras.
Dimensiones "HP" sólo en el extremo del motor.
** La dimensión "HD" para el bastidor del motor 254T/256T de 1 x 2 - 10 es sólo 11": se requieren una cuña del motor de ¾" y una cuña del bastidor de apoyo de 1¾".*

ODP = carcasse abritée (à ouvertures de ventilation protégées) ; TEFC = carcasse fermée autoventilée.
**Dimensions HP à l'extrémité du moteur seulement. La dimension HD pour la carcasse 254T ou 256T, version 1X2-10 seulement, est de 11 po ; une cale de moteur de ¾ po et une cale de palier de 1¾ po sont requises.*

SSH S-Group Close Coupled – Dimensions and Weights, *SSH Acople Cerrado – Dimensiones y Pesos, Dimensions et poids – SSH montée sur moteur, groupe S*

(All dimensions in inches and weights in lbs. Do not use for construction purposes.)
(Todas las dimensiones en pulgadas y pesos en libras. No usar para propósitos de construcción.)



Dimensions "L" Determined by Pump and Motor, Dimensiones "L" Determinadas por la Bomba y el Motor, Dimensions L – pompe et moteur		150 lb. Flange, Brida de 150 lib., Bride, 150 lb/po ²		CP Max., CP Máx., CP max.	DC Max., DC Máx., DC max.	DD	X	Y	Motor Frame Size, Tamaño del Armazón del Motor, Carcasse de moteur				Wt. (lbs.), Pesos (libras), Poids
Pump, Bomba, Pompe		Suct. Succ. ① Aspir.	Disch. Desc. ① Refoul.						143/145	182/184	213/215	254/256	
9SH	1 x 2 – 6	2	1	25⅝	5	4¾	6⅝	3⅛	9⅝	10¼	11¼	–	24
10SH	1 x 2 – 8				5⅝	5⅜	7⅛						32
11SH	1 x 2 – 10			27⅞	6⅞	6⅝	8⅞	4	10½	11⅛	12⅛	12⅜	54
4SH	1½ x 2½ – 6	2½	1½	25½	5	4¾	6⅝	3¼	9¾	10⅝	11⅜	—	25
7SH	1½ x 2½ – 8			27⅞	5⅝	5⅜	7⅛	4	10½	11⅛	12⅛	12⅜	34
5SH	2 x 2½ – 6		2		5	4¾	6⅝						25
8SH	2 x 2½ – 8				6	4¾	7¹⁵⁄₁₆						36
6SH	2½ x 3 – 6	3	2½										27

① For use with ANSI class 150 mating flanges.
Para usar con bridas que casan ANSI clase 150.
À utiliser avec des contre-brides ANSI, classe 150.

NOTE:

1. Pumps shipped in vertical discharge as standard. For other orientations, remove casing bolts, rotate discharge to desired position, and tighten ⅜ – 16 bolts to 12 ft./lbs., ⁷⁄₁₆ – 14 bolts to 20 ft./lbs.
2. ALL dimensions in inches.
3. Motor dimensions may vary with motor manufacturer.
4. Not for construction purposes.

NOTA:

1. *Las bombas se transportarán en descarga vertical como estándar. Para otras orientaciones, retirar los tornillos de la carcasa, rotar la descarga a la posición deseada, y apretar ⅜ – 16 tornillos a 12 pies/libras, ⁷⁄₁₆ – 14 tornillos a 20 pies/libras.*
2. *TODAS las dimensiones en pulgadas.*
3. *Las dimensiones puede que varíen con los fabricantes.*
4. *No para propósitos de construcción.*

NOTA :

1. *L'orifice de refoulement est orienté vers le haut. Pour l'orienter autrement, enlever les vis de fixation du corps de pompe, placer l'orifice dans le sens voulu, puis reposer et serrer les vis ⅜ - 16 à 12 lbf·pi et ⁷⁄₁₆ - 14 à 20 lbf·pi.*
2. *Les dimensions sont en pouces, et le poids, en livres.*
3. *Les dimensions et le poids du moteur peuvent varier selon le fabricant.*
4. *Ne pas utiliser les dimensions pour la construction si elles ne sont pas certifiées à cette effet.*

Dimensions Determined by JM Motor Frame, *Dimensiones Determinadas por el Armazón del Motor JM, Dimensions – carcasse de moteur JM*

JM Frame, JM Armazón, Carcasse	A	AB	B	D	E	F	G	H Dia., H Diám., H (diam.)	P Max., P Máx., P max.	Motor Wt. (lbs.) Peso Motor (lib.), Poids du moteur
143JM	6½	5¼	6	3½	2¾	2	⅛	¹¹⁄₃₂	6⅝	41
145JM						2½				57
182JM	8½	5⅞	6½	4½	3¾	2¼	⁵⁄₁₆	¹³⁄₃₂	7⅞	77
184JM						2¾				97
213JM	9½	7⅓	8	5¼	4¼		⁷⁄₃₂		9⅝	122
215JM						3½				155
254TCZ	11¼	9	9½	6¼	5	4⅛	¼	¹⁷⁄₃₂	11½	265
256TCZ			11¾			5				320

Motor Frame Selections, *Selecciones del Armazón del Motor, Choix de carcasses de moteur*

Motor Frame, Armazón del Motor, Carcasse	Motor Horsepower, Potencia del Motor, Puissance (hp)							
	3500 RPM, 3500 RPM, 3 500 tr/min				1750 RPM, 1750 RPM, 1 750 tr/min			
	1Ø, Monofásicos 1Ø		3Ø, Trifásicos 3Ø		1Ø, Monofásicos 1Ø		3Ø, Trifásicos 3Ø	
	ODP	TEFC	ODP	TEFC	ODP	TEFC	ODP	TEFC
143JM	–	–	–	–	–	–	1	1
145JM	2	2	2-3	2	1-1½	1-1½	1½-2	1½-2
182JM	3	3	5	3	2	2-3	3	3
184JM	5	5	7½	5	3	–	5	5
213JM	7½	–	10	7½	5	–	7½	7½
215JM	10	–	15	10-15	–	–	–	–
254TCZ	–	–	20	–	–	–	–	–
256TCZ	–	–	25	20-25	–	–	–	–

ODP = carcasse abritée (à ouvertures de ventilation protégées) ;
TEFC = carcasse fermée autoventilée.

G&L Pumps

GOULDS PUMPS LIMITED WARRANTY

This warranty applies to all water systems pumps manufactured by Goulds Pumps.

Any part or parts found to be defective within the warranty period shall be replaced at no charge to the dealer during the warranty period. The warranty period shall exist for a period of twelve (12) months from date of installation or eighteen (18) months from date of manufacture, whichever period is shorter.

A dealer who believes that a warranty claim exists must contact the authorized GouldsPumps distributor from whom the pump was purchased and furnish complete details regarding the claim. The distributor is authorized to adjust any warranty claims utilizing the Goulds Pumps Customer Service Department.

The warranty excludes:

(a) Labor, transportation and related costs incurred by the dealer;
(b) Reinstallation costs of repaired equipment;
(c) Reinstallation costs of replacement equipment;
(d) Consequential damages of any kind; and,
(e) Reimbursement for loss caused by interruption of service.

For purposes of this warranty, the following terms have these definitions:

(1) "Distributor" means any individual, partnership, corporation, association, or other legal relationship that stands between Goulds Pumps and the dealer in purchases, consignments or contracts for sale of the subject pumps.
(2) "Dealer" means any individual, partnership, corporation, association, or other legal relationship which engages in the business of selling or leasing pumps to customers.
(3) "Customer" means any entity who buys or leases the subject pumps from a dealer. The "customer" may mean an individual, partnership, corporation, limited liability company, association or other legal entity which may engage in any type of business.

THIS WARRANTY EXTENDS TO THE DEALER ONLY.

GARANTÍA LIMITADA DE GOULDS PUMPS

Esta garantía es aplicable a todas las bombas para sistemas de agua fabricadas por Goulds Pumps. Toda parte o partes que resultaren defectuosas dentro del período de garantía serán reemplazadas, sin cargo para el comerciante, durante dicho período de garantía. Tal período de garantía se extiende por doce (12) meses a partir de la fecha de instalación, o dieciocho (18) meses a partir de la fecha de fabricación, cualquiera se cumpla primero.

Todo comerciante que considere que existe lugar a un reclamo de garantía deberá ponerse en contacto con el distribuidor autorizado de Goulds Pumps del cual adquiriera la bomba y ofrecer información detallada con respecto al reclamo El distribuidor está autorizado a liquidar todos los reclamos por garantía a través del Departamento de Servicios a Clientes de Goulds Pumps.

La presente garantía excluye:

(a) La mano de obra, el transporte y los costos relacionados en los que incurra el comerciante;
(b) los costos de reinstalación del equipo reparado;
(c) los costos de reinstalación del equipo reemplazado;
(d) daños emergentes de cualquier naturaleza; y
(e) el reembolso de cualquier pérdida causada por la interrupción del servicio

A los fines de esta garantía, los términos "Distribuidor", "Comerciante" y "Cliente" se definen como sigue:

(1) "Distribuidor" es aquel individuo, sociedad, corporación, asociación u otra persona jurídica que opera en relación legal entre Goulds Pumps y el comerciante para la compra, consignación o contratos de venta de las bombas en cuestión.
(2) "Comerciante" es todo individuo, sociedad, corporación, asociación u otra persona jurídica que en el marco de una relación legal realiza negocios de venta o alquiler-venta (leasing) de bombas a clientes.
(3) "Cliente" es toda entidad que compra o que adquiere bajo la modalidad de leasing las bombas en cuestión de un comerciante. El término "cliente" puede significar un individuo, sociedad, corporación, sociedad de responsabilidad limitada, asociación o cualquier otra persona jurídica con actividades en cualquier tipo de negocios.

LA PRESENTE GARANTÍA SE EXTIENDE AL COMERCIANTE ÚNICAMENTE.

GARANTIE LIMITÉE DE GOULDS PUMPS

La présente garantie s'applique à chaque pompe de système d'alimentation en eau fabriquée par Goulds Pumps.

Toute pièce se révélant défectueuse sera remplacée sans frais pour le détaillant durant la période de garantie suivante expirant la première : douze (12) mois à compter de la date d'installation ou dix-huit (18) mois à partir de la date de fabrication.

Le détaillant qui, aux termes de cette garantie, désire effectuer une demande de règlement doit s'adresser au distributeur Goulds Pumps agréé chez lequel la pompe a été achetée et fournir tous les détails à l'appui de sa demande. Le distributeur est autorisé à régler toute demande par le biais du service à la clientèle de Goulds Pumps.

La garantie ne couvre pas :

a) les frais de main-d'œuvre ou de transport ni les frais connexes encourus par le détaillant ;
b) les frais de réinstallation de l'équipement réparé ;
c) les frais de réinstallation de l'équipement de remplacement ;
d) les dommages indirects de quelque nature que ce soit ;
e) ni les pertes découlant de la panne.

Aux fins de la présente garantie, les termes ci-dessous sont définis comme suit :

1) « Distributeur » signifie une personne, une société de personnes, une société de capitaux, une association ou autre entité juridique servant d'intermédiaire entre Goulds Pumps et le détaillant pour les achats, les consignations ou les contrats de vente des pompes en question.
2) « Détaillant » veut dire une personne, une société de personnes, une société de capitaux, une association ou autre entité juridique dont les activités commerciales sont la vente ou la location de pompes à des clients.
3) « Client » signifie une entité qui achète ou loue les pompes en question chez un détaillant. Un « client » peut être une personne, une société de personnes, une société de capitaux, une société à responsabilité limitée, une association ou autre entité juridique se livrant à quelque activité que ce soit.

CETTE GARANTIE SE RAPPORTE AU DÉTAILLANT SEULEMENT.

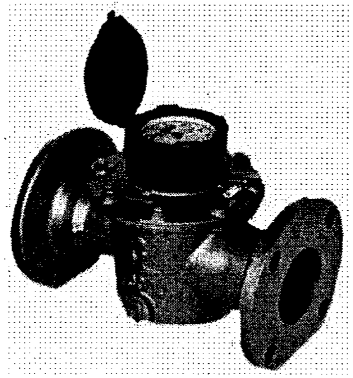
Goulds Pumps
ITT Industries

Specification Sheet

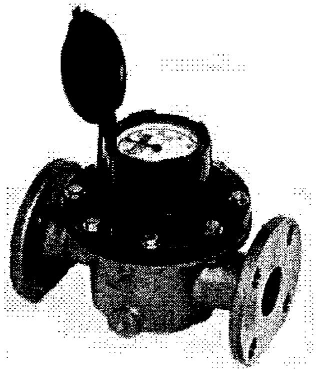
Industrial Turbine Meters

Model T3000 Bronze, Magnetic Drive,
Flanged Ends

Sizes: 1 1/2", 2" and 3"



T3000CB



T3000CP

Description

Specifications

side of the cover with four stainless steel screws and washers, one insert of which is placed eccentrically in the cover. The internal regulator assembly is interconnected with an external regulator shaft located on top of the cover. This allows meter calibration without depressurizing the test bench or meter service. The regulator is protected by a tamperproof device. The main case and cover are assembled with an O-ring gasket and stainless steel bolts. The register assembly is secured to the main case with a slotted screw and is hinged over the inlet throat. However, the register can be rotated and locked in any 360 degree position therein.

Register. The register is contained within a 90% copper seamless can which is oven cured at 150°F for 90 minutes to eliminate condensation. The 1/4" true tempered glass lens is secured in an "L" shaped gasket, then roll sealed to produce a permanent sealed design. To assure easy reading, the totalizer wheels are large and color coded. The applicable size, model, registration, part number and date code are printed on the calibrated dial face. Moving clockwise during operation, the extra thin sweep hand does not interfere with meter reading, and the flow indicator will detect plumbing leaks.

Magnetic Drive. The magnetic drive design eliminates miscoupling associated with right angle drives. Torque is absorbed in the undergear assembly below the driving magnet. As a result, the driving magnet is turning slowly at all flows, assuring magnetic coupling with the register assembly. The undergearing is protected by an appropriately filtered encasement.

Connections. All sizes are available with 4-bolt round flanged end connections. The 1 1/2" and 2" meters are also available with 2-bolt oval flanged-end connections. Both flanged connections conform to ANSI B16.1 cast-iron pipe flange, Class 125. Both bronze and cast-iron companion flanges are available. The companion flanges are faced, drilled and tapped with ANSI B2.1 internal taper pipe thread and conform to ANSI B16.1 cast-iron pipe flange, Class 125.

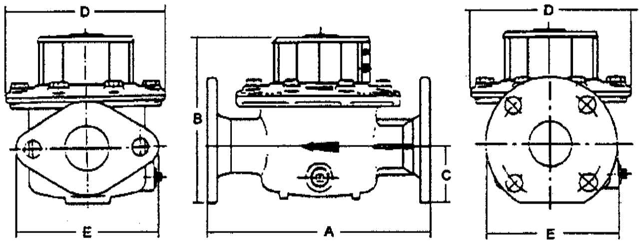
Maintenance. The measuring element with integral straightening vanes can be removed, repaired or replaced without removing the main case from the service line. Blank cover plates are available for use during repair. Pretested and calibrated measuring elements with cover plates and registers are available for exchange or purchase. In addition, AMCO Water Metering Systems Inc. maintains a fully equipped and staffed repair facility in Ocala, Florida.

Pulsers. See Specification Sheet #LRP/HRP-T3000.
LRP (2-wire) Reed Switch, 4 Watt (50V AC/DC Max.)
HRP (3-wire) Slotted Disc, 6-15 VDC
Both units require power from an external source.

Dimensions and Net Weights

Meter Size	Dimensions (Inches)					Weight (lbs.)
	A	B	C	D	E	
1 1/2" Oval	10	7 3/4	2 7/16	7 3/8	5 5/8	19 1/2
1 1/2" Round	10	7 3/4	2 7/16	7 3/8	5 1/16	20
2" Oval	10	7 3/4	2 7/16	7 3/8	6 1/8	21 1/2
2" Round	10	7 7/8	2 9/16	7 3/8	6 1/16	22
3"	11 7/8	9 3/8	3 13/16	7 3/8	7 1/2	33 3/8

Note: Add ¾" to overall height with polymer top plate (1½" - 3")



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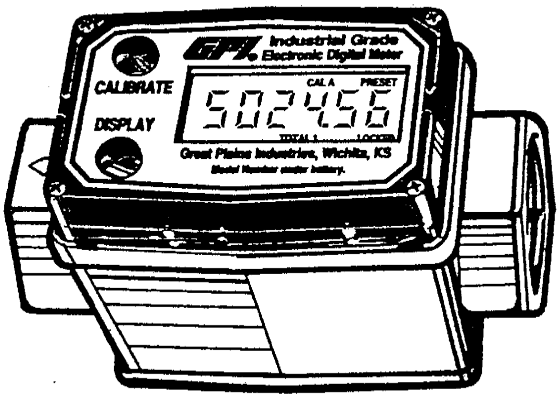
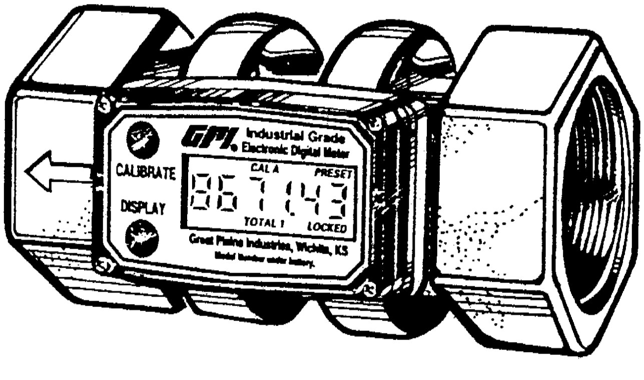
www.watermeters.com

Manual Number 920709-4

Industrial Grade
COMPUTER ELECTRONICS
Owner's Manual





Computer Electronics shown with Model S100 and S200 Turbine Housings which are sold separately.

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To the owner . .

Congratulations on receiving your GPI Industrial Grade Computer Electronics. We are pleased to provide you with a product designed to give you maximum reliability and efficiency.

Our business is the design, manufacture, and marketing of liquid handling, agricultural, and recreational products. We succeed because we provide customers with innovative, reliable, safe, timely, and competitively-priced products. We pride ourselves in conducting our business with integrity and professionalism.

We are proud to provide you with a quality product and the support you need to obtain years of safe, dependable service.

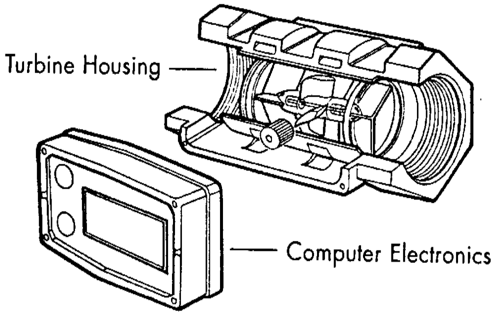
President
Great Plains Industries, Inc.

TABLE OF CONTENTS

GENERAL INFORMATION

This manual will assist you in operating and maintaining the Computer Electronics of the GPI Industrial Grade Meters. (See Figure 1) Calibration details are given in this manual. Information on turbine housings and accessory modules are contained in other manuals. Please reference those as necessary.

Figure 1



For best results, take the time to fully acquaint yourself with all information about all components of your GPI Electronic Digital Metering System prior to installation and use.

If you need assistance, contact the dealer from whom you purchased your computer.

⚠ This symbol is used throughout the manual to call your attention to safety messages.

Warnings alert you to the potential for personal injury.

Cautions call your attention to practices or procedures which may damage your equipment.

Notes give information that can improve efficiency of operations.

It is your responsibility to make sure that all operators have access to adequate instructions about safe operating and maintenance procedures.

Safety Instructions

For your safety, review the major warnings and cautions below before operating your equipment.

1. This equipment is approved to handle only fluids which are compatible with all wetted materials.

2. When measuring flammable liquids, observe precautions against fire or explosion.
3. When handling hazardous liquids, always follow the liquid manufacturer's safety precautions.
4. When working in hazardous environments, always exercise appropriate safety precautions.
5. For best results, always verify accuracy before use.

Product Description

These computer electronics are designed specifically for use on GPI Industrial Grade Turbine Housings. They are also designed to work with several accessory modules which transmit an electronic signal to a wide variety of external equipment.

The CMOS, microprocessor-based electronics have extremely low power requirements and data retention capabilities in both RAM and ROM. Information is clearly displayed on a large 6-digit LCD readout with two-point floating decimal for totals from .01 to 999,999. All operations are easily accessed with the two buttons on the front panel.

Liquid flows through the turbine housing causing an internal rotor to spin. As the rotor spins, an electrical signal is generated in the pickup coil. This pulse data is translated from the turbine into calibrated flow units shown on the computer's readout.

Upon receipt, examine your equipment for visible damage. The computer is a precision measuring instrument and should be handled as such. If any items appear damaged or missing, contact your distributor.

Make sure your computer model meets your specific needs. Refer to the Specifications Section to confirm required features. The model number of your computer is displayed on the lower front side of the computer and also underneath a battery.

INSTALLATION

If you ordered your computer electronics with a turbine housing, it is installed at the factory.

If you ordered your computer separately from your turbine, simply mount the computer on the turbine with the four screws at the corners of the faceplate. Make sure the O-ring is fully seated before tightening the screws.

If you ordered the computer with turbine and an accessory module, please review and thoroughly understand all installation instructions before proceeding.

All GPI turbines are designed to measure flow in only one direction. The direction is indicated by the arrow cast-molded in the turbine outlet. If the opposite direction is desired, simply rotate the computer electronics 180 degrees prior to installation.

Avoid electronically "noisy" environments. Install at least 6 inches (15.2cm) away from motors, relays, or transformers.

All GPI meters are Factory Mutual Approved and carry a Class 1, Division 1 Approval for hazardous environments. In addition, GPI meters have NEMA Type 4 enclosures. They are tested and calibrated at the factory using state-of-the-art calibration procedures and testing equipment.

To ensure accurate measurement, remove all air from the system before use.

1. Ensure some back pressure on the turbine.
2. Open the discharge valve or nozzle and allow fluid to completely fill the system. Make sure the stream is full and steady.
3. Close the discharge valve or nozzle.
4. Start normal operations.

It is strongly recommended that accuracy be verified prior to use. To do this, remove all air from the system, measure an exact known volume into an accurate container, and verify the volume against the readout or recording equipment. If necessary, use a correction factor to figure final volume. For best results, accuracy should be verified periodically as part of a routine maintenance schedule.

OPERATIONS

All operations are reflected in the LCD readout. The top line identifies the calibration curve. The middle line reflects flow information. The bottom line shows information from the totalizer. Words or "flags" display on the top and bottom line to further identify specific information.

The computer is powered by field replaceable batteries. When the readout becomes dim or faded, the batteries need to be replaced. Reference the Maintenance Section for details.

NOTE: Operations can be practiced prior to installation. To simulate flow conditions, blow gently through the turbine.

Turn On

The meter is on when any display is present. It turns on automatically when liquid flows through the meter. It can be turned on manually by pressing and releasing the DISPLAY button.

Turn Off

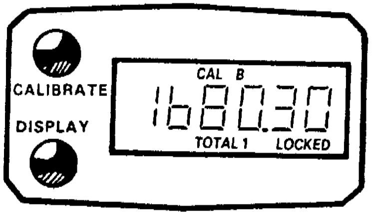
The meter turns off automatically approximately four minutes after flow stops. When the meter is off, the readout is blank.

Batch and Cumulative Totals

Total flags are displayed on the bottom line. A Batch Total indicates flow during a single use. It is labeled with TOTAL followed by a number. On most models this is TOTAL 2. To zero a batch total, make sure it is displayed and hold down DISPLAY for three seconds until the display changes to zeros.

The Cumulative Total is the total of all liquid measured since the meter's power was connected. At your first use, the Cumulative Total is not zero because of calibration at the factory. The Cumulative Total is labeled as TOTAL LOCKED indicating it cannot be manually zeroed. (See Figure 2) The Cumulative Total is zeroed only when batteries are removed or go dead or when the Cumulative Total reaches the maximum value of 999,999.

Figure 2



To change between totals, press and release DISPLAY.

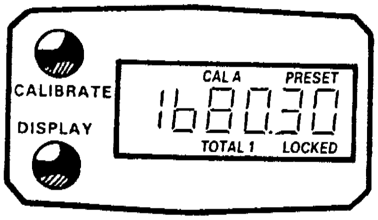
NOTE: Generally, readout displays change when buttons are released.

Factory and Field Calibration Curves

Calibration Curve information is shown on the top line of the readout. The Field Calibration Curve is set by the user. It can be changed or modified at any time using the Calibration Procedures in the Calibration Section. If a Field Calibration has not been completed, the meter uses the Factory Calibration Curve. Field Calibration is shown as CAL followed by a letter. On most models this is CAL B.

A Factory Calibration Curve is preset by the manufacturer and stored permanently in the meter's computer. The Factory Calibration Curve is always flagged with PRESET on the top line. In most models, Factory Calibration appears as CAL A PRESET. (See Figure 3)

Figure 3

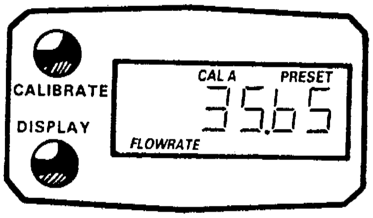


To change between a Field Calibration Curve and a Factory Calibration Curve, hold CALIBRATE down while pressing and releasing DISPLAY. When the desired curve appears, release both buttons.

Flow Rate

Some models include a Rate of Flow feature. When this feature is activated, the word FLOWRATE displays to the left on the bottom line. (See Figure 4) When this flag is displayed, the numbers on the middle line reflect the rate of flow. To activate this feature, press and release DISPLAY until FLOWRATE appears to the left on the bottom line.

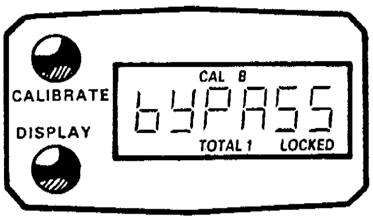
Figure 4



Bypass

Some models contain a Bypass feature for those instances when the meter has continuous flow and power conservation is important. When Bypass is activated the flow is not monitored or totaled by the computer. When activated, BYPASS displays on the middle line. (See Figure 5) In Bypass Mode, the meter no longer senses the flow and the readout goes off after a few minutes. Push the DISPLAY button to activate the readout again.

Figure 5



Propeller

A small propeller displays to indicate liquid is flowing through the meter.

"NO" Flag

The NO flag displays on the left of the top line when particular conditions have not been met during calibration procedures. While NO displays, normal flow does not register on the meter. To resume normal flow counting, return to CAL A Preset and back to CAL B before continuing field calibration. This information is detailed fully in the Calibration Section.

CALIBRATION

Field Calibration and Factory calibration are defined in the section above. Field Calibration is necessary when Factory Calibration accuracy is not acceptable. Factory Calibration is completed with either stoddard test solvent (on Mid-Flow turbine sizes) or water (on High-Flow turbine sizes) at 70°F (21°C).

If you are dispensing a comparable liquid which has a different uniform viscosity, a Field Calibration can improve meter accuracy.

NOTE: A Field Calibration below the 10:1 flow range can adversely effect accuracy.

The use of a uniformly dependable, accurate calibration container is highly recommended for the most accurate results.

Due to high flow rate, it is strongly recommended that Field Calibration of High Flow (1-1/2 and 2 inch) meters be completed with a combination of volume and weight using fine resolution scales.

For most accurate results during Field Calibration, dispense at a flow rate which best simulates your actual operating conditions. During Field Calibration, avoid repeated stopping or "trickling" of the flow.

Make sure you meet the meter's minimum flow rate requirements.

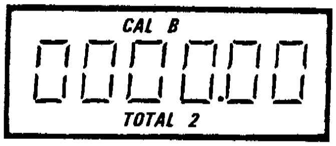
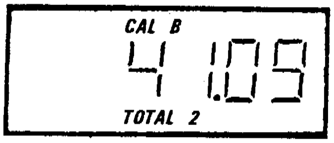
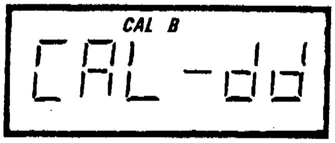
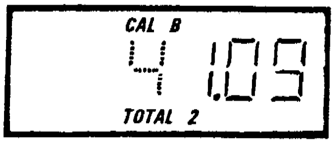
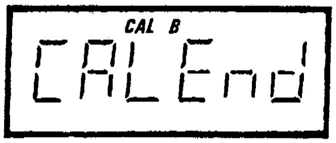
1/2 inch meters -	0.5 GPM (1.9 LPM)
3/4 inch meters -	1 GPM (3.8 LPM)
1 inch meters -	2.5 GPM (9.5 LPM)
1-1/2 inch meters -	5 GPM (19 LPM)
2 inch meters -	10 GPM (38 LPM)

If the minimum flow rate requirements are not met during the Field Calibration procedures, the readout blinks "NO" when you try to exit Calibration Mode and you must calibrate again.

The maximum volume dispensed and adjusted during the Calibration Procedure below should not exceed 99.99 units in most models. On models with 1-1/2 or 2-inch fittings and some special order models, the maximum volume should not exceed 999.9 units. During calibration, the two left-hand digits on the readout are ignored.

For best results, the meter should be installed and purged of air prior to Field Calibration.

Dispense/Display Calibration Procedures

YOUR ACTION	NOTES
1. Hold down CALIBRATE while pressing and releasing DISPLAY until the Field Calibration Curve appears. Release both buttons.	Remember, Field Calibration curves are *not* preset.
2. Press and release DISPLAY until the Batch Total appears.	Remember, a Batch Total is *not* locked.
3. Hold down DISPLAY for three seconds to zero the total.  	
4. Dispense the desired volume and stop.  	For the most accurate results, dispense at a flow rate which best simulates your actual operating conditions. Avoid stopping or "trickling" the flow.
5. Press CALIBRATE then hold down DISPLAY (both) for approximately three seconds until CAL-dd flashes. Release both buttons.  	
6. When the buttons are released, the volume dispensed returns with one digit flashing. Set this readout to the amount you want. DISPLAY moves from left to right. CALIBRATE changes the value from 0-9.  	Remember, the two left-hand digits are ignored during calibration.
7. With the readout set to the desired amount, hold down CALIBRATE as you briefly press DISPLAY. CAL End flashes and the original amount appears without any flashing digits.  	Calibration is complete and you can resume normal operations. If NO displays, see Troubleshooting.

MAINTENANCE

The computer electronics are powered by lithium batteries which provide at least 4,000 hours of actual use. If the meter's readout should become dim or blank, the batteries should be replaced. Replacement batteries can be ordered from the factory. See details in the Parts Section or your distributor.

When batteries are disconnected or fail, the Batch and Cumulative Totals return to zero. Factory and Field Calibration Curves are retained in the meter's computer when power is lost.

It is strongly recommended that battery check and terminal cleaning be a part of a routine maintenance schedule. Battery terminals should be cleaned annually. Batteries can be replace without removing the meter from the piping system.

Replace Batteries

1. Remove the corner screws from the meter face and lift the computer electronics from the turbine.
2. Remove the batteries.
3. Check the battery terminals and remove any corrosion.
4. Install the new batteries and make sure the positive posts are positioned correctly. When the batteries are installed correctly, the computer powers on automatically and the readout displays information.
5. Make sure the O-ring is fully seated before placing the computer electronics on the turbine. Tighten the four screws.
6. Do not clean exterior of computer assembly with Isopropyl Alcohol.

TROUBLESHOOTING

Symptom	Probable Cause	Corrective Action
Meter is not accurate	1. Field Calibration not performed properly	Field calibrate again or select Factory Calibration.
	2. Factory Calibration not suitable for liquid being measured	Perform a Field Calibration according to Calibration Section.
	3. Meter operated below minimum flow rate	Increase flow rate.
	4. Meter partially clogged with dried liquid	Remove meter. Clean carefully. Make sure rotor spins freely.
	5. Turbine bearings partially clogged with dried liquid	Remove meter. Clean carefully. Make sure rotor spins freely.
	6. Sealant material wrapped around rotor	Remove meter. Make sure rotor spins freely.
	7. Installed too close to fittings	Install correctly.
	8. Installed too close to motors or electrically "noisy" environment	Install correctly.

TROUBLESHOOTING

Symptom	Probable Cause	Corrective Action
Readout faded or blank	1. Batteries weak, dead, or not connected	Remove computer, check and replace batteries if necessary.
	2. Computer defective	Contact the factory.
Normal flow rate but meter does not count (Meter comes on when DISPLAY button pushed)	1. Field Calibration not performed correctly	Field Calibrate again or select Factory Calibration.
	2. Rotor stuck or damaged	Remove meter. Make sure rotor spins freely.
	3. Sealant material wrapped around rotor	Remove meter. Make sure rotor spins freely.
	4. Computer defective	Contact the factory.
Reduced flow rate and meter does not count (Meter comes on when DISPLAY button pushed)	1. Meter clogged with dried liquids	Remove meter. Clean carefully. Make sure rotor spins freely.
	2. Below minimum flowrate	Increase flow.
Cannot get meter into field calibration	1. Factory Calibration (PRESET) curve active	Hold down CALIBRATE and push and release DISPLAY until PRESET flag goes off. Proceed with calibration according to the Calibration Section.
	2. Computer circuit board defective	Replace computer. Contact the factory.
	3. Button defective	Replace computer. Contact the factory.
Computer blinks "NO" after field calibration	1. Flow rate too low	Try again and increase flow rate to minimum calibration rate. See Calibration Section.
	2. Rotor not spinning freely	Remove meter. Clean carefully. Make sure rotor spins freely.

SPECIFICATIONS

Features available include:

- 0 to 3 Totalizing Registers
- 1 to 3 Calibration Curves
- 1 Point Field Calibration Curve
- Rate of Flow Feature – Yes or No
- Bypass Feature – Yes or No
- Flow Rate Time Base in Minutes, Seconds, Hours, or Days

Input Pulse Rate:

Minimum Pulse In:	DC
Minimum Coil Input:	10 Hz
Maximum Raw:	750 Hz

K-Factor:

Minimum:	16 pulses/unit
Maximum:	10,000 pulses/ unit*

Field Calibration:

Maximum Pulse Count:	65,535 pulses
Minimum Time:	6 seconds

Readout Totals:

Minimum Display:	0.01
Maximum Display:	999,999

Temperatures:

Operational:	+14° to +140°F (-10° to +60°C)
Storage:	-40° to +158°F (-40° to +70°C)

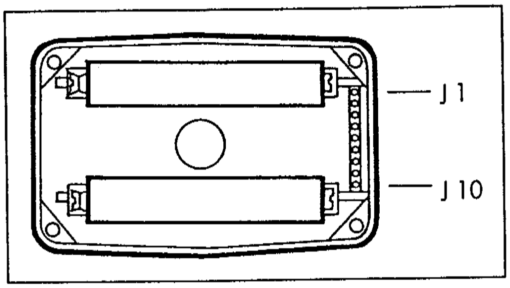
If wider operating temperature ranges are desired, reference information on GPI Remote Kits.

Power:

Internal Power Supply:	2 Lithium Batteries at 3 volts each
Minimum Battery Life:	4,000 operational hours
Optional External Power:	5.75 volts DC ±5%

* Consult factory for higher K-Factor prescaled values.

Computer Electronics Terminal Connections



J-1	**Reset** When connected by a jumper wire to Ground (J1-6), this has the same effect as initial power up and zeroes out all totalizers.
J-2	**Pulse Signal Output** This supplies a high-level amplified open collector signal. Output will withstand a maximum open-circuit voltage of 60 volts DC and a maximum closed-circuit of 100 mA.
J-3	**Calibration Preset Override** When connected by a jumper wire to Ground J1-6, this has the same effect as pressing the CALIBRATE button but allows modification of Preset Calibration Curves.
J-4	**Pulse Signal Input** Requires a sine or square wave with open-circuit voltage of 3-30 volts P-P, a maximum rise/fall rate of 0.01 V/µ second and a maximum frequency of 750 Hz.
J-5	**Power Input** When used with Ground (J1-6), this has reverse polarity protection, but no on-board voltage regulation. Supplied voltage must be 5.75 volts DC ±5%.
J-6	**Ground**
J-7, 8, 9, 10	Programming interfaces. Not accessable to user.

Model Number System for Computer Electronics

Product Identifier

Computer Electronics Assembly

01 = Special, 1 Button
02 = Special, 2 Button
03 = 2 Totals, 2 Cals
04 = 2 Totals, 2 Cals, Rate
05 = 3 Totals, Bypass, 3 Cals
06 = 2 Totals, 1 Cal
07 = 3 Totals, Bypass, Rate, 3 Cals
08 = Rate, 2 Cals

Factory Calibrated Units

GM = Gallons per Minute
LM = Liters per Minute
OO = Special

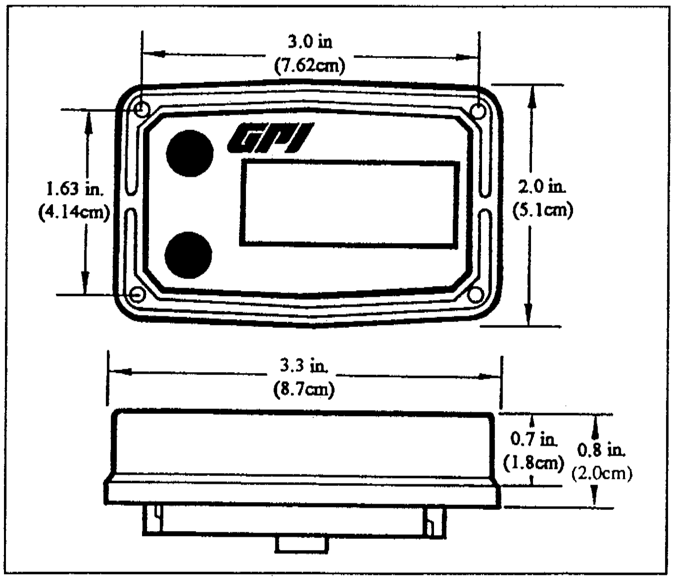
Turbine Housing

Fitting

Packaging

A2+ 03+GM +S075+N+A1 **(sample)**

Computer Electronic Codes



PARTS

The factory, when provided with model number and serial number, can replace your entire Computer Electronics Assembly.

Order replacement kits, parts, and accessories with the part numbers given here.

Part No.	Description
113520-1	Battery Replacement Kit
901002-52	O-Ring
116000-1	Large (5 gal.) Calib. Container
116004-6	Small (5 liter) Calib. Container
116004-5	Small (5 qt.) Calib. Container

SERVICE

For warranty consideration, parts, or other service information, please contact your local distributor. If you need further assistance, call the GPI Customer Service Department in Wichita, Kansas, during normal business hours.

1-888-996-3837

To obtain prompt, efficient service, always be prepared with the following information:

1. The model number of your computer electronics.
2. The serial number or manufacturing date code of your computer electronics.
3. Specific information about part numbers and descriptions.

For warranty work always be prepared with your original sales slip or other evidence of purchase date.

Returning Parts

Please contact the factory before returning any parts. It may be possible to diagnose the trouble and identify needed parts in a telephone call. GPI can also inform you of any special handling requirements you will need to follow covering the transportation and handling of equipment which has been used to transfer hazardous or flammable liquids.

CAUTION: Do not return computer electronics or meters without specific authority from the GPI Customer Service Department. Due to strict regulations governing transportation, handling, and disposal of hazardous or flammable liquids, GPI will not accept computer electronics or meters for rework unless they are completely free of liquid residue.

CAUTION: Meters not flushed before shipment can be refused and returned to the sender.

Copy the information located on the Turbine housing.
This information will be required by Customer Service.

Model No: ______________________________

Serial No: ______________________________

MFD: ______________________________

Distributor Name: ______________________________

Distributor Phone Number: ______________________________

Great Plains Industries, Inc. Limited Warranty Policy

Great Plains Industries, Inc., 5252 East 36th Street North, Wichita, Kansas USA 67220-3205, hereby provides a limited one year warranty against defects in material and workmanship on all products manufactured by Great Plains Industries, Inc. This warranty shall extend to the purchaser of this product and to any person to whom such product is transferred during the warranty period.

The warranty period shall begin on the date of the original new equipment purchase. Warrantor's obligation hereunder shall be limited to repairing defective workmanship or replacing or repairing any defective part or parts. This warranty shall not apply if:

a.) the product has been altered or modified outside the warrantor's duly appointed representative;

b.) the product has been subjected to neglect, misuse, abuse or damage or has been installed or operated other than in accordance with the manufacturer's operating instructions.

To make a claim against this warranty, notice of claim must be given in writing to the company at its above address no later than 30 days after the expiration of the warranty period. Such notice shall identify the defect in the product. The company shall, within 14 days of receipt of such notice, notify the customer to either send the product, transportation prepaid, to the company at its office in Wichita, Kansas, or to a duly authorized service center. The company shall perform all obligations imposed on it by the terms of this warranty within 60 days of receipt of the defective product.

GREAT PLAINS INDUSTRIES, INC. EXCLUDES LIABILITY UNDER THIS WARRANTY FOR DIRECT, INDIRECT. INCIDENTAL AND CONSEQUENTIAL DAMAGES INCURRED IN THE USE OR LOSS OF USE OF THE PRODUCT WARRANTED HEREUNDER.

The company herewith expressly disclaims any warranty of merchantability or fitness for any particular purpose other than for which it was designed.

This warranty gives you specific rights and you may also have other rights which vary from U.S. state to U.S. state.

NOTE: In compliance with MAGNUSON MOSS CONSUMER WARRANTY ACT - Part 702 (governs the resale availability of the warranty terms).

GPI®
5252 East 36th Street North
Wichita, KS USA 67220-3205
TEL: 316-686-7361
FAX: 316-686-6746

GREAT PLAINS INDUSTRIES, INC.
1-888-996-3837
www.gplains.com/gpi

Patent Numbers
U.S. Patents 4,856,348; 4,700,579; and 5,046,370. Australian Patent 572,494. Canadian Patent 1,223,464. European Patent 0147004. German Patent P347894.2-08. Italian Patent 68074-BE/89.

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Operations Guide for Industrial Grade Computer Electronics

CE

TABLE OF CONTENTS

DEUTSCH

ALLGEMEINES

Herzlichen Glückwunsch zu Ihrer Entscheidung für eine GPI-Rechnerelektronik für industrielle Anwendungen. Die nachstehenden Anweisungen werden Ihnen beim Bedienen und Warten Ihrer Rechnerelektronik behilflich sein (Bild 1). Die Eichverfahren werden im Nachstehenden beschrieben. Information bezüglich der Turbinengehäuse und der Zubehörmodule ist in den anderen Anleitungen enthalten. Bitte ziehen Sie diese nach Bedarf heran.

Bemerkung: Die im nachstehenden Text erwähnten “Bilder” beziehen sich auf die Fotos in der beigelegten englischen Bedieneranleitung.

Sicherheitsvorschriften

Damit die Sicherheit bei der Bedienung gewährleistet ist, sollten die nachstehenden Sicherheitsvorschriften eingehalten werden.

1. Das beschriebene Gerät ist ausschließlich genehmigt für die Verwendung mit Flüssigkeiten, die kompatibel sind mit dem Baumaterial des Gehäuses.
2. Bei der Messung von leichtentzündlichen Flüssigkeiten sollten sämtliche Brand- und Explosionsverhütungsvorschriften eingehalten werden.
3. Unter Verwendung von gefährlichen Flussigkeiten sind die Sicherheitsvorschriften des Lieferanten immer strengstens einzuhalten.
4. Falls das Gerät in einer risikoreichen Umgebung betrieben wird, sollten entsprechende Sicherheitsmaßnahmen getroffen werden.
5. Damit man immer die bestmöglichen Resultate erreicht, sollte die Eichung vor jeder Verwendung überprüft werden.

Die vorliegende Rechnerelektronik wurde speziell für den Einsatz an den GPI-Turbinengehäusen für industrielle Anwendungen entworfen. Sie ist außerdem vorgesehen zum Betrieb in Kombination mit verschiedenen Zubehörmodulen zur Übermittlung eines elektronischen Signals an eine große Anzahl von Anschlußgeräten.

Sämtliche GPI-Durchflußmeter wurden im Werk abgenommen und sind mit einer Genehmigungsbescheinigung Klasse 1, Abteilung 1, für den Einsatz in risikoträchtigen Umgebungen versehen. Die Durchflußmeter wurden im Werk abgenommen und geeicht gemäß den fortschrittlichsten Eichverfahren und unter Zuhilfenahme der modernsten Abnahmevorrichtungen. Die Werkseichung wurde entweder mit einem Standard-Abnahmelösemittel (Mittelflußturbinen) oder mit Wasser (Hochflußturbinen) auf 21 Celsius-Grad (70 Fahrenheit-Grad) vorgenommen.

Die Modellnummer Ihres Rechners wurde unten vorne am Rechner und unter einer der Batterien angebracht.

TÄGLICHER EINSATZ

Die im täglichen Einsatz meist durchgeführten Operationen werden nachstehend beschriebenen. Weitere Operationen werden

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im Abschnitt Bedienung erläutert. Lesen Sie die oben angeführten Sicherheitsvorschriften vor dem Gebrauch aufmerksam durch.

Der Durchflußmeter schaltet automatisch ein, sobald der Fluß anfängt, und schaltet einige Minuten nach dem Aufhören des Flusses automatisch aus. Der Durchflußmeter kann außerdem eingeschaltet werden, indem man die Taste ANZEIGE ("DISPLAY") eindrückt und losläßt.

Um die genaue gemessene Menge pro Beförderung abzulesen, verwendet man die Teilsumme. Um die Teilsumme rückzusetzen, sollte man sicherstellen, daß der Durchflußmeter eingeschaltet ist, und die Taste ANZEIGE (DISPLAY) drei Sekunden lang eingedrückt halten, bis die Anzeige genullt ist. Wenn die Meldung GESPERRT ("LOCKED") erscheint, wird die Gesamtsumme angezeigt. Diese Summe kann nicht von Hand rückgesetzt werden. Die Taste ANZEIGE (DISPLAY) eindrücken und loslassen, bis die Meldung GESPERRT (LOCKED) verschwindet. Die Batterien ersetzen, sobald die Anzeige unleserlich wird. Für nähere Information verweisen wir auf den Abschnitt Wartung.

AUFSTELLUNG

Falls die Rechnerelektronik zusammen mit einem Turbinengehäuse bestellt wurde, so wird sie bereits im Werk eingebaut. Wurde die Elektronik jedoch separat bestellt, so reicht es aus, den Rechner mittels der vier Schrauben in den Ecken der Frontplatte auf die Turbine zu befestigen. Stellen Sie sicher, daß sich der O-Ring einwandfrei in seinem Sitz befindet, bevor Sie die Schrauben anziehen. Wurde der Rechner zusammen mit der Turbine und mit einem Zubehörmodul bestellt, so wird empfohlen, sämtliche Aufstellungsanweisungen gründlich zu lesen und sie sich einzuprägen, bevor man mit der eigentlichen Installation anfängt.

Sämtliche GPI-Turbinen sind zur Messung des Flusses in einer einzigen Richtung vorgesehen. Diese Richtung wird angedeutet durch den Pfeil an der Ausgangsseite der Turbine. Wünscht man den Fluß in der entgegengesetzten Richtung zu messen, so reicht es aus, den Rechner vor der Aufstellung um 180 Grad zu drehen.

Vermeiden Sie eine Aufstellung in einer elektronisch gestörten Umgebung. Der Rechner sollte in einer Mindestentfernung von 15.2 cm (6 Zoll) von eventuellen Motoren, Relais oder Trafos installiert werden.

Überprüfung der Genauigkeit

Es wird empfohlen, die Genauigkeit und die Eichung vor jedem Einsatz zu überprüfen. Sicherstellen, daß sich im System keine Luft befindet. Eine genau bestimmte Menge Flüssigkeit in einen Eichbehälter befördern. Die beförderte Menge mit der Anzeige oder mit der Meßeinrichtung vergleichen. Es kann notwendig sein, einen Korrekturfaktor zu verwenden, um die Endmenge zu bestimmen. Die Genauigkeit ist im Rahmen der vorbeugenden Wartung regelmäßig zu überprüfen, damit man stets die besten Resultate erreicht.

BEDIENUNG

Sämtliche Operationen werden an der Frontseite des Durchflußmeters angezeigt (Bild 3). Die obere Zeile stellt die Eichkurve dar. Die mittlere Zeile zeigt die Information bezüglich des Flusses. Auf der unteren Zeile werden die Gesamt- und Teilsummen angezeigt.

Die Teilsumme stellt den Fluß während einer einzigen Beförderung dar. Die Meldung besteht aus der Bezeichnung SUMME ("TOTAL") und einer Zahl auf der unteren Zeile. Bei den meisten Modellen handelt es sich um die Zahl 2 ("TOTAL 2"). Um die Teilsumme rückzusetzen, sollte man sicherstellen, daß die Teilsumme angezeigt ist, und die Taste ANZEIGE ("DISPLAY") eingedrückt halten, bis die angezeigten Zahlen genullt sind.

Die Gesamtsumme stellt die Summe aller Messungen dar, seitdem die Speisung des Durchflußmeters angeschlossen wurde. Die Anzeige dieser Summe setzt sich zusammen aus der Bezeichnung SUMME (TOTAL) und einer Zahl, und ist immer GESPERRT ("LOCKED"), da sie nicht von Hand rückgesetzt werden kann (Bild 2). Um von einer Summe auf die andere umzuschalten, ist die Taste ANZEIGE

(DISPLAY) einzudrücken und loszulassen. Im Allgemeinen verändert sich die Anzeige, sobald die Tasten losgelassen werden. Die Gesamtsumme wird genullt sobald die Batterien erschöpft sind oder entfernt werden, oder sobald die Summe den Höchstwert von 999,999 erreicht.

Die zwei Eichkurventypen, Eichung vor Ort und Werkseichung, werden auf der oberen Zeile angezeigt. Der Bediener stellt vor Ort eine Eichkurve ein. Diese Zeile kann zu jeder Zeit abgeändert werden, indem man die Anweisungen im Abschnitt Eichung befolgt. Die Werkseichkurve wird vom Hersteller eingestellt und permanent im Speicher des eingebauten Rechners festgehalten. Die Werkseichkurven werden angezeigt mit der Bezeichnung VORGEGEBEN ("PRESET") auf der oberen Zeile (Bild 3).

Um die Eichkurven abzuändern, sollte die Taste EICHUNG ("CALIBRATE") eingedrückt gehalten werden, während man die Taste ANZEIGE ("DISPLAY") eindrückt und wieder losläßt. Sobald die gewünschte Kurve erscheint, läßt man beide Tasten los. Die Eichkurve vor Ort wird angezeigt mit der Bezeichnung EICHUNG ("CAL") und einem Buchstaben. Bei den meisten Modellen handelt es sich um den Buchstaben B ("CAL B"). Die Werkseichung wird immer mit der Bezeichnung VORGEGEBEN ("PRESET") nebenan angezeigt (Bild 3). Bei den meisten Modellen wird die Werkseichung angezeigt durch die Meldung EICHUNG A VORGEGEBEN ("CAL A PRESET").

Einige Modelle sind mit einer Anzeige des Durchsatzes ausgestattet, im Gegensatz zur normalen Flußmenge. Wenn diese Option aktiviert ist, wird die Bezeichnung DURCHSATZ ("FLOWRATE") auf der unteren Zeile links angezeigt (Bild 4), und stellen die Zahlen auf der mittleren Zeile den Durchsatz dar, z. B. in Liter pro Minute. Um diese Option zu aktivieren, sollte man die Taste ANZEIGE (DISPLAY) eindrücken und loslassen, bis die Bezeichnung DURCHSATZ (FLOWRATE) erscheint.

Einge Modelle verfügen außerdem über eine Umgehungsoption für diejenige Anwendungen, wobei der Durchflußmeter bei einem Dauerfluß eingesetzt wird, und es wichtig ist, die Batterien zu sparen. Wenn diese Option aktiv ist, wird der Fluß vom Rechner weder überwacht noch gemessen, und wird die Bezeichnung UMGEHUNG ("BYPASS") auf der mittleren Zeile angezeigt (Bild 5). Während der Umgehungsoperation ermittelt der Durchflußmeter den Fluß nicht, und wird die Anzeige nach wenigen Minuten gelöscht. Um die Anzeige zu aktivieren und die gute Wirkung zu überprüfen, sollte auf die Taste ANZEIGE ("DISPLAY") gedrückt werden. Die Umgehungsoption kann erneut eingeschaltet werden, um die Speisung der Batterien zu sparen.

Jedesmal, wenn Flüssigkeit durch den Durchflußmeter strömt, wird ein kleines Flügelrad angezeigt.

EICHUNG

Die Eichung vor Ort ist notwendig, wenn die Genauigkeit der Werkseichung nicht ausreicht. Die Werkseichung wird mit Flüssigkeiten mit einer niedrigen Viskosität durchgeführt. Wenn Flüssigkeiten mit einer höheren Viskosität befördert werden, kann eine Eichung vor Ort die Genauigkeit des Durchflußmeters verbessern. Eichung vor Ort unter dem Flußverhältnis von 10:1 kann sich negativ auf die Genauigkeit auswirken.

Wegen des erheblichen Durchsatzes soll die Eichung vor Ort der Hochfluß-Durchflußmeter (1-1/2 und 2 Zoll) im Zusammenhang mit einer genauen Bestimmung der Menge und des Gewichts anhand von Skalen mit einer Feinauflösung durchgeführt werden.

Damit bei der Eichung vor Ort die bestmöglichen Resultate erreicht werden, sollte die Flüssigkeit bei dem Durchsatz gemessen werden, der sich den wirklichen Betriebsbedingungen am besten annähert. Außerdem sollte die Beförderung beim vollen Durchfluß stattfinden. Den vollen Durchfluß so oft wie notwendig ein- und ausschalten. Einen genauen Eichbehälter verwenden.

Während der Eichung sind die Mindestforderungen für den Durchsatz des Durchflußmeters zu berücksichtigen. Der Mindestdurchsatz für den Halbzolldurchflußmeter ist 1.9 Liter/Min (0.5 Gallonen/

Min). Der Mindestdurchsatz für den Dreiviertelzolldurchflußmeter beträgt 3,8 Liter/Min (1 Gallone/Min). Der Mindestdurchsatz für den Einzolldurchflußmeter ist 9,5 Liter/Min (2,5 Gallonen/Min). Der Mindestdurchsatz für den Anderthalbzolldurchflußmeter beträgt 19 Liter/Min (5 Gallonen/Min). Der Mindestdurchsatz für den Zweizolldurchflußmeter ist 38 Liter/ Min (10 Gallonen/Min).

Bei der Eichung sollten die Tasten in der richtigen Reihenfolge betätigt werden. Vor der Eichung sollte der Durchflußmeter gemäß den obigen Anweisungen installiert sein. Das System ist unmittelbar vor der Eichung zu entlüften.

Das Maximum, das während eines Eichungsvorgangs verteilt bzw. angepaßt wird, sollte bei den meisten Modellen 99,99 Einheiten nicht übersteigen. Bei Modellen mit Beschlägen im Umfang von 1-1/2 oder 2 Zoll und einigen spezialangefertigten Modellen, sollte das Maximum 999,9 Einheiten nicht übersteigen. Während des Eichungsvorgangs werden die zwei linken Stellen auf der Anzeige ignoriert.

Eichungsvorgänge - Ableitungung/ Anzeige

1. Die Taste EICHUNG ("CALIBRATE") gedrückt halten und gleichzeitig die Taste ANZEIGE ("DISPLAY") drücken und wieder loslassen, bis die Eichkurve erscheint. Beide Tasten loslassen.

   Beachten Sie: Eichkurven sind *nicht* voreingestellt.
2. Die Taste ANZEIGE ("DISPLAY") drücken und wieder loslassen, bis die Gesamtdurchflußmenge angezeigt wird.

   Beachten Sie: Gesamtdurchflußmengen werden *nicht* permanent eingestellt.
3. Die Taste ANZEIGE ("DISPLAY") drei Sekunden lang gedrückt halten, um das Ergebnis auf Null zurückzusetzen.
4. Die gewünschte Menge ableiten und Verfahren einstellen.

   Die besten Ergebnisse werden erzielt, indem die Ableitung bei einer Durchflußrate durchgeführt wird, die den gewöhnlichen Betriebsbedingungen entspricht. Ein teilweises oder völliges Eindämmen des Durchflusses ist zu vermeiden.
5. Die Taste EICHUNG ("CALIBRATE") drücken und dann zusammen mit der Taste ANZEIGE ("DISPLAY") so lange (etwa drei Sekunden) gedrückt halten, bis die Anzeige EICHUNG-dd ("CAL-dd") aufblinkt. Beide Tasten loslassen.
6. Sobald die Tasten losgelassen werden, fließt die abgeleitete Menge zurück, begleitet von einer aufleuchtenden Ziffer. Stellen Sie die Zahlenangabe auf den gewünschten Wert ein. ANZEIGE ("DISPLAY") bewegt sich von links nach rechts. EICHUNG ("CALIBRATE") verstellt den Zahlenwert zwischen 0 und 9.

   Beachten Sie: Während des Eichungsvorgangs werden die zwei linken Stellen auf der Anzeige ignoriert.
7. Sobald Sie die Zahlenangabe auf den gewünschten Wert eingestellt haben, die Taste EICHUNG ("CALIBRATE") gedrückt halten und kurz die Taste ANZEIGE ("DISPLAY") drücken. EICHUNG-Ende ("CAL-End") leuchtet auf und der soeben eingestellte Wert erscheint, ohne daß dabei Ziffern aufblinken. Der Eichungsvorgang ist damit abgeschlossen.

   Sie können nun den normalen Betrieb wiederaufnehmen. Falls die Anzeige NEIN ("NO") erscheint, siehe Anmerkungen zu Fehlersuche und -behebung.

WARTUNG

Diese Durchflußmeter sind im täglichen Gebrauch praktisch wartungsfrei. Es soll trotzdem vermieden werden, daß die Flüssigkeit im Inneren des Durchflußmeters erstarrt. Falls die Flüssigkeit erstarrt ist und sich auf das Laufrad abgesetzt hat, so sind die inneren Teile mit einem kriechfähigen Schmiermittel wie z.B. WD-40 oder mit einem Lösungsmittel zu reinigen. Der Durchflußmeter darf unter keinen Umständen in eine Flüssigkeit eingetaucht werden. Um die Rückstände vom Laufrad zu entfernen, kann man eine weiche Bürste oder eine kleine Probe einsetzen. Keine Druckluft durch den Durchflußmeter blasen.

Ersetzung der Batterien

Die hier besprochenen Durchflußmeter sind ausgestattet mit ersetzbaren Lithiumbatterien, die die Speisung während mindestens 4.000 Betriebsstunden gewährleisten. Damit die gute Wirkung sichergestellt ist, sollte man mindestens einmal pro Jahr die Batterien überprüfen und die Pole reinigen. Wenn die Anzeige des Durchflußmeters unleserlich wird, sind die Batterien zu ersetzen. Wenn die Batterien abgeschaltet werden oder erschöpft sind, werden die Teil- und Gesamtsummen genullt. Die Werkseichkurve und die Kurve der Eichung vor Ort bleiben erhalten. Wenden Sie sich an den örtlichen Vertreter oder Großhändler für die Beschaffung von neuen Batterien.

Um die Batterien zu ersetzen, müssen die Schrauben in den Ecken der Frontplatte des Durchflußmeters gelöst und muß die Rechnergruppe entfernt werden. Die erschöpften Batterien entnehmen. Falls notwendig ist die Korrosion von den Polen zu entfernen. Die neuen Batterien mit den Pluspolen in die richtige Richtung einsetzen. Die Anzeige wird sofort wieder leserlich. Sicherstellen, daß sich der O-Ring fest in seinem Sitz befindet. Die Rechnergruppe erneut auf die Turbine aufsetzen und die Frontplatte mit den Schrauben in den Ecken anschrauben.

FEHLERSUCHE

A. DER DURCHFLUßMETER MIßT NICHT GENAU

1. **Die Eichung vor Ort wurde nicht richtig durchgeführt.** Die Eichung wiederholen oder die Werkseichung anwählen. Wir verweisen auf die Anweisungen für die Bedienung und die Eichung.
2. **Die Werkseichung eignet sich nicht für die zu messende Flüssigkeit.** Eine Eichung vor Ort durchführen gemäß den Anweisungen für die Eichung.
3. **Der Durchflußmeter wird unter dem Mindestdurchsatz betrieben.** Den Durchsatz erhöhen.
4. **Der Durchflußmeter ist teilweise verstopft durch erstarrte Flüssigkeit.** Den Durchflußmeter entfernen und sorgfältig reinigen.
5. **Die Lager des Durchflußmeters sind teilweise verstopft durch erstarrte Flüssigkeit.** Den Durchflußmeter entfernen und sorgfältig reinigen.
6. **Dichtungsmaterial hat sich um das Laufrad gewickelt.** Den Durchflußmeter ausbauen und das Dichtungsmaterial vom Laufrad entfernen. Sicherstellen, daß sich das Laufrad frei bewegen kann.
7. **Der Durchflußmeter wurde zu nahe an den Aramaturen installiert.** Richtig installieren. Wir verweisen auf die Anweisungen für die Installation.
8. **Der Durchflußmeter wurde zu nahe an einem Motor oder in einer elektrisch gestörten Umgebung installiert.** Richtig installieren. Wir verweisen auf die Anweisungen für die Installation.

B. ANZEIGE KAUM ODER NICHT LESERLICH

1. **Die Batterien sind erschöpft oder abgeschaltet.** Den Rechner entfernen und die Batterien ersetzen. Wir verweisen auf den Abschnitt Wartung.
2. **Der Rechner ist defekt.** Wenden Sie sich an den örtlichen Vertreter oder Großhändler.

C. NORMALER DURCHSATZ, ABER DER DURCHFLUßMETER MIßT NICHT. **(Der Durchflußmeter schaltet ein, wenn man auf die Taste ANZEIGE ("DISPLAY") drückt.)**

1. **Die Eichung vor Ort wurde nicht richtig durchgeführt.** Die Eichung wiederholen oder die Werkseichung anwählen. Wir verweisen auf den Abschnitt Bedienung oder Eichung.
2. **Das Laufrad hat sich festgefressen oder ist beschädigt.** Den Durchflußmeter entfernen. Sicherstellen, daß sich das Laufrad frei bewegen kann.
3. **Dichtungsmaterial hat sich um das Laufrad gewickelt.** Den Durchflußmeter ausbauen und die Fremdkörper vom Laufrad entfernen. Sicherstellen, daß das Laufrad sich frei bewegen kann.
4. **Der Rechner ist defekt.** Wenden Sie sich bitte an den örtlichen Vertreter oder Großhändler.

D. REDUZIERTER DURCHSATZ UND DER DURCHFLUßMETER MIßT NICHT (Der Durchflußmeter schaltet ein, wenn man auf die Taste ANZEIGE ("DISPLAY") drückt.)

1. **Der Durchflußmeter ist verstopft durch erstarrte Flüssigkeit.** Den Durchflußmeter ausbauen und sorgfältig reinigen. Wir verweisen auf den Abschnitt Wartung. Sicherstellen, daß das Laufrad frei dreht.

E. UMSCHALTEN DES DURCHFLUßMETERS AUF EICHUNG VOR ORT UNMÖGLICH

1. **Die Werkseichkurve VORGEGEBEN ("PRESET") ist aktiv.** Wir verweisen auf die Anweisungen für die Eichung.
2. **Die Schaltkarte des Rechners ist defekt.** Den Rechner ersetzen. Wenden Sie sich an den örtlichen Verteiler oder Großhändler.

F. NACH DER EICHUNG VOR ORT BLINKT DIE MELDUNG NEIN ("NO").

1. **Durchsatz zu gering.** Erneut versuchen und den Minimumdurchsatz berücksichtigen. Wir verweisen auf die Anweisungen für die Eichung.
2. **Das Laufrad kann sich nicht frei bewegen.** Den Durchflußmeter ausbauen und sorgfältig reinigen.

SERVICE

Für sämtliche GPI-Durchflußmeter gilt eine beschränkte einjährige Gewährleistung. Für die Gewährleistung, Ersatzteile oder sonstige Service-Auskünfte wenden Sie sich bitte an den örtlichen Vertreter oder Großhändler.

GPI ist eine eingetragene Schutzmarke der Gesellschaft Great Plains Industries, Inc. Patente in den Vereinigten Staaten 4,856,348; 4,700,579 und 5,046,370. Australisches Patent 572,494. Kanadisches Patent 1,223,464. Europäisches Patent 0147004. Deutsches Patent P347894.2-08. Italienisches Patent 68074-BE/89.

ESPAÑOL

INFORMACIÓN GENERAL

Le felicitamos por haber elegido un ordenador GPI de calidad industrial. Las siguientes instrucciones le ayudarán a instalar el ordenador y a mantenerlo en buen estado. (Figura 1) Las instrucciones para la calibración se encuentran aquí. Las instrucciones de la caja de la turbina y módulos accesorios se encuentran en otros manuales. Consúltelos si es necesario.

Nota: las «figuras» mencionadas en el texto se refieren a las fotografías del manual de instrucciones inglés adjunto.

Instrucciones de Seguridad

Para su futura seguridad, le rogamos lea atentamente las advertencias hechas a continuación.

1. Este contador está previsto para funcionar únicamente con fluidos compatibles con el material de construcción de la caja del contador.
2. Cuando mida líquidos inflamables, tome todas las precauciones necesarias para evitar incendios o explosiones.
3. Cuando trabaje con líquidos peligrosos, observe siempre las instrucciones de seguridad dadas por el fabricante de éstos.
4. Cuando trabaje en un entorno peligroso, tome siempre las precauciones de seguridad convenientes.
5. Para mejores resultados, compruebe siempre la calibración antes de utilizar el contador.

Estos ordenadores se utilizan específicamente en cajas de turbina GPI de calidad industrial. También están previstos para funcionar con varios módulos accesorios que transmiten una señal eléctrica a una gran cantidad de elementos externos.

Todos los contadores GPI están homologados por Factory Mutual, con una homologación de Clase 1, División 1, para ser utilizados en un entorno peligroso. Han sido sometidos a pruebas y calibrados en la fábrica, por medio de procedimientos de calibración y equipos de prueba punteros.

La calibración en la fábrica se lleva a cabo mediante un disolvente Stoddard para pruebas (para las turbinas de Flujo Medio) o agua (para las turbinas de Gran Flujo), a 21 grados C (70 grados F).

El número de modelo de su ordenador se encuentra en la parte frontal inferior del ordenador y también debajo de la batería.

USO DIARIO

Para el uso corriente, las operaciones que le indicamos a continuación son las más utilizadas. Las demás se encuentran en el capítulo Utilización. Antes de utilizar el contador, lea las Instrucciones de Seguridad aquí arriba.

Este contador empieza a funcionar automáticamente cuando el líquido empieza a correr y se detiene automáticamente unos minutos después de que el flujo haya cesado. También se puede accionar el contador manualmente pulsando y soltando el botón PANTALLA («DISPLAY»).

Para ver el volumen medido en cada uso, utilice el Total parcial. Para que el total parcial vuelva a la posición cero, asegúrese de que el contador está en posición de funcionamiento y mantenga pulsado el botón PANTALLA (DISPLAY) durante tres segundos hasta que aparezcan ceros. Si el visualizador indica BLOQUEADO («LOCKED»), se trata del Total general. Este no se puede volver manualmente a la posición cero. Pulse y suelte el botón PANTALLA (DISPLAY) hasta que la indicación BLOQUEADO (LOCKED) desaparezca. Si los números se borran o desaparecen, reemplace las baterías Véanse detalles en el capítulo Mantenimiento.

INSTALACIÓN

Si Ud ha encargado el ordenador con una caja de turbina, la instalación se hace en la fábrica. Si ha encargado el ordenador y la turbina por separado, coloque simplemente el ordenador en la turbina con los cuatro tornillos situados en las esquinas de la placa frontal. Asegúrese de que la junta está correctamente colocada antes de apretar los tornillos. Si ha encargado el ordenador con turbina y un módulo accesorio, lea muy atentamente todas las instrucciones para la instalación antes de empezar.

Todas las turbinas GPI están previstas para medir el paso del flujo en una sola dirección, o sea, la dirección que indica la flecha moldeada en el metal, situada en la salida de la turbina. Si desea trabajar en la otra dirección, basta con girar el ordenador de 180 grados antes de empezar la instalación.

Evite instalar el contador en un lugar donde haya «parásitos» electrónicos. Instale el contador a una distancia de por lo menos 15,2 cm (6 pulgadas) de cualquier motor, relé o transformador.

Control de la Precisión

Antes de cada utilización, compruebe la precisión y la calibración. Asegúrese de que no hay aire en el sistema. Mida un volumen exacto conocido en un contenedor de precisión. Compruebe el volumen con las indicaciones del visualizador o del registrador. Si es necesario, utilice un factor de corrección para determinar el volumen final. Para obtener un resultado óptimo, conviene incluir el control periódico de la precisión en las operaciones de mantenimiento corriente.

UTILIZACIÓN

Puede visualizar todas las operaciones en la pantalla situada en la parte frontal del contador. (Figura 3). La línea de arriba indica la curva de calibración. En la línea del medio se encuentran los datos relativos al flujo. En la línea de abajo se encuentran los datos procedentes del totalizador.

El Total parcial indica el volumen de líquido medido durante una sola utilización. Aparece la palabra TOTAL («TOTAL») y un número en la línea de abajo. En la mayoría de los modelos éste es el TOTAL 2 («TOTAL 2»). Para volver el Total parcial a la posición cero, asegúrese de que la pantalla indica el Total parcial y mantenga el botón PANTALLA («DIS PLAY») pulsado hasta que aparezcan ceros.

El Total general indica la cantidad líquido medido por el contador desde que éste se conectó. Para indicar este total, aparece la palabra TOTAL (TOTAL) con un número y siempre la palabra

BLOQUEADO («LOCKED») porque este total no se puede volver manualmente a la posición cero. (Figura 2) Para pasar de un total a otro, pulse y suelte el botón PANTALLA (DISPLAY). Las indicaciones de la pantalla suelen cambiar cuando se suelta el botón. El Total general vuelve a la posición cero cuando las baterías se quitan o van perdiendo potencia o cuando el total alcanza el valor máximo (999,999).

Ambas curvas de calibración, la Calibración en condiciones reales y la Calibración de fábrica, se pueden ver en la línea superior del visualizador. El usuario determina la Curva de Calibración en condiciones reales. Puede cambiarse o modificarse en todo momento siguiendo las instrucciones dadas más adelante en el capítulo Calibración. La Curva de Calibración de fábrica está preseleccionada por el fabricante y almacenada permanentemente en el ordenador del contador. La pantalla indica PRESELECCIÓN («PRESET») en la línea superior para indicar las Curvas de Calibración de Fábrica. (Figure 3)

Para cambiar las Curvas de Calibración, mantenga pulsado el botón CALIBRAR («CALIBRATE») mientras pulsa y suelta el botón PANTALLA («DISPLAY»). Cuando aparezca la curva deseada, suelte ambos botones. La calibración en condiciones reales está representada por CAL («CAL») y una letra. En la mayoría de los modelos suele ser la letra B («CAL B»). Junto a la Calibración de fábrica, aparece siempre la palabra PRESELECCIÓN («PRESET»). (Figura 3) En la mayoría de los modelos, PRESELECCIÓN CAL A («CAL A PRESET») indica la Calibración de fábrica.

En algunos modelos la pantalla indica la velocidad del flujo en lugar del habitual volumen del flujo. Cuando está activada, aparece la palabra VELOCIDAD DEL FLUJO («FLOWRATE») a la izquierda, en la línea inferior. (Figura 4) Cuando está activada, los números situados en la línea del medio indican la velocidad del flujo, por ejemplo, litros por minuto. Para activarla, pulse y suelte el botón PANTALLA (DISPLAY) hasta que aparezca VELOCIDAD DEL FLUJO (FLOWRATE).

Algunos modelos contienen un sistema de desvío para cuando el líquido fluye continuamente por el contador y que resulta importante mantener la corriente. Cuando el sistema de desvío está funcionando, el ordenador para de controlar y de totalizar el flujo. Cuando funciona el desvío, la palabra DESVIO («BYPASS») aparece en la línea del medio de la pantalla. (Figura 5) Durante el desvío, el contador deja de detectar el paso del líquido y los datos de la pantalla desaparecen después de unos minutos. Pulse el botón PANTALLA («DISPLAY») para activar la visualización y compruebe su funcionamiento. Active de nuevo el sistema de desvío para conservar la corriente de la batería.

Cada vez que el líquido fluye por el contador, aparece una pequeña hélice en la pantalla.

CALIBRACIÓN

La Calibración en condiciones reales es necesaria cuando la precisión de la Calibración de Fábrica no conviene. La Calibración de Fábrica se lleva a cabo con líquidos de poca viscosidad. Si utiliza un líquido con una viscosidad diferente, la Calibración en condiciones reales mejorará la precisión del contador.

La Calibración de un punto en condiciones reales, por debajo de un caudal de 10:1, puede tener une efecto adverso en la precisión.

Debido a la velocidad elevada del flujo la Calibración en condiciones reales de los Contadores de Gran Flujo (36 mm y 48 mm o 1-1/2 y 2 pulgadas) ha de llevarse a cabo combinando el volumen y el peso, determinados por medio de escalas de alta precisión.

Para obtener una precisión óptima durante la Calibración en condiciones reales, abra la admisión de líquido hasta alcanzar la velocidad de flujo que mejor simule sus condiciones de funcionamiento reales. Abra también al máximo. Abra al máximo y cierre rápidamente tantas veces como sea necesario. Utilice un contenedor de calibración de precisión.

Durante la calibración, respete los requisitos mínimos del contador en cuanto a velocidad de flujo. El mínimo para los contadores de 12 mm (1/2 pulgada) es 1,9 LPM (0,5 GPM). Para los de 18 mm (3/4 de pulgada), 3,8 LPM (1 GPM). Para los de 24 mm (1 pulgada), 9,5 LPM (2,5 GPM). Para los de 38 mm (1-1/2 pulgada), 19 LPM (5 GPM) y los de 48 mm (2 pulgadas), 38 LPM (10 GPM).

Durante las operaciones de calibración, pulse los botones en el orden indicado. Antes de empezar a calibrar, instale el contador siguiendo las instrucciones que le hemos dado. Justo antes de empezar a calibrar, purgue el sistema para sacarle todo el aire.

El máximo volumen que se puede usar durante la calibración no debe exceder 99,99 unidades en la gran mayoría de los modelos. Algunos modelos especiales, y modelos con juntas de 1-1/2 a 2 pulgadas pueden calibrarse con un volumen mayor, siempre y cuando no se excedan 999,9 unidades. Recuerde que los 2 dígitos de la izquierda son ignorados durante la calibración.

Procedimientos de Calibración

1. Mantenga pulsado el botón de calibrar ("CALIBRATE") mientras pulsa y suelta el botón de pantalla ("DISPLAY"), hasta que aparezca la curva de calibración en campo. Suelte ambos botones.

   Recuerde que la curva de calibración en campo *no* está preprogramada.
2. Pulse y suelte el botón de PANTALLA ("DISPLAY") hasta que aparezca el total por lote.

   Recuerde que el total por lote *no* está programado.
3. Presione el botón de PANTALLA ("DISPLAY") durante tres segundos para borrar el total por lote.
4. Dispense el volumen deseado de tal forma que la velocidad del flujo sea similar a la que usted desea usar en condiciones normales. Evite detener e disminuir el flujo.
5. Presione el botón de CALIBRAR ("CALIBRATE") y PANTALLA ("DISPLAY") durante tres segundos aproximadamente, hasta que el mensaje "CAL-dd" aparezca en la pantalla. Suelte ambos botones.
6. Al soltar los botones, comenzará a parpadear uno de los dígitos de la pantalla. Ajuste el volumen del líquido; use el botón de PANTALLA ("DISPLAY") para cambiar de dígito, y el botón de CALIBRAR ("CALIBRATE") para modificar el valor del dígito entre 0 y 9.

   Recuerde que no se consideran los dos dígitos de la izquierda durante la calibración.
7. Mientras mantiene pulsado el botón de CALIBRAR ("CALIBRATE") pulse momentáneamente el botón de PANTALLA ("DISPLAY"), y aparecerá el mensaje "CAL End" en la pantalla. El aparato queda calibrado.

   Si aparece el mensaje NO ("NO") en la pantalla, vea la sección de "Detección de Averías."

MANTENIMIENTO

Virtualmente, estos contadores no necesitan mantenimiento en su uso corriente. No deje que se seque ningún líquido dentro del contador. Si algún líquido se ha secado y endurecido en el rotor, limpie los componentes internos con un lubricante penetrante como el WD-40 o con un disolvente para limpiar. No sumerja el contador. Se puede utilizar un pincel suave o una sonda pequeña para limpiar los residuos pegados al rotor. No utilice aire comprimido.

Cambio de Baterías

Este contador lleva baterías de litio reemplazables cuya duración es de 4.000 horas de uso real. Compruebe las baterías y limpie los contactos por lo menos una vez al año para conseguir un funcionamiento óptimo. Si las indicaciones de la pantalla se borran o desaparecen, es que la corriente es insuficiente o que las baterías están gastadas. Cuando las baterías están desconectadas o fallan, los Totales parcial y general vuelven a la posición cero. Sin embargo, las Curvas de calibración de fábrica y en condiciones reales no cambian. Diríjase a su distribuidor o vendedor local para el cambio de baterías.

Para cambiar las baterías, saque los tornillos de las esquinas de la parte frontal del contador y levante el bloque del ordenador. Saque las baterías gastadas. Limpie la corrosión que haya podido formarse en los contactos. Coloque las baterías nuevas en su sitio, con el polo positivo en la posición correcta. Las indicaciones de la pantalla deben aparecer inmediatamente. Asegúrese de que la junta está correctamente colocada. Coloque el ordenador en la turbina y sujete los tornillos.

DETECCIÓN DE AVERIAS

A. EL CONTADOR CARECE DE PRECISIÓN

1. **La Calibración en condiciones reales no está hecha correctamente.** Vuelva a calibrar o seleccione la Calibración de fábrica. Véanse las instrucciones en los capítulos Utilización y Calibración.
2. **La Calibración de fábrica no conviene para el líquido utilizado.** Realice una Calibración en condiciones reales siguiendo las instrucciones de Calibración.
3. **Se utiliza el contador por debajo de la velocidad mínima de flujo.** Aumente la velocidad del flujo.
4. **Se ha secado líquido en el contador, obstruyéndolo parcialmente.** Saque el contador. Limpie cuidadosamente.
5. **Se ha secado líquido, obstruyendo parcialmente los cojinetes del contador.** Saque el contador. Limpie cuidadosamente.
6. **Se ha enroscado material para obturar en del rotor.** Saque el contador. Limpie el rotor. Asegúrese de que el rotor gira libremente.
7. **Se ha instalado el contador demasiado cerca de los empalmes.** Instale correctamente. Véanse las instrucciones de Instalación.
8. **Se ha instalado el contador demasiado cerca de algún motor o en un lugar donde existen «parásitos» eléctricos.** Instale correctamente. Véanse las instrucciones de Instalación.

B. VISUALIZACIÓN BORROSA O INVISIBLE

1. **Las baterías van perdiendo potencia o están gastadas o desconectadas.** Levante el ordenador y reemplace las baterías. Véase capítulo Mantenimiento.
2. **Fallo del ordenador.** Póngase en contacto con su vendedor o distribuidor local.

C. VELOCIDAD DEL FLUJO NORMAL PERO EL CONTADOR NO CUENTA. **(El contador se enciende cuando el botón PANTALLA («DISPLAY») está pulsado).**

1. **La calibración en condiciones reales está mal hecha.** Vuelva a calibrar o seleccione la Calibración de fábrica. Véanse las instrucciones en los capítulos Utilización y Calibración.
2. **El rotor está bloqueado o averiado.** Quite el contador. Asegúrese de que el rotor gira libremente.
3. **Se ha enroscado material para obturar en el rotor.** Saque el contador. Limpie el rotor. Asegúrese de que el rotor gira libremente.
4. **Fallo del ordenador.** Póngase en contacto con su vendedor o distribuidor local.

D. VELOCIDAD DEL FLUJO REDUCIDA Y EL CONTADOR NO CUENTA. **(El contador se enciende cuando el botón PANTALLA («DISPLAY») está pulsado).**

1. **Se han secado líquidos en el contador, obstruyéndolo.** Saque el contador. Limpie cuidadosamente. Véase el capítulo Mantenimiento. Asegúrese de que el rotor gira libremente.

E. NO SE CONSIGUE LA CALIBRACIÓN EN CONDICIONES REALES

1. **La Curva de Calibración de fábrica (PRESELECCIÓN («PRESET»)) está activada.** Véanse las instrucciones de Calibración.
2. **El circuito del tablero del ordenador no funciona.** Reemplace el ordenador. Póngase en contacto con su vendedor o distribuidor local.

F. ARPADEA EL NO («NO») DESPUES DE LA CALIBRACIÓN EN CONDICIONES REALES.

1. **Poca velocidad de flujo.** Inténtelo otra vez y aumente la velocidad de flujo hasta alcanzar el mínimo. Véanse las instrucciones de Calibración.

2. **El rotor no gira libremente.** Quite el contador. Limpie cuidadosamente.

REPARACIÓN

Todos los contadores GPI están cubiertos por una garantía limitada de un año. Para más información acerca de la garantía, los recambios o cualquier reparación, diríjase a su distribuidor o vendedor local.

GPI es una marca registrada de Great Plains Industries, Inc. Patente estadounidense: 4,856,348; 4,700,579 y 5,046,370. Patente australiana: 572,494. Patente canadiense: 1,223,464. Patente europea: EU 0147004. Patente alemana: P347894.2-08. Patente italiana: 68074-BE/89.

FRANÇAIS

INFORMATION GENERALE

Toutes nos félicitations pour avoir choisi de l'électronique d'ordinateur d'usage industriel GPI. Les instructions suivantes vous aideront à utiliser et entretenir votre électronique d'ordinateur. (Figure 1) Les procédures de calibrage sont mentionnées ci-après. L'information sur les boîtiers de turbine et les modules accessoires se trouve dans d'autres manuels. Veuillez y faire référence si nécessaire.

Note: Les «Figures» mentionnées dans ce texte renvoient aux illustrations dans la version anglaise du «Manuel du Propriétaire» ci-jointe.

Instructions de sécurité

Pour votre sécurité future, veuillez parcourir les instructions de sécurité ciaprès.

1. Cet équipement est uniquement approuvé pour l'usage avec des liquides compatibles avec le matériau du boîtier.
2. Observez les précautions contre l'incendie ou l'explosion lorsque vous mesurez des liquides inflammables.
3. Respectez toujours les précautions de sécurité du fabricant du liquide lorsque vous manipulez des liquides dangereux.
4. Observez toujours les précautions de sécurité appropriées en travaillant dans des environnements dangereux.
5. Contrôlez toujours le calibrage avant usage pour obtenir un résultat optimal.

Cette électronique d'ordinateur est spécialement conçue pour l'emploi sur des boîtiers de turbine d'usage industriels GPI. Elle est également conçue pour fonctionner avec plusieurs modules accessoires qui transmettent un signal électronique vers un grande variété de périphériques.

Tous les compteurs GPI sont approuvés en usine et possèdent une approbation de classe 1, division 1 pour les environnements dangereux. Ils sont testés et calibrés en usine à l'aide de procédures de calibrage et d'équipement d'essai de pointe. Le calibrage en usine est effectué soit avec un solvant d'essai à base de naphtalène (sur des formats de turbine à débit moyen), soit avec de l'eau (sur des formats de turbine à débit élevé) à 21 degrés C (70 degrés F).

Le numéro de modèle de votre ordinateur est affiché sur la face avant inférieure de l'ordinateur ainsi que sous une batterie.

USAGE QUOTIDIEN

Au jour le jour, les opérations suivantes sont les plus courantes. D'autres sont mentionnées dans la Section «Fonctionnement». Parcourez les instructions de sécurité susmentionnées avant utilisation.

Le compteur s'enclenche automatiquement dès que le liquide se met à couler et il s'éteint automatiquement quelques minutes après que le liquide se soit arrêté de couler. Le compteur peut également être branché en appuyant et en relâchant le bouton d'AFFICHAGE («DISPLAY»).

Servez-vous du total par lot pour connaître le volume exact mesuré lors de chaque utilisation. Pour remettre le total par lot à zéro, veillez à ce que le compteur soit branché et maintenez le bouton d'AFFICHAGE enfoncé pendant trois secondes, jusqu'à ce que des zéros apparaissent. Si VERROUILLE («LOCKED») apparaît sur l'affichage, le total cumulé est affiché. Celui-ci ne peut être remis à zéro manuellement. Enfoncez et relâchez AFFICHAGE (DISPLAY) jusqu'à ce que VERROUILLE (LOCKED) disparaisse. Si les chiffres de l'affichage sont faibles ou s'effacent, les batteries doivent être remplacées. Voir les détails dans la Section «Entretien».

INSTALLATION

Si vous avez commandé votre électronique d'ordinateur avec un boîtier de turbine, elle est installée à l'usine. Si vous avez commandé votre ordinateur et votre turbine séparément, montez simplement l'ordinateur sur la turbine avec les quatre vis aux coins de la plaque avant. Veillez à ce que l'anneau en O soit tout à fait en place avant de serrer les vis. Si vous avez commandé l'ordinateur avec la turbine et un module accessoire, veuillez revoir et comprendre à fond toutes les instructions d'installation avant d'y procéder.

Toutes les turbines GPI sont conçues pour mesurer le débit dans une seule direction. La direction est indiquée par la flèche coulée dans la sortie de la turbine. Si vous souhaitez le sens inverse, faites simplement tourner l'électronique de l'ordinateur de 180 degrés avant l'installation.

Evitez les environnements électriquement «bruyants». Installez l'ordinateur au moins à 15,2 cm (6 pouces) de moteurs, de relais ou de transformateurs.

Vérification de la précision

Avant chaque emploi, contrôlez la précision et vérifiez le calibrage. Assurez-vous que le système ne contient pas d'air. Mesurez un volume connu avec exactitude dans un récipient précis. Vérifiez le volume par rapport au dispositif de lecture ou d'enregistrement. Si nécessaire, utilisez un facteur de correction pour représenter le volume final. La précision doit être vérifiée périodiquement, en tant que partie d'un schéma d'entretien de routine, pour un meilleur résultat.

FONCTIONNEMENT

Toutes les opérations sont indiquées sur l'affichage à l'avant du compteur. (Figure 3). La ligne supérieure identifie la courbe de calibrage. La ligne centrale indique l'information concernant le débit. La ligne inférieure montre l'information provenant du totalisateur.

Le total par lot indique le débit pendant une seule utilisation. Il est désigné comme TOTAL («TOTAL») suivi d'un chiffre sur la ligne inférieure. Sur la plupart des modèles, ce TOTAL est 2 («TOTAL 2»). Pour remettre le total par lot à zéro, veillez à ce que le total par lot soit affiché et maintenez AFFICHAGE («DISPLAY») enfoncé jusqu'à ce que l'affichage indique uniquement des zéros.

Le total cumulé est le total de tout le liquide mesuré depuis que le compteur a été connecté à la source de courant. Ce total est désigné par TOTAL (TOTAL) suivi d'un chiffre et toujours VERROUILLE («LOCKED»), car il ne peut être remis à zéro manuellement. (Figure 2). Pour passer d'un total à l'autre, enfoncez et relâchez AFFICHAGE (DISPLAY). En général, l'affichage change lorsque les boutons sont relâchés. Le total cumulé revient à zéro lorsque les batteries sont retirées ou s'épuisent ou encore lorsque le total atteint sa valeur maximale de 999.999.

Les deux types de courbe de calibrage - le calibrage par l'utilisateur et celui de l'usine - apparaissent sur la ligne supérieure de l'affichage. La courbe de calibrage par l'utilisateur est réglée par l'utilisateur. Elle peut être modifiée ou adaptée à tout instant selon les procédures indiquées dans la Section «Calibrage» ci-après. La courbe de calibrage de l'usine est préréglée par le fabricant et mémorisée en permanence dans l'ordinateur du compteur. Les courbes de calibrage d'usine affichent PREREGLE («PRESET) sur la ligne supérieure. (Figure 3).

Pour changer les courbes de calibrage, maintenez le bouton CALIBRAGE («CALIBRATE») enfoncé tout en enfonçant et relâchant AFFICHAGE («DISPLAY»). Lorsque la courbe souhaitée apparaît, relâchez les deux boutons. Le calibrage par l'utilisateur est indiqué par CAL («CAL») suivi d'une lettre. Sur la plupart des modèles il s'agit de CAL B («CAL B»). Le calibrage d'usine est toujours suivi du mot PREREGLE («PRESET») (Figure 3). Dans la plupart des modèles, le calibrage d'usine apparaît comme CAL A PREREGLE («CAL A PRESET»).

Certains modèles comportent également un affichage de la vitesse du débit, en opposition à l'habituelle quantité du débit. Lorsque cette fonction est activée, le mot VITESSE DU DEBIT («FLOWRATE») apparaît à gauche sur la ligne inférieure. (Figure 4). Dans cette fonction, les chiffres sur la ligne centrale indiquent la vitesse du débit, par exemple litres par minute. Pour activer cette fonction, enfoncez et relâchez AFFICHAGE (DISPLAY) jusqu'à ce que VITESSE DU DEBIT (FLOWRATE) apparaisse.

Certains modèles comportent une fonction de dérivation pour les cas où le débit du compteur est constant et que l'économie d'énergie est importante. Lorsque la fonction de dérivation est activée, le débit n'est pas mesuré et n'est pas totalisé par l'ordinateur. Lorsque cette fonction est activée, le mot DERIVATION («BYPASS») est affiché sur la ligne centrale. (Figure 5). Pendant la dérivation, le compteur ne mesure plus le débit et l'affichage s'éteint après quelques minutes. Appuyez sur le bouton AFFICHAGE («DISPLAY») pour activer l'affichage et vérifier si le compteur fonctionne comme il faut. Réactivez la dérivation pour économiser l'énergie des batteries.

Chaque fois qu'un liquide coule par le compteur, un e petite hélice est affichée.

CALIBRAGE

Le calibrage par l'utilisateur est nécessaire lorsque la précision du calibrage d'usine est insuffisante. Le calibrage d'usine est effectué à l'aide d'un liquide de faible viscosité. Si vous travaillez avec un liquide d'une autre viscosité, un calibrage par l'utilisateur peut améliorer la précision.

Le calibrage par l'utilisateur améliore la précision lorsque les caractéristiques de fonctionnement - habituellement le débit - ne sont pas uniformes. Un calibrage par l'utilisateur à point unique inférieur à un débit de 10:1 peut influencer défavorablement la précision.

Compte tenu des vitesses de débit élevées le calibrage par l'utilisateur de compteurs à débit élevé (1-1/2 et 2 pouces) doit être effectué avec une combinaison de volume et de poids déterminée à l'aide d'échelles à résolution précise.

Pendant le calibrage, les exigences minimales de vitesse de débit du compteur doivent être remplies. Le miminum du compteur de 1/2 pouce est de 1,9 LPM (0,5 GPM). Le minimum du compteur de 3/4 pouce est 3,8 LPM (1 GPM). Le minimum du compteur de 1 pouce est 9,5 LPM (2,5 GPM). Le minimum du compteur de 1-1/2 pouces est 19 LPM (5 GPM). Le minimum du compteur de 2 pouces est 38 LPM (10 GPM).

Utilisez les combinaisons de touches correctes pendant les procédures de calibrage. Avant de procéder au calibrage, installez le compteur conformément aux instructions susmentionnées. Purgez le système juste avant le calibrage.

Durant les procédures de calibrage décrites ci-dessous, le volume maximum distribué et réglé ne doit pas dépasser 99,99 unités pour la plupart des modèles. Sur les compteurs à raccord de 1,5 ou 2 pouces et sur certains modèles spéciaux, le volume maximum ne doit pas dépasser 999,9 unités. Pendant le calibrage, les deux numéros situés complètement à gauche sur l'affichage sont ignorés.

Procédures de calibrage de distribution/affichage

1. Appuyez sur le bouton CALIBRAGE («CALIBRATE») tout en enfonçant et en relâchant AFFICHAGE («DISPLAY») jusqu'à ce que la courbe de calibrage de terrain apparaisse. Relâchez les deux boutons.

   Notez bien que les courbes de calibrage de terrain *ne sont pas* préréglées.
2. Maintenez AFFICHAGE («DISPLAY») enfoncé jusqu'à voir apparaître le total cumulé.

   Notez bien qu'un total cumulé *n'est pas* verrouillé.

3. Maintenez le bouton AFFICHAGE («DISPLAY») enfoncé pendant trois secondes pour ramener à zéro le total.
4. Distribuez le volume désiré puis arrêtez.

   Pour obtenir les résultats les plus précis, distribuez à la vitesse de débit qui simule au plus près vos conditions réelles de fonctionnement. Evitez d'arrêter le débit ou de faire couler goutte à goutte.
5. Appuyez sur CALIBRAGE («CALIBRATE») puis enfoncez AFFICHAGE («DISPLAY») (en même temps) pendant environ trois secondes, jusqu'à voir clignoter CAL-dd («CAL-dd»). Relâchez les deux boutons.
6. Lorsque les boutons sont relâchés, le volume distribué est affiché avec un numéro clignotant. Réglez cet affichage au volume désiré. Le bouton AFFICHAGE («DISPLAY») fait bouger de gauche à droite, et CALIBRAGE («CALIBRATE») change la valeur de 0 à 9.

   Notez bien que pendant le calibrage, les deux numéros situés complètement à gauche de l'affichage sont ignorés.
7. Avec l'affichage réglé au volume désiré, appuyez sur le bouton CALIBRAGE («CALIBRATE») tout en appuyant rapidement sur AFFICHAGE («DISPLAY»). CAL-End («CAL-End») clignote et le nouveau volume réglé s'affiche sans numéro clignotant.

   Le calibrage est terminé et vous retournez au fonctionnement normal. Si NON («NO») s'affiche, voir la section intitulée : Résolution des problèmes.

ENTRETIEN

Lors d'un usage quotidien, ces compteurs ne requièrent quasi aucun entretien. Ne laissez pas des liquides sécher dans le compteur. Si des liquides ont séché et se sont coagulés sur le rotor, nettoyez les parties internes à l'aide d'un lubrifiant pénétrant tel que WD-40 ou un solvant de nettoyage. Ne submergez pas le compteur. Vous pouvez utiliser une brosse douce ou une petite sonde pour enlever des résidus du compteur. Ne soufflez pas d'air comprimé dans le compteur.

Remplacer les batteries

Ce compteur est équipé de batteries au lithium remplaçables par l'utilisateur et procurant du courant pour au moins 4.000 heures d'usage effectif. Vérifiez les batteries et nettoyez les bornes au moins chaque année pour assurer le bon fonctionnement. Si l'affichage du compteur devient faible ou disparaît entièrement, ceci signifie que le courant est faible ou épuisé. Lorsque les batteries sont déconnectées ou épuisées, les totaux par lot et cumulé reviennent à zéro. Les courbes de calibrage par l'utilisateur et d'usine ne sont pas perdues. Contactez votre concessionnaire ou distributeur local pour des batteries de remplacement.

Pour remplacer les batteries, enlevez les vis dans les coins de la face avant du compteur et soulevez la partie ordinateur. Retirez les anciennes batteries. Nettoyez si nécessaire la corrosion des bornes. Mettez les nouvelles batteries en place avec le pôle positif en position correcte. Vous devriez immédiatement voir les messages apparaître sur l'affichage de l'ordinateur. Assurez-vous que la bague en O soit bien en place. Remettez la partie ordinateur sur la turbine et fixez à l'aide des vis dans les coins.

RECHERCHE DES PANNES

A. LE METRE N'EST PAS PRECIS

1. **Le calibrage par l'utilisateur n'a pas été effectué comme il faut.** Répétez le calibrage par l'utilisateur ou sélectionnez le calibrage d'usine. Voir les instructions de fonctionnement et de calibrage.
2. **Le calibrage d'usine ne convient pas au liquide mesuré.** Procédez à un calibrage par l'utilisateur conformément aux instructions de calibrage.
3. **Le compteur a fonctionné sous le débit minimal.** Augmentez le débit.
4. **Le compteur est partiellement bouché par du liquide séché.** Retirez le compteur. Nettoyez soigneusement.
5. **Les roulements du compteur sont partiellement bouchés par du liquide séché.** Retirez le compteur. Nettoyez soigneusement.

6. **Un matériau étanche est enroulé autour du rotor.** Retirez le compteur. Enlevez le matériau en question du rotor. Veillez à ce que le rotor tourne sans être gêné.
7. **Monté trop près des garnitures.** Installez correctement. Voir instructions d'installation.
8. **Monté trop près de moteurs ou d'un environnement électriquement «bruyant».** Installez correctement. Voir instructions d'installation.

B. L'AFFICHAGE FAIBLE OU DISPARU

1. **Les batteries sont faibles, épuisées ou non connectées.** Retirez l'ordinateur et remplacez les batteries. Voir section «Entretien».
2. **L'ordinateur est défectueux.** Contactez le concessionnaire ou distributeur local.

C. LE DEBIT EST NORMAL MAIS LE METRE NE COMPTE PAS. (Le compteur est branché lorsque le bouton AFFICHAGE («DISPLAY») est enfoncé.)

1. **Le calibrage par l'utilisateur n'a pas été effectué correctement.** Répétez le calibrage par l'utilisateur ou sélectionnez le calibrage d'usine. Voir les instructions de fonctionnement ou de calibrage.
2. **Le rotor est bloqué ou endommagé.** Retirez le compteur. Veillez à ce que le rotor tourne sans être gêné.
3. **Un matériau étanche est enroulé autour du rotor.** Retirez le compteur. Enlevez le matériau en question du rotor. Veillez à ce que le rotor tourne sans être gêné.
4. **L'ordinateur est défectueux.** Contactez votre concessionnaire ou distributeur local.

D. LE DEBIT EST REDUIT ET LE COMPTEUR NE COMPTE PAS (Le compteur est branché lorsque le bouton AFFICHAGE («DISPLAY») est enfoncé.)

1. **Le compteur est bouché par des liquides séchés.** Retirez le compteur. Nettoyez soigneusement. Voir Section «Entretien». Veillez à ce que le rotor tourne sans être gêné.

E. IMPOSSIBLE DE METTRE LE COMPTEUR EN CALIBRAGE PAR L'UTILISATEUR

1. **Le calibrage d'usine PREREGLE («PRESET») est actif.** Voir les instructions de calibrage.
2. **La carte à circuits imprimés de l'ordinateur est défectueuse.** Remplacez l'ordinateur. Contactez votre concessionnaire ou distributeur local.

F. L'ORDINATEUR CLIGNOTE NON («NO») APRES LE CALIBRAGE PAR L'UTILISATEUR.

1. **La vitesse du débit est trop faible.** Essayez à nouveau et augmentez la vitesse du débit au minimum. Voir les instructions de calibrage.
2. **Le rotor ne tourne pas sans gêne.** Retirez le compteur. Nettoyez soigneusement.

SERVICE

Tous les compteurs GPI sont couverts par une garantie limitée d'un an. Pour ce qui est de la garantie, des pièces ou d'autres informations concernant le service, veuillez contacter votre concessionnaire ou distributeur local.

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ITALIANO

INFORMAZIONI GENERICHE

Congratulazioni per avere ricevuto la vostra elettronica di elaborazione GPI per applicazioni industriali. Lo scopo delle presenti istruzioni è di aiutarvi nell'uso e nella manutenzione della vostra elettronica di elaborazione (fig. 1). Le procedure di calibratura sono descritte qui di seguito. Gli argomenti relativi agli alloggiamenti turbina e ai moduli accessori sono contenuti negli altri manuali. Si prega di consultare questi ultimi a seconda della necessità.

Osservazione: Le "figure" menzionate nel seguente testo si riferiscono alle fotografie nell'allegato Manuale dell'Utente in lingua inglese.

Prescrizioni di sicurezza

Per Vostra maggiore sicurezza, si raccomanda di leggere attentamente le seguenti prescrizioni di sicurezza.

1. Il flussometro in oggetto è stato approvato esclusivamente per fluidi compatibili con il materiale dell'alloggiamento del flussometro stesso.
2. Quando si misurano liquidi infiammabili, occorre prendere tutte le misure di sicurezza contro l'incendio o l'esplosione.
3. Quando si usano liquidi pericolosi, occorre seguire sempre le prescrizioni di sicurezza del produttore del liquido stesso.
4. Prendere le necessarie precauzioni di sicurezza quando si lavora in ambienti a rischio.
5. Onde ottenere sempre i migliori risultati, occorre verificare la calibratura prima di ogni uso.

La presente elettronica di elaborazione è stata progettata appositamente per l'uso sugli alloggiamenti turbina GPI per applicazioni industriali. E' stata progettata inoltre per il funzionamento in combinazione con vari moduli accessori, i quali trasmettono un segnale elettronico ad un'ampia gamma di apparecchiature esterne.

Tutti i flussometri GPI sono stati collaudati in fabbrica e sono corredati di un certificato di approvazione, classe 1, divisione 1, per ambienti a rischio. I flussometri sono stati collaudati è calibrati in fabbrica applicando le procedure di calibratura e usando le apparecchiature di collaudo più avanzate. La calibratura in fabbrica è stata effettuata o con solvente di collaudo normalizzato (per le turbine a Flusso Medio) oppure con acqua (per le turbine a Flusso Elevato) scaldata a 21 gradi centigradi (70 gradi F).

Il numero di modello del vostro computer è riportato sulla parte anteriore in basso del computer e anche sotto una delle batterie.

USO QUOTIDIANO

Per quanto riguarda l'uso quotidiano, le operazioni descritte qui di seguito sono quelle più effettuate. Altre operazioni sono descritte nella sezione Operazioni. Rileggere attentamente le prescrizioni di sicurezza riportate qui sopra prima dell'uso.

Il flussometro si inserisce automaticamente quando il flusso inizia e si disinserisce automaticamente alcuni minuti dopo l'arresto del flusso. Il flussometro può inoltre essere inserito premendo e rilasciando il tasto VISUAL. ("DISPLAY").

Per vedere l'esatto volume misurato ad ogni uso, occorre servirsi del Totale Parziale. Per azzerare il totale parziale, assicurarsi che il flussometro sia inserito e tenere premuto il tasto VISUAL (DISPLAY) per tre secondi fino a quando non vengano visualizzati solo zeri. Quando compare il messaggio BLOCCATO ("LOCKED"), si visualizza il Totale Cumulativo. Questo totale non può essere azzerato a mano. Premere e rilasciare il tasto VISUAL (DISPLAY) fino a quando scompare il messaggio BLOCCATO (LOCKED). Sostituire le batterie quando i numeri sul display diventano poco leggibili. Per maggiori informazioni, vedasi la sezione Manutenzione.

INSTALLAZIONE

Se l'elettronica di elaborazione è stata ordinata insieme ad un alloggiamento turbina, la stessa è stata installata in fabbrica. Se invece l'elettronica è stata ordinata separatamente, è sufficiente montare il computer sulla turbina per mezzo delle quattro viti situate negli angoli del pannello anteriore. Assicurarsi che l'o-ring sia inserito correttamente nella propria sede prima di stringere le viti. Se il computer è stato ordinato insieme alla turbina e ad un modulo accessorio, si raccomanda di rileggere ed assimilare approfonditamente tutte le istruzioni per l'installazione prima di procedere.

Tutte le turbine GPI sono state progettate per la misura del flusso in una sola direzione. La direzione è indicata dalla freccia riportata sul lato di uscita della turbina. Se si desidera misurare il flusso nella direzione opposta, basta girare il computer di 180 gradi prima dell'installazione.

Evitare ogni ambiente a forti disturbi elettronici. Installare il computer ad una distanza di almeno 15.2 cm (6 pollici) da eventuali motori, relé o trasformatori.

Verifica della precisione

Si raccomanda di verificare la precisione e la calibratura prima di ogni uso. Assicurarsi che il sistema non contenga aria. Convogliare un volume misurato con esattezza in un contenitore appropriato. Confrontare il volume con la visualizzazione o con il dispositivo di misura. Può essere necessario usare un fattore di correzione per determinare il volume finale. Verificare la precisione periodiamente, quale parte del programma di manutenzione ordinaria, per ottenere in ogni momento i risultati migliori.

OPERAZIONI

Tutte le operazioni sono visualizzate sul display frontale del flussometro (Figura 3). La riga in alto indica la curva di calibratura. La riga in mezzo rappresenta l'informazione sul flusso. La riga in basso visualizza le informazioni relative ai totali.

Il Totale Parziale indica il flusso durante una singola erogazione. Il messaggio si compone della dicitura TOTALE ("TOTAL") seguita da un numero sulla riga in basso. Nella maggior parte dei modelli, si tratta del numero 2 ("TOTAL 2"). Per azzerare il Totale Parziale, occorre assicurarsi che il Totale Parziale sia visualizzato e tenere il tasto VISUAL. ("DISPLAY") premuto fino a quando i numeri visualizzati non diventino zero.

Il Totale Cumulativo è il totale di tutto il liquido misurato da quando l'alimentazione del flussometro è stata collegata. Questo totale è visualizzato con la dicitura TOTALE (TOTAL) seguita da un numero, ed è sempre BLOCCATO ("LOCKED"), dato che non può essere azzerato a mano (Figura 2). Per commutare da un totale all'altro, occorre premere e rilasciare il tasto VISUAL (DISPLAY). Di solito, la visualizzazione cambia quando i tasti sono rilasciati. Il Totale Cumulativo torna a zero quando le batterie sono scollegate o scariche o quando il totale raggiunge il valore massimo di 999,999.

I due tipi di curva di calibratura, Calibratura sul Posto e Calibratura in Fabbrica, sono visualizzati nella riga in alto del display. L'utente imposta una Curva di Calibratura sul Posto. Tale riga può essere cambiata o modificata in ogni momento, seguendo le procedure descritte di seguito nella sezione Calibratura. La Curva di Calibratura in Fabbrica è impostata dal produttore e memorizzata in via permanente nel computer incorporato del flussometro. Le Curve di Calibratura in Fabbrica sono indicate dalla dicitura PREDEFINITA ("PRESET") sulla riga in alto (Figura 3).

Per cambiare le Curve di Calibratura, occorre tenere il tasto CALIBRATURA ("CALIBRATE") premuto, mentre si preme e si rilascia il tasto VISUAL. ("DISPLAY"). Quando compare la curva desiderata, si rilasciano entrambi i tasti. La Calibratura sul Posto è indicata dalla sigla CAL ("CAL"), seguita da una lettera. Nella maggior parte dei modelli, si tratta della lettera B ("CAL B"). La Calibratura in Fabbrica è visualizzata sempre con la parola PREDEFINITO ("PRESET") accanto (Figura 3). Nella maggior parte dei modelli, la Calibratura in Fabbrica compare come CAL A PREDEFINITA ("CAL A PRESET").

Alcuni modelli comprendono una visualizzazione della Portata, in contrapposizione con il normale volume del flusso. Quando tale opzione è attivata, la parola PORTATA ("FLOWRATE") è visualizzata a sinistra sulla riga in fondo (Figura 4), e i numeri sulla riga in mezzo indicano la portata, p. es. in litri al minuto. Per attivare tale opzione, occorre premere e rilasciare il tasto VISUAL (DISPLAY) fino a quando non compaia PORTATA (FLOWRATE).

Alcuni modelli dispongono inoltre di un'opzione Bypass per le applicazioni in cui il flussometro è impiegato con un flusso continuo ed è importante conservare l'alimentazione. Quando tale opzione è attivata, il flusso non viene sorvegliato né totalizzato dal computer, e la parola BIPASSO ("BYPASS") è visualizzata sulla riga in mezzo (Figura 5). Durante l'operazione di bipasso, il flussometro non rileva più il flusso e il display si spegne dopo pochi minuti. Premere il tasto VISUAL. ("DISPLAY") per attivare la visualizzazione e controllare il buon funzionamento. Attivare il bipasso nuovamente per conservare l'alimentazione delle batterie.

Ogni volta che del liquido corre attraverso il flussometro, viene visualizzata una piccola elica.

CALIBRATURA

La calibratura sul posto è necessaria quando la precisione della calibratura effettuata in fabbrica non è soddisfacente. La calibratura in fabbrica si effettua con liquidi a bassa viscosità. Se si erogano liquidi con una viscosità diversa, una calibratura effettuata sul posto può migliorare la precisione.

Una calibratura sul posto al di sotto del rapporto di portata di 10:1 può ripercuotersi negativamente sulla precisione.

A causa delle portate elevate e (1-1/2 - 2 pollici) la calibratura sul posto dei flussometri a flusso elevato andrà effettuata con una combinazione di volume e peso accuratamente determinati per mezzo di scale a risoluzione fine.

Per ottenere i risultati più precisi possibile nella calibratura sul posto, occorre erogare alla portata che più si avvicina alle condizioni operative reali. Occorre inoltre effettuare l'erogazione a pieno flusso. Avviare ed arrestare il pieno flusso tante volte quanto necessario. Usare un contenitore di calibratura preciso.

Osservare le richieste minime di portata del flussometro durante la calibratura. Il minimo per il flussometro da 1/2 pollice è di 1,9 litri/min. (0,5 galloni/min.) Il minimo per il flussometro da 3/4 pollici è di 3,8 litri/min. (1 gallone/min.) Il minimo per il flussometro da 1 pollice è di 9,5 litri/min. (2,5 galloni/min.) Il minimo per il flussometro da 1 1/2 pollice è di 19 litri/min. (5 galloni/min.) Il minimo per il flussometro da 2 pollici è di 38 litri/min. (10 galloni/min.)

Premere i tasti nell'ordine esatto durante le procedure di calibratura. Prima della calibratura, il flussometro deve essere installato seguendo le istruzioni sopra riportate. Spurgare il sistema immediatamente prima della calibratura.

Il volume massimo erogato e regolato durante la procedura di calibratura indicata di seguito non eccede le 99,99 unità nella maggior parte dei modelli. Nei modelli con raccordi di 1 1/2 o 2 pollici e in alcuni modelli su ordinazione speciale, il volume massimo non deve superare le 999,9 unità. Durante la calibratura, ignorare i due numeri a sinistra sul flussometro.

Procedure di calibratura erogazione/visualizzazione

1. Tenere premuto il tasto CALIBRARE ("CALIBRATE") mentre si preme e si rilascia il tasto VISUAL ("DISPLAY") fino a quando non compare la curva di calibratura su campo. Rilasciare ambedue i tasti.

   Ricordarsi che le curve di calibratura su campo non sono prestabilite.
2. Premere e rilasciare VISUAL ("DISPLAY") finché non compare il totale cumulativo.

   Ricordarsi che il totale cumulativo *non* è bloccato.
3. Tenere premuto VISUAL ("DISPLAY") per tre secondi per azzerare il totale.
4. Erogare il volume desiderato e arrestare il flusso.

   Per ottenere risultati più precisi, erogare un tasso di flusso che simuli il più possibile le proprie condizioni operative effettive. Evitare di arrestare o diminuire di troppo il flusso.
5. Premere CALIBRARE ("CALIBRATE"), tenere quindi premuto VISUAL ("DISPLAY") (entrambi) per circa tre secondi, finché l'indicatore CAL-dd ("Cal-dd") non lampeggi. Rilasciare entrambi i tasti.
6. Quando i tasti vengono rilasciati, l'indicazione del volume erogato riappare con una cifra lampeggiante. Impostare il flussometro alla portata che si desidera. Il VISUAL ("DISPLAY") si sposta da sinistra a destra. CALIBRARE ("CALIBRATE") cambia il valore da 0 a 9.

   Ricordarsi che le due cifre a sinistra devono essere ignorate durante la calibratura.

7. Con il flussometro impostato alla portata voluta, tenere premuto CALIBRARE ("CALIBRATE") e premere brevemente VISUAL ("DISPLAY"). L'indicatore Cal-End ("Cal-End") lampeggia e la nuova portata regolata compare senza nessuna cifra lampeggiante.

   La calibratura è completa e si possono riprendere le operazioni normali. Se viene visualizzata la parola NO ("NO"), vedere la sezione soluzione dei problemi.

MANUTENZIONE

I flussometri in oggetto sono praticamente esenti da manutenzione per quanto riguarda l'uso quotidiano. Non permettere che i liquidi si solidifichino all'interno del flussometro. Se il liquido si è solidificato e depositato sul girante, occorre pulire le parti interne con un lubrificante penetrante tipo WD-40 o con un solvente di pulizia. Non immergere il flussometro. Per rimuovere residui dal girante si può utilizzare una spazzola morbida o una piccola sonda. Non soffiare aria compressa attraverso il flussometro.

Sostituzione delle batterie

Il flussometro in oggetto è equipaggiato di batterie al litio sostituibili, le quali assicurano l'alimentazione per almeno 4.000 ore di servizio effettivo. Controllare le batterie e pulire i terminali almeno ogni anno per garantire il buon funzionamento. Se il display del flussometro diventa poco leggibile, significa che le batterie sono scariche. Quando le batterie vengono scollegate o quando sono scariche, il totale parziale e quello cumulativo tornano a zero. Le curve di calibratura in fabbrica e sul posto non si perdono. Contattare il rivenditore o l'agente locale per ordinare nuove batterie.

Per sostituire le batterie, occorre rimuovere le viti negli angoli della piastra frontale del flussometro e togliere il gruppo computer. Rimuovere le batterie consumate. Se necessario, asportare la corrosione dai terminali. Mettere le batterie nuove in posizione con i poli positivi nella giusta direzione. Si vedranno immediatamente le diciture sul display del computer. Assicurarsi che l'o-ring sia posizionato correttamente nella propria sede. Posizionare il gruppo computer di nuovo sulla turbina e chiudere con le viti negli angoli.

LOCALIZZAZIONE GUASTI

A. IL FLUSSOMETRO NON E' PRECISO

1. **La calibratura sul posto non è stata effettuata correttamente.** Ripetere la calibratura o selezionare calibratura in fabbrica. Si vedano le istruzioni per l'operazione e la calibratura.
2. **La calibratura in fabbrica non è adatta al liquido da misurare.** Eseguire una calibratura sul posto seguendo le istruzioni per la calibratura.
3. **Il flussometro viene impiegato al di sotto della portata minima.** Aumentare la portata.
4. **Il flussometro è parzialmente intasato dal liquido solidificato.** Togliere il flussometro. Pulire accuratamente.
5. **I cuscinetti del flussometro sono parzialmente intasati dal liquido solidificato.** Togliere il flussometro. Pulire accuratamente.
6. **Il girante è avvolto da materiale di tenuta.** Togliere il flussometro. Rimuovere il materiale dal girante. Assicurarsi che il girante giri liberamente.
7. **Il flussometro è stato installato troppo vicino alla raccorderia.** Installare in modo corretto. Si vedano le istruzioni per l'installazione.
8. **Il flussometro è stato installato troppo vicino a dei motori o in un ambiente a forti disturbi elettrici.** Installare in modo corretto. Si vedano le istruzioni per l'installazione.

B. DISPLAY POCO O NON LEGGIBILE

1. **Le batterie sono scariche o scollegate.** Togliere il computer e sostituire le batterie. Vedasi la sezione manutenzione.

2. **Il computer è difettoso.** Contattare l'agente o il rivenditore locale.

C. **PORTATA NORMALE MA IL FLUSSOMETRO NON ESEGUE IL CONTEGGIO. (Il flussometro si attiva quando si preme il tasto VISUAL. ("DISPLAY").)**
   1. **La Calibratura sul Posto non è stata effettuata correttamente.** Ripetere la Calibratura sul Posto o selezionare la Calibratura in Fabbrica. Vedasi la sezione Operazione o Calibratura.
   2. **Il girante è grippato o danneggiato.** Togliere il flussometro. Assicurarsi che il girante giri liberamente.
   3. **Il girante è avvolto da materiale di tenuta.** Togliere il flussometro. Rimuovere il materiale dal girante. Assicurarsi che il girante giri liberamente.
   4. **Il computer è difettoso.** Contattare l'agente o il rivenditore locale.

D. **PORTATA RIDOTTA E IL FLUSSOMETRO NON EFFETTUA IL CONTEGGIO (Il flussometro si attiva quando si preme sul tasto VISUAL. ("DISPLAY").)**
   1. **Il flussometro è intasato con liquidi solidificati.** Togliere il flussometro. Pulire accuratamente. Vedasi la sezione Manutenzione. Assicurarsi che il girante giri liberamente.
   2. **Il girante non gira liberamente.** Rimuovere il flussometro. Pulire accuratamente.

E. **IMPOSSIBILE COMMUTARE IL FLUSSOMETRO ALLA CALIBRATURA SUL POSTO**
   1. **La curva di Calibratura in Fabbrica PREDEFINITA ("PRESET") è attiva.** Si vedano le istruzioni per la Calibratura.
   2. **Il circuito stampato del computer è difettoso.** Sostituire il computer. Contattare l'agente o il rivenditore locale.

F. **LAMPEGGIA IL MESSAGGIO NO ("NO") DOPO LA CALIBRATURA SUL POSTO.**
   1. **Portata troppo limitata.** Riprovare ed aumentare la portata al minimo. Si vedano le istruzioni per la Calibratura.

SERVIZIO

Tutti i flussometri GPI sono coperti da una garanzia limitata di 1 anno. Per la garanzia, i ricambi, o altre informazioni relative al servizio, si prega di contattare l'agente o venditore locale.

GPI è un marchio registrato della Great Plains Industries, Inc. Brevetti negli Stati Uniti 4,856,348; 4,700,579 e 5,046,370. Brevetto Australiano 572,494. Brevetto Canadese 1,223,464. Brevetto Europeo 0147004. Brevetto Tedesco P347894.2-08. Brevetto Italiano 68074-BE/89.

ENGLISH

GENERAL INFORMATION

Congratulations on receiving your GPI Industrial Grade Computer Electronics. These instructions will help you operate and maintain your computer electronics. (Figure 1) Calibration procedures are given here. Information on turbine housings and accessory modules are contained in other manuals. Please reference those as necessary.

Note: "Figures" mentioned in this text refer to illustrations in the enclosed English Owner's Manual.

Safety Instructions

For your future safety, please review the safety instructions below.

1. This equipment is approved to handle only fluids which are compatible with the housing material.
2. When measuring flammable liquids, observe precautions against fire or explosion.
3. When handling hazardous liquids, always follow the liquid manufacturer's safety precautions.
4. When working in hazardous environments, always exercise appropriate safety precautions.

5. For best results, always verify calibration before use.

These computer electronics are designed specifically for use on GPI Industrial Grade Turbine Housings. They are also designed to work with several accessory modules which transmit an electronic signal to a wide variety of external equipment.

All GPI meters are Factory Mutual Approved and carry a Class 1, Division 1 Approval for hazardous environments. They are tested and calibrated at the factory using state-of-the-art calibration procedures and testing equipment. Factory Calibration is completed with either stoddard test solvent (on Mid Flow turbine sizes) or water (on High Flow turbine sizes) at 21 degrees C (70 degrees F).

The model number of your computer is displayed on the lower front side of the computer and also underneath a battery.

DAILY USE

On a day-to-day basis, the operations given below are the most commonly used. Others are listed in the Operations Section. Before use, review the Safety Instructions above.

The meter turns on automatically when flow starts and turns off automatically a few minutes after flow stops. The meter can also be turned on by pressing and releasing the DISPLAY button ("DISPLAY").

To see the exact volume measured with each use, use the Batch Total. To zero the Batch Total, make sure the meter is on and hold down the DISPLAY button for three seconds until zeros appear. If LOCKED ("LOCKED") appears on the readout, the Cumulative Total is displayed. It cannot be manually zeroed. Press and release DISPLAY until LOCKED does not appear. If the numbers in the readout are dim or fading, the batteries need replacement. See details in the Maintenance Section.

INSTALLATION

If you ordered your computer electronics with a turbine housing, it is installed at the factory. If you ordered your computer separately from your turbine, simply mount the computer on the turbine with the four screws at the corners of the faceplate. Make sure the O-ring is fully seated before tightening the screws. If you ordered the computer with turbine and an accessory module, please review and thoroughly understand all installation instructions before proceeding.

All GPI turbines are designed to measure flow in only one direction. The direction is indicated by the arrow cast-molded in the turbine outlet. If the opposite direction is desired, simply rotate the computer electronics 180 degrees prior to installation.

Avoid electronically "noisy" environments. Install the computer at least 15.2 cm (6 inches) away from motors, relays, or transformers.

Verify Accuracy

Before easy use, check the accuracy and verify calibration. Make sure there is no air in the system. Measure an exact known volume into an accurate container. Verify the volume against the readout or recording equipment. If necessary, use a correction factory to figure final volume. For best results, accuracy should be verified periodically as part of a routine maintenance schedule.

OPERATIONS

All operations are reflected in the readout on the meter's face. (Figure 3) The top line identifies the calibration curve. The middle line reflects flow information. The bottom line shows information from the totalizer.

The Batch Total indicates flow during a single use. It is shown as TOTAL ("TOTAL") followed by a number on the bottom line. On most models this is TOTAL 2 ("TOTAL 2"). To zero the Batch Total, make sure the Batch Total is displayed and hold DISPLAY ("DISPLAY") down until the readout changes to zeros.

The Cumulative Total is the total of all liquid measured since the meter's power supply was connected. This total is labeled with TOTAL followed by a number and always LOCKED ("LOCKED"), because it cannot be manually zeroed. (Figure 2) To change between totals, press and release DISPLAY. Generally, the readout changes when the buttons are released. The Cumulative Total returns to zero when batteries are removed or lose power or when the total reaches its maximum value of 999,999.

The two types of calibration curves, Field Calibration and Factory Calibration, are shown on the top line of the readout. A Field Calibration Curve is set by the user. It can be changed or modified at any time using procedures given in the Calibration Section below. A Factory Calibration Curve is preset by the manufacturer and stored permanently in the meter's computer. Factory Calibration Curves display PRESET ("PRESET") on the top line. (Figure 3)

To change Calibration Curves, hold the CALIBRATE button ("CALIBRATE") down while pressing and releasing DISPLAY ("DISPLAY"). When the desired curve appears, release both buttons. Field Calibration is labeled with CAL ("CAL") followed by a letter. On most models this is CAL B ("CAL B"). Factory Calibration always has the word PRESET ("PRESET") displayed next to it. (Figure 3) In most models, Factory Calibration appears as CAL A PRESET ("CAL A PRESET").

Some models include a Rate of Flow display, as opposed to the usual flow volume. When activated, the word FLOWRATE ("FLOWRATE") displays to the left on the bottom line. (Figure 4) When activated, the numbers on the middle line reflect the rate of flow, for example liters per minute. To activate this feature, press and release DISPLAY until FLOWRATE appears.

Some models contain a Bypass feature for those instances when the meter has continuous flow and power conservation is important. When Bypass is activated the flow is not monitored and not totaled by the computer. When activated, the word BYPASS ("BYPASS") displays on the middle line. (Figure 5) During bypass, the meter no longer senses the flow and the readout goes off after a few minutes. Push the DISPLAY button ("DISPLAY") to activate the readout and check proper operation. Activate bypass again to conserve battery power.

Any time liquid flows through the meter, a small propeller displays.

CALIBRATION

Field Calibration is necessary when Factory Calibration accuracy is not acceptable. Factory Calibration is completed with thin viscosity liquid. If you are dispensing a liquid which has a different viscosity, a Field Calibration can improve accuracy. A Field Calibration below the 10:1 flow range can adversely effect accuracy.

Due to high flow rates the Field Calibration of High Flow (1-1/2 and 2 inch) meters should be completed with a combination of volume and weight determined with fine resolution scales.

For most accurate results during Field Calibration, dispense at a flow rate which best simulates your actual operating conditions. Also, dispense at full flow. Quickly start and stop a full flow as many times as necessary. Use an accurate calibration container.

During calibration, meet the meter's minimum requirements for flow rate. The 1/2 inch meter's minimum is 1.9 LPM (0.5 GPM). The 3/4 inch meter's minimum is 3.8 LPM (1 GPM). The 1 inch meter's minimum is 9.5 LPM (2.5 GPM). The 1-1/2 inch meter's minimum is 19 LPM (5 GPM). The 2 inch meter's minimum is 38 LPM (10 GPM).

Use the correct button sequence during calibration procedures. Before calibrating, install the meter according to the instructions given above. Immediately prior to calibration, purge the system of air.

The maximum volume dispensed and adjusted during the Calibration Procedure below should not exceed 99.99 units in most models. On models with 1-1/2 or 2-inch fittings and some special order models, the maximum volume should not exceed 999.9 units. During calibration, the two left-hand digits on the readout are ignored.

Dispense/Display Calibration Procedures

1. Hold down the CALIBRATE ("CALIBRATE") while pressing and

releasing DISPLAY ("DISPLAY") until the Field Calibration Curve appears. Release both buttons.

Remember, Field Calibration curves are *not* preset.

2. Press and release DISPLAY ("DISPLAY") until the Batch Total appears.

   Remember, a Batch Total is *not* locked.
3. Hold down DISPLAY ("DISPLAY") for three seconds to zero the total.
4. Dispense the desired volume and stop.

   For the most accurate results, dispense at a flow rate which best simulates your actual operating conditions. Avoid stopping or "trickling" the flow.
5. Press CALIBRATE ("CALIBRATE") then hold down DISPLAY ("DISPLAY") (both) for approximately three seconds until CAL-dd flashes. Release both buttons.
6. When the buttons are released, the volume dispensed returns with one digit flashing. Set this readout to the amount you want. DISPLAY ("DISPLAY") moves from left to right. CALIBRATE ("CALIBRATE") changes the value from 0-9.

   Remember, the two left-hand digits are ignored during calibration.
7. With the readout set to the desired amount, hold down CALIBRATE ("CALIBRATE") as you briefly press DISPLAY ("DISPLAY"). CAL End flashes and the new adjusted amount appears without any flashing digits.

   Calibration is complete and you can resume normal operations. If NO ("NO") displays, see Troubleshooting.

MAINTENANCE

During daily use, these meters are virtually maintenance-free. Don't let liquids dry inside the meter. If liquids have dried and caked on the rotor, clean the internal parts with a penetrating lubricant such as WD-40 or a cleaning solvent. Do not submerge the meter. A soft brush or small probe can be used to remove residue from the rotor. Do not blow compressed air through the meter.

Battery Replacement

This meter is equipped with field replaceable lithium batteries which provide power for at least 4,000 hours of actual use. Check the batteries and clean the terminals at least every year to ensure proper operation. If the meter's readout should become dim or blank, power is low or exhausted. When batteries are disconnected or fail, the Batch and Cumulative Totals return to zero. Factory and Field Calibration Curves are not lost. Contact your local dealer or distributor for replacement batteries.

To replace batteries, remove the corner screws from the face of the meter and lift off the computer assembly. Remove the old batteries. If necessary, clean corrosion from the terminals. Place the new batteries in position with the positive posts in the correct position. You should immediately see the labels on the computer readout. Make sure the O-ring is fully seated. Put the computer assembly back on the turbine and secure with the corner screws.

TROUBLESHOOTING

A. METER IS NOT ACCURATE.

1. **Field Calibration not performed properly.** Field calibrate again or select Factory Calibration. See Operations and Calibration instructions.
2. **Factory Calibration not suitable for liquid being measured.** Perform a Field Calibration according to Calibration instructions.
3. **Meter operated below minimum flow rate.** Increase flow rate.
4. **Meter partially clogged with dried liquid.** Remove meter. Clean carefully.
5. **Meter bearings partially clogged with dried liquid.** Remove meter. Clean carefully.
6. **Sealant material wrapped around rotor.** Remove meter. Clear material from rotor. Make sure rotor spins freely.
7. **Installed too close to fittings.** Install correctly. See Installation instructions.
8. **Installed too close to motors or electrically "noisy" environment.**

Install correctly. See Installation instructions.

B. READOUT FADED OR BLANK.

1. **Batteries weak, dead, or not connected.** Remove computer and replace batteries. See Maintenance section.
2. **Computer defective.** Contact local dealer or distributor.

C. NORMAL FLOW RATE BUT METER DOES NOT COUNT.

(Meter comes on when DISPLAY ("DISPLAY") button is pushed.)

1. **Field Calibration not performed correctly.** Field Calibrate again or select Factory Calibration. See Operations or Calibration sections.
2. **Rotor stuck or damaged.** Remove meter. Make sure rotor spins freely.
3. **Sealant material wrapped around rotor.** Remove meter. Clear material from rotor. Make sure rotor spins freely.
4. **Computer defective.** Contact your local dealer or distributor.

D. REDUCED FLOW RATE AND METER DOES NOT COUNT

(Meter comes on when DISPLAY ("DISPLAY") button is pushed.)

1. **Meter clogged with dried liquids.** Remove meter. Clean carefully. See Maintenance section. Make sure rotor spins freely.

E. CANNOT GET METER INTO FIELD CALIBRATION.

1. **Factory Calibration PRESET ("PRESET") curve active.** See Calibration instructions.
2. **Computer circuit board defective.** Replace computer. Contact your local dealer or distributor.

F. COMPUTER BLINKS NO ("NO") AFTER FIELD CALIBRATION.

1. **Flow rate too low.** Try again and increase flow rate to minimum. See Calibration instructions.
2. **Rotor not spinning freely.** Remove meter. Clean carefully.

SERVICE

All GPI meters are covered by a limited one year warranty. For warranty, parts, or other service information, please contact your local dealer or distributor.

GPI is a registered trademark of Great Plains Industries, Inc. U.S. Patent 4,856,348; 4,700,579; 5,046,370; Australian Patent 572,494. Canadian Patent 1,223,464. European Patent EU 0147004. German Patent P3478494-2. Italian Patent 68074-BE/89.

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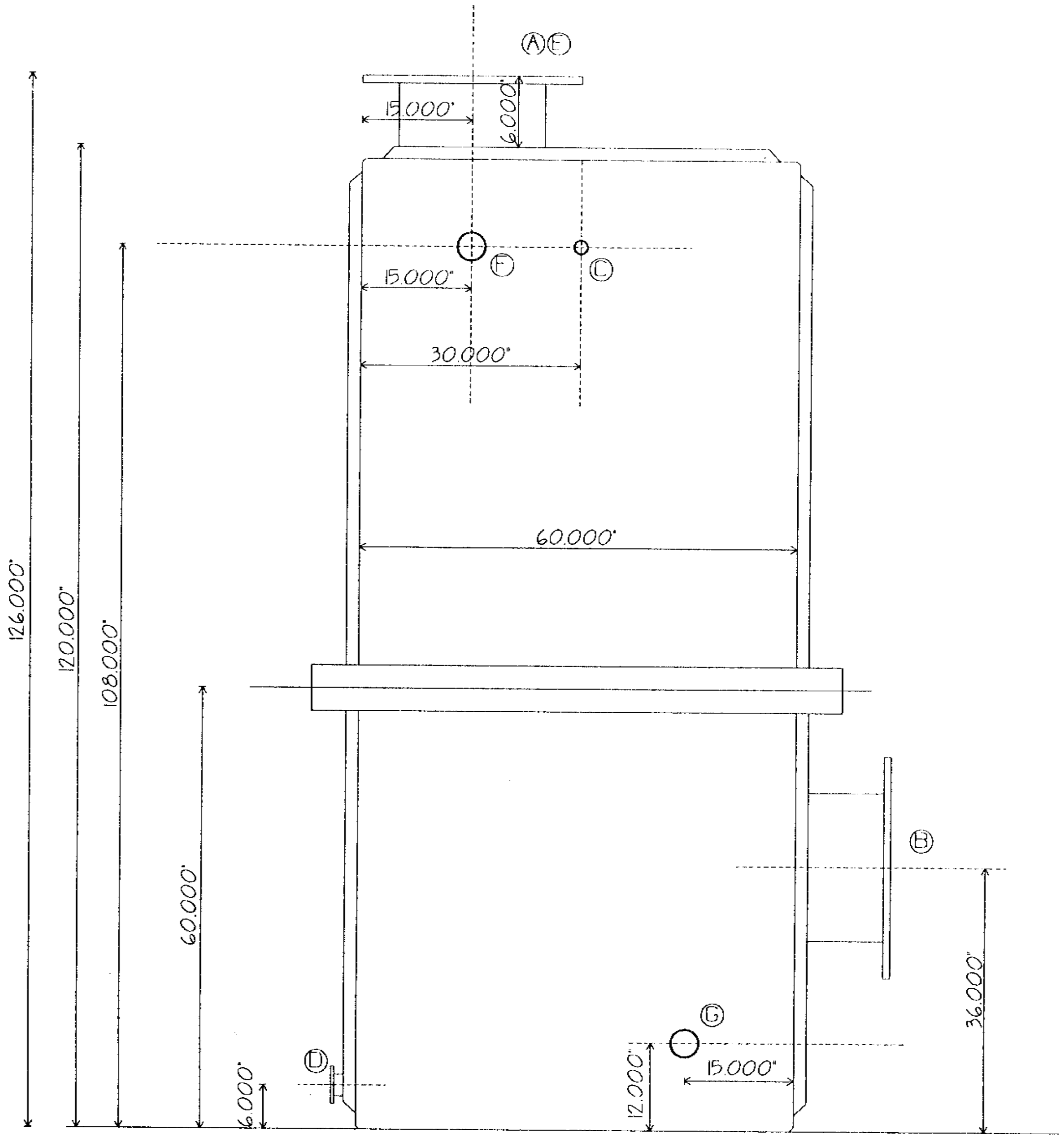
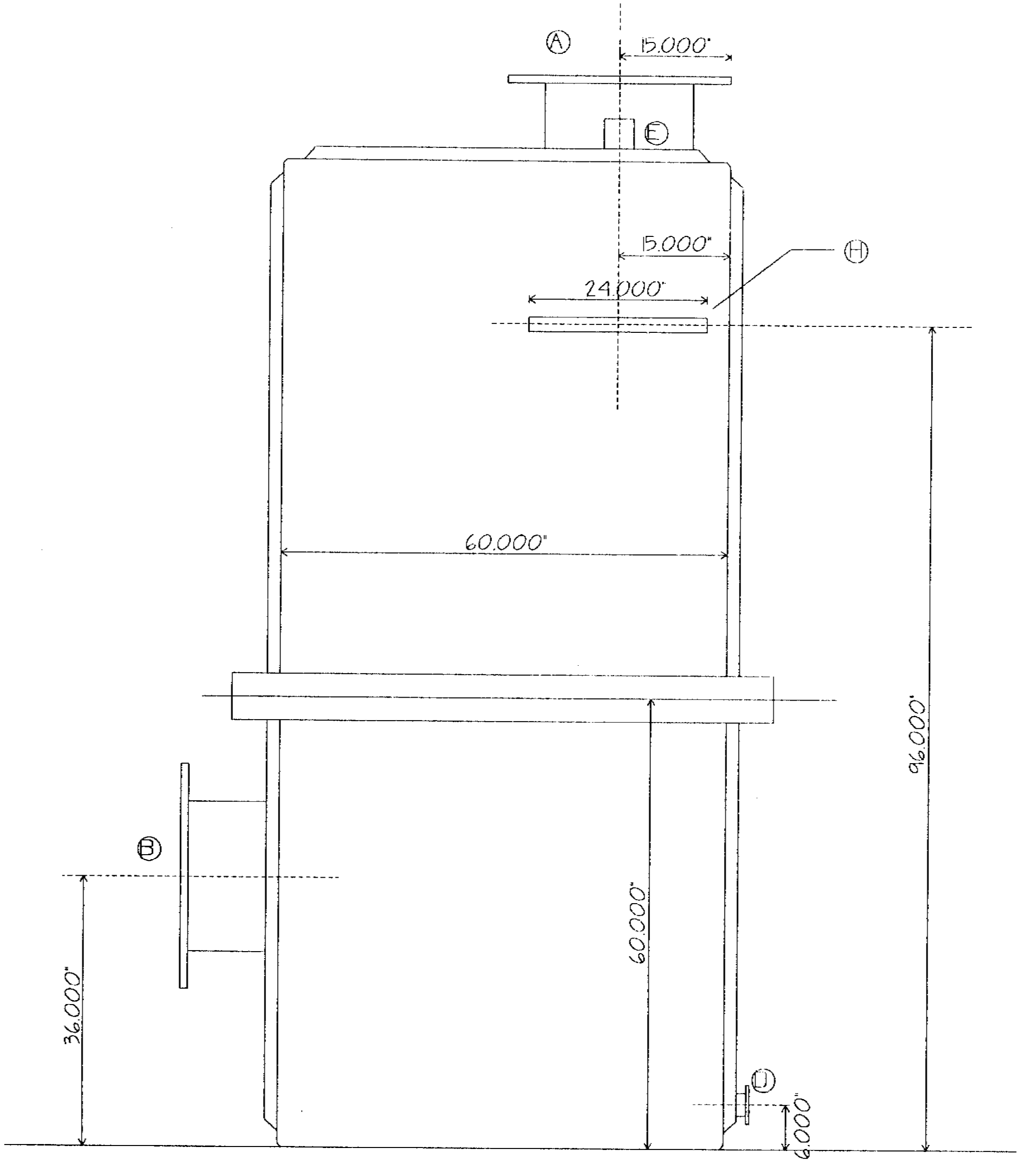


Ⓐ	20 INCH TOP MANWAY
Ⓑ	20 INCH SIDE MANWAY
Ⓒ	2 INCH FULL COUPLING (SUMP INFLUENT)
Ⓓ	3 INCH FLANGED NOZZLE (LEVEL TRANSMITTER)
Ⓔ	4 INCH FLANGE (VENT CONNECTION)
Ⓕ	4 INCH FULL COUPLING (TANK INFLUENT)
Ⓖ	4 INCH FULL COUPLING (TANK EFFLUENT)
Ⓗ	LADDER CONNECTION

NOTES:
1. LADDER BACKET CONNECTION TO BE 24 INCHES TO CENTER.
2. ALL TANK CUT OUTS TO BE KEPT AND SHIPPED WITH COMPLETED UNIT.
3. MEASUREMENTS TAKEN TO CONNECTION CENTERLINE.
4. PROVIDE TEST RESULTS PRIOR TO SHIPMENT.



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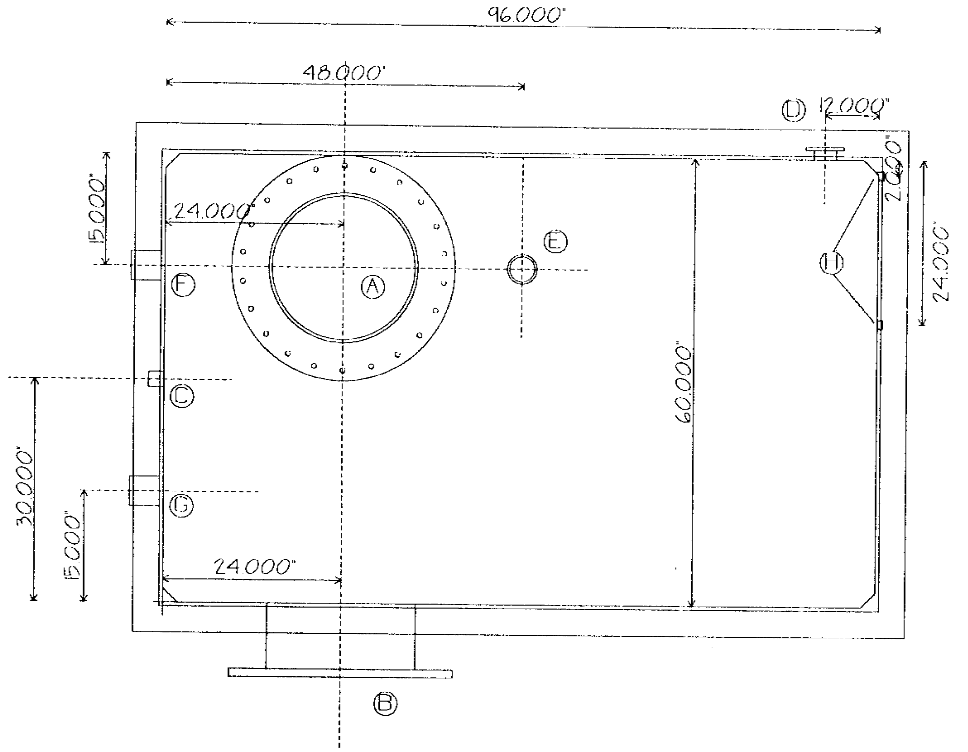

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3. MEASUREMENTS TAKEN TO CONNECTION CENTERLINE.
4. PROVIDE TEST RESULTS PRIOR TO SHIPMENT.

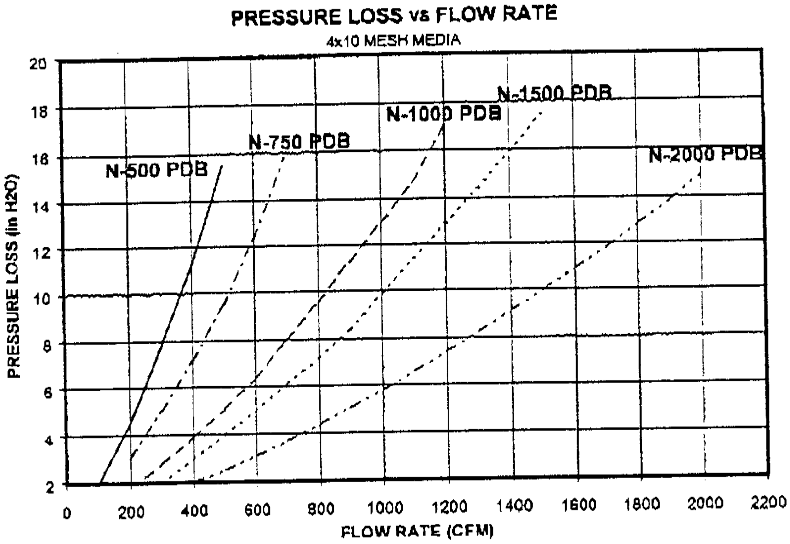
NIXTOX® PDB

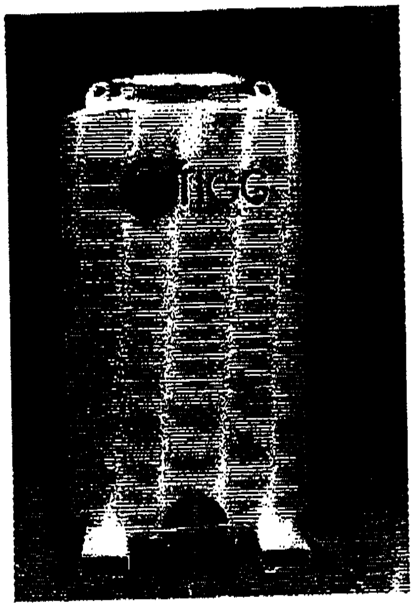
STEEL VESSELS

MODEL	NOMINAL FLOW (CFM)	MAX PRESS (PSIG)	MAX TEMP (deg F)	FLG. INLET / OUTLET (IN)	DIAMETER / APPROX HEIGHT (IN)	STANDARD ADSORBENT FILL (LBS)	SHIPPING WEIGHT - STANDARD FILL (LBS)
N-500 PDB	500	15	180	6 / 6	38 / 76	1000	1850
N-750 PDB	750	15	180	6 / 6	46 / 86	1500	2700
N-1000 PDB	1000	15	180	8 / 8	57 / 89	2200	3625
N-1500 PDB	1500	15	180	8 / 8	68 / 93	3700	5560
N-2000 PDB	2000	15	180	10 / 10	85 / 106	6200	8935

NOTES:
1) Nominal design flow may be conservative. Desired contact time may allow higher or lower flow rates.
2) Dry virgin activated or reactivated carbon provided as standard adsorbent.
3) Maximum adsorbent fill is based on a bed density of 29 lb/ft^3.
4) Maximum adsorbent fill can differ based on variable bed density and alternate adsorbents.

The NIXTOX Series Modular Adsorbers are designed for applications with relatively high flow rates or where more on-line adsorbent is required. Model numbers reflect nominal design flow for air and other vapors. The vessels are fabricated of carbon steel and provided with a high solids epoxy lining. Where process conditions dictate, the vessels can be fabricated from other materials such as stainless steel. In addition, a different lining can be substituted for the high solids epoxy. Manways are 18 inches in diameter for easy access. The vessels are provided with lifting lugs and fork channels. *Specifications and properties are subject to change without notice.*





N-750 PDB ILLUSTRATION

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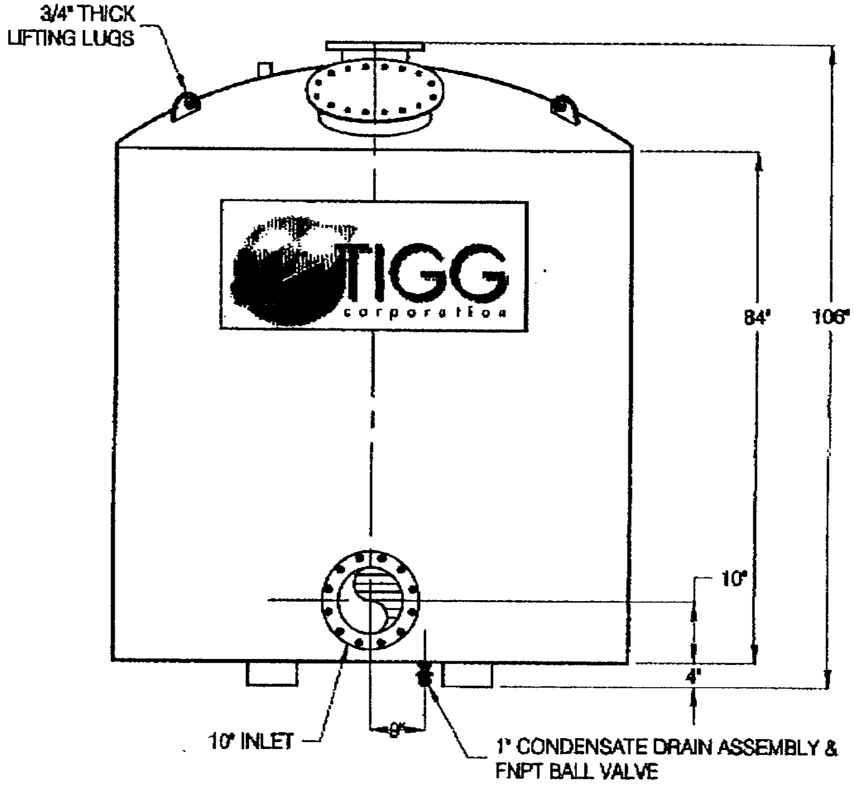
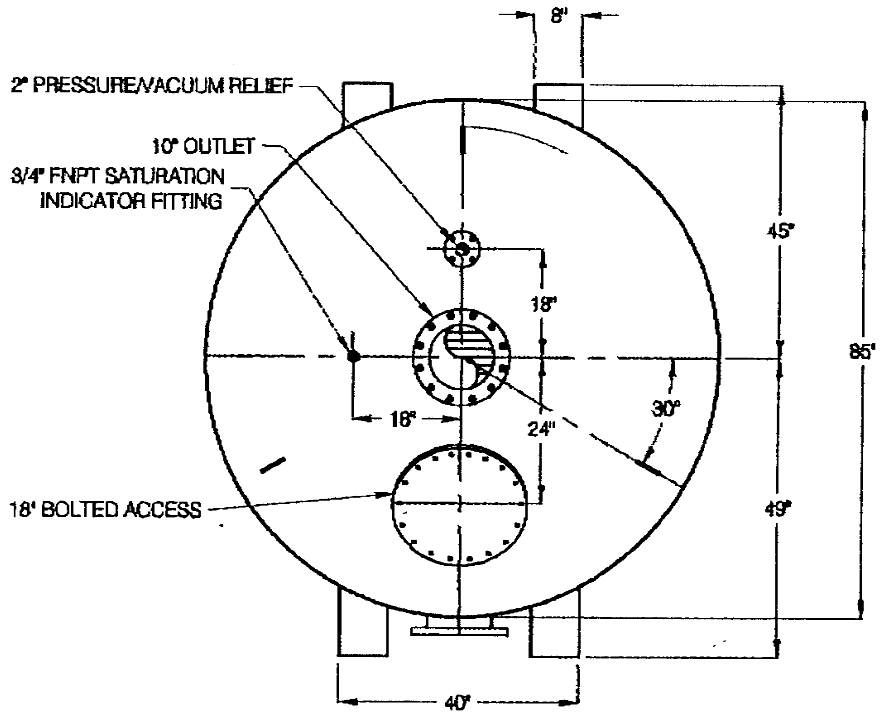


ELEVATION



PLAN

VESSEL MATERIALS	LINING	EXTERIOR PAINT	TOP HEAD/ BOTTOM PLATE THICKNESS	SHELL THICKNESS	INTERNALS	ADSORBENT OUTLET ASSEMBLY	CONDENSATE DRAIN ASSEMBLY	VOLUME OF VESSEL	STANDARD CARBON FILL	SHIP WT. (STANDARD FILL)	CARBON TYPE	MAXIMUM OPERATING PRESSURE	MAXIMUM OPERATING TEMPERATURE
CARBON STEEL	HIGH SOLIDS EPOXY	ACRYLIC WATERBORNE PRIMER & ENAMEL	3/16" 1/4"	3/16"	PLENUM	18" BOLTED ACCESS	STAINLESS STEEL W/PLUG	220 FT^3 (NOT INCLUDING TOP HEAD OR VOL BELOW PLENUM)	6200	8935	TIGG 5C 0410 VAPOR PHASE	15 PSIG	180°F

TIGG corporation

PHONE (412) 257-9580 FAX (412) 257-8520

N-2000 PDB

DATE: 5/8/00

NATIONAL ENVIRONMENTAL SYSTEMS, INC.
36 Maple Avenue, Seekonk, Massachusetts 02771
TEL (508) 761 6611 FAX (508) 761 6898

WARRANTY

All products not manufactured by National Environmental Systems, Inc., carry the original manufacturer's warranty. Copies are available on request.

National Environmental Systems, Inc., warrants its packaged and manufactured equipment against any defect in material or workmanship, under normal use and storage for a period of twelve (12) months from date of manufacture. In the event that products are found to be defective within the warranty period, National Environmental Systems, Inc., sole obligation and remedy shall be the furnishing of replacements for any defective parts, and such replacement parts shall be furnished but not installed by National Environmental Systems, Inc. NATIONAL ENVIRONMENTAL SYSTEMS, INC., WILL NOT BE LIABLE FOR SPECIAL OR CONSEQUENTIAL DAMAGES IN ANY CLAIM SUIT OR PROCEEDINGS ARISING UNDER WARRANTY, NOR WILL NATIONAL ENVIRONMENTAL SYSTEMS, INC., ACCEPT ANY LIABILITY FOR CLAIMS FOR LABOR, LOSS OR PROFIT, REPAIRS OR OTHER EXPENSES INCIDENTAL TO REPLACEMENT. The product warranty expressed above is our only warranty and may not be verbally changed or modified by any representative of National Environmental Systems, Inc. All freight costs incurred in shipping parts to or from National Environmental Systems, Inc., or to the manufacturer if necessary are at the expense of the customer.

National Environmental Systems, Inc, will invoice the cost of any replacement parts. These parts will be credited upon certification the original part was defective and the defective part was returned within one week of notifying National Environmental Systems, Inc., of the malfunction. If the part is found to have been misused no credit will be issued. In order for National Environmental Systems, Inc., to ship a replacement part on account, all outstanding invoices must be current

National Environmental Systems, Inc., expressly disclaims any warranties, expressed or implied, including any warranty of merchantability or fitness for particular purpose or any warranty arising from a course of dealing or usage of trade. Except to the extent required by applicable law. National Environmental Systems, Inc., shall not be liable, in tort, contract or otherwise, for any loss or damage, whether direct, consequential or incidental, of any person or entity arising in connections with the equipment.

NES

NATIONAL ENVIRONMENTAL SYSTEMS, INC
36 Maple Avenue, Seekonk, Massachusetts 02771
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System Manual

NES PROJECT NUMBER: 01-A-083
PROJECT NAME: Mr. C's Dry Cleaners
Book 2 of 2

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Latham, NY 12110

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National Environmental Systems, Inc., is a Woman-Owned Small Business

Verbatim™

Owner's Manual

SINCE 1948

RACO®

REMOTE ALARMS AND CONTROLS

Warranty

RACO Manufacturing and Engineering Co. Inc., Emeryville, California warrants this product to be in good working order for a period of five years from date of purchase as a new product. In the event of failure of any part(s) due to defect in material or workmanship occurring within that five year period, RACO will, at it's option repair or replace the product at no charge for parts or labor.

Any alteration of the product without instruction from RACO's Engineering Department will automatically void this warranty. If alterations of the unit are authorized by RACO, please complete the authorization form in the Owners Manual and return the form to RACO to ensure the warranty. Under no circumstances will RACO be responsible for consequential or secondary damages.

The defective product should be returned, insured and freight prepaid, securely packaged to the address listed below. Please include a copy of your sales receipt, the dialers serial number, and a detailed description of the problem you are experiencing.

RACO Manufacturing and Engineering Co. Inc.
Service Department
1400 62nd Street
Emeryville, CA 94608

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Verbatim™

Addendum to
Owner's Manual

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RACO®
REMOTE ALARMS AND CONTROLS

Addendum to Verbatim Owner's Manual

Changes in Verbatim Firmware
Revision 2.12

Raco Manufacturing and Engineering continually makes improvements in the operation and functionality of its products. This addendum describes Verbatim firmware revision 2.12 and its differences to the previous firmware revisions.

Are You Familiar with the Operation of the Verbatim Autodialer Yet?

Changes to a few, very specific features of the Verbatim are described in this addendum. It is assumed that the reader of this addendum is already familiar with the basic operation and programming method of the Verbatim. If this is not the case, please take the time necessary to familiarize yourself with the Verbatim autodialer by reading the Verbatim Owner's Manual.

Addendum Table of Contents

App. 1 Use New Programming Code for Total Clear-down

Section 3.1 of the Verbatim User's Manual (Starting Up and Clearing the Unit) advises that it's a good procedure to completely clear down the unit back to factory defaults. This step clears out all programming and should be performed prior to installation and before programming the unit for the application.

The User's Manual says to use programming code 9359 for the total clear-down operation. In firmware revision 2.12 programming code 9359 still operates identically to the way it did in previous firmware revisions. However, a new programming code, 935911, performs a more thorough clear-down, including a hardware reset.

For total clear-down press:

9 3 5 9 1 1 ENTER

This operation will perform a special type of hardware reset which clears all memory including user speech messages and resets all user programming back to factory defaults.

Note: If you perform this operation while programming the Verbatim over-the-phone the unit will hang up the phone without even saying "good-bye". However, the Verbatim will be ready to receive another a call from you immediately.

App. 2 Modbus Protocol & Local Data Logger (LDL) Now User Settable

In previous Verbatim firmware revisions, network protocols were always "hardcoded" at the factory and could not be altered. With firmware revision 2.12 and above the user may reconfigure networks and protocols as desired (within the basic capabilities of the unit as specified at time of purchase).

In fact, units are now shipped with *NO* protocols enabled. The user ***must*** enable the desired protocol at the time of installation according to the intended application of the product.

App. 2.1 Determining Network Port Number & Protocol Identifier

The Verbatim supports four device ports, named NET1-4. Connections to any of these ports are completely separate from each other. Each will need to be configured independently. The table below describes how they may be used. NET3, usable only for the Modbus Plus protocol, is only available in the Verbatim Gateway product. Consult the factory for details.

Port Name	NET1	NET2	NET4
Location:	J307 on expansion card (diagram in chapter 2)	J303 on expansion card (diagram in chapter 2)	inside door front panel card (see section 2.3)
Connector Type:	RJ-45	RJ-45	VPPC-1
Interface Specification:	RS-232C	RS-232C	Centronics
Supported Protocols:	Modbus, LDL	Modbus, LDL	LDL only

Network Device Ports

The general steps for connecting the Verbatim to a Modbus network or to a Local Data Logger printer are as follows:

- Determine which network interfaces are needed for the application. This step is beyond the scope of this manual. Consult the equipment vendors, or contact RACO Customer Service for advice.

- Prepare the external network connection. The following subsections describe usage and configuration for many interfacing devices. Follow the vendor's procedures for installation and configuration.

- Connect the correct cable between the autodialer and the network. Section 2 provides a diagram. Appendix F contains wiring diagrams for all cables. It now ought to be safe to power up all equipment.

- Use code 4906 to configure the desired protocol driver on the autodialer port.

- Use the other 490 codes to alter default settings for the autodialer's baud rate, data bits, stop bits, parity, node number, and communications timers as appropriate. If necessary, use the 495 codes to further optimize performance.

App. 2.1.1 User Codes for Enabling a Protocol on a Port

To enable a protocol on a particular port enter:

4906 net * N

Function:	Sets protocol for network. Omit *N to just read the value
Range:	See Table below
Default:	NONE. **All protocols must be explicitly configured by the user.**
Response:	*<net ID> protocol is <current protocol>*

N	Protocol	Description	Nets
0	NONE	device disabled	All nets
5	MODBUSM	Modbus Master	Net 1 or Net 2 on VCP card
128	LDL	Local Data Logging May only be used on one device	Net 2 only on VCP Otherwise - Net 4

Protocol Identifiers

If there is any error setting a protocol then the error response is made, and the prior protocol and operations are restored. If the configuration is successful the following things happen:

- All network parameters are set to their default values, and all diagnostics are cleared. These default values depend on the protocol.

- If the new protocol is different than the old, all RCs using that device are completely cleared down. If the old and new protocols are identical, then only the diagnostic information is cleared.

- If the new protocol is Modbus, RC scanning on the net is enabled.

- If the new protocol is LDL then the prior LDL device (if any) is closed and output will resume on the new device with no data loss.

- If the old protocol is LDL and the new one is not, then all unprinted data will be lost.

App. 2.2 Local Data Logger Specifics

The Local Data Logger (LDL) interface (either serial or parallel) may now be turned ON/OFF or reconfigured by the operator. If your LDL printer is interfaced via the Asynchronous Communications option (VCP Card), you may now set serial interface parameters to match the settings of your serial printer. The serial parameters of baud rate, data bits, stop bits and parity may be read and changed by programming codes.

NOTE: The Local Data Logger now must be turned ON by the operator before any LDL output will be sent to the printer. LDL is set to OFF by factory default.

App. 2.2.1 Determining Your Local Data Logger Method of Interface

There are two possible ways to interface a printer to the Verbatim for Local Data Logging — parallel or serial. The remainder of this section describes these two methods and the steps necessary to connect and configure LDL.

Parallel interfaced printers are the most common type of printers and are usually the least expensive. Raco Verbatim autodialers always include a parallel interface for Local Data Logging at no extra cost. However, there is one disadvantage of parallel interfaced printers. The parallel interface requires that the cable between the Verbatim and the printer be short — about 15 feet maximum.

Serial interfaced printers can have comparatively long cables — up to several thousand feet if the baud rate is derated with the increase in cable length. The major disadvantage of serial printers is that the serial interface usually increases the cost of the printer.

Is Serial Local Data Logging a Possibility?

Your Verbatim autodialer may have been configured at the factory with the Verbatim Asynchronous Communications Option. This Verbatim expansion card is sometime also called the Async. Com. Card and is label on the expansion circuit card as VCP.

You may not have specifically requested this option. However, you may have received it as a result of ordering the Modbus PLC interface option. If your Verbatim unit *does* have the Async. Com. Card then it is possible to interface a serial printer for Local Data Logging. That is, if you are using the Async. Com. Card for just one Modbus (PLC) network connection then you may use the remaining network port to interface a serial printer for Local Data Logging.

Required Cables

Serial printers are interfaced via Raco cable VSER-01 (cable drawing is Owner's Manual Appendix G-2) connected to the modular jack J303 on the VCP card. (Refer to Owner's Manual Appendix F-4)

The parallel interface for Local Data Logging uses Raco cable VPPC-1 (cable drawing is Appendix G-3) connected as per the instructions in section 2.3 of the Verbatim Owner's Manual.

App. 2.2.2 Turning ON LDL

To turn ON the Local Data Logger interface press:

4 9 0 6 Net * 128 enter

Where Net is:

2 for the Serial Interfaced LDL (Modular Connector J303 on VCP Card)
4 for the Parallel Interfaced LDL (Dual-row Connector on Front Door)

Note: * is the key labeled 'POINT' on the top portion of the key and '*' on the lower portion..

App 2.3 Setting Serial LDL Parameters

Note: The following is not applicable to parallel interfaced LDL.

To read the serial communication parameters for serial interfaced LDL press:

4 9 0 0 2 enter

To reset all serial communications parameters for serial LDL to factory defaults press:

4 9 0 0 2 * enter

To set the baud rate for serial interfaced LDL press:

4 9 0 1 2 * N enter

Where N, if present, is 50, 75, 110, 150, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 7200, 9600, 14400, 19200, 28800, or 57600. All other values are ignored.

To set the data bits for serial interfaced LDL press:

4 9 0 2 2 * N enter

Where N, if present, is 5, 6, 7 or 8. All other values will be ignored.

To set the stop bits for serial interfaced LDL press:

4 9 0 3 2 * N enter

Where N, if present, is 0 for NO parity, 1 for ODD parity, 2 for EVEN parity, 3 for SPACE parity, or 4 for MARK parity. All other values will be ignored.

App 2.4 LDL Notes and Exceptions

NOTES:
1) Factory defaults for serial interfaced LDL are: 9600 baud, 8 data bits, 1 stop bit, NO parity.
2) Setting serial communications parameters applies only to printers interfaced via the Asynchronous Communications Option (NET 2). When a Local Data Logger printer is interfaced via the parallel printer interface (NET 4) there are no communications parameters to be set.
3) Only one interface method, either serial or parallel, may be used at a time. Turning ON the serial interfaced LDL turns OFF the parallel interfaced LDL and vise versa.

App. 3 Programming Code 917 Removed But Features Still Exist

The combined programming code for *Phone Fault Detection & Automatic Tone/Pulse Selection* has been removed.

App. 3.1 Automatic Tone/Pulse Selection

Automatic tone/pulse selection can no longer be configured by the operator. However, the Verbatim still performs automatic selection of tone or pulse dialing.

The unit performs automatic tone/pulse selection only after the following events occur:
1) power is applied to the unit *and* dialing mode had not been altered from default tone mode.
2) the operator performs programming code 9 3 5 9 1 1 to set all programming to factory defaults.
3) jumper blocks JB-3 or JB-5 shorted together for hardware reset.

Notes:
1) performing programming codes 9 3 5 9 or 9 3 5 9 1 1 or shorting jumper block JB-3 will erase all programming.
2) If the operator has explicitly programmed the dialing mode (using code 901) cycling power or shorting jumper block JB-5 will ***not*** change the dialing mode programming.

If the Verbatim has automatically selected the dialing mode the resulting setting may be read by using programming code 901. And, as in all versions of Verbatim firmware, the operator may also use code 901 to manually select tone or pulse dialing mode. Refer to the Verbatim Owner's Manual section 3.2

App. 3.2 Phone Fault Detection

Use programming code 916 to turn ON/OFF Phone Fault Detection. In prior firmware revisions programming code 916 was only used to set the Phone Fault Detection Interval. Now, also use code 916 to turn ON/OFF the Phone Fault Detection feature as follows:

Turn Phone Fault Detection OFF by setting the Phone Fault Detection Interval to a value of 0.
Turn Phone Fault Detection ON by setting any valid Phone Fault Detection Interval.

To turn OFF Phone Fault Detection press:

9 1 6 0 enter

To turn ON Phone Fault Detection press:

9 1 6 V enter

Where: V a valid Phone Fault Detection interval of 0.1 hours to 24.0 hours.

App. 4 Personal Identification Numbers

The personal identification number (PIN) feature is provided as a way both to limit telephone access to the Verbatim autodialer and to provide an audit trail of acknowledgments. The use of PINs is always optional, and the default configuration omits them. PINs do not alter operations of the programming mode security feature (code 910) in any way.

Each authorized operator is assigned a unique PIN to identify them. This PIN will appear in the printed Local Data Logger reports of telephone sessions and alarm acknowledgments. The remainder of this section describes operations in more detail.

App. 4.1 PIN Operations

A PIN consists of 1-5 digits. It is not possible to use any letters or other symbols. Up to 32 distinct PINs may be configured.

Once any PIN has been configured, thereafter all over-the-phone sessions will require entry of a valid PIN. The session begins with the station ID message followed by a prompt to enter a PIN. The entry is made by pressing the DTMF keys, followed by the double pound-key termination.

This prompt is given a maximum of three times at 10 second intervals. If no valid PIN is entered, the Verbatim says *good-bye* and then hangs up. The calling sequence then proceeds as if the call had not been answered at all.

If a valid PIN is entered, that event is logged and the session continues as standard. Entry of the PIN does not automatically acknowledge anything. Use of the usual DTMF tones is still required. Any acknowledgments during the session will cause that operator's PIN to become associated with the acknowledgment status of the channel. That PIN will then be printed as part of any subsequent LDL status reports. Voice status reports omit this PIN information.

Only the most recent PIN to have acknowledged a channel (either ALARM or RTN) will be logged. Any operator working from the front panel is always given the PIN of 00000. Standard operations may be restored at any time by clearing all PINs (code 48*).

App. 4.1.1 PIN Local Data Logger Output Examples

The following text provides a sample of the LDL output when PINs are active. All PIN-specific entries are shown in boldface italics. The first segment shows a sample alarm session:

```
ALARM  MODE 13:39:10 Mon.  8/14/95

Alarm session with phone #1. # is 1.   13:39:16 Mon.  8/14/95

Valid PIN 50000 entered 13:39:39 Mon.  8/14/95

Channel                         Status

------------------------------------------------------

   1                           ALARM

   2                           ALARM

   3                           ALARM

Acknowledgment for linked alarms via phone #1 (1) PIN was 50000.
13:39:46 Mon.  8/14/95

HUNG-UP at  13:39:47 Mon.  8/14/95

NORMAL MODE  at 13:39:47 Mon.  8/14/95
```

This next segment shows a sample phone-in session. Note that the PIN '00000' indicates operator acknowledgment from the front panel.

```
CALL-IN MODE 13:41:52 Mon.  8/14/95
```

```
Valid PIN 50000 entered 13:42:02 Mon.  8/14/95

Channel                        Status
--------------------------------------------------

   1                         ALARM, Acknowledged by PIN 50000
   2                         ALARM, Acknowledged by PIN 00000
   3                         ALARM, Acknowledged by PIN 40032
   4                         NORMAL

HUNG-UP at  13:42:19 Mon.  8/14/95
```

App. 4.2 Programming Personal Identification Numbers

The following programming codes are provided for configuring and controlling the PIN functionality. For security reasons, all commands in this group are available only from the front panel. If entered over the telephone, the *error, enter program code* response is made.

48 ddddd	
Function	Establishes 'ddddd' as a valid PIN. 'ddddd' must consist of 1 to 5 numeric digits.
Response	*P-I-N is ddddd* (success) *P-I-N exceeded* (32 PINs already configured, invalid characters, too long, or '00000' is specified.
Note	The sequence '00000' is reserved to indicate any front panel operator.

48 ddddd *	
Function	Deletes 'ddddd' as a valid PIN.
Response	*P-I-N ddddd is cleared* (success) *P-I-N error* (failure)
Note	Any channels currently acknowledged by PIN 'ddddd' will thereafter appear acknowledged "by PIN 00000".

48	
Function	Lists all PINs currently configured
Response	*All P-I-Ns programmed are ...list...* (PINs currently configured) *No P-I-N is programmed* (No PINs currently configured)

48 *	
Function	Erases all PINs currently configured
Response	*All P-I-Ns programmed are cleared*

Note: This effectively turns off all PIN functionality. No more "acknowledged by PIN ....." messages will be logged.

App. 5 Totalizer Alarm Reset Timers Now Affected by Programming Codes 904 and 922

In prior firmware revisions changing the setting of either code 904 (Read/Set Alarm Reset Time) or code 922 (Alarm Reset Timer On/Off) had no effect on the alarm reset timers for totalizer alarm channels. Now, with Version 2.11, changing the setting of code 904 or 922 will clear the alarm reset timers for totalizer channels in exactly the same manner as for discrete and analog alarm channels.

App. 6 Feature Codes 923 and 981 Now Mutually Exclusive

Programming code 923 is used to program the Verbatim to cease the alarm calling sequence when all inputs have returned-to-normal status. Programming code 981 is used to program the Verbatim to make calls to personnel when the inputs to channels with acknowledged status return-to-normal (no violation) These two features have now been made mutually exclusive. That is, setting one feature ON sets the other OFF. Refer to page K-5 for details on code 923. Refer to section E.1 for details on code 981.

Table of Contents

1 Overview

2 Installation

3 Programming and Testing

4 Recording Voice Messages

5 Using Your Verbatim Autodialer

6 Advanced Programming

7 Using the Alarm Ready Schedule Feature

8 Maintenance, Testing, and Battery Replacement

9 Troubleshooting Tips

A Verbatim Series DFP Autodialer

B Analog Signal Input

C Remote Supervisory Control Output

D Printer Options

E Data Acquisition/Central Data Logging

F MODBUS Interface

G Cabling Diagrams

H Verbatim Floobydust

I Verbatim™ Series VSS Autodialer Specification

J Worksheets

K

Annunciator Sequences and Options

Glossary

Index

FCC Notice to Users

Warranty Registration Card

Response Card

1 Overview

1.1 Product Description

The Verbatim™ autodialer functions as a remote alarm monitor, typically monitoring critical facilities which are not staffed 24 hours a day.

The Verbatim autodialer may be factory configured for different input and output configurations. Your Verbatim may have as many as 32 discrete inputs, 16 analog inputs, 8 digital outputs and 96 Remote Channels. The minimum configuration of the Verbatim autodialer monitors 4 internal input channels.

The internal inputs are sometimes called Physical Channels (PCs). PCs monitor user-supplied external sensors such as float switches, limit switches, etc. Sensors connected to discrete inputs are usually dry (non-powered), isolated contacts which close or open to indicate the sensed condition. In most cases, the outputs of logic controllers may be connected directly to Physical Channel inputs without the need for interfacing relays or other signal conditioning.

Remote Channels (RCs) do not directly connect to sensors. RCs monitor PLC I/O and data table locations as defined by the user. RC data is kept current by the Verbatim constantly making queries to PLC data registers over the industrial network connection.

An alarm condition can be indicated by change at a sensor, by new data from a Remote Channel (RC), or by loss of AC power. When an alarm occurs, the Verbatim accesses the standard phone line to which it is connected, dials the appropriate phone numbers and delivers the user's own pre-recorded voice message corresponding to those particular alarm conditions that are currently active.

Dialing continues repeatedly through the entire list of up to 16 programmed phone numbers, until the alarm is acknowledged by touch tone command or by calling the Verbatim autodialer back.

The Verbatim autodialer incorporates many flexible, voice-supported programming and message recording options, to meet a wide range of user requirements. Yet, in most cases, the user may rely on pre-existing default programmed parameters, greatly simplifying programming. Even default voice alarm messages are provided.

Note:

All user programming except access code and voice message recording may be entered, reviewed or changed either from the front panel or from a remote telephone at any time. Thus, installation and programming may easily be done by separate personnel at separate times.

Most programming is entered in the form of 3-digit codes as described in this manual. All user programming, including recorded messages, is maintained in permanent non-volatile memory.

The Verbatim autodialer incorporates extremely thorough and effective electrical surge protection and overall rugged construction, to deliver reliable operation under real-world conditions.

1.2 Manual Description

This manual guides you through the following procedures:

- Location and mounting
- Initial programming
- Configuring Remote Channels to monitor PLCs
- Voice message recording
- Using Your Verbatim autodialer
- Advanced programming

A glossary explaining the terms used in this manual is included the end of the manual, along with a troubleshooting guide, an index, a return authorization form, and FCC notice to users.

Worksheets are provided to document and clarify your programming and message recording steps.

Please take a moment to read, complete, and mail the warranty registration card at the back of this manual.

1.2.2 Conventions

Throughout this manual various icons are used to visually identify information. They are as follows:

- ◆ The solid diamond symbol shows a list of procedures, decisions, or single step tasks.
- The bullet symbol shows a list of items.

💣 The bomb indicates a warning message. The information concerns process that may result in damage to equipment or harm to a person.

✋ The hand indicates a caution message. The information concerns a process that may result in equipment failure.

✏ The pencil indicates general information.

❖ The open diamond pattern indicates one or more exceptions or special considerations for a process.

☎ The phone indicates that you can access the Verbatim autodialer through your phone.

MINUS #

Other icons include button or keys on the Verbatim autodialer front panel.

“items in quotes”	Quotation marks indicate titles of sections and messages.
italic	Italic text indicates items for emphasis, message text, and sample text.
ALL CAPITALS	Capital letters reference the names of keys, lights, and LEDs.
Initial Capital Letters	Capitalization of the first letter of a set of words indicates mode and function types.

2 Installation

This section describes how to install the Verbatim autodialer and how to install a parallel printer to use the Parallel Printer Local Data Logging feature.

2.1 Location and Mounting

Choose a mounting location which is not exposed to condensing humidity or temperatures beyond the limits of 20°-130°F. This location should ideally be within 5 feet of a standard RJ-11 phone jack and a *grounded* 120 VAC power outlet.

1. Mount the Verbatim autodialer on centers of 6" x 11 3/8" using the external mounting ears on the enclosure. #10 or 3/16" bolt sizes are best.
2. Install the NEMA 4X weatherproof outer enclosure, (optional purchase).

   This allows the Verbatim autodialer to be mounted outdoors as long as temperature limits are not violated. It is best to provide at least an overhead shelter to minimize direct precipitation and solar heating effects.
3. Install the heater/thermostat for cold or humid environments, (optional purchase).

   The 120 VAC heater dissipates 75 watts, providing a temperature rise of approximately 30 degrees, or 60 degrees when enclosed in the optional NEMA 4X enclosure.

2.2 Wiring

Refer to the diagram on page 2-3 for an example of the wiring connections.

1. Inspect and remove any foreign materials which might create short circuits.
2. Connect the red (positive) battery lead to the positive terminal on the gel-cell battery.
3. Plug the power cord into a *grounded* 120 VAC *outlet.*

   Or, remove the power cord from the Verbatim autodialer and install well-grounded 120 VAC power to terminal strip TS3, located on the lower right of the main circuit board.

If there are any green grounding wires in place on TS3 originating from plug-in expansion cards, leave those green grounding wires in place on the terminal marked GRN (Green). If the Verbatim autodialer turns on when power is applied, turn it off with the red POWER ON/OFF key.

4. Connect dry (unpowered) contacts to the terminal strip connection points.

   The connection point for basic four-channel units is terminal strip TS1, located on the lower left of the main circuit board. Note that there are four common return terminals marked “C”; any combination of these internally grounded terminals may be used. Terminal strip TS1 may be unplugged for convenience. All terminal points are screw clamp type, eliminating the need for wire termination lugs.

   The contact input wires should ideally be light (18 to 24 gauge) signal wire rather than heavy power wire. This reduces problems of bulk and stiffness.

5. If your unit has 8 or more inputs, the VX32 Channel Expansion Card should be plugged into connector J4.

   If your unit has this card installed, then use TS1 for common return connections only, and connect one side of each contact to the appropriately marked channel input number on the VX32 card. Leave TS1 terminals 1,2,3 and 4 disconnected.

Notes:

- The common *return* side of the contacts will need to be consolidated into not more than four wires coming into the TS1 terminals marked “C”.
- Route the wires to the VX32 card so that they do not protrude above the top of the card, other wise they will interfere with the front panel board when the door is closed.
- Terminal strip TS1, and the terminal strips on the VX32 card if any, are not removable terminal blocks. Be sure that the terminal strips do not become unplugged due to wires being stressed when the door is closed.

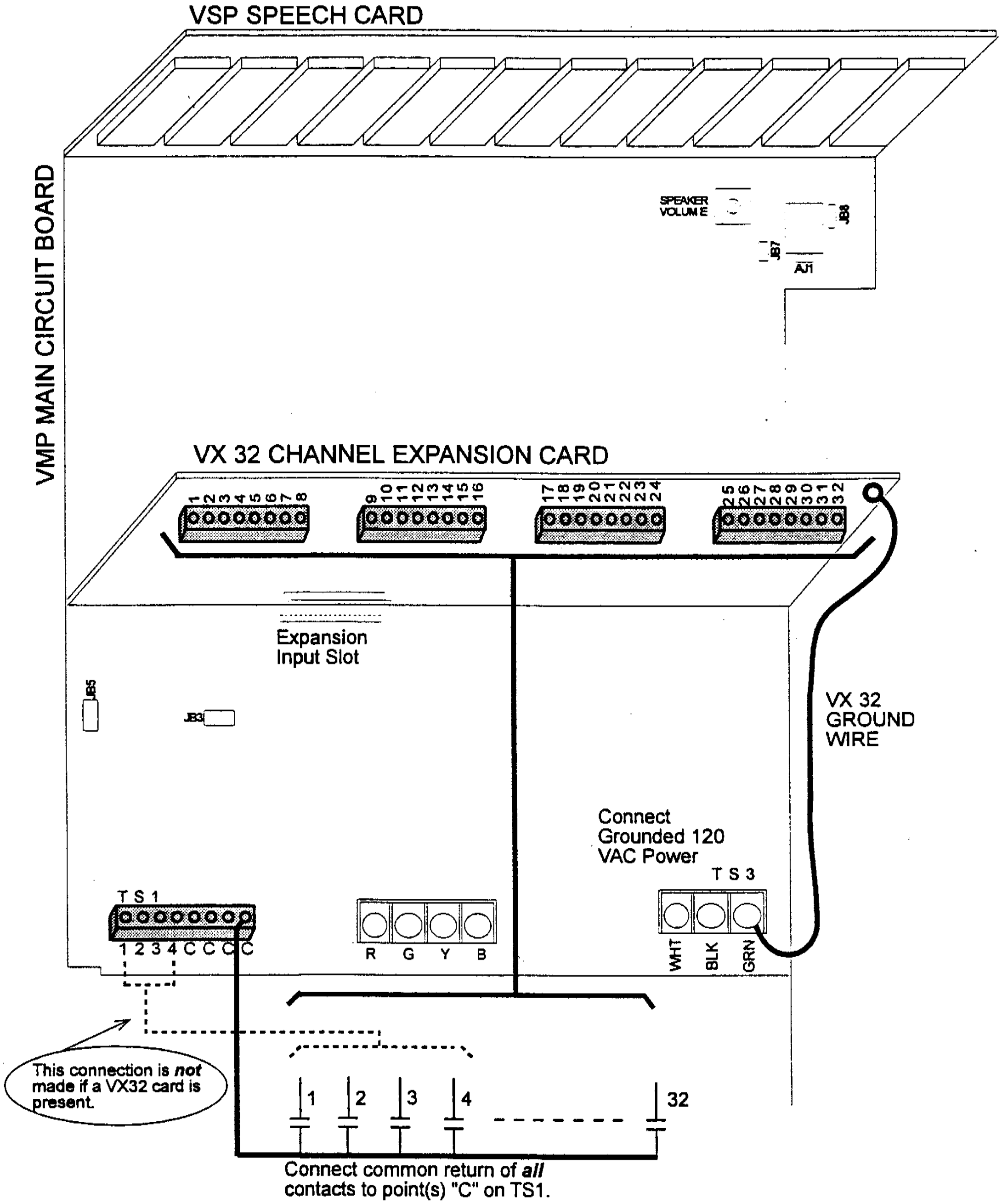
Caution:

NO 120 VAC INPUT CIRCUITS! Please verify that the circuits you connect to these inputs are "dry" (unpowered) and are ***not*** directly connected to 120 VAC power. Connecting such circuits will damage the unit.

Exception:

If your inputs are coming from a logic controller with TTL, CMOS or 5-volt DC logic outputs, direct connection may be made as long as the controller has the same electrical ground as the Verbatim autodialer.

Electrical Connection Diagram For Dry Contact Inputs



The common returns for all inputs are connected to TS1 terminals marked "C". These four "C" terminals are connected together and to electrical ground.

4 Channel Verbatim: Connect one side of each contact to the corresponding numbered terminals on TS1. The other side of each contact connects to the common return (the "C" terminals on TS1).

8 Or More Channel Verbatim: Connect one side of each contact to the corresponding numbered terminals on the VX32 expansion card. Connect the other side of each contact to the common return (the "C" terminals on TS1 of the main board). Note that TS1 terminals 1 through 4 are not used in this case.

2.3

Installing the Parallel Printer

The Verbatim Parallel Printer Local Data Logger feature will print reports on a local printer which is connected via a standard parallel interface. The local printer will automatically print out each action that occurs; e.g., alarms, acknowledgments, programming entries, inquiry calls, etc. You can cause a printout, upon command, at any time. Also, you may program the Verbatim for automatic printout of all input conditions at regular intervals. A time/date stamp will be included with each printed item.

You will need to:

- Connect the parallel printer to the Verbatim front panel using the RACO PPC-1 cable (or equivalent).
- Set the time and date so that each printout will be accompanied by the proper time and date stamp.

2.3.1

Installing the Printer Cable

Note:

If you ordered the Verbatim Parallel Printer Port Adapter Cable from RACO at the time you ordered your Verbatim autodialer it should already be properly installed. (The cable may be ordered from RACO using the part # VPPC-1.) You may also use an identically wired cable from a separate source. If you wish to acquire or fabricate the cable yourself, please refer to the, *"VPPC-1 Serial Cable Connection Diagram,"* in Appendix G.

The front panel circuit board must show a designation of VFP4 or higher. Also, the firmware version for the program chips U3 and U4 (on the main circuit board) must be V2.01 or higher. If your hardware does not conform to these revision levels contact your RACO Sales Representative about getting the proper upgrade modules.

The VPPC-1 cable attaches to the front panel circuit board where the mating pins protrude, just inside the front door of the Verbatim . Orient the connector so the cable's Pin 1 index (a red stripe on the cable or an arrow on the connector) is near the corner of the front panel board. The cable extends out of the Verbatim chassis and overlaps the lower chassis wall at the bottom of the chassis. When the front door of the Verbatim is closed the flat ribbon cable will be safely folded around the lower wall of the Verbatim chassis.

At the other end of the VPPC-1 cable is a standard "Centronics" style 36 pin connector. This 36 pin connector is the proper gender to mate with the data connector on the back of your parallel printer. However, if the printer cannot be located within the three-foot length of the VPPC-1 cable, install a standard

"Centronics" parallel printer extension cable (male on one end, female on the other). The extension cable extends from the end of the VPPC-1 cable to the printer.

Note:

The maximum length of the printer extension cable should be no greater than 10 feet. If you need to extend the printer greater than 10 feet from the Verbatim please consider ordering the RACO Serial Local Data Logger Option. Serial interfaces may be extended to a few hundred feet if necessary. Furthermore, if a serial interface is used together with special "line driver" devices, the printer cable may be extended for thousands of feet.

2.3.2 Load Paper and Place Printer On line

The printer must be properly loaded with paper and be on line in order for the Verbatim to print reports. (Some printers have a button labeled "select" rather than "on line.") If the printer runs out of paper or is taken off line, printing will cease immediately. A limited amount of printout data can be saved in the Verbatim internal print buffer while the printer is off line or out of paper. The size of the Verbatim printer buffer depends on several factors such as which Verbatim options are configured (i.e., analog, RSC, PLC interface, etc.). If the printer is off line or out of paper, printout data is sent to the Verbatim buffer each time it would otherwise be printed on the printer. Once the amount of data sent to the buffer exceeds the size of the buffer, printout items will continue to be copied to the buffer but will begin to overwrite buffered data. The printer buffer "wraps" around and new printout data is copied over the oldest printout data.

It is possible that no data will be lost while your printer is out of paper or off-line if you manage to restore the printer to operation before the Verbatim buffer "wraps." Then as soon as the printer is restored to operation, the Verbatim sends the buffered reports to the printer. (Note that the date/time stamp eventually printed will show the time and date of the event; not the time and date of the printing activity.)

2.3.3 Programming Time and Date

Time and date may be entered or changed with the following programming code entries:

- To check the date:

```
9 4 1 ENTER
```

- To set the date:

```
9 4 1 MM DD YY DW ENTER
```

MM is the month (01 for January, etc.), DD is the day of the month (07 for the 7th day of the month, YY is year (93 for 1993) and DW is the day of the week (1 for Sunday, 2 for Monday, etc.) Entry of the DW is optional.

- To check the time:

```
9 4 2 ENTER
```

- To set the time:

```
9 4 2  HH MM SS ENTER
```

HH are the hours in 24 hour format (13 for 1 PM), MM for minutes (don't forget the leading zeros) and SS is the seconds. Entry of SS is optional.

- To clear the time and date back to a default time and re-initializes the real-time clock chip:

```
935 7 ENTER
```

Note:

The preceding operation should only be necessary if the real-time clock chip has been added or replaced in the field.

2.3.4 Printout at Regular Intervals

The Verbatim autodialer may be programmed to automatically log (print on the printer) all input conditions at regular intervals, by entering the following code:

```
943 XXX.X ENTER
```

where XXX.X is the desired printing interval in hours, from 0.1 to 999.9 The first such printout will occur when the period elapses, rather than immediately upon programming.

- To check the presently programmed printing interval enter the following code:

```
943 ENTER
```

- To turn off the regular interval printing function enter the following code:

```
943 0 ENTER
```

- To immediately print a record of all current user programming enter the following code:

```
944 ENTER
```

2.3.5 Turning Off the System With a Printer

Some parallel printers tend to "leak" electrical current through the parallel interface into the Verbatim when it is powered off, resulting in the Verbatim not remaining turned off. It is possible that a few seconds after powering off the Verbatim it will turn itself back on again. To remedy this condition simply turn off the printer whenever turning off the Verbatim .

3 Programming and Testing

3.1 Starting Up and Clearing the Unit

Basic set-up and testing of the Verbatim involves:

- Program at least one phone number.
- Program the input channels to reflect alarm conditions.
- Test the alarm conditions to be sure witing and programming are correct.
- Record voice messages, trip delays and other programming as desired.

PROGRAM
SHIFT

All programming operations must be done with the unit in the Program mode.

1. To put the Verbatim autodialer in the Program mode, press PROGRAM.

   Program mode is indicated by the lighted PROGRAM LED.

Note:

Before you begin programming the Verbatim for your monitoring application it is best to first clear the unit's memory of any old programming. This step also ensures that memory corruption, which might have occurred during shipment or due to anomalous power distrubances, will be wiped away. See Step 2 below.

Caution:

The following step erases all user programming including recorded messages so normally it is done only at initial start-up.

2. To clear the system memory, press:

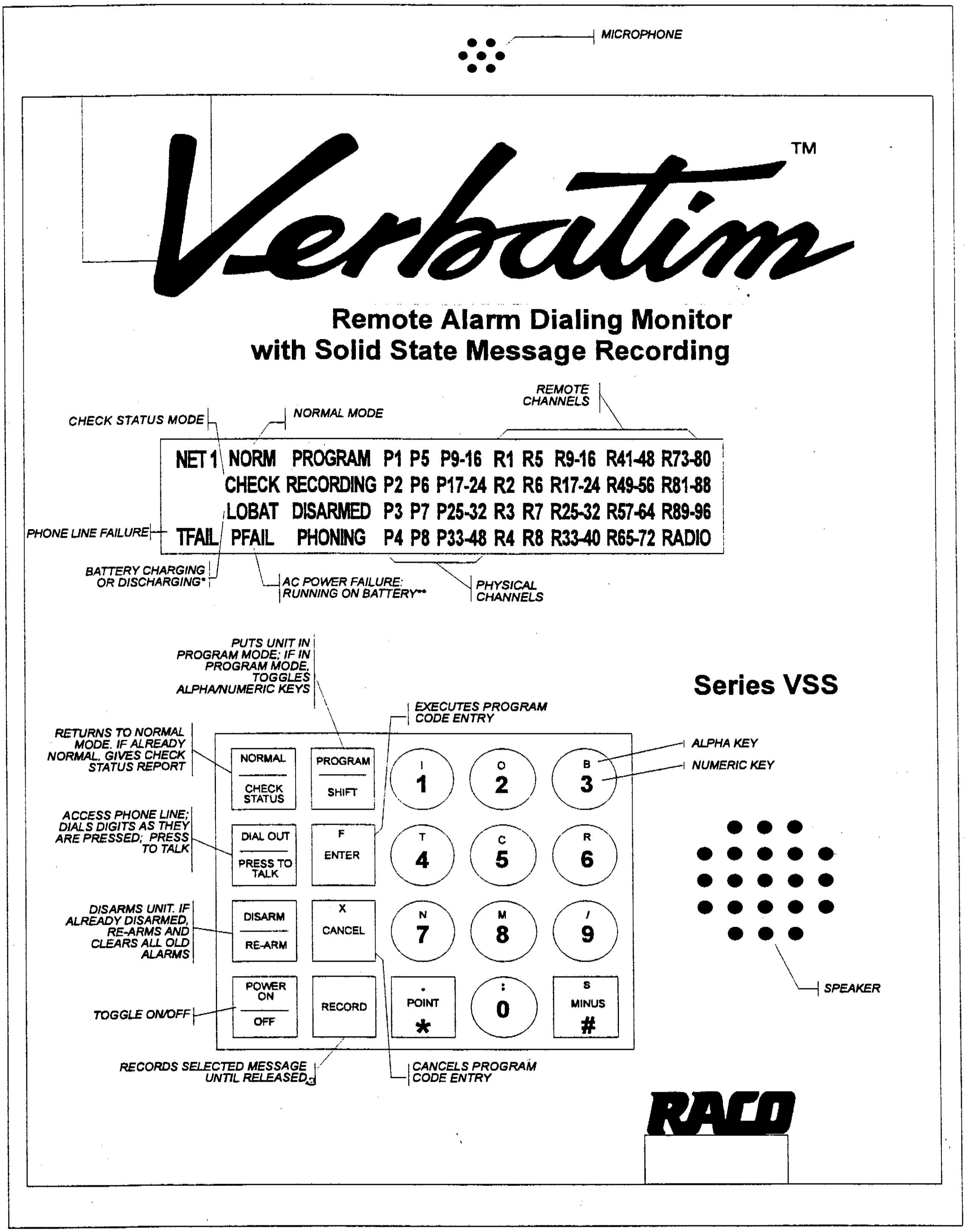
   `9 35 9 ENTER`

   If you make an error in code entry, press CANCEL and start again.

Exceptions:

If you have powered up your Verbatim without connecting a live telephone line to the unit you may observe that the TFAIL indicator is on. This indicates that the unit is checking for the presence of a telephone connection and attempting to determine the line configuration. If you are planning to program your unit without a live telephone connection you may wish to disable the Telephone Line Fault Detection (Phone Fault) feature by pressing `9 17 0 ENTER` See Section 6.2.6 for information on temporarily disabling this feature.

Front Panel Keys and Indicators Diagram



*** A discharged battery may take up to a day to fully charge. Meanwhile, light may remain on.**

**** During AC power failure, all illuminated LED's will flash to conserve battery power.**

3.2 Programming Phone Numbers

Refer to Programming Worksheet A (See Appendix J). You are encouraged to write down the phone numbers you want to program, along with a person's name for each phone number.

- To program the first dial-out phone number, press:

  `7 01 (then the complete phone number) ENTER`

  For example, to program 1 (510) 658-6713 as the first phone number, press:

  `7 01 1 5 1 0 6 5 8 6 7 1 3 ENTER`

- To program a second phone number:

  Use code 7 02 instead of 7 01, progressing to a maximum of code 7 16 for the 16th phone number.

Each number may be up to 60 digits in length. Be sure to include any necessary area codes or "1" prefixes.

❖

Exceptions:

- To use touch tone dialing, press:

  `9 01 1 ENTER`

- To go back to standard pulse dialing, press:

  `9 01 0 ENTER`

- To insert delays between dialed digits.

  Press the MINUS key once for each additional delay desired in the phone number programming process. Default delay is one second.

- Refer to Section 6. "Advanced Programming," for specialized programming such as *grouping* phone numbers with input channels, *Call Progress Monitoring* phone fault detection, etc., or to establish and use a *call forward* phone number, etc.

3.3 Programming Input Channels

Your Verbatim autodialer needs to know whether its input channels are to be *normally closed* (alarm on Open Circuit), or *normally open* (alarm on Closed Circuit).

All contact inputs are initially set normally closed (i.e. they will alarm on Open Circuit). This is the default setting and, therefore, any open circuits, including any inputs left disconnected during installation, will appear as alarms until the inputs are programmed.

- To automatically program the inputs:

  Make sure all inputs are in their normal (non-alarm) state. Then press:

  `5 0 0 ENTER`

The Verbatim autodialer automatically examines all inputs and programs them to alarm on the opposite input state from their present status. This code 500 does not affect any channels that have been programmed for Disabled Channels, Status Only, Run Time Meter, or Pulse Totalizer function.

Exceptions

In most cases, no further programming of contact inputs is necessary. However, the following configuration options are available:

- To set any input to be disabled and never be annunciated, press:

  `5 ZZ 0 ENTER`

  where ZZ is the 2 digit channel number you are programming. Be sure to always use a leading 0 for channels 1 through 9 to keep the channel number a two-digit entry.

- To set an individual contact input for normally closed operation (i.e. to alarm on Open Circuit), press:

  `5 ZZ 1 ENTER`

- To set an individual contact input channel for normally open operation (i.e. to alarm on Closed Circuit), press:

  `5 ZZ 2 ENTER`

- To set inputs to report status only, program each individual channel as follows:

  `5 ZZ 3 ENTER`

  This setup never causes an alarm to dial out.

- To set contact inputs for the run-time meter function, program each channel as follows:

  `5 ZZ 4 ENTER`

See Section 6.2.3, “Channel Programming (Configuring).” This setup never causes an alarm to dial out but reports the total accumulated hours that the input contact is closed.

- To set any of your contact inputs for the Pulse Totalizer function, see Section 6.2.3, “Channel Programming (Configuring)."

3.4 Initial Testing

Perform the following steps to ensure that your Verbatim autodialer is properly installed.

DISARM
RE-ARM

1. First, temporarily disarm the unit by pressing:

   DISARM/RE-ARM until the DISARM LED is flashing. This prevents the unit from dialing out.

2. Next, physically trip each sensing device in turn (manipulate float switches, relays, etc.).

   Verify that the corresponding input channel LED lights at the front panel, and then restore all sensors to their normal state.

DISARM
RE-ARM

3. Now press DISARM/RE-ARM. This will clear out the channel input LEDs and restore the unit to a ready condition.
4. To test the phone line connection, with the unit’s phone cord plugged into its phone jack, temporarily remove the AC power cord to the unit.

   The PFAIL LED will illuminate. At this point all illuminated LEDs will flash on and off in order to conserve battery power. Since the unit is not disarmed this time, after a 0.1 minute Alarm Trip Delay the PHONING light will illuminate and the unit will access the phone line and will begin dialing the first phone number.

DIAL OUT
PRESS TO TALK

   The unit will recite its station ID and power failure messages. You may converse with the person answering by pressing and releasing DIALOUT/ PRESS TO TALK. Press this key again when you wish to speak, and release this key to listen. This action will suspend message recital. In this case, when the conversation is done, you should end the call by pressing NORMAL. Ordinarily the alarm call would end automatically.

DISARM
RE-ARM

5. Now press DISARM/RE-ARM twice.

   This step disarms and then rearms the unit clearing all acknowledged alarms. This clearing also occurs automatically after the Alarm Reset Time has elapsed (default value 1 hour). See Section 5.6, “Alarm Reset Time-out After Acknowledgment.”

6. Your Verbatim autodialer is now able to operate, having at least one dialout phone number programmed and having its input channels configured.

   However, you may wish to record your own voice messages (see the next section) or perform special advanced programming items (see Section 6, "Advanced Programming") before referring to Section 5, "Using Your Verbatim autodialer."

4

Recording Voice Messages

This chapter describes how to record your own voice messages. Messages may be recorded for the Station ID and for the Alarm and Normal condition for every channel in your Verbatim autodialer.

Note:

Be sure to complete the programming of the input channels as described in the previous chapter before recording any messages.

Using Default Messages Instead of Recording Your Own.

Recording messages is an optional step. Your Verbatim autodialer comes with built-in default normal and alarm messages for all channels. Recording voice messages can be postponed until you have become more familiar with your unit. You may even choose to record or re-record your own messages from a remote telephone at any time.

Using default messages for selected channels or for the Normal condition of channels is an excellent way to conserve speech memory for certain important and lengthy alarm messages.

Types of Default Messages

- Discrete (i.e. digital, contact) physical channel inputs:
  "Channel N Normal" and "Channel N Alarm."
- Discrete remote channel inputs:
  "Remote Channel N Normal" and "Remote Channel N Alarm."
- Discrete Status-only or Run-time meter physical channel inputs:
  "Channel N is ON" when input circuit is closed, and "Channel N is OFF" when input circuit is open.
- Discrete Status-only remote channel inputs:
  "Remote Channel N is ONE" or "Remote Channel N is ZERO."
- Analog (integer) physical or remote channel inputs:
  ["Channel N, present reading is ..."] followed by the recited analog value.
- Station ID message:
  "ID Number N."

There is also a default Network ID message. See Appendix F for details.

4.1 Planning Messages

Worksheet C in Appendix J is provided to assist you with this. Please use the Worksheet! Not only will you then have a written record of your messages for future reference, you will also then be prepared to record your messages with the greatest ease and efficiency.

In general, two different messages are used for each input channel:
One message for the Normal Condition, and another for the Alarm (fault) Condition.

When you have written down the messages that you want to record, you are ready to verify/extend your recording time.

⁂

Exceptions:

- Status-only or Run-time Metering Channels. See Section 6.2.3, "Channel Programming (Configuring)."

  To record your own messages for these specially configured channels rather than relying on the default "Channel N is ON" or "Channel N is OFF" messages:

  - Plan a message for the Closed Circuit condition and another message for the Open Circuit condition for each channel.

  For Run-time channels, the unit will add a report of the run-time in hours, using built-in speech, after the Closed or Open Circuit message.

- Pulse Totalizer Channels

  See Section 6.2.3, "Channel Programming (Configuring)," for special guidance in planning Pulse Totalizer messages.

4.2 Managing Available Speech Memory

The table below shows the total available message recording time for units with differing total number of channels. The available message recording time may be extended in two ways. First, you may explicitly change the recording rate from the default Rate 1 to Rates 2, 3, or 4 (See Section 6). Secondly, you may automatically extend the message recording time by using the Autoextend™ feature described in this section.

Unit type	Initial recording time (at Rate 1):	Extendable to: (Rate 2, 3 or 4)
4-8	26 sec	40, 54 or 79 sec
16-32	104 sec	160, 216 or 318 sec
33-40 chan. unit	130 sec	200, 270 or 399 sec
41-48 chan. unit	156 sec	240, 324 or 476 sec
49-56 chan. unit	182 sec	280, 378 or 555 sec
57 or more	208 sec	320, 432 or 624 sec

4.2.1 Verifying/Extending Recording Time

Initially, the unit is set for the fastest memory use rate ("Rate 1"), giving the highest fidelity sound recording. If you are sure that your messages take less than the "initial" time shown above for your unit (14 seconds total for a 4-channel unit), go to Section 4.3, "Record Your Messages." You may also verify your unit's current rate setting and corresponding total message recording time by pressing:

`9 1 1 ENTER.`

If, after performing this step, you think you may need more recording time perform the Autoextend™ step described next. The Autoextend™ feature will automatically extend the available recording time, selecting the optimum recording rate (speech memory rate) to give you the highest possible recording sound quality for your length of recording.

Warning:

The following step will erase any existing recorded messages.

To use the Autoextend™ feature to extend recording time, have your message Worksheet handy as you press:

`9 1 2 ENTER`

The Verbatim autodialer will prompt you to immediately begin reciting your entire list of messages at the sound of the beep, one after another, at the same speed that you will want to later record them.

During this time, the Verbatim autodialer will *not* be recording your spoken messages. Instead, it will be timing you.

When you have finished reciting (not recording) the last message, immediately press ENTER.

☎ Over the phone, press ZERO to start the timing, and ZERO again to end the timing. See Section 5.7, "Programming by Phone."

Based on how long your message recital took, the Autoextend feature will automatically calculate which recording rate is optimum for your length of recording time, and will then automatically select that rate. It will tell you how many seconds your message took, and how much total recording time it has now given you.

4.3 Record Your Messages

First, minimize any background sounds. Then proceed as follows:

- Have your message Worksheet in front of you and be prepared to recite the first Alarm (fault) Condition message in a loud clear voice within about 6 to 12 inches of the microphone located at the top of the front panel. Press:

  ```
  1 ZZ ENTER
  ```

  where ZZ is the appropriate 2-digit channel number, such as 01 for channel 1. Be sure to use leading zeroes, in order to keep ZZ a 2-digit entry. Use 00 for the Station ID message.

RECORD

The voice specifically identifies the message you are about to record, and then prompts you to press the RECORD key and hold it just for the duration of your spoken message. Note that the RECORDING light comes on during recording.

☎

Over the phone, since there is no RECORD key, the voice will prompt you to press ZERO to begin recording, and press ZERO again to stop recording. See Section 5.7, "Programming by Phone."

The Verbatim autodialer will immediately play back the message you have just recorded, allowing you to determine if you need to re-record it louder, softer or more clearly, etc.

Experiment with different volume levels to get the best message clarity. If there is too much background noise at the Verbatim autodialer site, record your messages over the phone.

Always stop the recording promptly to avoid wasting recording time.

- To record an alternate "Normal Condition" message for channel ZZ, press:

  ```
  2 ZZ ENTER
  ```

  and follow the same procedure as above.

- To review both existing messages for channel ZZ, press:

  ```
  3 ZZ ENTER
  ```

  The Verbatim autodialer will replay both existing messages for channel ZZ. This will include any default messages remaining in use.

⁂

Exceptions:

- For any channels programmed for "Status Only" or for Run Time Meter function, use code 1 ZZ for the Open Circuit message, and 2 ZZ for the Closed Circuit message.
- If you run out of recording time, you will hear the message "No more message time." See Section 4.2 above to re-establish total available recording time. You may elect to shorten some messages, or rely more on selected default messages, or you may Autoextend the available recording time. Then, re-record all messages.
- If you wish to extend the available time for a specific message while leaving the other messages unaffected, enter the code for recording that message, but add an extra digit 1 through 4, before pressing ENTER.

  The digit 1 (Rate 1) gives the shortest time and the best sound quality, while 4 (Rate 4) gives the longest time with poorest sound quality.
- If you wish to reinstate a default message, enter the code for recording that message, and an extra POINT before pressing ENTER. For example:

  `1 ZZ POINT ENTER`
- If you wish to use the default Station ID message but with a different ID number in place of the "one", press:

  `9 1 4 N ENTER`

  where N is the desired ID number which may be up to 16 digits long. Some users program the Verbatim autodialer's own phone number as its ID number.
- If you want to set a specific recording rate rather than letting Autoextend do it, press:

  `9 1 3 N ENTER`

  where N is the desired recording rate 1, 2, 3 or 4.
- You will then need to re-record any messages that were previously recorded at a different rate.

5

Using Your Verbatim Autodialer

5.1

Placing Inquiry Calls to the Verbatim Autodialer

You may call the Verbatim autodialer at any time from any phone. The unit will wait the programmed number of rings before answering and then will begin a full status report. The status report starts with the Station ID Message, followed by any special warning messages (e.g.: no phone numbers programmed, or the unit is disarmed, etc.), and concludes with the listing of the status of each channel input.

If there are no alarm conditions on any channel, then the Verbatim autodialer will say "All channels normal" just prior to beginning the complete channel status report.

If there are channels with unacknowledged alarms conditions prior to the call, placing a call to the unit will result in the acknowledgement of these alarms. The Verbatim autodialer will say "Alarm is acknowledged" immediately after reciting the Station ID message.

Exception:

The Call in Acknowledge Mode command (Code 925) may be used to set the Verbatim so that calls *to* the unit will not automatically acknowledge alarms.

The channel status report will be recited the programmed number of message repeats (default is 3 times). Between each recital the Verbatim autodialer will issue a prompting beep and then wait a few seconds for you to optionally enter a special Command Tone. See Section 5.7, "Programming by Phone." After all message repeats, if you have not entered a tone, the unit will say "Goodbye" and terminate the call.

See Section 6.2, "Programming Operations."

5.2

CHECK STATUS Inquiry at Panel

NORMAL
CHECK STATUS

When the NORM LED is lit, you may hear a report of current conditions by pressing the NORMAL/CHECK STATUS key. You may cut this report short by again pressing the NORMAL/CHECK STATUS key.

5.3 Receiving Alarm Calls

When any input condition violates the programmed alarm criteria for an interval longer than the Alarm Trip Delay for that input (See Section 6.2.6), the unit goes into an Unacknowledged Alarm state. The unit begins dialing the first of up to 16 programmed phone numbers. See Section 6.1, “Program Codes,” about optional Alarm Call Grouping if you want the numbers dialed to depend on which channel is in alarm. Whenever there is an Unacknowledged Alarm the corresponding channel alarm LED begins flashing.

The voice messages follow the same format as an inquiry call, including the prompting beep, except the channels having no alarm activity are not included in the alarm report. If there is no acknowledgment, the Verbatim autodialer will replay the message for the programmed number of repeats (default is 3) and then will say, “Goodbye,” before terminating the call.

See Appendix I for information on alternate annunciator state models. Annunciator state models support various Return To Normal (RTN) calling sequences.

Phrases Appended to Alarm Messages

(user recorded or default)

These appending phrases will continue to be included in any status reports until the Alarm Reset time expires for that channel.

ALERT
Any channel with an input violation which has not been present longer than the Alarm Trip Delay for that channel will have its status message appended with the word "Alert."

NOW NORMAL
If the violation which originally caused the alarm has gone away the phrase "Now Normal" will be appeneded to the alarm status message.

ACKNOWLEDGED
Any channel which was in an unacknowledged alarm state but became acknowledged will have its status message appended with the word "Acknowledged."

NOW NORMAL, ACKNOWLEDGED
Any channel which is both acknowledged and whose input voilation has gone away will have its status messages appended with the phrase "Now Normal, Acknowledged."

Note:

When the autodialer goes into alarm, it dials each phone number in sequence until it receives an acknowledgement. The alarm may be acknowledged after the warble tone by pressing a touch tone "9"; by calling the unit back after it says, "goodbye," or by pressing NORMAL on the front panel. After acknowledgement, the dialer will not call out again on that channel until it is reset. This is usually done automatically after a set period of time called the *Alarm Reset Time*, which allows the person who acknowledged the alarm time to go fix the source of the problem without further callouts from the dialer. After the reset time, the unit is automatically reset, and any alarms present at that time will cause a dial out.

Exception:

Power Failure alarms only cause two spoken messages: *1)* When power has been off for longer than the Power Failure Trip Delay, "Power is Off" is reported. *2)* When power has been off and is later restored the message "Power is On" is reported.

5.4

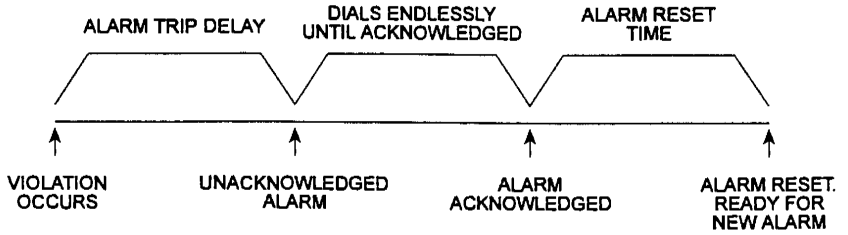
Continued Dialing in the Absence of Acknowledgment

The Verbatim autodialer will then wait for the programmed Time Between Alarm Calls (default 2 minutes; See Section 6.2.12, "Miscellaneous Programming Tips," to change default time), during which you may call the Verbatim autodialer back to acknowledge the alarm. If no acknowledgment is received at the end of this period, the next phone number will be dialed. The process will be repeated indefinitely, repeatedly going through all the designated phone numbers, until acknowledgment is received.

Exception:

If you want further calling terminated when channels return to normal you may so program the unit by using the "Set Return to Normal" command (Code 923). See Appendix K.

ANATOMY OF AN ALARM



5.5 Acknowledging the Alarm Call

To acknowledge the alarm during the alarm call wait to hear the prompting "warble" tone then enter a touch tone '9' (Also 1, 2, 4, or 0 will acknowledge in this situation). The Verbatim autodialer will say “Alarm is acknowledged, Goodbye” and terminate the call. See Section 5.7, “Programming by Phone,” for additional ways of acknowledging an alarm without ending the call.

Alternative methods of Acknowledging:

Wait for the alarm call to end then place a call to unit.

At the front panel press NORMAL, PROGRAM, DISARM, or DIALOUT .

Upon acknowledgment, the channel LED changes from flashing to steady illumination.

At the end of the Alarm Reset period the channel alarm LED turns off, the Acknowledged Alarm status is cleared for that particular channel input, and it is again ready to go into Unacknowledged Alarm whenever a violation occurs at that input. In particular, if a violation has not been removed (prior to timeout), dialing begins immediately upon the Alarm Reset period timeout. To reactivate the alarm before the alarm reset timeout period is over, re-arm the alarm.

5.6 Alarm Reset Timeout After Acknowledgment

As shown in the figure, "Anatomy of an Alarm," p. 5-3, when an acknowledgment is received, the Verbatim autodialer begins timing out the Alarm Reset Time, (default 1 hour).

Further calling on behalf of that channel is suspended, regardless of further activity at that particular input during this period. If new alarms occur on other channels during this period, the unit will go back into the Unacknowledged Alarm state and dial the first appropriate phone number, with dialing continuing until a new acknowledgment is received.

5.7 Programming by Phone

☎

During any phone call (inquiry call or alarm call), at the end of each round of messages, the prompting warble tone is issued. If you press a Command Tone “1” at the sound of the warble tone, the Verbatim autodialer will prompt you to enter a program code. (Or, if you have established a Security Access Code, you will first be prompted for this code).

To enter programming codes over the phone:

- Enter a touch tone "1" after the warble tone.
- Enter the program code followed by # #.
- Enter an additional # # when you are ready to hang up.

You may enter codes for most of the programming operations described in this manual except reading or changing the optional security access code. See Section 6 for more information about the 910 Security Access feature.

Since some of the front panel keys are not found on a touch tone keypad, some special conventions apply for over-the-phone programming:

In Place Of:	Enter:
CANCEL	* *
ENTER	# #
POINT	*
MINUS	#

- To enter the Program Mode press "1" after the warble tone.
- To end a phone call after programming:

  Press # # without a prior digit entry.

  The Verbatim autodialer will then issue a prompting beep which is another opportunity to enter a "1" if you didn't want to end the call. It will then say "Goodbye" and end the call.

Exception:

Over the phone, you may not program more than one consecutive dialing delay, because # # (two in a row) is interpreted as ENTER when programming. However, you may extend this delay using code 928. See *Program Code Table* p. 6-9.

- If you initially enter a Command Tone "2" in place of the "1", you will be in a special Program Review Mode, which allows you the safety of checking any of the programming items or messages, without the possibility of altering any of them.
- If you initially enter a Command Tone "3" in place of the "1", you will hear a report of each channel that has any acknowledged or unacknowledged alarm condition.
- If you initially enter a Command Tone "4" in place of the "1", you will hear a listing of all programmed phone numbers, plus any other basic programming items that you have altered from their default values. This is particularly useful in diagnosing operating problems.

- If you initially enter a Command Tone "8" in place of the "1", the unit will not be acknowledged and will immediately say "goodbye" and end the phone call.
- If you initially enter a Command Tone of "0, 5, 6, 7, or 9," in place of the "1", the alarms will acknowledge an alarm and the unit will immediately say "goodbye" and end the phone call.

Note:

Command tones "1, 2, 3, and 4" will acknowledge all alarms, even those not in their Alarm Call Group (ACG). See Section 6.2.13. Command tones "0, 5, 6, 7, and 9" will acknowledge only alarms in their ACG. Command tone "8" will not acknowledge any alarms, but will give the status of all alarms.

5.8

Dialing Out and Conversing Through the Verbatim Autodialer

DIAL OUT
PRESS TO TALK

At the panel, starting in the Normal Mode, press the DIALOUT/PRESS TO TALK key. Next press the digits of the phone number you want to dial. Each digit you press will be dialed as you press it. You will then hear the sound of the ringing.

When you hear the phone answered, press and hold the same DIALOUT/ PRESS TO TALK key as you speak to the person on the line, and release the key to listen. Continue the conversation in this manner.

- To end the call press NORMAL. If the DIALOUT/PRESS TO TALK key is not pressed for more than 2 minutes (or as previously set), the Verbatim autodialer will automatically end the call.
- To automatically re-dial a number that was previously manually entered by this method, press DIALOUT/ PRESS TO TALK as before, then press ENTER rather than entering digits manually.

NORMAL
CHECK STATUS

If you are at the panel when a phone call is in progress, you may suspend the message report and converse with the person on the other end by pressing the DIALOUT/PRESS TO TALK key as described above. There will be no additional dialing, since connection has already been established. To end the call, press NORMAL.

6 Advanced Programming

6.1 Program Codes

This chapter provides the Program Codes table which summarizes the wide variety of available programming operations, along with a description and comments. Additional information may be found in referenced notes below as well as in the referenced sections elsewhere in the manual.

When the overall programming is cleared out at initial start-up, all programming is automatically set to factory default values as shown in the table. Most of these default values are quite suitable for most users and only selected items may need to be programmed to different values.

ENTER

- To read the existing programmed settings:

  Enter a code and then ENTER without any intervening value. This reads the existing programmed setting without changing it.

POINT *

- To clear a program:

  Enter POINT ***after the code*** and before ENTER. This clears the program item, or returns it to its default value.

In the Program Codes table, several forms of numeric value entries are shown:

Value	Definition
V	A value of one or more digits which may include a decimal point or minus. Examples: .5, 2.8, 300.6, 60.
N	One or more digits giving a whole number; no decimal points allowed. Examples: 1, 5, 20.
DN	A two-digit Designation Number for phone numbers (01 for first number, 02 for second, etc.).
1/0	Used to turn a function ON (1) or OFF (0).
ZZ	2-digit channel number (use ZZ=00 for ID message).

6.1.1 Notes for Programming Code Table:

Refer to these numbered items under the "Notes" column in the following *Programming Code Table.*

1. ZZ = 2 digit channel number. Use ZZ=00 for Station ID message.
2. For any channels you have programmed as "Status Only" or "Run Time Meter", use code 1 ZZ for the Open Circuit message, use code 2 ZZ for the Closed Circuit Message. See Section 6.2, "Programming Operations," for message information for any Pulse Totalizer channels.
3. DN (Designation Number) is 01 for first dialout phone number, 02 for second number, etc. DN = 00 for special "callback" phone number. Use MINUS to insert any needed delays between digits. Each such delay is 1 second unless extended using code 928.
4. Actual power failure trip delay may be a fraction of a second longer than programmed value, due to power supply discharge time which varies with the number of option boards.

Caution:

5. If Alarm Reset Function is turned OFF, acknowledged alarms will NEVER RE-ARM, preventing further alarm calls after acknowledgment for each channel.
6. Speaker always operates during front panel programming, even if programmed to be off.
7. Cannot be read or changed over the phone.
8. Does not change channels that have been configured for "Status Only," "Run Time Meter," or "Pulse Totalizer."

Caution:

9. High Speed Dialing setting may not work reliably with some telephone company exchanges.
10. Add POINT to restore default message.
11. To pre-set a Run Time value, include the value before ENTER.
12. Maximum value that can be entered is 4,294,967,294.
13. Omits all mention of disabled channel. Restore by setting for Normally Closed, Normally Open, etc.

Programming Code Table (Page 1 of 8)

Code	Description & Comments	Default	Range/Values	Notes *See p. 6-2*	Section
Channel Status Reading					
0ZZ	Reads status of channel ZZ				6.2.1
0ZZ0	Reads actual open/closed circuit status directly				6.2.1
Message Recording and Reviewing					
100	Records Station ID message			1, 2, 10	4.3, 6.2.2
1ZZ	Records channel ZZ alarm message			1, 2, 10	4.3, 6.2.2
2ZZ	Records channel ZZ normal message			1, 2, 10	4.3, 6.2.2
3ZZ	Reviews channel ZZ both messages ZZ=00 for Station ID msg			1	4, 4.3, 6.2.2
911	Reads current record rate and available record time				4.2
912	Autoextend: sets optimum record rate for recited msg				4.2
913 N	Sets recording rate	Rate 1	Rate 1-4		4.3
914 N	Inserts N in place of 1 in canned station ID message	Station 1	1-16 digits		4.3
Channel Programming (Configuration)					
500	Sets current status as normal for all channels				3.3, 6.2.3
500 N	Sets all inputs to config parameter N	normally closed	0/1/2/3 0 = disarmed 1 = normally closed (default) 2 = normally open 3 = no alarm		3.3, 6.2.3
5ZZ	Reads alarm criteria for channel ZZ	1			6.2.3
5ZZ 0	Disables channel ZZ			13	3.3, 6.2.3
5ZZ 1	Sets chan ZZ normally closed			1	3.3, 6.2.3
5ZZ 2	Sets chan ZZ normally open			1	3.3, 6.2.3
5ZZ 3	Sets chan ZZ for no alarm (status report only)			1	3.3, 6.2.3
5ZZ 4	Sets chan ZZ for run time meter operation			1	3.3, 6.2.4
5ZZ 4 V	Preset starting value	0.0 hrs	0.0-99,999.9 hrs	1	6.2.4
5ZZ 7 N	Pulse totalizer: ACTIVATES with starting value N			12, 2	6.2.5
5ZZ 8 N	Pulse totalizer: sets scale factor N			12	6.2.5
5ZZ 6 N	Pulse totalizer: sets alarm setpoint N with starting value N			12	6.2.5

Programming Code (Page 2 of 8)

Alarm Trip Delays

Code	Description & Comments	Default	Range/Values	Notes *See p. 6-2*	Section
600	Reads power failure alarm trip delay				6.2.6
600 V	Sets power failure alarm trip delay to V	0.1 min	0.1-999.9 min		6.2.6
6ZZ	Reads chan ZZ alarm trip delay				6.2.6
6ZZ V	Sets chan ZZ individual alarm trip delay to V	2 sec	0.1-9999.9 sec	1	6.2.6
6ZZ POINT	Returns chan ZZ individual alarm trip delay to default	2 sec		1	6.2.6
902 V	Sets global (all channels) alarm trip delay to V seconds	2 sec	0.1-9999.9 sec		6.2.6
902 POINT	Returns global (all channels) alarm trip delay to default	2 sec			6.2.6

Phone Numbers and Pulse/Tone Dialing

Code	Description & Comments	Default	Range/Values	Notes *See p. 6-2*	Section
700	Reads special "callback" phone number			See Code 924	6.2.18
700 N	Sets special "callback" phone # to N		1 - 60 digits		6.2.18
7DN	Reads phone number DN		01 - 16 DN = 01-16		3.2, 6.2.7
7DN N	Sets phone number DN to N phone #		1 - 60 digits N can = up to 60 digits	3	3.2, 6.2.7
7DN POINT	Clears out phone number DN				3.2, 6.2.7
900 0/1	Read/Set Call Progress Monitoring	0 (OFF)	0/1 0 = OFF 1 = ON		6.2.12
901 0/1/2	Sets dialing mode	Pulse mode	0/1/2 0 = pulse 1 = tone 2 = high speed	9	6.2.7
903 V	Sets time between callouts to V	2 min	0.1-99.9 min		6.2.18
906 N	Sets ring answer delay to N N = whole number	1 ring	1 - 20 rings		6.2.18
908 0/1	Sets Autocall ON/OFF	OFF	0/1 0 = OFF 1 = ON		6.2.18
909 V	Sets Autocall interval to V	24 hrs	0.1-99.9 hrs		6.2.18
916 N	Set Automatic Phone Fault Detect frequency	24 hrs	0.1 - 24 hrs	916 POINT resets to default	6.2.10
917 0/1/2/3	Set Phone Fault and Auto Tone-Pulse	3	0/1/2/3 0 = Phone Fault OFF/Auto Tone-Pulse OFF 1 = Phone Fault ON/Auto Tone-Pulse OFF 2 = Phone Fault OFF/Auto Tone-Pulse ON 3 = Phone Fault ON/Auto Tone-Pulse ON		6.2.10
918	CPM Ring Count	10 rings	5 - 20 rings		6.2.12
928 N	Extends length of inserted dialing delays to N sec	1 sec	1 - 10 sec		6.2.7

Programming Code (Page 3 of 8)

Code	Description & Comments	Default	Range/Values	Notes *See p. 6-2*	Section
Alarm Call Grouping					
5ZZ 9	Reads channel ZZ alarm call grouping linkage			1	6.2.13
5ZZ 9 DN	Links channel ZZ to phone numbers DN.	Calls all phone #s	01 - 16 DN = 01-16	1	6.2.13
5ZZ 9 POINT	Clears channel ZZ alarm call grouping linkage.			1	6.2.13
Alarm Ready Scheduling					
935 7	Initializes real-time clock chip on install to 1/6/92 2				2.3, 6.2.19, 7.9
941 MMDDYYD	Sets date	01/06/92 2	01/01/94 - 12/13/20 <u>D *(Day Code)* is optional</u>: 1 = Sunday 2 = Monday 3 = Tuesday 4 = Wednesday 5 = Thursday 6 = Friday 7 = Saturday		2.3, 7.9
942 HHMMSS	Sets time	08:00:00	00:00-23:59:59 (military-24-hour-clock)		2.3, 7.9
961	Read weekday rearm/disarm times				7.9
961 RRRR DDDD	Sets weekday rearm/disarm times	1700, 0800		RRRR=rearm time, DDDD=disarm time (military-24-hour-clock)	7.9
962	Reads weekend rearm/disarm times				7.9
962 RRRR DDDD	Sets weekend rearm/disarm times	1700, 0800		RRRR=rearm time, DDDD=disarm time (military-24-hour clock)	7.9
963	Reads weekend rearm/disarm day of week				7.9
963 R D	Sets weekend rearm/disarm day of week	Friday, Monday	R = rearm day D = disarm day		7.9
964	Reads holiday rearm date				7.9
964 MMDDYY	Sets holiday rearm date	12/24/90	Today - 12/31/20 MM = month DD = day YY = year		7.9
965	Reads holiday disarm date				7.9
965 MMDDYY	Sets holiday disarm date	12/24/90	The day after the holiday rearm date (see Code 964) - 12/31/20		7.9

Programming Code (Page 4 of 8)

Code	*Description & Comments*	*Default*	*Range/Values*	*Notes* *See p. 6-2*	*Section*
Alarm Ready Scheduling . . . *Continued from p. 6-5*					
966	Reads alarm ready schedule control number				7.9
966 N	Sets alarm ready schedule control number	0	N control 0-7 0 = OFF 1 = Weekday 2 = Weekend 3 = Weekday and Weekend 4 = Holiday 5 = Weekday and Holiday 6 = Weekend and Holiday 7 = Weekday, Weekend and Holiday		7.9
Local Data Logging Programming Codes					
935 7	Initialize real-time clock chip on install to 1/6/92 2				2.3, 6.2.19, 7.9
941 MMDDYYD	Sets date.	01/06/92 2	01/01/94-12/31/20 <u>D *(Day Code)* is optional</u>: 1 = Sunday 2 = Monday 3 = Tuesday 4 = Wednesday 5 = Thursday 6 = Friday 7 = Saturday		2.3, 7.9
942 HHMMSS	Sets time	08:00:00	00:00-23:59:59 (military-24-hour clock)		2.3, 7.9
943 V	Sets regular interval local printing	OFF	0 = OFF .1 - 999.9 hrs		2.3, 7.9
944	Prints all current programming immediately				2.3, 7.9
Analog Input Programming					
5 ZZ 1 X.XX	Sets low signal input value				B.1.5
5 XX 1 POINT	Sets low signal input value to real world point				B.1.5
5 ZZ 2 X.XX	Sets low signal input spoken value				B.1.5
5 ZZ 3 X.XX	Sets high signal input value				B.1.5
5 ZZ 3 POINT	Sets high signal input value to real world point				B.1.5
5 ZZ 4 X.XX	Sets high signal input spoken value				B.1.5

Programming Code (Page 5 of 8)

Code	Description & Comments	Default	Range/Values	Notes See p. 6-2	Section

Analog Input Programming . . . *Continued from p. 6-6*

5 ZZ 5 X.XX	Sets low setpoint alarm value				B.1.5
5 ZZ 6 X.XX	Sets high setpoint alarm value				B.1.5
5 ZZ 7	Sets analog input signal type	0	0/1/2 0 = 4-20 ma signal 1 = 0-1 VDC signal 2 = RACO TS-705A		B.1.3

Remote Supervisory Control

For all items in this section: N = output number, Range = 01, 02, 03, 04, 05, 06, 07, 08

95 N	Reads RSC output #N ON/OFF condition			14	C.1.3
95 N 0	Turns RSC output #N OFF				C.1.3
95 N 1	Turns RSC output #N OFF				C.1.3
95 N 2 V	Turns RSC output #N ON for V seconds only	1 sec	1 - 99,999 sec		C.1.3
95 N 3 V	Turns RSC output #N OFF for V seconds only	1 sec	1 - 99,999 sec		C.1.3
9500	Reports ON/OFF status of all outputs				C.1.3
9500 0	Turns OFF all outputs				C.1.3
9500 1	Turns ON all outputs				C.1.3
9500 8 V	Establish default pulse duration in minutes (When using 95 N 2 or 95 N 3)				C.1.3
9500 9 V	Establish default pulse duration in seconds (When using 95 N 2 or 95 N 3)				H.2.3

Data Acquisition/Central Data Logging

919 V	Sets quick intercall time	60 sec	35-999 sec		E.2
981 V	Return To Normal (RTN) calling	0	0/1/2/3/4/5	See Code 923	E.1, K.4
982 0/1/2	Acknowledgment calls to central station	0	0/1/2 0 = 1 1 = ON 2 = resets all alarm acknowledgment call status		E.3
983 0/1	Modem Automatic Speed Select	1	0/1 0 = OFF 1 = ON		E.4

Programming Code (Page 6 of 8)

Code	Description & Comments	Default	Range/Values	Notes See p. 6-2	Section
Data Acquisition/Central Data Logging . . . *Continued from p. 6-7*					
984 0/1	Modem High/Low speed selection	1	0/1 0 = 300 1 = 1200		E.5
985 N	Data call attempts	3	1 - 10		E.6
986 0/1	Sets answer mode	0	0/1 0 = Data-to-Voice 1 = Voice Only		E.7
987 N	Data/Voice autocall calls	0	0/1/2 0 = Autocalls to Central Station only 1 = Autocalls to personnel numbers only 2 = Autocalls to all numbers		E.8
Miscellaneous Programming Items					
902 V	Sets global (all channels) alarm trip delay to V	2 sec	0.1-9999.9 sec		6.2.6
904 V	Sets alarm reset time to V	1 hour	0.1-99.9 hr		5.6, 6.2.18
905	Clears all acknowledged alarms and clears reset timers				6.2.18
907 N	Sets number of alarm message repeats to N N = whole number	3 repeats	1-20 repeats		5.3, 6.2.18
910 N	Establishes a security access code N	None	0-8 digits	7	6.2.18
920 V	Power failure trip delay (duplicates function of code 600)	0.1 min	0.1-999.9 min	4	6.2.6
921 0/1	Sets power failure alarm	ON	0/1 0 = off 1 = on		6.2.6
922 0/1	Sets alarm reset timers	ON	0/1 0 = off 1 = on	5	6.2.18
923	Annunciator Sequence	1	1-4 <u>Values</u>: 1 = M-1designations 2 = A-1-4 designations 3 = A-1 designations 4 = A-1-4 variant	See also Code 981	K.4
924	Initiates test callback to phone # 00			unit must be ARMED	6.2.18
925 0/1	Turns on/off alarm acknowledgment on call-in to dialer.	ON	0/1 0 = OFF 1 = ON		
926 V	Sets delay before return to normal (Exit Delay) to V	2 min	1-99.9 min	Nonrecurring Function	6.2.18

Programming Code (Page 7 of 8)

Code	*Description & Comments*	*Default*	*Range/Values*	*Notes See p. 6-2*	*Section*
Miscellaneous Programming Items . . . *Continued from p. 6-8*					
927 0/1	Sets intercall delay parameter	0	0/1 Values: 0 = Normal operation of intercall delay. 1 = If new Unacknowledged alarms occur during the intercall delay period, the unit will begin a new dialout immediately. The unit will dial the next phone number in the dialing sequence. It will not start over at the top of the list.	** Firmware version 2.01+ only**	
928 N	Extends length of inserted dialing delays to N sec	1 sec	1-10 sec		5.7, 6.2.7
930 0/1	Sets arm or disarm unit for alarm callouts	armed	0/1 0 = disarms 1 = arms unit		6.2.18
932	Invokes one-time 15-second listening period	OFF			6.2.18
933 0/1	Sets local microphone ON or OFF	OFF	0/1 0 = OFF 1 = ON		6.2.18
934 0/1	Sets speaker ON or OFF	ON	0/1 1 = ON 0 = OFF	6	6.2.18
Clear Out Operations					
935 0	Clears out phone numbers; sets all delays to defaults				6.2.19
935 1	Clears out phone numbers only				6.2.19
935 2	Clears out all alarm call grouping linkage				6.2.19
935 3	Sets the following delays to their factory default values: 902, 903, 904, 920, 921, 926, 928			921 sets power failure alarm ON	6.2.19
935 4	Clears all user recorded messages				6.2.19
935 5	Clears all programming except messages			does not clear 913, 930, 941, 942	6.2.19
935 6	Clears all totalizers to 0 (not to preset) reading				6.2.19
935 7	Clears real-time clock chip (reinitialize)				2.3, 6.2.19, 8.9
935 9	Total clearout: Erases all programming & messages			does not clear 941, 942	3.1, 6.2.19
Diagnostic Readouts					
940	Reads all 4 diagnostic counts (add 0 to clear all 4)				6.2.20
940 1	Reads call in count (add 0 to clear)				6.2.20
940 2	Reads dial out count (add 0 to clear)				6.2.20
940 3	Reads acknowledged alarm count (add 0 to clear)				6.2.20
940 4	Reads power failure alarm count (add 0 to clear)				6.2.20

Programming Code (Page 8 of 8)

Code	Description & Comments	Default	Range/Values	Notes See p. 6-2	Section
Local Alarm/Line Seizure					
960 0	Read local alarm relay/line seizure				H.8
960 00/01	Set local alarm relay/line seizure 00 = local alarm relay 01 = line seizure	00	00/01		H.8

6.2 Programming Operations

The following descriptions show the relevant program codes in parenthesis, and are organized according to their appearance in the preceding Program Codes table located in Section 6.1, "Program Codes."

Refer also to Section 5, "Using Your Verbatim Autodialer," for a description of over-the-phone programming.

6.2.1 Channel Status Reading

Code	Function	Description
0 ZZ	Read Status of Channel ZZ	Plays the message that corresponds to the present input condition of Channel ZZ.
0 ZZ 0	Read Open/Closed Circuit Status Directly	Says "Channel ZZ is closed" if channel ZZ input is presently Closed Circuit, or "Channel ZZ is open" if the input is Open Circuit. Useful in troubleshooting, especially at setup time.

Note:

If a channel is disabled, its status will never be mentioned.

6.2.2 Message Recording and Reviewing

Be sure to refer to Section 4, "Record Voice Messages," for important details on message recording, including codes 911, 912, 913, and 914.

Code	Function	Description
100	Record Station Message	
1 ZZ	Record Channel ZZ Alarm Message	Used for Open Circuit message for channels programmed for NO ALARM (status only), or for Run Time Meter operation. Also used for a preamble message for channels programmed for Totalizer or Analog function.

2 ZZ	Record Channel ZZ Normal Message	Used for Closed Circuit message for channels programmed for NO ALARM (Status Only) or for Run Time Meter operation. Also used for "units of measure" portion of a message following preamble and digit readings, for channels programmed for Totalizer or Analog function.
3 ZZ	Review Channel ZZ Messages	Use 3 00 to review Station ID message

6.2.3 Channel Programming (Configuring)

Also see Section 3.3, "Programming Input Channels."

Code Function	Description
500 Set Present Input Status as Normal Condition for All Contact Input Channels	Used at setup time as the most expedient way of programming the Normally Open/Normally Closed configurations ("Alarm Criteria") of contact input channels. Special configurations such as Status Only, Run Time Meter or Totalizer may then be programmed for specific individual channels. This code does not affect channels already programmed for Status Only, Run Time Meter, or Pulse Totalizer. **APPLIES ONLY TO CONTACT INPUTS.**
500 0 Sets the Alarm Criteria for all contact channels to DISABLED	Used at setup time as the most expedient way of programming all channels to the same alarm criteria. **APPLIES ONLY TO CONTACT INPUTS.**
500 1 Sets the Alarm Criteria for all contact channels to NORMALLY CLOSED	Same as above
500 2 Sets the Alarm Criteria for all contact channels to NORMALLY OPEN	Same as above
500 3 Sets the Alarm Criteria for all contact channels to STATUS ONLY	Same as above
5 ZZ Read Channel ZZ Programming ("Alarm Criteria")	
5 ZZ 0 Disables Channel from Being Monitored and Reported	
5 ZZ 1 Set Channel ZZ for Normally Closed Operation	An Open Circuit condition will cause an alarm. **APPLIES ONLY TO CONTACT INPUTS.**
5 ZZ 2 Set Channel ZZ for Normally Open Operation	A Closed Circuit condition will cause an alarm. **APPLIES ONLY TO CONTACT INPUTS.**
5 ZZ 3 Set Channel ZZ for No Alarm (Status Only)	**APPLIES ONLY TO CONTACT INPUTS.**

6.2.4 Run Time Meter Programming

You may program any of the ordinary contact (digital or discrete) input channels to accumulate and report the number of hours that their respective input circuits have been closed. Any such channels will never cause an alarm, but on inquiry will recite the channel's Closed Circuit message or the Open Circuit message according to the status of the input, and will then report the accumulated Closed Circuit time (run time) to the tenth of an hour.

- To program channel ZZ for Run Time Meter operation, press:

  `5 ZZ 4 ENTER`

- To preset a starting value, press:

  `5 ZZ 4 V ENTER`

  where V may be any value from 0 to 99,999.9.

- To delete the Run Time Meter programming, you must reprogram the channel for any other type of alarm criteria.

As with channels programmed for NO ALARM (Status Only) operation, the default Open Circuit message is “Channel N is off.” To record your own Open Circuit message for channel ZZ, use program code 1 ZZ. The default Closed Circuit message is “Channel N is on.” To record your own Closed Circuit message for channel ZZ, use program code 2 ZZ.

6.2.5 Pulse Totalizer Function Programming

The Totalizer function counts the accumulated number of pulses (momentary contact closures) occurring at the contact input for a channel which you have programmed for Totalizer operation. This function is typically used to accumulate the pulse output of rotary flow meters.

An alarm set-point may be programmed to create an alarm call upon reaching a particular total value. Scale and offset factors are programmable, and user-recorded messages may be used.

Any contact input channel may be programmed for the Totalizer function, up to a total of 8 Totalizers. The input pulse rate must not exceed 100 pulses per second, and if the rate is over 50 pulses per second, the pulses must have a 50% duty cycle.

- To program channel ZZ for Totalizer operation, press:

  `5 ZZ 7 ENTER.`

Note:

This function must be done to Activate the Totalizer. It is only possible to program up to 8 contact input channels for Pulse Totalizer. However, any 8 inputs may be used from the full set of contact inputs in your unit.

- To establish a non-zero starting value for the spoken reading, add the desired starting spoken value after the 7 and before ENTER.
- To establish a scale factor (so that a number of pulses will be translated into a single spoken unit count), press:

  `5 ZZ 8 N ENTER`

  where N is the number of pulses corresponding to a single spoken unit count. For example, if a pulse from a flow meter occurs for each 1/10 gallon of water flow, but the desired report is needs to be in thousands of gallons, a value of 10,000 would be used for N. The unit uses the word "percent" in speaking of the scale factor.

The spoken scaled value will "roll over" to zero upon reaching 4,294,967,294 (2^{32}). Values above this should not be entered at the keyboard.

The default message for Totalizer channels is "Channel N Totalizer count is N." User-recorded messages are normally done in two segments. Use program code 1 ZZ to record a preamble message such as "The total water flow reading is". Use program code 2 ZZ to record an ending units-of-measure message such as "thousand gallons". During the report, the unit will insert the digits comprising the actual scaled value. In this example, the resulting complete report would be "The total water flow reading is (spoken value) thousand gallons".

- To establish a Totalizer alarm set-point, press:

  `5 ZZ 6 N ENTER.`

When the scaled value reaches N, the unit will go into Unacknowledged Alarm and begin dialing. After the initial alarm has occured, a new alarm will not occur until the user has reset the criteria. You may program a value of zero for N to cancel any previously programmed Totalizer alarm set-point for channel ZZ.

- To clear out all Totalizer readings to zero in one step, press:

  `9 3 5 6 ENTER.`

6.2.6 Alarm Trip Delays

The Alarm Trip Delay is the length of time after a violation occurs before the unit goes into Unacknowledged Alarm and begins dialing. The default value is 2 seconds for all inputs and 0.1 minute (6 seconds) for power failure. During this time, if a status is read, the message will be the ALARM message, with the extra word "alert" appended. If the violation is corrected before the Alarm Trip Delay times out, no alarm or dialout will occur.

There are two ways to change this Alarm Trip Delay: global (common for all channels except power failure) programming, and individual programming for each channel and power failure.

- To program a new global Alarm Trip Delay, press:

  `9 0 2 V ENTER`

  where V is a value consisting of 1 to 4 digits, between .1 and 9999.9 seconds. For example, possible entries include .1, 5, 5.1, and 600.1 (seconds).

- If you wish to program a new Alarm Trip Delay for an individual ZZ channel, press:

  `6 ZZ V ENTER`

- To set a different Power Failure Trip Delay, press:

  `6 00 V ENTER` (code 920 does the same thing)

- To turn off the Power Failure Alarm function, press:

  `9 2 1 0 ENTER`

- To turn on the Power Failure Alarm function, press:

  `9 2 1 1 ENTER`

Note:

The global code 902 overrides any previously set individual channel Alarm Trip Delays. Therefore, if you wish to establish a different global Alarm Delay and also program selected inputs for still different individual trip delays, perform the global programming first, and then any individual trip delay programming.

The default trip delay is 2 seconds for the contact channels and 6 seconds (.1 hour) for power failure. If you are getting a lot of "nuisance" alarms, with a call saying, "alarm now normal," you might think about setting the alarm trip delay up a bit. A good example of this would be the power fail trip delay. In some areas of the country, it is very common to have short periods of power failure -- ten seconds or less. These may not be of particular concern, so setting the power fail trip delay to .2 or .3 hours could save unnecessary phone calls.

Caution:

When leaving program mode all timers for unacknowledged alarms and violations will be reset.

6.2.7 Phone Numbers and Pulse/Tone Dialing

Also see the section 6.2.13, “Alarm Call Grouping,” and Section 3.1, “Starting Up and Clearing the Unit.”

Note:

DN is the 2-digit Designation Number: 01 for the first phone number, 02 for the second number, up to 16 for the 16th phone number.

Refer to Programming Worksheet A. Write down each phone number you wish to program, along with a person's name, for future reference.

◆ To program the first phone number to be dialed on alarm, press:

`7 01 (then the complete phone number) ENTER.`

◆ To program the second phone number to be dialed on alarm:

Use code 7 02 in place of 7 01, progressing to a maximum of code 7 16 for a 16th phone number.

Each phone number may be up to 60 digits in length. Be sure to include any necessary area codes or "1" prefixes.

◆ To erase phone number DN, press:

`7 DN POINT ENTER.`

◆ If you need Touch Tone dialing, press:

`9 01 1 ENTER.`

◆ For high speed dialing, press:

`9 01 2 ENTER.`

Caution:

"High speed dialing" may not work reliably with some older telephone company exchanges.

◆ To switch back to pulse dialing, press:

`9 01 0 ENTER`

◆ To insert delays between dialed digits (e.g. after a leading "9" in PBX systems), in the programming process, press the MINUS key once for each one-second delay desired. To extend the length of each delay beyond 1 second, press:

`9 28 N ENTER`

where N is the number of seconds of delay desired for each delay invoked with the MINUS key.

6.2.8 Enhanced Telephone Interface Features

The Enhanced Telephone Interface features give the user additional power to solve unusual telephone system interface problems and to provide more reliable and efficient notification of alarms.

The Enhanced Telephone Interface Features include the following functions:

- 60 Digit Phone Numbers
  - For all 16 telephone numbers and the call-back number.
- Telephone Line Fault Detection (Phone Fault)
  - Tests phone line at regular programmed interval
  - Flashes TFAIL LED on dialer front panel upon failure
  - Logs Phone Faults and phone line restoration to Local Printer
- Automatic Selection of Tone versus Pulse Dialing
  - Tests for tone capability upon first power up without user intervention
  - May be overridden for PBXs with “non-standard” dialtones
- Call Progress Monitoring (CPM)
  - Detects busy and ringing signals
  - Waits until phone is answered to annunciate voice reports
  - Abandons call if busy or no answer and quickly tries next number
- Numeric Pager Support
  - Designate Pager only numbers - no voice annunciation
  - Insert pager system terminator characters such as ‘#’ or ‘*’
  - Insert DTMF A, B, C & D tones in phone number strings for unique IDs
- PBX Support
  - Ignore “non-standard” PBX dialtones
  - Insert “wait for outside line” dialtone into phone number strings

The Enhanced Telephone Interface Features are included on Verbatims with a mainboard Revision of VMP-5a and above and firmware revisions 2.09 and above ONLY.

Contact your RACO Representative about upgrading if the Enchanced Telephone Interface is required.

6.2.9

60 Digit Phone Numbers

Telephone numbers may be as long as 60 digits. This allows, for instance, the Verbatim autodialer to make calls using long distance companies which require entry of access codes. Even with many digits occupied by long distance numbers and access codes there will still be sufficient digits remaining for calls to pager systems requiring complex sequences of terminators, ID numbers, time delays, tone detects, etc.

6.2.10

Telephone Line Fault Detection (Phone Fault)

The Phone Fault Detection feature tests the telephone line whenever the unit needs to make a phone call and at a regular programmable time interval (as long as there are phone numbers programmed).

Phone Fault is turned ON by default but may be disabled if so desired. Also, the Phone Fault Detection interval is user programmable.

Phone Fault shares a user code with the Automatic Tone/Pulse Selection capability. The basic user command is code 917. Entering code 917 with no parameter will cause a recitation of the current settings for Phone Fault and Automatic Tone/Pulse Selection.

The following parameters may be entered:

- Turns OFF BOTH Phone Fault Detect and Auto. Tone/Pulse Select

  ```
  9 1 7 0
  ```

- Turns ON Phone Fault Detect, turns OFF Auto. Tone/Pulse Select

  ```
  9 1 7 1
  ```

- Turns OFF phone fault detect, turns ON Auto. Tone/Pulse Select

  ```
  9 1 7 2
  ```

- Turns ON BOTH Phone Fault Detect and Auto. Tone/Pulse Select (default)

  ```
  9 1 7 3
  ```

Note:

The factory default setting for code 917 is parameter 3, BOTH Phone Fault Detect and Auto. Tone/Pulse Select ON.

The command code 916 is used to set the Automatic Phone Fault Detection interval. This time interval can range from 0.1 hour to 24 hours. The factory default setting is 24 hours. Enter the command 916 followed by a value from 0.1 to 24.0 to program the Phone Fault Detection interval.

- For example, to set the Phone Fault Detection interval to 0.3 hour., enter:
  `916 0.3`

Whenever a Phone Fault is first detected, a Local Data Logger (LDL) message will be sent to the printer with date and time stamp. Additionally, the Phone Fault LED, labeled TFAIL, will begin to blink.

If a Phone Fault is detected at the beginning of an outgoing phone call the TFAIL LED will flash and the unit will return to the NORMAL state. Then, while still in the NORMAL state, the unit will continually check the telephone line every 30 seconds for restoration of the telephone service.

When telephone service is restored, a message will be sent to the Local Data Logger's printer and the TFAIL LED will go from flashing to solid ON. The Verbatim autodialer will then resume making any pending phone calls. The TFAIL LED will remain ON until a voice message about the Phone Fault is communicated via the phone or to an operator at the front panel by pressing the CHECK STATUS button. The TFAIL LED and pending voice annunciation of the Phone Fault condition may also be cleared at the front panel by pressing the DISARM/RE-ARM button twice.

No Phone Fault Detection will be performed if there are no phone numbers programmed. If the unit needs to make an alarm call when there is a Phone Fault the numbered channel LEDs will blink continuously even though the unit is in the NORMAL state. This unusual condition will only be seen while there is a Phone Fault and the unit is constantly testing for the return of telephone service.

6.2.11 Automatic Tone/Pulse Selection

When Automatic Tone/Pulse Selection is ON the Verbatim autodialer will test for the ability to use tone dialing. This test will be performed only once, one minute after the unit is powered on or is reset. Automatic Tone/Pulse Selection enables the installer to not be concerned about whether the telephone line supports tone dialing.

Automatic Tone/Pulse Selection shares a user code with Phone Fault Detection. The basic user command is code 917. Entering code 917 with no parameter will cause a recitation of the current settings for Phone Fault and Automatic Tone/Pulse Selection. The following parameters may be entered:

- Turns OFF BOTH Phone Fault Detect and Auto. Tone/Pulse Select
  `9 1 7 0`
- Turns ON Phone Fault Detect, turns OFF Auto. Tone/Pulse Select
  `9 1 7 1`

- ◆ Turns OFF phone fault detect, turns ON Auto. Tone/Pulse Select

  `9 1 7 2`

- ◆ Turns ON BOTH Phone Fault Detect and Auto. Tone/Pulse Select (default)

  `9 1 7 3`

Note:

The factory default setting for code 917 is parameter 3, BOTH Phone Fault Detect and Auto. Tone/Pulse Select ON.

Setting Automatic Tone/Pulse Selection ON when it was previously OFF will cause the Verbatim autodialer to perform the test for Tone/Pulse Selection even though it has been longer than one minute since the unit was last powered on or reset.

After powering the unit on, Automatic Tone/Pulse Selection may be temporarily suspended by any front panel activity. Automatic Tone/Pulse Selection will then be resumed one minute after the front panel activity has ceased.

No Tone/Pulse Selection will be done while the unit is being programmed over the phone or if there are not phone numbers programmed.

6.2.12 Call Progress Monitoring (CPM)

Call Progress Monitoring (CPM) operates by listening for the presence or absence of busy and ringing signals. These are the same signals you hear after you dial a phone number. Proper operation of CPM requires that the busy and ringing signals are composed of standard Call Progress frequencies.

The possibility exists that CPM may not function properly because the CPM tones on a particular phone system are not standard.

Unlike other equipment with Call Progress Monitoring, CPM on the Verbatim autodialer does not include detection for the dial tone at the beginning of the dialout session. However, dialtone detection is an integral part of Phone Fault Detection. This allows CPM to be operational even when the Verbatim autodialer is installed inside of a PBX phone system which has a non-standard dialtone.

CPM is intended to detect the following phone line states:

- phone line is busy - both subscriber and trunk busy signals are detected
- non-existent phone number
- phone unanswered - still ringing
- phone answered - ringing stopped

When CPM determines that a call is not complete, an appropriate report will be sent to the local printer.

Reasons for a non-completed call:

- CPM determines the line is busy
- CPM does not detect cessation of ringing before end of programmed CPM ring count
- CPM does not detect either busy signal or valid ring signals

Reason for a completed Call:

- CPM detects at least one ring followed by cessation of ringing

If a call is not completed, the Verbatim autodialer will disconnect the call and enter the intercall delay state. At the end of the intercall delay, the next programmed telephone number will be dialed.

When a call is not completed, the intercall delay will always be shortened to 30 seconds. This CPM altered intercall delay is fixed at 30 seconds and is not affected by the user-programmed intercall delay. The normal programmable intercall delay will apply only to the delay between completed calls.

Call Progress Monitoring for firmaware version 2.09 is set to ON by factory default. If CPM is OFF the Verbatim will deliver voice messages without regard to any ringing or busy signals. This unit will simply dial the number, then after a short delay, start annunciating voice reports.

As noted above, dialtone detection is actually a part of the Phone Fault Detection feature. It is possible to have CPM turned OFF and Phone Fault Detect turned ON. In this case, the unit will test for a dialtone but not for busy or ringing signals.

Use code 900 to read or set CPM programming. Use code 900 followed by a 1 or 0 parameter to program CPM ON (1) or OFF (0).

The CPM ring count is the number of rings Verbatim autodialer will wait for an answer before considering the call to be incomplete. Use code 918 to read or set the number of CPM rings. The factory default is 10 rings and the user may program any number of rings from 5 to 20.

- For example, to program the CPM ring count to 10 rings, enter:

  `918 10 then ENTER`

6.2.13

Alarm Call Grouping

This is a programming step that "links" selected channels to selected dialout phone numbers, so that when a given channel goes into alarm, only the phone numbers "linked" to that channel will be dialed. Ordinarily, an alarm on any channel will cause dialing of the entire list of phone numbers.

Alarm Call Grouping is typically done when certain channels are associated with a specific category of personnel, such as electrical, plumbing, security, etc. However, Power Failure to the Verbatim autodialer causes dialing of all phone numbers. If you need to limit Power Failure alarm calls to selected numbers:

1. Turn off the regular Power Failure alarm function using code 9 2 1 0, (described below)
2. Then connect an unused input channel for power failure monitoring, using the contacts of a relay.

To program for Alarm Call Grouping:

1. Enter your phone number. It is important to first write in your entire list of phone numbers on Programming Worksheet A in Appendix J.

Note:

There is a 2-digit "Designation Number" on the Worksheet associated with each phone number (01 for the first number, etc.). This number corresponds with the 3-digit program code for entering phone numbers (701 for the first number, etc.).

2. Group them by using code `5 ZZ 9 DN`. Begin by filling in Programming Worksheet B in Appendix J.

   Refer to the filled-in examples for guidance. The right-hand column will now contain the actual program code strings which you should now enter, terminating each string entry with the ENTER key.

   For example, to link channel 1 to the second and fifth phone numbers, following the filled-in example, you would press:

   ```
   5 01 9 02 05 ENTER
   ```

3. Phone numbers will always be dialed in ascending order of the 2-digit Designation Numbers, regardless of their order in your program code entry. Note that an alarm on any channel that is not "linked" with a program code entry will cause dialing of the entire list of phone numbers.

   - ◆ To read the linkage programming on channel ZZ, press:

     ```
     5 ZZ 9 ENTER
     ```

- To "un-link" channel ZZ so that it again calls all phone numbers, press:

  `5 ZZ 9 POINT ENTER`

- To undo all existing linkage on all channels, press:

  `9 35 2 ENTER`

6.2.14 Alarm Ready Scheduling

Refer to Section 7, "Using the Alarm Ready Schedule Feature," for use and application information. See also Appendix E , "Data Acquisition/Central Data Logging."

6.2.15 Local Data Logging Programming Codes

Refer to Chapter 2, "Installation," for use and application information.

6.2.16 Analog Input Programming

Refer to Appendices B, C and D, "Analog Signal Input," "Remote Supervisory Control Output," and "Printer Options," for use and application information.

6.2.17 Remote Supervisory Control

Refer to Appendices B, C and D, "Analog Signal Input," "Remote Supervisory Control Output," and "Printer Options," for use and application information. See also Appendix E, "Data Acquisition/Central Data Logging."

6.2.18 Data Acquisition/Central Data Logging

Refer to Appendix E, "Data Acquisition/Central Data Logging."

6.2.19 Miscellaneous Programming Tips

(903) Time Between Alarm Call Outs

This is the length of time after ending one alarm call-out and before beginning the next call-out. Default value is 2 minutes; range is 0.1 to 99.9 minutes.

- To program a different number of minutes V, press:

  `9 03 V ENTER`

(904, 922) Alarm Reset Time

This is the length of time after acknowledgment before a given channel (or Power Failure) is automatically reset to a clear condition, ready to act on a new alarm condition. Refer to the diagram "Anatomy of an Alarm" in Section 5, "Using Your Verbatim Autodialer," for a depiction of the various events involved in association with the Alarm Reset Time. Default value is 1 hour; range is 0.1 to 99.9 hours.

- To program a different number of hours V, press:

```
9 04 V ENTER
```

- To turn the Alarm Reset Timer function off, press:

```
9 22 0 ENTER
```

Caution:

You should not turn the alarm reset timer function off under normal circumstances because once a given channel's alarm has been acknowledged, it would never again cause an alarm call out.

- To turn the Alarm Reset Timer function on again, press:

```
9 22 1 ENTER
```

(905) Clear All Acknowledged Alarms and Alarm Reset Timers

Especially during setup and testing, it is useful to be able to re-trip an alarm after it has previously been tripped and acknowledged, without having to wait for the Alarm Reset Time to expire.

- To perform this clear out, press:

```
9 0 5 ENTER
```

At the panel, the same result may be more easily obtained by pressing DISARM/RE-ARM to disarm the unit, then pressing it again to rearm the unit.

(906) Ring Answer Delay

Represents the number of rings required when calling the Verbatim unit, before the unit will answer. A long ring delay might be programmed if you wish personnel to have the opportunity to answer a regular telephone on the same line, before the Verbatim autodialer would answer. Default value is 1 ring; range is 1 to 20 rings.

- To program a different number of rings N, press:

```
9 06 N ENTER
```

(907) Number of Alarm Message Repeats

Represents the total number of times each message or set of messages is spoken during each alarm call out. Normally a value of 3 repeats (strictly speaking, the alarm message plus 2 repeats) should be programmed. The reason for this is that there needs to be adequate message recital time to allow adequate time to answer the phone call and hear at least one complete set of messages. Default value is 3 repeats; range is 1 to 20 repeats.

- To program a different number of repeats N, press:

  ```
  9 07 N ENTER
  ```

(908) Autocall Test Function

The Autocall Test Function causes the unit to place test calls at regular intervals for the purpose of ongoing verification of Verbatim autodialer and phone line functioning. Calls are placed only once for each interval, to each regular phone number programmed (7 01 through 7 16). The exception being the acknowledgement of a test call, where additional calls will not be placed for that time interval. Each call gives the station ID message and a statement that this is a test call, plus a report of all inputs.

- To turn this function on, press:

  ```
  9 08 1 ENTER
  ```

- To turn it off, press:

  ```
  9 08 0 ENTER
  ```

The first series of calls begins as soon as the Autocall Test Function is turned on. Therefore, if you want the unit to call at 5 PM each day, you will need to turn this function on at that time. The default interval is 24 hours; range is 0.1 to 99.9 hours.

- To program a different interval V, press:

  ```
  9 09 V ENTER
  ```

Note:

If the Verbatim autodialer is in the disarmed mode, call-outs/autocalls will not be made.

(910) Security Access Code

Once you establish a Security Access Code, unauthorized personnel are prevented from altering your programming or messages over the phone without first entering the Access Code. This does not affect programming access at the panel.

- To establish an Access Code N of up to 8 digits, press:

  ```
  9 10 N ENTER (at the panel)
  ```

Once established, whenever you press a Command Tone 1 at the prompting beep, the unit first prompts you to enter the Access Code before allowing you to perform programming or message recording operations. You may still read existing programming without using the Access Code by pressing a Command Tone 2 at the prompting beep. However, the Access Code itself cannot be read over the phone.

- To delete the Security Access Code so that no code is required in order to perform over the phone programming, press:

  `9 1 0 POINT ENTER (at the panel)` **ONLY**

(921, 930) Power Failure Alarm Function ON/OFF; DISARM/RE-ARM All Alarms

- To turn off the Power Failure Alarm function, press:

  `9 21 0 ENTER`

- To turn the Power Failure Alarm function on again, press:

  `9 21 1 ENTER`

- To disarm the unit, preventing any alarm call outs, press:

  `9 30 0 ENTER`

- To rearm the unit, press:

  `9 30 1 ENTER`

At the front panel, the same result is more easily obtained by using the DISARM/RE-ARM key.

(700, 924) Callback/Callforward

This feature causes the unit to dial a special "zeroth" phone number on command. This is typically initiated over the phone, causing the unit to call back to the person who invoked the command, in order to verify the ability of the unit to successfully dial out. The unit gives a status report of all channels as part of this call.

- To program this special callback number, press:

  `7 00 (then the complete phone number) ENTER`

- To initiate the actual dialing, press:

  `9 2 4 ENTER`

If you have executed this command over the phone, the unit will advise you that it will be calling the callback number in 15 seconds. Then it will end the current call in preparation for placing the callback call. If you have executed this command at the front panel, the dialing will occur immediately.

Note:

If the Verbatim autodialer is in the disarmed mode, call-outs/autocalls will not be made.

(926) Delay Before Return to Normal (Exit Delay)

Sometimes it is desirable to prepare the unit for the ability to detect violations and dial out, but with an "exit delay" that allows the user time to exit or remove temporarily existing alarm violations before the unit becomes active.

To set delay before Return to Normal:

1. Press:

   ```
   9 26 V ENTER
   ```

   where V is the desired delay in minutes (range 1.0 to 99.9 minutes).

2. Then press DISARM/RE-ARM if necessary to extinguish the flashing DISARMED legend light. However, do not press NORMAL, but instead leave the unit in PROGRAM mode, with the PROGRAM light illuminated. The unit cannot go into alarm while in PROGRAM mode.

When the delay period times out, the unit will automatically return to NORMAL mode and will then be ready to act on any alarm violations that occur after that time. This code must be re-entered each time you wish an exit delay, since the delay value automatically returns to the default value of 2 minutes upon timeout.

The 2 minute default value provides protection against the possibility that someone might walk away leaving the unit in PROGRAM mode, or perhaps hang up the phone after performing over-the-phone programming without properly ending the call.

(932, 933, 934) Microphone and Speaker Operation

If you enable the front panel microphone using program code 933 as described below, the microphone will be automatically activated for a 15 second listening period at the end of each alarm or inquiry call, allowing you to hear the sounds near the unit from a remote telephone.

An additional warble tone is issued at the end of this listening period, allowing you to postpone tone acknowledgment until after the listening period.

- To turn this function on, press:

  ```
  9 33 1 ENTER
  ```

- To turn this function off, press:

  ```
  9 33 0 ENTER
  ```

If you have turned the microphone on, as above, then during any phone call, you may also invoke a one-time listening period by entering Remote Program Mode (press 1 at the warble tone) and then entering 9 3 2 # #.

- To turn off the speaker so that neither alarm call or inquiry call activity is heard at the unit, press:

```
9 34 0 ENTER
```

The speaker will still be heard when operating keys at the front panel.

- To turn the speaker on again, press:

```
9 34 1 ENTER
```

Note:

The speaker volume may be adjusted via the trimpot marked SPKR VOL shown on the Electrical Connection Diagram. See Section A.1, "Adjusting Internal Speaker Volume.

6.2.20 Program Clear Out Operations

The following list of program codes provides a flexible variety of operations to conveniently clear selected programming items in order to allow for a fresh start.

Code	Function
935 0	Clears out phone numbers; sets all delays to default.
935 1	Clears out phone numbers only.
935 2	Clears out all alarm call grouping linkage.
935 3	Sets the following delays to their factory default values: 902, 903, 904, 920, 921, 926, 928 (921 sets power failure alarm ON)
935 4	Clears all user recorded messages.
935 5	Clears all programming except messages. (Does not clear 913, 930, 941, and 942)
935 6	Clears all Totalizer counts to zero.
935 7	Clears and initializes clock.
935 9	Total clear out (Does not clear 941 and 942).

Caution:

Code 9 35 9 erases all programming and messages.

6.2.21 (940) Diagnostic Readouts

To assist in analyzing the way the unit is operating, the following list of diagnostic count codes is provided.

Code	Function
940	Reads all 4 diagnostic counts (add 0 to clear all 4)
940 1	Reads Call In Count (add 0 to clear)
940 2	Reads Dial Out Count (add 0 to clear)
940 3	Reads Acknowledged Alarm Count (add 0 to clear)
940 4	Reads Power Failure Alarm Count (add 0 to clear)
940 0	To Clear all Counts

7 Using the Alarm Ready Schedule Feature

7.1 Definition

An Alarm Ready Schedule is defined as an interval of time during which the Verbatim autodialer is ARMED and "Ready" to respond to alarm conditions. Alarm Ready Schedules can be automatically started according to times and dates entered by the operator. An Alarm Ready Schedule commences with the Verbatim autodialer becoming REARMED. (If the Verbatim autodialer was previously not DISARMED then the schedule will still be commenced at that time.) Once the Alarm Ready Schedule has commenced the Verbatim autodialer will continue in an ARMED state until the end of the Alarm Ready Schedule, at which time the Verbatim autodialer will be automatically DISARMED. Once an Alarm Ready Schedule has commenced it is said to be "active."

There are three steps to programming for Alarm Ready Scheduling:

- Date and time setting
- Enter alarm start and stop times
- Enable the Alarm Ready Scheduling feature using code `966 N`.

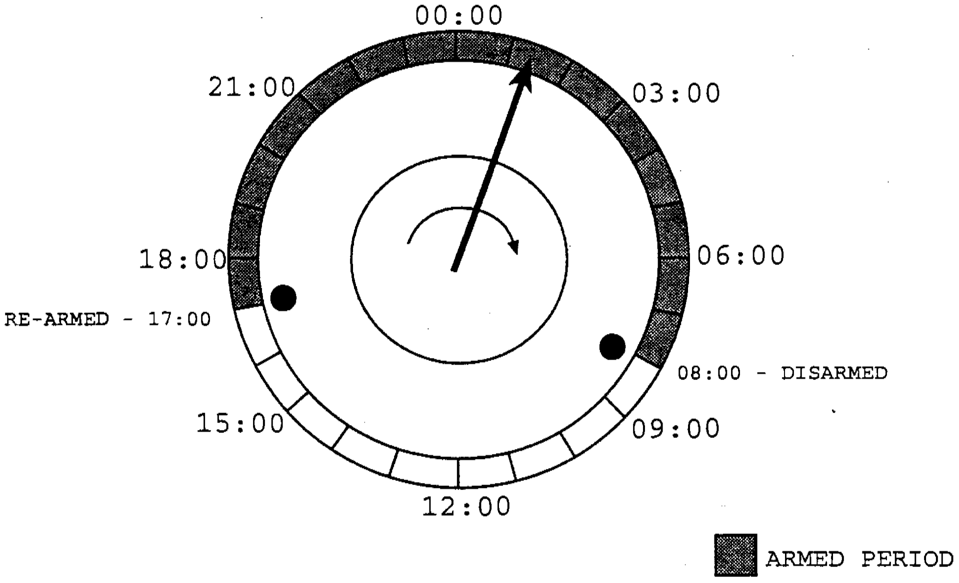
7.2 General Descriptions

Alarm Ready Schedules can be viewed as really nothing more than an automated way of pressing the REARM/DISARM button. Therefore, if an alarm occurs while the Verbatim autodialer is DISARMED, no dial-outs will be made and the alarm will be automatically acknowledged. Correspondingly, if there is an acknowledged alarm when the Verbatim autodialer becomes REARMED and the input violation is still present then the Verbatim autodialer will begin calling after the trip delay has elapsed.

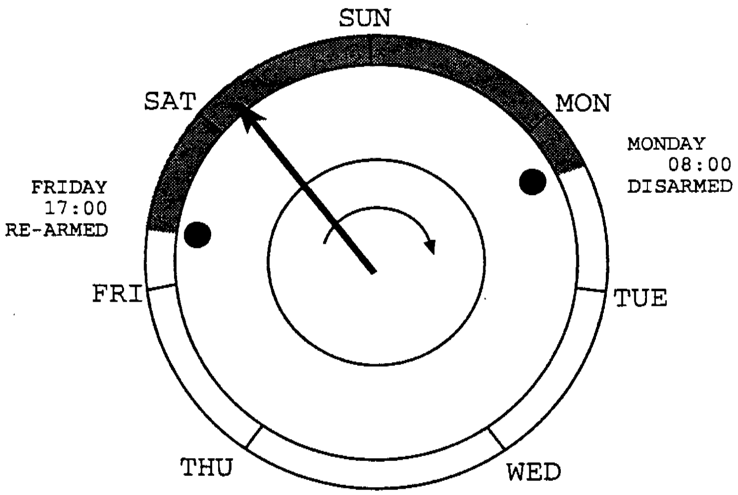
If the Verbatim autodialer is doing a sequence of alarm calls or Autocall calls at the time when an Alarm Ready Schedule should change the Verbatim autodialer's REARM/DISARM state the change will be delayed until after the end of the calling sequence.

Alarm Ready Schedules can be temporarily overridden by the operator pressing the REARM/DISARM button. However, if the REARM/DISARM button is pressed during an active Alarm Ready Schedule the schedule still remains active. If the operator DISARMs the Verbatim autodialer in the middle of an Alarm Ready Schedule the schedule will actually continue to it's ending time. It will then deactivate itself and attempt to DISARM the Verbatim autodialer just as if the Verbatim autodialer was still ARMED. If the operator DISARMs the Verbatim autodialer in the middle of an active Alarm Ready Schedule, then REARMs the Verbatim autodialer once again before the end of the Alarm Ready Schedule the schedule will remain active until its ending time. The schedule will then be deactivated and the Verbatim autodialer will be DISARMED.

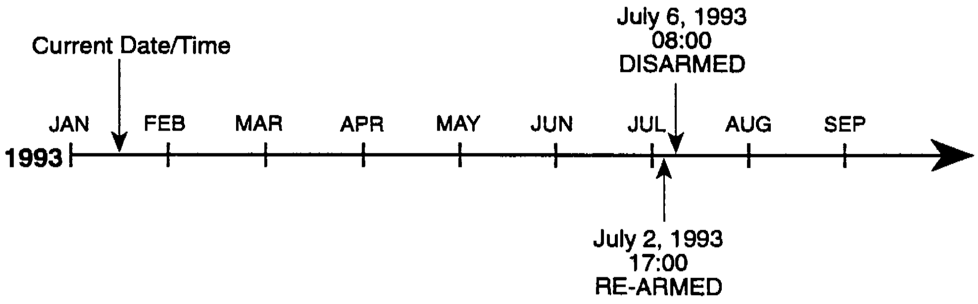
Weekday Timer



Weekend Timer



Holiday Timer is Linear



7.3 Alarm Ready Schedule Modes

There are three possible Alarm Ready Schedules modes: Weekday, Weekend & Holiday. Any combination of these three possible schedules may be enabled at one time, however, the Verbatim may only become REARMED or DISARMED by one mode at a time. See Section 7.7, "Alarm Ready Schedule Priorities." For example, you may have both weekday & weekend schedules enabled at the same time or you may have all three enabled at the same time. When the Verbatim becomes DISARMED or REARMED by an Alarm Ready Schedule it will verbally announce which mode caused the REARM/DISARM action. The Alarm Ready Schedule modes are as follows:

Mode	Schedule
Mode 1	Weekday Schedule
Mode 2	Weekend Schedule
Mode 3	Holiday Schedule

For example, if there was a weekday schedule enabled to REARM the Verbatim at 1700 daily, when the weekday schedule became active the Verbatim would say, “REARMED for mode 1”. Also, when there is a local printer connected to the Verbatim , the mode of the Alarm Ready Schedule causing the REARM/ DISARM (WEEKDAY, WEEKEND, or HOLIDAY) will be printed along with the current time.

7.4

Weekday Schedule Mode 1

The weekday schedule will REARM the Verbatim autodialer daily at the programmed weekday REARM time and DISARM the Verbatim autodialer daily at the programmed DISARM time. If no weekend schedule is enabled (via the Alarm Ready Control Number settings) then the weekday schedule applies everyday, Monday through Sunday. As noted below, the weekend schedule is overridden by the weekend and holiday schedules.

7.5

Weekend Schedule Mode 2

If programmed, the weekend schedule operates once a week. The weekend schedule is set by factory default to be Friday through Monday. If the defaults are used the Verbatim autodialer could be REARMED every Friday afternoon at 1700 and DISARMED again every Monday morning at 0800. The weekend schedule could be changed from the defaults, for example, so that the Verbatim autodialer would be REARMED on Saturday and DISARMED on Monday (for organizations with 6 day work-weeks).

When the weekend schedule is enabled the weekday schedule will be overridden. In other words, there would be no DISARMING of the unit at 0800 Saturday morning.

By default, the weekend REARM/DISARM times are set to be the same as the weekday REARM/DISARM times. However, non-default weekend REARM/ DISARM times may be entered if the operator so chooses.

Therefore, if personnel regularly leave early on Fridays then the REARM time could be set to 1500 instead of the usual 1700.

7.6

Holiday Schedule Mode 3

The Holiday schedule is a one-shot, non-recurring schedule which overrides all of the other schedules.

The Holiday schedule will be set by factory default to some Holiday period in the past (such as last Christmas).

Note:

> For the Holiday schedule only, the exact date is entered including the year. Once, the Holiday schedule has been run it is complete and finished until a new schedule, for some date in the future, is entered.

To use the Holiday Alarm Ready Schedule, the operator must enter the REARM date (month/date/year) and DISARM date (month/date/year).

For the time-of-day, the Holiday Alarm Ready Schedule always uses the Weekend REARM/DISARM times.

7.7 Alarm Ready Schedule Priorities

There is a priority among the Alarm Ready Schedules. The Holiday Alarm Ready Schedule has the highest priority, then comes the weekend schedule and finally the weekday schedule.

If all three Alarm Ready Schedules are to be active, a Holiday schedule will always start at it's scheduled time & date regardless of the state of the other schedules. When the Holiday schedule is over then the other schedules will resume.

Likewise, the Weekend Alarm Ready Schedule has priority over the Weekday Alarm Ready Schedule. The weekend schedule will always start at its programmed day-of-week and time regardless of the state of the weekday schedule. When the weekend schedule is over then the weekday schedule will resume.

7.8 Programming Alarm Ready Schedule Parameters

The following section explains the Verbatim autodialer codes to be used for programming Alarm Ready Schedules and the Alarm Ready Schedule Control Numbers. Alarm Ready Schedule parameters may be entered either at the front panel or over the phone.

There are some restrictions which must be remembered when entering DISARM/REARM times and ALARM READY SCHEDULE CONTROL NUMBERS.

1. When entering new schedule times, the REARM time must be later than the time the operator is programming the schedule. However, it may not be possible to "jump" into a schedule when exiting the programming mode. For example, if the current time is 1700 hours and the operator enters a weekday schedule to REARM daily at 1630 and DISARM daily at 0730, this new schedule would not start until the following day at 1630 hours.

   Conversely, assume that the current time is 1700 hours and that the operator goes into PROGRAM mode and enters a new weekday schedule to REARM at 1705 and DISARM at 0800. At this time, the operator can either return to NORMAL mode or continue in PROGRAM mode and do other programming. Even though it may be after 1705 when finally returning to the NORMAL mode, the weekday schedule will still begin (or have begun) at 1705 hours.

2. You cannot enter any holiday date values which will cause the holiday REARM or DISARM date and time to be earlier than the current date and time. As explained below, the holiday schedule uses the weekend times for the time-of-day of the holiday REARM and DISARM.
3. It's useful to understand that the Verbatim autodialer's internal count-down timers used for REARM/DISARM times are re-calculated as a result of the operator making certain Alarm Ready Schedule programming changes. Anytime a new REARM or DISARM date/time is entered, a calculation is made to determine the next REARM and DISARM for that particular schedule.

   Also, when the ALARM READY SCHEDULE CONTROL NUMBER is changed all REARM and DISARM date/times are re-calculated. Further, whenever the current date or time is set or changed by the operator, all REARM and DISARM date/times will be re-calculated.

7.9 Starting the Real-Time Clock Chip, Time and Date Setting

Use Program Code 935 7 ENTER to start the real time clock chip. This needs to be done only once at the time of the installation of the chip.

Time and date may be set or corrected with the following programming code entries:

- To check the date:

  `941 ENTER`

- To set the date:

  `941 MM DD YY D ENTER`

MM is the month (03 for March); DD is the date (07 for the 7th day of the month); YY is the year (89 for 1989); and D is the day of the week (1 for Sunday; 2 for Monday, etc.). Entry of D is optional.

- To check the time:

  `942 ENTER`

- To set the time:

  `942 HH MM SS ENTER`

HH are the hours in military time (13 for 1 PM); MM are the MM (09 for 9 minutes); and SS are the seconds. Entry of SS is optional.

- To clear the time and date back to 00:00:00 on 01/01/89:

  `935 7 ENTER`

7.10 Setting Alarm Start & Stop Times

CODE 961

READ WEEKDAY REARM & DISARM TIME (defaults: 1700 & 0800) Press 9 6 1 then ENTER to hear the Weekday REARM & DISARM times recited. Times will not be altered and new REARM & DISARM values will not be calculated.

SET WEEKDAY REARM & DISARM TIME Press 9 6 1 plus REARM & DISARM time. For example, 961 1600 0700 then ENTER to set REARM time to 1600 (4:00 P.M.) & DISARM time to 0700 (7:00 A.M.) The user is allowed to enter just the REARM time, i.e.; 961 1600 (enter). But, if the user wants to change the DISARM time then both the REARM & DISARM times must be entered.

CODE 962

READ WEEKEND REARM & DISARM TIME (defaults: 1700 & 0800) Press 9 6 2 then (enter) to hear the Weekend REARM & DISARM times recited. Times will not be altered and new REARM & DISARM values will not be calculated.

SET WEEKEND REARM & DISARM TIME Press 9 6 2 plus REARM & DISARM time then ENTER, for example, 962 1500 0700 then ENTER to set REARM time to 3:00 P.M. & DISARM time to 7:00 A.M. The user is allowed to enter just the REARM time, i.e.; 962 1500 ENTER. But, if the user wants to change the DISARM time, then both the REARM & DISARM times must be entered.

CODE 963:

READ WEEKEND REARM & DISARM DAY-OF-WEEK (defaults: Fri. & Mon.) - Press 9 6 3 then ENTER to hear the Weekend REARM & DISARM day-of-week (d-o-w) recited as a number from 1 to 7. Note: Sunday = 1, Monday = 2, etc. Day-of-week will not be altered and new REARM & DISARM values will not be calculated.

SET WEEKEND REARM & DISARM DAY-OF-WEEK Press 9 6 3 plus REARM & DISARM d-o-w then ENTER. For example, 963 6 1 then ENTER to set the weekend REARM day-of-week to Friday & REARM day-of-week to Sunday. The user is allowed to change only the REARM d-o-w if so desired, e.g.; 963 7 ENTER to set the REARM d-o-w to Saturday. But, if the user wants to change the DISARM d-o-w then both the REARM d-o-w & DISARM d-o-w must be entered.

CODE 964:

READ HOLIDAY REARM DATE (default: 12/24/95) Press 9 6 4 then ENTER to hear the Holiday REARM date recited. The Holiday REARM will not be altered.

SET HOLIDAY REARM DATE Press 9 6 4 plus REARM date. For example, enter 964 12 24 95 ENTER to set holiday REARM date to December 24, 1995. The new REARM date can not be before today's date.

Note:

The day-of-week date cannot be entered for a Holiday schedule.

CODE 965:

READ HOLIDAY DISARM DATE (default: 12/26/95) Press 9 6 5 then ENTER to hear the Holiday DISARM date recited. The Holiday DISARM will not be altered.

SET HOLIDAY DISARM DATE Press 9 6 5 plus REARM date. For Example, enter 965 12 26 95 ENTER to set holiday DISARM date to December 26, 1995. The new DISARM date can not be before today's date.

Note:

The day-of-week date cannot be entered for a Holiday schedule.

7.11 Enabling the Alarm Ready Schedule Feature

CODE 966

READ ALARM READY SCHEDULE CONTROL NUMBER (default: 0) Press 9 6 6 then (enter) to hear the Alarm Ready Schedule Control Number recited. The Control number will not be altered and new REARM & DISARM values will not be calculated.

ALARM READY SCHEDULE CONTROL NUMBER HAS THE FOLLOWING MEANING:

0 OFF No Alarm Ready Schedules executed. Also used to reset all active Alarm Ready Schedules.

1 Only the Weekday Alarm Ready Schedule will be active. (Daily: Monday-Sunday) Default: REARMED everyday 1700 & DISARMED everyday 0800.

2. Only Weekend Alarm Ready Schedule will be active. Default: REARM every Friday 1700 & DISARM every Monday 0800.
3. Both Weekday & Weekend Alarm Ready Schedules will be active. Default: REARM daily at 1700 Monday-Thursday & DISARM daily at 0800 Tuesday-Friday. REARM Friday at 1700 & DISARM Monday at 0800.
4. Only Holiday Alarm Ready Schedule will be activated. Default: REARM at 1700 December 24, 1990 then DISARM at 0800 December 26, 1990
5. Both Holiday & Weekday Alarm Ready Schedules will be activated. Default: REARM daily at 1700 & DISARM daily at 0800. REARM at 1700 December 24, 1990 then DISARM at 0800 December 26, 1990.
6. Both Holiday & Weekend Alarm Ready Schedules will be activated. Default: REARM every Friday at 1700 then DISARM every Monday at 0800. REARM at 1700 December 24, 1990 then DISARM at 0800 December 26, 1990.
7. Holiday, Weekend & Weekday Alarm Ready Schedules will be activated. Default: REARM daily at 1700 Monday-Thursday then DISARM daily at 0800 Tuesday-Fri. REARM every Friday at 1700 then DISARM every Monday at 0800. REARM at 1700 December 24, 1990 then DISARM at 0800 December 26, 1990.

Note:

Whenever a new Alarm Ready Schedule Control Number is entered all REARM & DISARM values will be recalculated. Any active Alarm Ready Schedules will be halted and the Verbatim autodialer will be left in which ever REARM/DISARM state it was last in.

7.12 Factory Defaults

Activity	Schedule
Weekday REARM time	1700
Weekday DISARM time	0800
Weekend REARM day-of-week	Friday
Weekend DISARM day-of-week	Monday
Weekend REARM time	1700
Weekend DISARM time	0800
Holiday REARM date	12/24/90
Holiday DISARM date	12/26/90
Holiday REARM time	always same as Weekend REARM time
Holiday DISARM time	always same as Weekend DISARMtime
Alarm Ready Control Number	0 (all schedules disabled)

Note:

Both Weekend times are initially the same as their respective Weekday times, but can be reprogrammed.

7.13 Weekday and Weekend Alarm Ready Schedule Programming Example

For the following example assume that personnel are present at a plant being monitored by the Verbatim autodialer during normal business hours, Monday through Friday, 7 A.M. to 4 P.M. Assume further that there is someone at the plant every Saturday from 7 A.M. until 12 Noon and that the personnel would be aware of any alarm conditions at the plant and would not want the Verbatim autodialer to be making calls to phone numbers in its phone number list.

In this example, the Verbatim autodialer should be:

- REARMED every weekday evening at 1600
- DISARMED every weekday morning at 0700
- REARMED every Saturday at 1200 noon
- Stay in the ARMED state until it is DISARMED every Monday at 0700

For the example, use the following steps:

1. Verify that the current time is one of the times when the Verbatim autodialer is DISARMED, i.e.; during normal workday hours. It is important that the time be the current time, since any Alarm Ready Schedule begins with the Verbatim autodialer becoming REARMED and ends with the Verbatim autodialer becoming DISARMED.

   If a user were to set up a repeating Alarm Ready Schedule (weekday or weekend) during the time the Verbatim autodialer was to be ARMED, the programmed schedule would not actually begin until the next time that schedule was to take effect. For example, if the current time was 1630 and a weekday schedule was being programmed, that weekday schedule would not actually start until the next day at 1600.
2. Press the PROGRAM key to put the Verbatim autodialer into the program mode.
3. Set the current date and time: (if not already set)
   a. Enter CODE "941 MM DD YY d" followed by ENTER

      Where:

      MM = 2 digits for month, DD = 2 digits for date,

      YY = 2 digits for year, and d = 1 digit for day-of-week.

b. Enter CODE "942 HH MM SS" followed by ENTER

Where:

HH = 2 digits for hours, MM = 2 digits for minutes,
SS = 2 digits for seconds.

4. Set the Weekday REARM/DISARM times:

   Enter CODE "961 1600 0700" followed by ENTER to set the REARM time to 1600 and the DISARM time to 0700.

5. Set the Weekend REARM/DISARM times:

   Enter CODE "962 1200 0700" followed by ENTER to set the weekend REARM time to 1200 and the weekend DISARM time to 0700.

6. Set the Weekend REARM/DISARM day-of-week:

   Enter CODE "963 7 2" followed by ENTER to set the weekend REARM day-of-week to Saturday and the Weekend DISARM day-of-week to Monday.

7. Enable both the Weekday and Weekend Alarm Ready Schedules:

   Enter CODE "966 3" followed by ENTER to set the Alarm Ready Schedule Control Number to 3 to enable both the Weekday and the Weekend Alarm Ready Schedules.

Note:

If the Verbatim autodialer is configured with a local printer, a summary of all of the REARM and DISARM times will be printed.

8. Return to the Normal mode and make sure the Verbatim autodialer is DISARMED.

8

Maintenance, Testing, and Battery Replacement

Regular testing is the main element of a maintenance program for ongoing Verbatim autodialer reliability. The test should include interrupting AC power to the Verbatim autodialer for at least 4 hours to verify the gel cell battery maintains Verbatim autodialer operation for that time. You may wish to disconnect the phone cord to avoid nuisance calls during the test period.

Note:

The LOBAT light on the Verbatim activates whenever the charge or discharge current for the rechargeable battery exceeds a certain level. If the battery is not fully charged (as following installation or following a power failure) then the charging current will activate the light. If the battery is currently being discharged (as during a power failure) the light will be activated. The LOBAT light does not necessarily warn of a battery wearing out. It should be considered a secondary indication of battery and charger activity.

The gel cell battery is much like a car battery. That is, at the end of its life when called on to deliver power, it discharges very quickly without prior warning. The best protection is to replace the battery every 3 years regardless of any test results.

The battery is a *Power Sonic PS 640, 4 AH 6 volts*

You may order a replacement battery from RACO at the address below:

RACO Manufacturing and Engineering Co.
1400 62nd Street
Emeryville, CA 94608

Or from:

Power Sonic, Redwood City, CA; (415) 364-5001

See Section 9.2, "Phone Support Procedures," and Section 9.3, "Returning Parts to the Factory," for more information.

9 Troubleshooting Tips

9.1 What's The Problem?

Unit is dead: no lights or voice.

If the unit will not respond to the ON/OFF key, verify that the battery is connected. Verify that there is 120 volts AC between the WHITE and BLACK wire terminals on TS3. Verify that the fuse (1/4 amp slow blow) is not blown.

Unit seems OK but will neither answer nor dial out on phone line.

This assumes that you hear a voice report at the panel when you press CHECK STATUS. With the NORMAL light lit, test the phone line by pressing DIAL-OUT. The PHONING light should light and you should hear a dial tone.

If you do not hear a dial tone, open the door of the unit and verify that relay K1 is correctly seated in its socket, with its indentation mark facing downward. Check the phone line and its connection with a DC voltmeter and/or a separate telephone handset. Verify the presence of about 50 volts DC between the RED and GREEN conductors on phone line terminal strip TS2. This voltage will drop to just a few volts when the Verbatim autodialer or other connected phone device goes off hook (PHONING light lit).

If you do hear the dial tone after pressing DIALOUT, press the digits of a valid phone number. You should hear the loud clicks of relay K1 (for pulse dialing) or else the tones of tone dialing, as you press each digit. The dial tone should cease after you have entered the first digit. Continue until you have dialed the complete phone number. You should now hear the sound of ringing and someone answering at the other end. End the call by pressing NORMAL.

Unit answers incoming calls, and also goes into alarm when it should and attempts to dial out, but does not reach dialed number.

First, verify whether the unit is actually attempting to dial out, as evidenced by pulse dialing clicks or tone dialing sounds followed by message recital. If not, then see the separate problem below, "Unit does not go into alarm when it should".

If your unit has previously been programmed for Automatic Tone/Pulse select (via code 917 2 or 917 3) and has been left connected to a phone line for several minutes, then you can assume that the correct dialing mode for your phone line has already been selected. Again, refer below to "Unit does not go into alarm when it should."

If Automatic Tone/Pulse select is programmed OFF (via code 917 0 or 917 1) and you hear the clicks or tone dialing sounds, but the dial tone does not cease, perhaps your phone system requires the opposite mode of dialing (pulse vs tone) from its presently set mode. Read the present mode by pressing PROGRAM 9 0 1 ENTER. Then set the opposite by entering 9 0 1 1 (to change to tone dialing), or 9 0 1 0 (to change to pulse dialing). Then press NORMAL and repeat the manual DIALOUT procedure as described above.

Verify that you have programmed complete phone numbers including any area codes or "1" prefixes that might be required to complete the call.

Consider whether your phone system requires a prefix such as 9 to be dialed, followed by a delay period (to access an outside phone line) before dialing out. If so, see Section 3.2, "Programming Phone Numbers."

Unit dials out, but will not answer incoming calls.

Check programmed ring delay by pressing PROGRAM 9 0 6 ENTER. If it is set for a number larger than one, the Verbatim autodialer is not supposed to answer until the corresponding number of rings has been received. Try setting it back to 1 using code 9 0 6 1 ENTER. If the unit still will not answer incoming calls but is able to dial out, try plugging a regular telephone into the same phone jack in place of the Verbatim autodialer and see if it rings. If the problem is not the phone line, try temporarily connecting test point C to test point D on the main circuit board, for a period of about 5 seconds and see if it "answers" with the PHONING light and a voice report, then call the factory for advice.

Unit will not go into alarm when it should.

This is usually the result of incomplete understanding of how the Verbatim autodialer manages alarms.

For the Verbatim autodialer to go into Unacknowledged Alarm and Dial Out, a violation must be continuously present for the Alarm Trip Delay time. At least one phone number must be programmed. The unit must not be in the DISARMED state. And, the channel that has the violation must not already be in an acknowledged alarm state, since acknowledged alarm status for a given channel (including power failure) precludes further activity on that channel until that status is cleared. Refer to Section 5, "Using Your Verbatim autodialer," for a discussion of how the unit manages alarms.

To clear the acknowledged alarm status of all channels including power failure, starting with the NORMAL light lit, press DISARM/RE-ARM to get the flashing DISARMED indication, then press it again to re-arm the unit with all acknowledged alarm statuses cleared. Now any violations lasting longer than the Alarm Trip Delay will cause unacknowledged alarms and dialing.

Unacknowledged alarm status is indicated by the corresponding channel number flashing. Acknowledged alarm status is indicated by the same light remaining on continuously without flashing.

If you don't observe this, press PROGRAM and then press 7 0 1 ENTER to check your first phone number. Press 9 0 2 to check the Global (overall) Alarm Trip Delay. For the specific channel ZZ (2 digits) that you are attempting to create an alarm on, also press 6 ZZ to check for any longer Individual Alarm Trip Delay setting.

Check the Normally Open/Normally Closed alarm criteria programming for this channel by pressing 5 ZZ. Make sure it is not set for No Alarm or for Run Time Meter, since these settings would not allow an alarm. Now, for example, if the channel is configured Normally Open, you will want to temporarily provide a Closed Circuit at its input to trip the alarm. You can directly read and verify the Open/Closed status you are applying by pressing 0 ZZ 0. You may also use a DC voltmeter to trace your circuit connections. With the Verbatim autodialer turned on, an Open Circuit to a channel contact input reads 5 volts DC with respect to the "C" terminals or electrical ground. A Closed Circuit reads zero volts.

Unit keeps calling when it should not.

Be sure that the initial alarm call is in fact being acknowledged. The unit will specifically state "alarm is acknowledged" at the moment you successfully acknowledge the call. The unit will accept a tone acknowledge only following the prompting warble beep.

Also, be sure that the alarm violation has been corrected. Otherwise, even if the alarm is acknowledged, when the Alarm Reset period times out, dialing will begin again.

Write down exactly what the unit recites when it gives the unwanted call. This provides valuable guidance as to the cause and correction of the problem. You may need to lengthen the Alarm Trip Delay in order to minimize nuisance alarms, particularly the power failure Alarm Trip Delay (code 920). If you hear an alarm message with the phrase "now normal" added at the end, it means that the violation occurred long enough to trip the alarm but has returned to normal by the time you are hearing the report. In the case of power failure, if the power has been restored by the time the message is being heard, the message will be "Power is on". The fact that power is mentioned at all lets you know that there has been a power failure lasting longer than the power failure Alarm Trip Delay. Power will continue to be mentioned in any phone call or front panel status check, until the Alarm Reset time expires.

Unit is continuously "locked" in on state, or is behaving erratically.

Environmental factors such as lightning or power surges may have caused program lockup. With the unit turned on, use a screwdriver blade to momentarily connect the two pins on Jumper Block JB5 (see diagram Appendix H, p. H-26).

If this does not return the unit to normal operation, next try jumping the 2 pins on JB3. This latter step will erase all user programming and recorded messages, so all user programming and messages will need to be re-entered.

9.2 Phone Support Procedures

Make sure you have the following before you call:

- Serial #: Found inside front panel. If you are not at the unit, call the unit up and enter program code 968. This will give you a number that our Customer Support Department can reference.
- Note the unit's symptoms: Exact speech pattern, what it is saying, if it is calling or not. The more specific and accurate you are in describing the symptoms, the quicker the Customer Support Department will be able to diagnose and troubleshoot the problem. In many cases, it may save a return to the factory.

THEN call 1-800-449-4539 for Customer Support.

If the Customer Support determines that the unit needs to be sent to the factory for repair, you will be given a Return Materials Authorization (RMA) number.

9.3 Returning Parts to Factory

Pack all parts well! To avoid extra charges, return any removed chips card guides or daughter boards to the factory at the address below:

RACO Manufacturing and Engineering Co.
1400 62nd Street
Emeryville, CA 94608

Remember to:

- Put return address on package.
- Include a packing slip.
- Have serial # and RMA # handy when you call in for tracking.

A Verbatim Series SFP Autodialer

The following is an instruction supplement for the Verbatim Series SFP autodialer. This supplement describes differences between the Verbatim Series SFP, and the Series VSS.

The Series SFP is a modified Verbatim autodialer which omits the front panel keypad and some of the front panel LED indicators. The primary practical difference between the two models is that the programming for the Series SFP must be done over the phone, whereas programming for the Series VSS may be done over the phone or at the front panel.

The enclosed diagram of the front panel of the Series SFP (p. A-2) replaces the Series VSS diagram on page 2-5 of this manual. A supplemental diagram of the inside view of the front door panel (p. A-3) is also enclosed, showing the location of the ON/OFF switch.

The practical differences to consider in programming and using the Series SFP are explained below.

A.1 Programming the Series SFP from a Remote Telephone

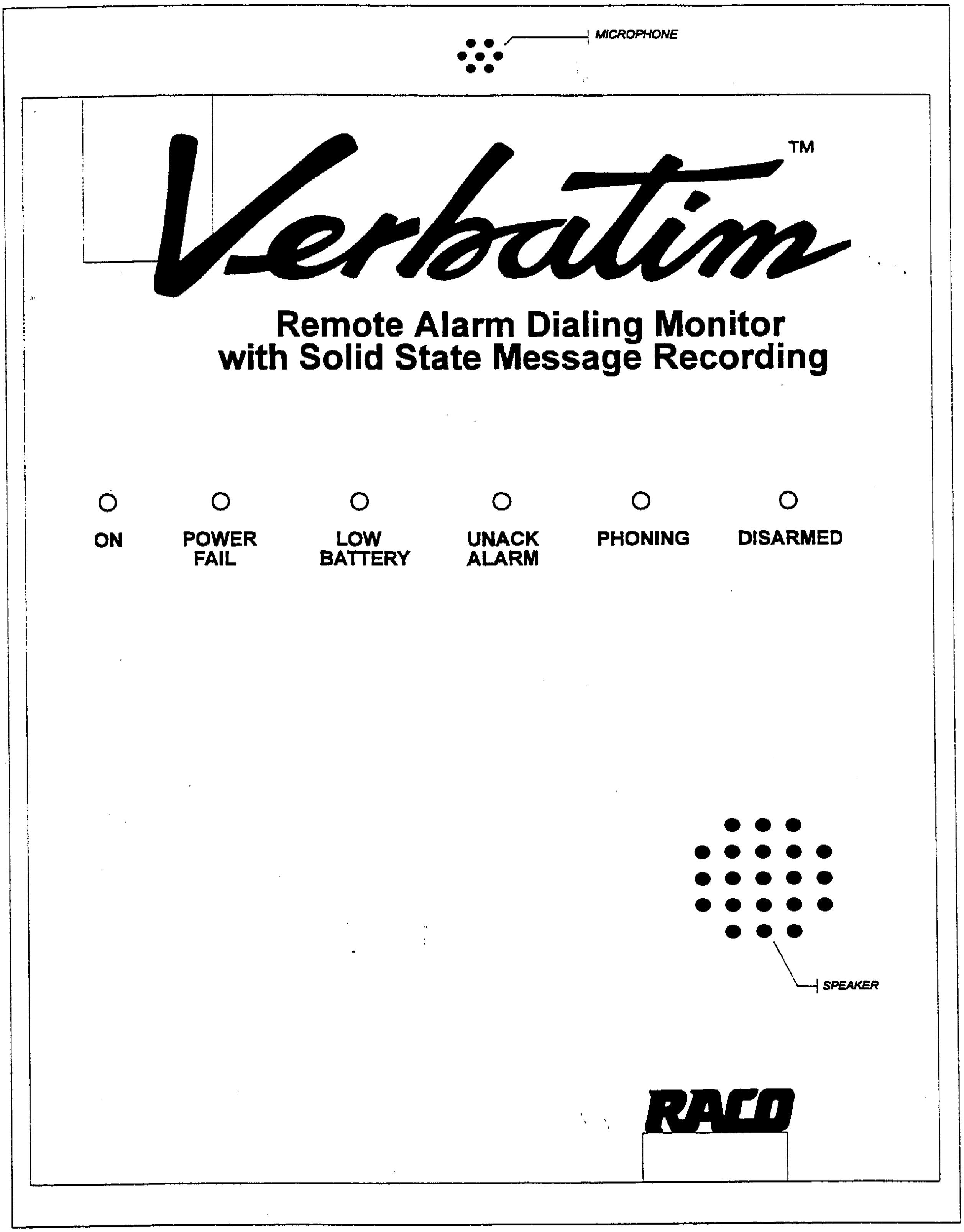
All programming of the Series SFP Verbatim autodialer is done from a remote Touch Tone telephone. This method of programming the product is described in Section 5.7 of this manual, and it is also more briefly referred to at other places in the manual such as Sections 4.2 and 4.3. With the Series SFP, this is the sole applicable means of programming. Therefore an "advance" description of over-the-phone programming follows.

When you call the Verbatim from any Touch Tone telephone, it will answer and begin reciting its message. At the end of each round of messages, you will hear a warble tone. If you press a command tone "1" immediately following this tone, you will the Verbatim autodialer will then be in Program Mode, and you will be prompted to enter a program code.

A chart listing the program codes is located in Section 6.1 of this manual. This section also includes some guidelines for using the program codes, and a more complete description of the programmable items is located in Section 6.2.

Program code entries generally consist of three digits, which may or may not be followed by additional followup values, before you complete the entry by pressing the # key twice. You will hear a spoken confirmation of each numerical tone digit as you issue it. There is no spoken response to the # or * key.

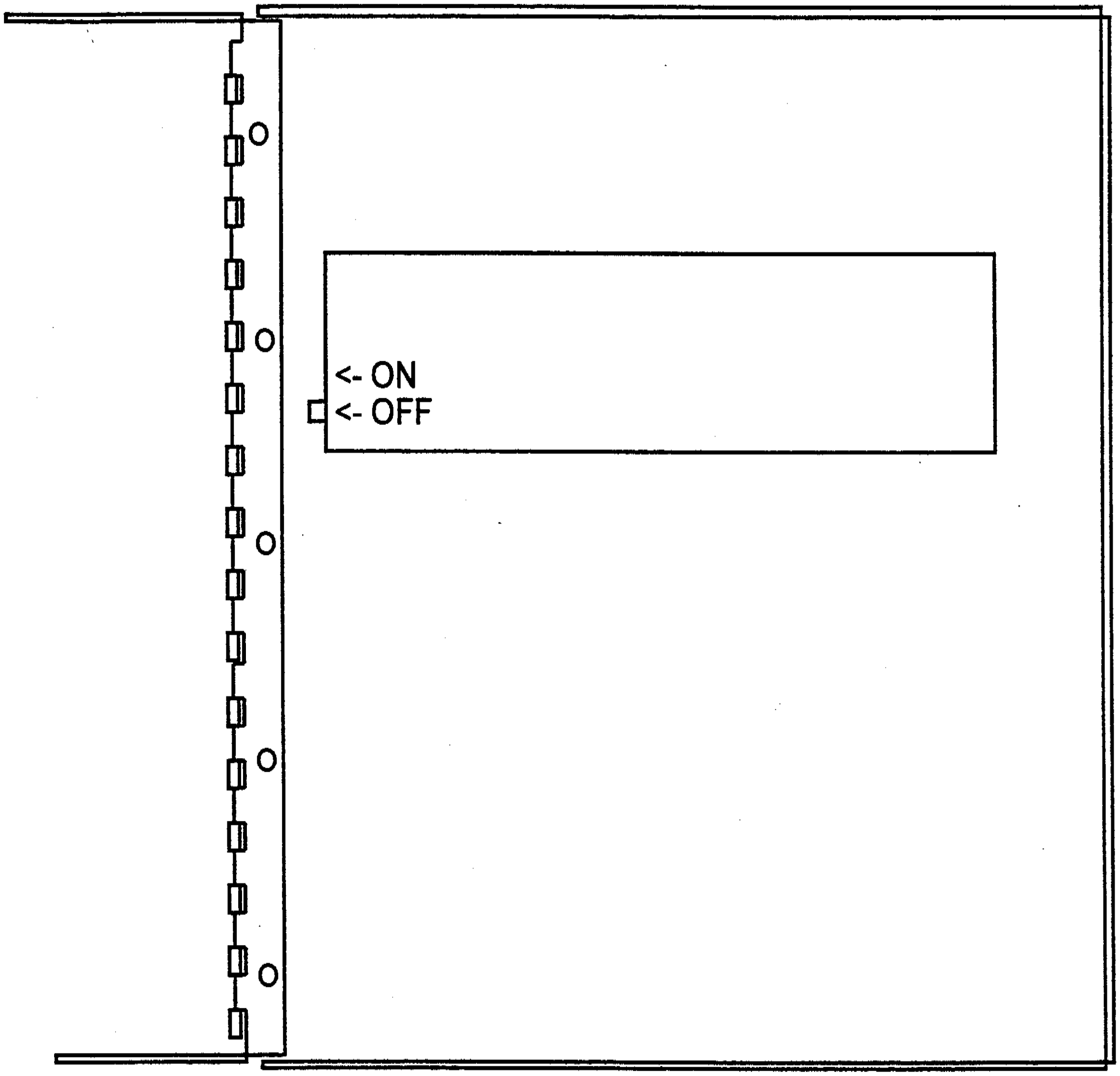
Verbatim Series SFP Front Panel Diagram



*** A discharged battery may take up to a day to fully charge. Meanwhile, light may remain on.**

**** During AC power failure, all illuminated LED's will flash to conserve battery power.**

Verbatim Series SFP Inside Front Panel ON/OFF Switch



Inside view of front panel, showing ON/OFF switch

Note:

The procedure of pressing the # key twice, is to be used in relation to all references throughout this manual to the term, "ENTER."

In general, if you enter just the three tone digits followed by # #, you will hear the present setting or value for that program item. If you include additional values before the # #, the new value will replace the existing setting or value. In either case, the voice report will provide confirmation of the updated program setting or value.

Sometimes there is need to include a decimal point or a minus as part of a value entry. Also, if you make a mistake as you are issuing tone digits, you will want to cancel the entry. The conventions for these functions are as follows:

CANCEL	* *
ENTER	# #
POINT	*
MINUS	#

To end a phone call after programming, press # # without any prior tone digit. The Verbatim autodialer will then issue a prompting warble tone which is an opportunity to re-enter a "1" if you did not really want to end the call. It will then say, "Goodbye," and end the call.

Refer to Section 5.7 for a description of the other command tones that may be used in place of the "1" for special purposes.

A.2 Programming and Testing

The following sections provide a sequential reference to this manual regarding the relevant differences and similarities in instructions for the Verbatim Series SFP.

A.2.1 Resetting (Clearing) the Unit

Caution:

The following step erases all user programming including recorded messages so normally it is done only at initial setup.

B Analog Signal Input

B.1 Analog Connections

Refer to the diagram (page B-10) showing the VAN analog boards for connection of analog inputs. Be sure you follow the indicated positive and negative polarity indications, except in the case of TS705 temperature sensor inputs, for which positive and negative polarity does not matter. Two signal wires are required for each input. The terminal blocks can be unplugged for convenience. Because of the space constraints, it is best to use small gauge wire like telephone wire. If bulkier wire is needed outside the dialer, it is best to install a terminal strip outside the dialer to make the transition from the bulkier wire to the more compact wiring going into the analog input connection points.

Note:

Take care to route the incoming signal wires to one side of the enclosure or the other so that they do not interfere with the front panel circuit board when the unit's door is closed. Also, try to route the analog signal wires away from power wiring to minimize noise pickup.

B.1.1 Programming for Analog Channels

Each analog input will need to be programmed to specify:

1. The analog Input Signal Type (if other than standard 4-20 ma input).
2. The numerical value to be spoken at a corresponding minimum signal level.
3. The numerical value to be spoken at a corresponding maximum signal level. Items 2 and 3 amount to programming the translating scaling factors for each analog input.
4. In many cases you will also want to program high and low setpoint limits for each analog input.
5. You may also elect to replace the generic default voice message with your own recorded messages for any analog channel, as described in section 4.

B.1.2 Assignment of Input Channel Numbers

The unit automatically assigns the lowest channel numbers to whatever number of contact input channels exist on the unit (whether or not you are using them) and the analog channels are assigned channel numbers beginning with the next available number.

For example, the first analog input on a unit with 24 contact inputs and 16 analog inputs would be "channel 25" and the last analog input would be "channel 40". Note that since the unit's maximum LED display capacity is a total of 32 channels, on such a unit the final 8 analog channels would not have corresponding LED status indicators on the front panel. Further, note that on units with remote channels, the LED display may group inputs into a single indicator.

It is important that you have correctly determined the channel number assigned for each analog input channel before performing the following programming steps.

B.1.3 Programming the Input Signal Type

(You may skip this step if you are using 4-20 ma inputs).

The analog inputs are very flexible and can accommodate a variety of Input Signal Types, but the unit needs to know which type each input is being used for a given analog input. Note that in addition to programming the Input Signal Type, the physical component configurations on the VAN plug-in circuit card must match the Signal Type used. Normally this will have been handled in the process of ordering the unit and will not require additional user attention. If there is any doubt about this, refer to the markings on the rear of the VAN circuit board. If there is still any question, refer to the markings you find and also your unit's serial number, when contacting the factory.

◆ To program the Input Signal Type for input channel ZZ:

```
5 ZZ 7 N ENTER
```

where ZZ is the two-digit channel number, and N is a single digit as follows:

0 for a 4-to-20 milliamp current loop input. This is the default setting, so if your inputs are 4-20 milliamp current loops, you may skip this step.

1 for 0 to 1 volt DC signal input. In the case of larger signal levels, such as 0 to 10 volts DC, the hardware input circuitry on the VAN card will have been factory configured to pre-scale the signal to a range within 0 to 1 volt DC, and corresponding special scaling information will be provided to fit the particular application.

- The speaker and microphone are present. However the microphone is limited to the function of optionally "listening in" since voice recording must be done via remote telephone.
- The On/Off function is controlled via the slide switch inside the front panel door. See diagram on page A-3 .

A.6 Enhanced Telephone Interface Features

The manual Section entitled, "Enhanced Telephone Interface Features," is generally applicable except that there is no front panel indication for telephone line failure.

Turn the unit on if it is not already on, via the switch at the rear of the front panel door. From a touch tone telephone, place a call to the phone number of the unit, and at the sound of the warble tone, issue a command tone "1" as described above.

To clear the system of all programming, in program mode as described above, issue:

`9 3 5   9   # #`

As always, if you make an error in issuing tone digits, press * CANCEL and start again.

A.2.2 Programming Phone Numbers

Essentially the same as Section 3.2 in this manual.

A.2.3 Programming Input Channels

Essentially the same as Section 3.3 in this manual.

A.2.4 Initial Testing

Temporarily place all input signal sources into their alarm state, long enough to satisfy the alarm trip delay. The unit will begin dialing the first phone number, perhaps before you have managed to get all the inputs into an alarm indication state. You should hear the a dial tone and then the sound of ringing, and then the sound of someone answering the call. Testing consists in verifying that the call is actually received at the first phone number, and that all the alarm messages are recited.

Your Verbatim Series SFP autodialer is now able to operate, having at least one dialout phone number programmed, and having its input channels configured. However, you may wish to record your own voice messages (Section 4) or perform special advanced programming items (Section 6) before referring to Section 5 on using your programmed Verbatim Autodialer.

A.3 Recording Messages In Your Own Voice

Essentially the same as Section 4 in the Owner's Manual, but following the guidelines for over-the-phone programming and recording.

A.4 Using Your Programmed Verbatim Autodialer

Section 5.7 is largely replaced by the discussion in Section 4 regarding over-the-phone programming, except for discussion of the alternative command codes "`2,`" "`3,`" "`4,`" and "`0.`"

Disregard Section 5.8.

A.5 Remainder of the Manual

All other descriptions in this manual may be followed and applied to the SFP with no practical limitiations.

Note:

The lack of front panel programming has specific impact on some minor aspects of specific programming items, as follows:

- **CODE 910:**

  SECURITY ACCESS CODE No Security Access Code may be programmed since this could only be programmed from the front panel keyboard.

- When a delay between dialing digits is needed (as for pager applications), it will only be possible to insert one delay period, since this is done over the phone by pressing the # key, and if this were pressed more than once in succession it would be interpreted as a Cancel Entry command. Therefore to get the length of delay desired, use `928` to extend the duration of the single delay from its default value of one second, to whatever value is needed.

- **CODE 926:**

  EXIT DELAY FUNCTION The Exit Delay function is not applicable in the absence of the front panel keyboard.

- The Speakerphone/Dialout function is not applicable in the absence of the front panel keyboard.

- There is no Parallel Printer Output.

2 for a Raco Temperature Sensor input (sensor model TS705A), used to measure temperatures from -20 to +120 degrees F.

3 for additional types of special custom-specified signals.

Summary of Codes for Input Signal Type

0 (default)	4-20 ma current loop
1	0-1 volt DC
2	Raco temperature sensor
3	Other special inputs

B.1.4 Programming the Scaling and Offset Factors

This set of steps is not necessary for inputs using a Raco Temperature Sensor, since these values will be automatically inserted if the parameter 2 is selected in the above step.

In the above step, accepting the default parameter of 0 for 4-20 milliamp inputs automatically provides for a spoken reading of 0.0 percent for the minimum (4 ma) signal input value, and 100.0 percent for the maximum (20 ma) signal, until you enter different factors.

In most cases, you will want to program the unit to give spoken reports in terms of the actual physical variables being monitored, such as water level in feet, etc. In general, you will need to determine the desired spoken numerical values corresponding to two widely separated (low end and high end) signal input values. Often this will be available from the overall system specifications. In other cases, this will be determined (or revised) based on actual on-the-spot observations. The Verbatim Autodialer offers the unique option of entering this scaling information based either on your particular system specifications (the System Specification method) or else on your real world observations (the Real World Method). Also, scaling information which you may have originally entered based on your system specifications may later be easily “fine tuned” based on real world observation.

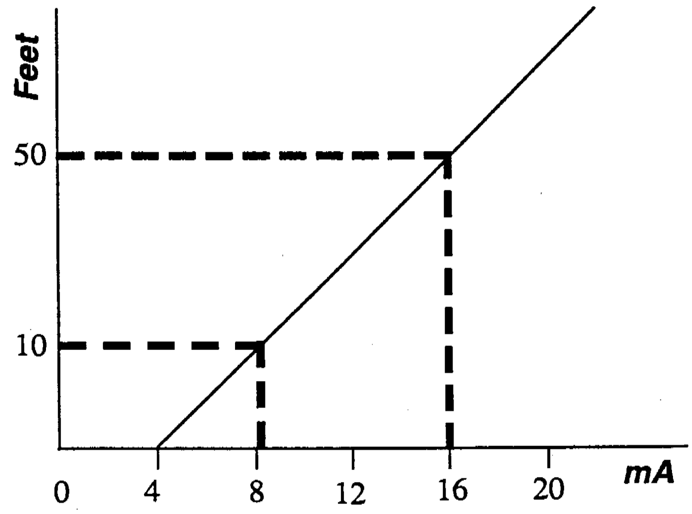
In addition, you may wish to record your own identifying message to replace the default message, as described in the message recording section of the manual.

B.1.5 Additional Perspective on Scaling Factors

Analog Math

It may be useful, in comprehending the process of establishing the scaling factors, to visualize a graph which relates the water level in a tank to the input from a 4-20 ma transducer. To establish the relationship on such a graph, it is necessary to define two separate points, or coordinate pairs ideally at two widely separated points on the graph. For such a linear relationship any point on the "reading" (Y) may be calculated from the formula:

```
y = mx + b
```



where m is the gain and b is the zero crossing point or Input (ma -> offset. The gain may be calculated from: m=(y2-y1)/x2-x1)

where x1, y1 is one coordinate pair on the graph and x2, y2 is the other.

Therefore, when you have chosen to enter non-default coordinates you are in fact setting the gain factor. This gain factor is taken along with the input signal type you have chosen which will define both the gain and offset.

Notice that each of the two points requires two separate coordinate pieces of information to define: the signal level and the corresponding water level. With two such points defined, an entire line or linear equation is defined, so that given any new signal level, we could use the graph to "look up" the corresponding water level. In operation, the Verbatim autodialer measures the signal level presented to it, and then calculates the corresponding physical value, all based on the line or linear equation defined by your entry of the high end and low end scaling information whether done by the System Specification Method or the Real World Method.

Be sure that the correct Input Signal Type setting is entered as described above, because changing the Signal Type setting will overwrite the programming described next.

System Specification Method of Programming Scaling Factors

The following four codes must be entered to invoke scaling:

- For the low-end portion of the data for channel ZZ, enter the following pair of codes:

  ```
  5 ZZ 1 X.XXXX ENTER
  ```

  where X.XXXX is the low input signal value chosen, within the bounds of input signal type.

  ```
  5 ZZ 2 YYYY.YYYY ENTER
  ```

  where YYYY.YYYY is the desired spoken numerical value

- Then to complete the scaling factors for this channel, enter the following pair of codes for the high-end portion of the data:

  ```
  5 ZZ 3 X.XXXX ENTER
  ```

  or

  ```
  5 ZZ 3 POINT ENTER
  ```

  for the high-end signal value

  ```
  5 ZZ 4 YYYY.YYYY
  ```

  for the high-end corresponding spoken value

Note:

For all analog value entries you may enter up to four digits before an optional decimal point, and up to four digits after, but simple entries (such as -20, 3.45, 500, 4, etc.) work as well.

Alternative Real World Method of Programming Scaling Factors

If the system specifications for the scaling factors are not known, or if you wish to adjust a previous entry to reflect real-world as opposed to system specification conditions, wait until the input signal or the physical variable happens to be near the low end of the scale. Enter the following pair of codes:

```
5 ZZ 1 POINT ENTER
```

which will automatically accept the present moment signal value as the low input signal value, rather than having to enter the value shown as X.XXXX above. Then, enter:

```
5 ZZ 2 YYYY.YYYY ENTER
```

where YYYY.YYYY is the corresponding low-end physical value which you observe in real-world terms.

At another time, when the signal or physical variable is toward the high end of the scale, enter the following pair of codes:

```
5 ZZ 3 POINT ENTER
```

which accepts the present signal level as corresponding to the high-end physical value which you enter as:

```
5 ZZ 4 YYYY.YYYY ENTER
```

Example:

It may already be known from your system's specification that for channel 6, a low-end signal of 4 milliamps corresponds to a desired spoken value of 34.5 feet of tank water level. In such a case, you would use the System Specifications Method to enter:

- for 4 milliamps

  `5 06 1 4 ENTER`

- for a spoken reading of 20.5

  `5 06 2 20.5 ENTER`

- for 20 milliamps

  `5 06 3 20 ENTER`

- for a spoken reading of 34.6

  `5 06 4 34.6 ENTER`

Then, suppose with the system in operation, you observe that the tank level is 31.7 feet, but the Verbatim reports a value of 31.45 feet. The discrepancy will most likely be due to a discrepancy of the sensor's actual output versus the theoretical system specification. Regardless, to correct for it, keeping in mind that the signal is presently near the high end of the scale, you would use the Real-World Method, entering:

- To reference the present signal level

  `5 06 3 POINT ENTER`

- To recalibrate 31.7 as the corresponding spoken value

  `5 06 4 31.7 ENTER`

Continue the example, there might also be a discrepancy toward the low end of the scale. Suppose on another day you observe a tank level of 22.5 feet but the Verbatim report 2293 feet. Since this signal is at the low end of the range, you would enter:

```
5 06 1 POINT ENTER
```

and

```
5 06 2 22.5 ENTER
```

Note:

These Real-World Method adjustments did not require you to measure any actual signal levels!

From that time on, assuming that the sensor maintains its calibration and has a linear output, the spoken value should track the actual value very closely. The Verbatim itself is much more accurate and consistent than almost any sensor available to connect to it. Note that the signal does not need to be exactly at the end of its range (e.g. 4 ma or 20 ma) for these programming steps. However, in general the wider the spread between the signal levels used, the better informed the Verbatim will be to reflect the actual relationship between the sensor's output and the real value being measured.

Note:

While the unit reports with very high accuracy and resolution, you do not need to enter your programming value to the same high degree of accuracy unless you choose to.

For TS705 Temperature Sensor Inputs

Selecting signal type "2" (TS705 sensor) will automatically load scaling factors as describe earlier. However, these automatically loaded scaling factors are not adjustable. If you want to be able to do Real World calibration adjustments for temperature sensor inputs, then instead of selecting sensor type "2", select sensor type "1" (0-1 VDC input) and enter scaling factors as follows:

```
5 ZZ 7 1 ENTER (Selects signal type 1)

5 ZZ 1 .843 ENTER

5 ZZ 2 -19.8 ENTER

5 ZZ 3 .316 ENTER

5 ZZ 4 120.1 ENTER
```

This gives the same scaling factors as would otherwise automatically result from selecting signal type 2, but it allows for subsequent adjustments using the Real-World adjustment method.

B.1.6 Programming High and Low Analog Setpoints

You should first enter the gain, offset and scaling factor programming described above before entering setpoints. Later, if you adjust the factors as described above, you may also need to adjust the setpoints correspondingly. Changing setpoint values after scaling is set could cause changes in the scaling values.

- To program a low limit setpoint for channel ZZ, use code:

  ```
  5 ZZ 5 X.XX ENTER
  ```

Note:

X.XX is the desired setpoint in terms of spoken units, rather than in terms of the signal value. You do not need to enter all four possible leading and trailing digits. Simple entries like 7 and 3.68 work as well.

- To program a high limit setpoint for channel ZZ, use code:

  ```
  5 ZZ 6 X.XX ENTER
  ```

Thereafter, whenever the measured value exceeds the setpoint for a continuous period exceeding the alarm trip delay, the unit will go into unacknowledged alarm and begin dialing to report the specific violation, also reporting the current measured value. As with contact inputs, if the input is no longer in violation at the moment of the report, the phrase "Now Normal" will be appended to that channel's report.

- To check an existing setpoint value, use the above codes but omit the value (X.XX).
- To turn off (completely disable) an unused analog channel so that it will not be included in status report, enter code:

  ```
  5 ZZ 0 ENTER
  ```

  where ZZ is the 2-digit channel number.
- To turn the channel on again, you must enter some high or low setpoint value for that channel.
- To turn off (disable) a high or low analog setpoint, while still leaving the channel able to report readings, enter a setpoint value of -0 for that particular setpoint. If you try to enter a setpoint value outside a wide signal range, the Verbatim will say "Error in number."

Note

The scanning time required by the unit to check all analog readings against established setpoints increases with the number analog channels. With 16 channels, the time can total on the order of one second, and this imposes a limit on how fast the unit can detect analog setpoint violations. Normally, this will not be noticed unless you set Alarm Trip Delays of less than two seconds, and there is no effect on the trip delay for contact channels in any case.

Refer to the following section for recording the corresponding voice messages other than the spoken numerical values.

B.1.7 Summary of Analog Programming Codes

Code	Description
Signal Type:	
5 ZZ 7 N	Select input signal type. 0 is default for 4-20 ma
Scaling:	
5 ZZ 1 X.XX or POINT	Low end signal value
5 ZZ 2 YYYY.YYYY	Corresponding low end spoken value
5 ZZ 3 X.XX or POINT	High end signal value
5 ZZ 4 YYYY.YYYY	Corresponding high end spoken value
***Setpoints*:**	
5 ZZ 5 X.XX	Low alarm limit setpoint
5 ZZ 6 X.XX	High alarm limit setpoint
5 ZZ 5(6) -0	Disable low (high) setpoint
Disable Channel:	
5 ZZ 0	Turn off (disable) channel ZZ

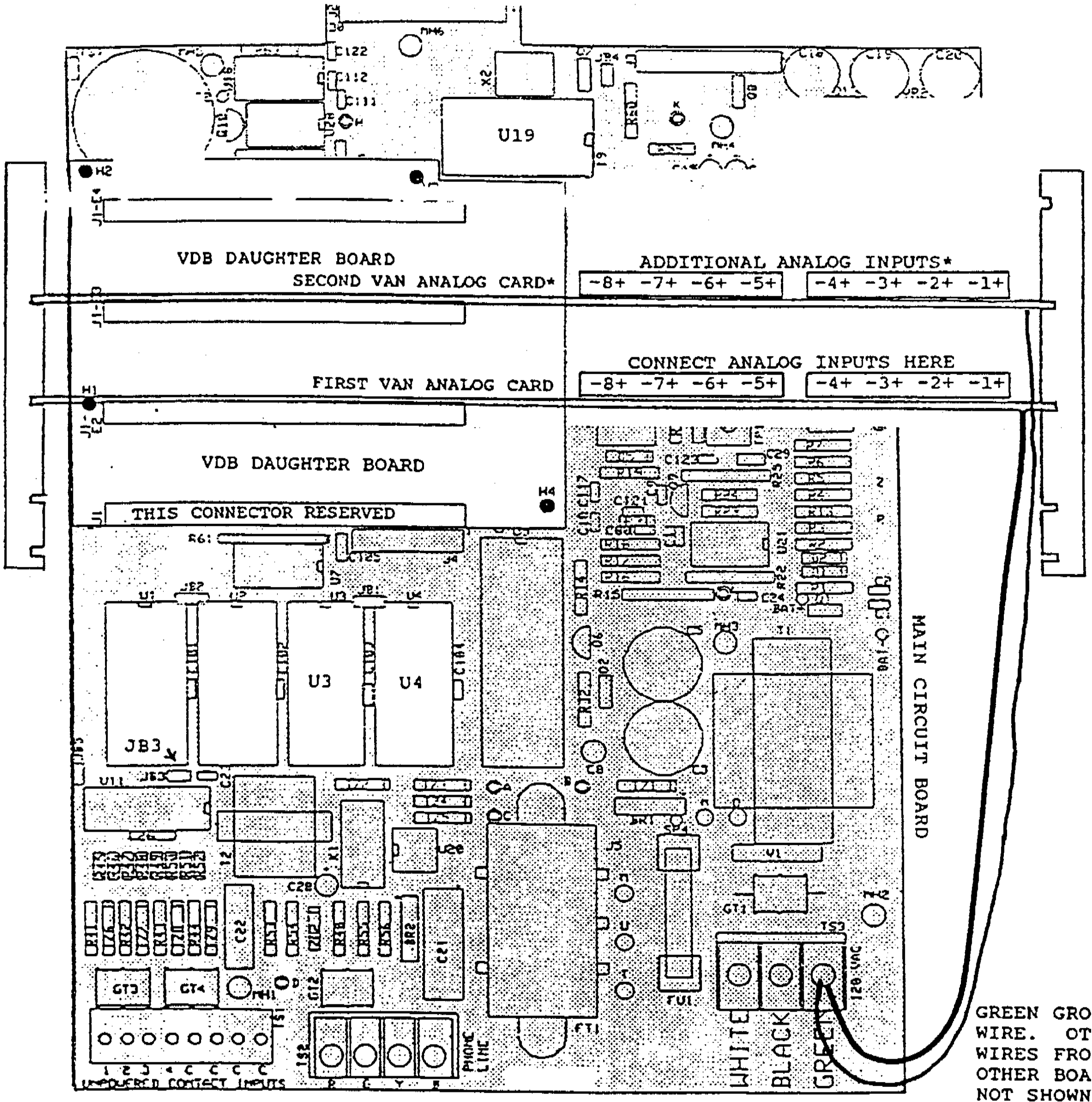
B.1.8 Recording Speech Messages for Analog Channels

This information supplements the basic information in the manual on recording speech messages. Refer to that information before attempting to record any speech messages.

For analog input channels, the default message is “The present channel N reading is ...”

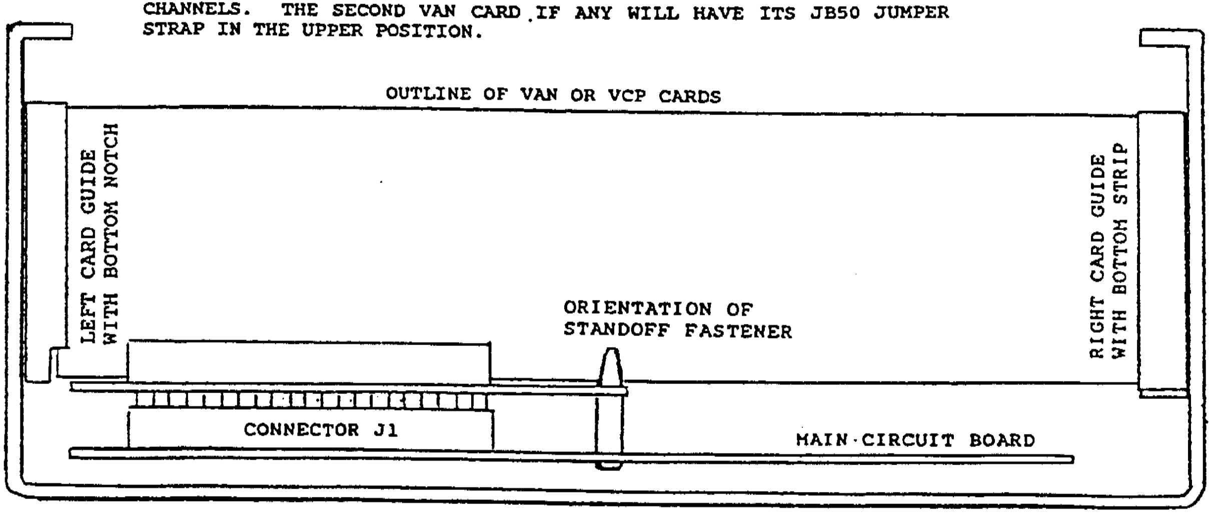
For any analog inputs, in place of the default messages you may plan to record a preamble message of the general form “The total water flow in gallons is” or “the main tank water level in feet is.”

Use program code 1 ZZ to record the analog preamble message.



GREEN GROUND WIRE. OTHER WIRES FROM OTHER BOARDS NOT SHOWN.

*UNITS EQUIPPED FOR 16 ANALOG CHANNELS WILL REQUIRE 2 VAN CARDS. THE SECOND (UPPER) CARD WILL BE FOR THE HIGHER NUMBERED ANALOG CHANNELS. THE SECOND VAN CARD IF ANY WILL HAVE ITS JB50 JUMPER STRAP IN THE UPPER POSITION.



B.1.9 If Analog Inputs Do Not Work Correctly

Recheck programming settings, especially the Input Signal Type setting. Verify that the polarity of your input connections is correct.

In the case of 4-20 ma input, does the spoken value always reflect a 0 ma signal level? If so, the problem is presumably with the connection or the signal source. Use a DC meter to verify that both sides of the offending input are within 10 VDC of ground. A 4-20 ma current loop input should give a meter reading of about .07 volt per milliamp of current as measured across the two signal input terminals.

Are other instruments included in the same current loop? If they read correctly, temporarily disconnect the input to the Verbatim Autodialer. This should throw the readings of the instruments off scale. If there is no such effect, your wiring is not including the Verbatim autodialer in the loop. Verify that the type of signal source agrees with the physical configuration on the VAN card according to the marking on the back of the card.

B.1.10 Troubleshooting Analog Grounding Problems for Verbatim Analog

The most common analog signal type in use in the Verbatim marketplace is current loops, wherein the signal is a controlled DC current ranging from 4 to 20 milliamperes.

The loop consists of a current transmitter (consisting of a transducer and a supporting power supply which may or may not be packaged into one unit), and one or more receiving devices which measure and respond to the current signal they detect on the loop. The power supply voltage is typically 24 volts DC.

The terms "transducer" and "transmitter" are used interchangeably. The transmitter's job is to ensure that the current level accurately reflects the physical parameter which the transducer is measuring (typically a pressure or liquid level), regardless of what impedance it sees in the loop.

In order to do this, it presents whatever voltage across its terminals is needed to achieve the correct current flow. This voltage must be great enough to accommodate the total resistance in the loop. The typical resistance contribution presented by each receiving device is 250 ohms. However, the DC resistance presented by the Verbatim analog inputs is around 70 ohms (49.9 ohm precision resistor plus two 10 ohm surge standoff resistors).

In theory, all elements in the loop are isolated from any connection to electrical ground. This is intended to eliminate concerns about errors in the signal caused by conflicting ground or other conflicting connections.

In practice it is not unusual to have some element of the loop in fact tied to ground or to some other voltage source away from ground -- or if not directly tied, at least limited in its ability to depart from the ground or other voltage. As long as only one element in the loop is so committed, there is no problem since the other elements can freely accommodate as needed.

The Verbatim has its own limitations in this respect. It can only accommodate a departure from ground voltage potential, of 8 volts nominal, before its protective tranzorbs begin to conduct and clamp the signal. Such clamping when in direct conflict with some other voltage commitment in the loop, will not only cause incorrect readings by the Verbatim, but also cause the other elements in the loop to read and respond incorrectly.

This ability to accommodate departures of both sides (positive and negative) or the analog signal input, is called the common mode input voltage range. A truly isolated input would have as much common mode input voltage range as the voltage limitation of the isolation, typically over 1,000 volts.

The reason we do not provide isolated inputs is because it is bulky, and expensive to achieve accurate translation across the isolation barrier. Also, these days there has been a large shift to transformer and capacitive coupling schemes to achieve DC isolation, but these provide almost zero protection against the fast rise time transients induced by lightning. So, we need to be able to troubleshoot when a customer places one of our analog inputs into a current loop where there is another conflicting voltage commitment.

When this problem occurs, the customer will typically report that his loop works but is thrown off when our analog input is placed in the loop. Sometimes the disturbance takes the form of not just altering the DC current but causing parasitic oscillations in the loop. It may not be easily discernible whether the disturbance is or is not taking the form of a parasitic oscillation. Regardless, temporarily ungrounding the dialer or unplugging the analog card, will usually eliminate the disturbance.

The procedure for troubleshooting and correction of this problem is generally as follows: First we need to find out as much as we can about any preexisting, conflicting voltage commitments. To do this, have the customer unplug the card or unground the dialer so that the loop is not disturbed, and then use a voltmeter to check both the AC and the DC voltage readings at each node around the loop, with respect to electrical ground.

We hope there is not much AC signal present. If there is a strong enough AC component on top of the DC voltages, there will be disturbance to the extent that the peak level in the AC waveform exceeds the common mode input limitation of our analog input. In such a case the cause of the AC component of the signal needs to be found and eliminated, if the following procedure does not lead to a good result.

However, it is possible and even likely, that an observed AC signal is merely a "softly" induced hum that holds no sway when it meets any clamping introduced by our analog input. With this in mind, it may be best to defer even taking AC reading until after the DC oriented methods have proven unsuccessful.

With the main focus being the DC voltage readings, we are looking at some point on the loop that is much less than eight volts DC away from ground, and that is where the Verbatim input should be relocated in the loop. Chances are good that the Verbatim had previously been placed at a point on the loop well away from ground potential and that the relocation will end the problem.

An added step that may be useful in addition to the two sets of voltage readings (AC and DC), especially if the voltage readings seem to be erratic, is to have the customer use a jumper wire to temporarily connect some candidate point in the loop to electrical ground, and observe whether the loop is disturbed by this temporary grounding. If it is not, that is a good place to locate our input in the loop. In fact, this approach can be used without taking voltage readings at all. But if it does not work, then we do want the voltage readings in order to best understand what is going on.

Occasionally, something in the loop will cause there to be no available point in the loop that is close to ground potential. In such cases, if this cannot be changed, then the customer will need to install an optical isolator between the loop and our inputs. The customer may be referred to: Action Instruments, San Diego, CA, (619) 279-5726. Isolators cost $300 per loop.

C Remote Supervisory Control Output

C.1 Remote Supervisory Control (VRSC) Output Installation and Operation Instructions

This option allows you to turn connected equipment on and off from any remote Touch Tone telephone, or from an non-Touch Tone telephone with the use of a portable tone generator. Option VRSC-4 provides 4 outputs, VRSC-8 provides 8 outputs. The unit's voice guides and confirms your operations. Advanced features such as programmable length momentary activations are included. Control operations may also be performed from the unit's keyboard.

Connections are normally made by means of optically isolated solid state relays housed in a separate Output Relay Enclosure which requires its own 120 VAC power connection. In some situations, the user may choose to make connections directly to the transition outputs within the main unit.

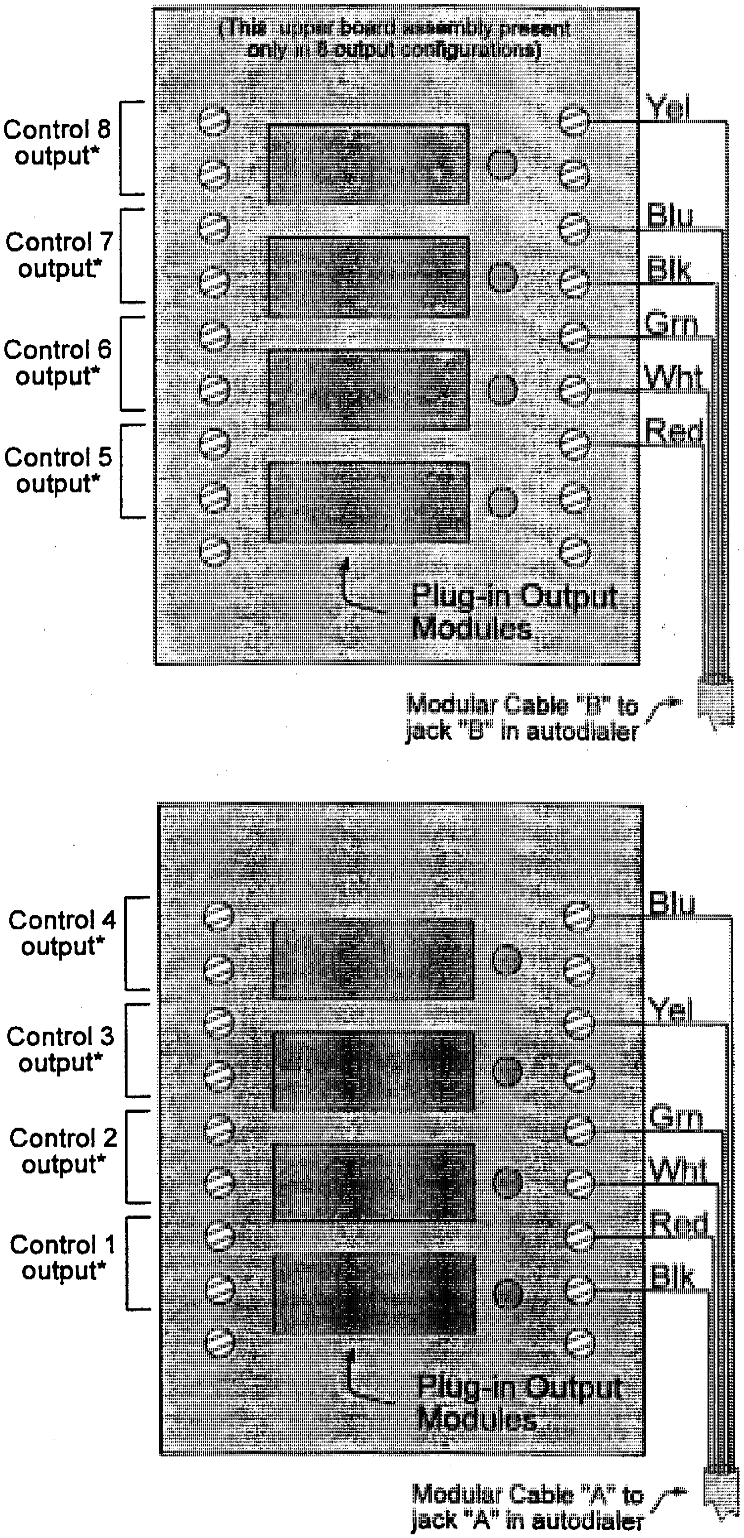
If your unit was not originally equipped with this option, refer to the separate instructions for adding this option.

C.1.1 Mounting and Wiring Connections for Remote Supervisor Control

If you are using the separate Output Relay Enclosure normally supplied with this option, mount the enclosure within 3 feet of the Verbatim Autodialer, and make your output connections to the left hand row of terminal strip points within the separate enclosure, as shown in the diagram of the VRSC Output Relay Enclosure. Be sure that the correct type of plug-in Opto 22 relays are in place. The available types are:

Type	Value
OAC5	12 to 140 VAC, 2 amps
OAC5A	24 to 280 VAC, 2 amps
OAC5A5	120/240 volt AC, Normally Closed
ODC5	5 to 60 VDC, 2 amps
ODC5A	5 to 200 VDC, 2 amps
ORR 5	Reed relay dry contact output

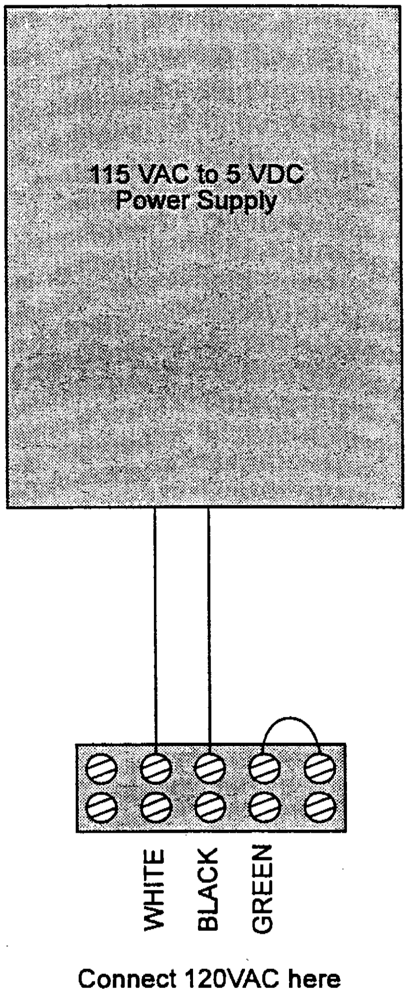
RSC Supervisory Remote Control Output Box Diagram



OUTPUT MODULE TYPES:

OAC5	12 to 140 VAC, 2 amps
OAC5A	24 to 280 VAC, 2 amps
ODC5	5 to 60 VDC, 2 amps
ODC5A	5 to 200 VDC, 0.67 amps
ORR5	Reed Relay Output

* If DC output modules are used, the lower terminal is the positive terminal, for each control output.



Unless ordered otherwise, type OAC5 is normally provided from the factory. Connect 120 VAC power as shown on this same diagram. Route modular "Cable A" through one of the entrance holes on the bottom of the Verbatim Autodialer, and plug it into J301 (the right-hand jack on the VCP circuit card, see diagram). The 8-output VRSC-8 option also includes a second modular "Cable B", connect this to the adjacent jack J302 on the VCP circuit card. Avoid routing these cables alongside power wiring and route them so that the front panel circuit board does not pinch them when the door is closed.

C.1.2 Optional Direct Connection Without Use of Output Relay Enclosure

The outputs on the VCP circuit card are NPN transistor open collectors capable of switching up to 12 volts DC at up to 500 ma, and thus these outputs may in some cases be connected directly to logic inputs of logic controllers, etc, although external pullup resistors may be required. Consult Raco for details. The color codes for VRSC cables "A" and "B" are:

Cable	Color Code
Cable A	
Common Return	Black
Output # 1	Red
Output # 2	Green
Output # 3	Yellow
Output # 4	Blue
Cable B	
Output # 5	Red
Output # 6	Green
Output # 7	Blue
Output # 8	Yellow

C.1.3 Remote Supervisory Control Operation

- To check the on/off status of output # N, use program code

  `9 5 N ENTER`

  where N is a 2 DIGIT output number (e.g. 01 for output # 1).

- To turn output # N ON, use program code

  `9 5 N 1 ENTER`

- To turn output # N OFF, use program code

  `9 5 N 0 ENTER`

- To turn output # N on for a specific number of seconds, use code

  `9 5 N 2 XXXXX ENTER`

  where XXXXX is the desired number of seconds, from 1 to 99999.

- To turn output # N off for a specific number of seconds, use code

  `9 5 N 3 XXXXX ENTER`

  where XXXXX is the desired number of seconds, from 1 to 99999.

- To establish a default pulse time duration in seconds for a given output N (2 digits), use code

  `9 5 N 9 XXXXX ENTER`

  where XXXXX is 1 to 99999 seconds.

- Alternatively, to establish a default pulse time duration in minutes, for individual output N (2 digits), use code

  `9 5 N 8 XXXX ENTER`

  where XXXX is 1 to 1666 minutes.

  Then you may use code 9 5 N 2 (or 3) without need to enter the digits. The unit will use the pre-stored value for that output's pulse length.

- To hear a report of the on/off status of ALL outputs in one operation, use program code

  `9 5 0 0 ENTER`

- To turn ALL outputs OFF in one operation, use code

  `9 5 0 0 0 ENTER`

- To turn ALL outputs ON in one operation, use code

  `9 5 0 0 1 ENTER`

- To establish a default pulse time duration for ALL outputs in one operation, use code

  `9 5 0 0 8 XXXX (XXXX = 1 to 1666 minutes)`

or

  `9 5 0 0 9 XXXXX (XXXXX = 1 to 99999 seconds)`

Warning:

Because the devices under control would not normally be operational during AC power failures, the Output Relay Enclosure does not include battery backup for the output relays during AC power failures. Upon restoration of AC power, the outputs will return to the state dictated by the Verbatim Autodialer.

When the Verbatim Autodialer itself is first turned on, and at certain other times when a microprocessor reset occurs, all the outputs will be turned ON for a fraction of a second, before assuming the state dictated by the Verbatim Autodialer. In some installations this could cause problems, and in such cases external time delay relays or other measures may be required to prevent unwanted momentary activation of controlled devices.

MM are the minutes (09 for 9 minutes)

SS are the seconds. Entry of SS is optional.

◆ To clear the time and date back to 00:00:00 on 01/01/89.

```
935 7 ENTER
```

D

Printer Options

D.1

Local Data Logger (Local Printer) Option

If your unit was not originally equipped with this option, refer to the separate instructions for installing this option. (See Section 2.3 for LDL parrallel). The local printer will automatically print out each activity that occurs: alarms, acknowledgments, programming entries, inquiry calls, etc.. A time and date stamp will be included with each report. The local printer may be either serial or parallel as discussed below.

D.1.1

Serial Printer Interface

- If your printer was obtained through Raco, it will have been properly configured and tested at the factory...
- If it was purchased independently, refer to the printer's instruction manual to configure it for 9600 baud, 8 data bits, 1 stop bit, and no parity.
- Improper configuration settings will result in "garbage" being printed, or possibly no printing at all.
- The printer must have a "serial" input.
- Printers not specified by or purchased through Raco are not guaranteed to be compatible for this application.
- Connect the DB-25 connector end of a Raco SER-01 cable (the specific type required will depend upon the printer type) to the input connector on the back of the printer.
- Route the small "modular" plug end of this same cable through one of the holes at the bottom of the Verbatim Autodialer, and plug it into modular jack J303 located near the left side of the Verbatim Autodialer, on the vertical VCP circuit card.
- Avoid routing this cable alongside power wiring, and route it so that the front panel circuit board does not pinch it when the door is closed.

D.1.2

Parallel Printer Interface

Some newer models of the VSS Series autodialer have a standard Parallel Printer Interface. This interface is accessed via the parallel printer port located on the inside of the unit front panel door. This printer port is already activated. (See Section F.3)

- To activate this port, attach a RACO VPPC-1 Parallel Printer Cable (or equivalent) to the front panel port and to the parallel port on your printer.

Caution:

Attach the parallel printer cable to the VSS front panel port with the "red striped edge" on the right side. If you connect any other way, you may damage the parallel connection on your printer.

D.1.3 Time and Date Setting

Time and date may be set or corrected with the following programming code entries:

- To check the date

  `941 ENTER`

- To set the date

  `941 MM DD YY D ENTER`

  where:

  MM is the month (03 for March)
  DD is the date (07 for the 7th day of the month)
  YY is the year (89 for 1989)
  D is the day of the week (1 for Sunday, 2 for Monday, etc.). Entry of D is optional.

- To check the time

  `942 ENTER`

- To set the time

  `942 HH MM SS ENTER`

  where:

  HH are the hours in military time (13 for 1 PM)
  MM are the minutes (09 for 9 minutes)
  SS are the seconds. Entry of SS is optional.

- To clear the time and date back to 00:00:00 on 01/01/89.

  `935 7 ENTER`

D.1.4 Printout at Regular Intervals

The unit may also be programmed to automatically log (printout) all input conditions at regular intervals, by entering code:

```
943 XXX.X ENTER
```

XXX.X is the desired printing interval in hours, from 0.1 to 999.9.

The first such printout will occur when the period elapses, rather than immediately upon programming.

◆ To check programmed printing interval

```
943 ENTER
```

◆ To turn off regular interval printing function

```
943 0 ENTER
```

◆ To printout All User-Entered Programming

```
944 ENTER
```

E

Data Acquisition/Central Data Logging

The following section describes commands used to configure features of the Data Acquisition/Central Data Logging options. The software is called SCADA.

E.1

Return To Normal (RTN) Calling

You may program the unit to place calls upon an input returning to its normal state. This applies only to channels which have become acknowledged alarms. Return to Normal (RTN) calls may be placed to people, to a SCADA Central Station or to a Central Data Logger (CDL) printer.

- There are three modes of calling for RTN calls:
  Mode 0 = Data only
  Mode 1 = Voice only
  Mode 2 = Data and Voice

Return-to-normal (RTN) calls on units NOT configured for SCADA or CDL will always be mode 1, Voice only. RTN calls on SCADA or CDL configured units may be mode 0, mode 1 or mode 2. If mode 1 is set on SCADA/CDL units then data calls to the SCADA Central Computer or CDL printer will be skipped. (See Appendix K for a discussion of the Return-to-Normal modes of operation.)

- To program Return to Normal Calls, press:

  `981 V`

  Where V is one of the following:

  - 0 = OFF - No return-to-normal calls will be made (Default is OFF)
  - 1 = ON - Return-to-normal calls will be made for channels in the ALARM, ACKNOWLEDGED state whose input returns to normal (non-violation).
  - 2 = used to manually reset all return to normal channel status - does not affect the return-to-normal calling ON/OFF state above or the calling modes below.
  - 3 = Sets return-to-normal mode to mode 0 - makes return to normal calls only in data mode to the SCADA Central Computer or to Central Data Logger Printer Entering this parameter does not affect the RTN ON/OFF state.

- 4 = Sets return-to-normal mode to mode 1 - makes return to normal calls only in voice mode (NO data calls to the SCADA Central Computer or Central Data Logger Printer. Entering this parameter does not affect the RTN ON/OFF state.
- 5 = Sets return-to-normal mode to mode 2 - makes both data and voice calls upon return to normal. Entering this parameter does not affect the RTN ON/OFF state.

E.2 Quick Intercall Delay & SCADA Units Connected to Cellular Phones

This section discusses two different but sometimes interrelating topics regarding SCADA configured autodialer/RTU units. One topic is the different ways in which the intercall delay operates in SCADA units. The other is the ability to interface SCADA units over cellular phones.

Units configured for SCADA operation may place and receive calls via cellular telephones instead of standard dial-up telephone lines. If purchased from RACO, the combination of autodialer/RTU, dial-up adaptor and cellular transceiver is called the CELLULARM™ package.

CELLULARM™ autodialers/RTUs may be used in cases where land lines are not available but cellular service is available in a particular area. CELLULARM™ units function nearly identically to land line based dial-up interfaced units.

Exceptions

The *intercall delay* (time between calls) functions somewhat differently on SCADA units than on non-SCADA units. On SCADA units a shortened intercall delay takes effect under certain circumstances. These circumstances are:

1) There is a fixed, non-adjustable intercall delay of 35 seconds between:
    a) multiple attempts at data calls to the SCADA Central Computer.
    b) the last personnel (voice) number and "wrapping around" to the data number again.
2) The is also a special adjustable quick intercall delay taken only between the progression from data calls to the first personnel (voice) call.

The quick intercall delay is set to 35 seconds by default. The usual intercall delay taken between between one personnel number and the next personnel number is 2.0 minutes by default.

The purpose of the quick intercall delay is for more expedient in transitioning from data calls to voice calls. However, in certain cases the quick intercall delay may actually interfere with attempts to call the autodialer/RTU for acknowledgement. This is especially true for cellular interfaced units.

Cellular phone calls often take substantially more time to connect to the called party. Therefore, on cellular interfaced units you may need to lengthen the quick intercall delay to allow a longer time "window" for acknowledgement calls from the SCADA Central Computer.

◆ To set the quick intercall time, press:

`919 V`

Where V is 35 to 999 secs.
Default is 60 secs.

Note:

Available ONLY on units with firmware revision between V1.36 to V1.99. Applies only when the autodialer/RTU is advancing to the first voice number. Does NOT apply to data call retries, calls between successive voice numbers or wrap-around from last voice number to data calls again.

E.3 Acknowledgment Calls To The SCADA Central Station

Units configured for SCADA operation may be programmed to make calls to the SCADA Central Computer to report alarms which were acknowledged by personnel. Alarm Acknowledgement which occurs during calls to personnel or when personnel call the unit will prompt a sequence of Acknowledgement calls made to the SCADA Central Computer. The purpose of Acknowledement calls is simply to log the event of alarms being acknowledged by personnel.

◆ To program the unit for Acknowledgement Calls, press:

`982 V`

Where V is one of the following:

- 0= OFF - (Default)
- 1= ON - Make Acknowledgment calls
- 2= resets all alarm acknowledgement call status - inhibits all further attempts for this alarm acknowledgement occurence.

E.4

Modem Automatic Speed Select for SCADA units

Automatic speed selection of 1200 baud or 300 baud may be programmed ON or OFF. When programmed ON, the unit will attempt to make data calls at 1200 baud first. If 1200 baud cannot be automatically negotiated with the SCADA Central Computer's modem, fallback to 300 baud will occur. When programmed OFF, the modem speed will be determined by the 984 command (below).

Exception

In some cases, 1200 baud may not provide reliable data communications due to phone line noise, etc. If necessary, use this command to force the unit's modem to use one specific speed only.

- To program the Automatic Speed Selection, press:

  `983 N`

  Where N is 1 (ON) or 0 (OFF)
  Default is 1

Note:

This command is not applicable to Central Data Logger units.

E.5

Modem High Speed or Low Speed Selection

When the unit is programmed with Automatic Speed Select OFF use this command to fix the modem speed at either 1200 or 300 baud.

- To program the (non-Automatically selected) Modem Speed, press:

  `984 N`

  Where N is 1 (1200) or 0 (300)

Note:

When Automatic Speed Select is set to ON (command 983) this command has no effect on modem speed.

E.6

Number of Data Call Attempts Before Tripping a Communications Alarm

The autodialer can make multiple attempts to communicate in data mode to the SCADA Central Computer or to the Central Data Logger (CDL) printer. When all attempts to establish data communications have failed a Communications Failure Alarm will be tripped. If the unit is able to make voice calls (i.e. more than just the 1st phone number programmed) the Communications Alarm will be announced to personnel along with the usual alarm and status report messages. When a calling sequence is ended, for example by alarms getting acknowledged, the Communications Alarm is cleared.

If the Communications Alarm persists and successful data communications to the SCADA Computer or CDL printer is eventually established a Communications Alarm message will be logged and/or printed. After a Communications Alarm is logged and/or printed it will be cleared.

- To set the number of attempts before tripping a Communications Failure Alarm, press:

  `985 N`

  Where N is 1 to 10
  Default is 3

Note:

If Automatic Speed Select is set ON the unit will actually make twice the programmed number of attempts before tripping a Communications Alarm; N attempts at 1200 baud and N attempts at 300 baud.

E.7

Answer Mode - VOICE ONLY or DATA-TO-VOICE

Most calls made to an autodialer/RTU will be polling calls from the SCADA Central Computer. By default the autodialer/RTU will be expecting a data call and answer with a modem answer tone. This is called DATA-to-VOICE answer mode. Personnel wishing to call an autodialer/RTU to get voice reports can just wait through the modem answer tone for a few seconds for the unit to fall back to voice mode and begin speaking.

The autodialer/RTU may also be programmed for VOICE ONLY answer mode. In VOICE ONLY mode the unit will never answer with a modem answer tone and voice annunciation will begin immediately upon answering.

Programming an autodialer/RTU for VOICE ONLY defeats polling calls from the SCADA Central Computer since the unit will only answer by voice and not assert a modem answer tone. However, VOICE ONLY answer mode does not affect data calls made FROM the RTU to the SCADA Central Computer or CDL Printer.

If your SCADA Central Computer is not operational you may wish to program the answer mode to VOICE ONLY. Customers who purchase the SCADA option for their autodialer/RTUs in advance of installing their SCADA Central Computer should use this programming command to make the unit function as a non-SCADA networked autodialer. In addition to programming the answer mode to VOICE ONLY make sure there is no 1st phone number programmed. (The 1st phone number does data only calls to the SCADA Computer.)

- To program the Answer Mode, press:

  `986 N`

  Where N is 0 (default) for DATA-to-VOICE or 1 for VOICE ONLY

Note:

Does not apply to Central Data Logger (CDL) units. CDL units never receive polling calls and always answer in VOICE ONLY mode. The 1st phone number must be programmed to call the CDL printer.

E.8

DATA/VOICE Autocall Calls for SCADA & Central Data Logger

Autocall calls may function substantially the same in SCADA and Central Data Logger (CDL) units as in standard, non-SCADA units. However, different operating modes of Autocall may be programmed in addition to the usual Autocall functionality.

Exceptions:

- Autocall calls may be restricted to only calling the SCADA Central Computer or CDL printer. Also, Autocall calls may be restricted to calling just the personnel numbers programmed into the unit (i.e. no calls to SCADA Computer of CDL printer). And finally, Autocalls may call both personnel numbers and SCADA Computer or CDL printer numbers.
- Autocall calls made to the SCADA Central Computer or CDL printer result in logging and printing of the Autocall session. No acknowledgement is required or is possible.
- Autocalls calls made to personnel numbers will be standard voice annunciation sessions.

◆ To program the DATA/VOICE Autocall mode, press:

`987 N`

Where N is 0 to 2

- 0 = (default) Autocall Calls made to SCADA Central Station only
- 1 = Autocall Calls made to personnel numbers only
- 2 = autocall Calls made to all numbers

F MODBUS Interface

This section covers the PLC specific functions of the Verbatim autodialer. It is assumed the reader is already familiar with the basic operation of the Verbatim autodialer. If this is not the case, please take the time now to review the previous sections of this manual.

In the discussion that follows, there are many technical terms specific to PLC operation which may be unfamiliar to those not experienced with PLCs. Please refer to the Glossary section for definition of these terms.

F.1 Overview

The Verbatim autodialer allows direct connection to Programmable Logic Controllers (PLCs) via a serial interface or other network connection. No direct connections from PLC output points to the Verbatim input points are required in order to monitor or annunciate for the PLC. Also, in most cases, no changes in the PLC's ladder logic program are required.

In addition, the autodialer allows connection to any non-PLC equipment compatible with supported PLC network protocols. An example of this application is a SCADA or DCS system running software configured with a PLC network protocol driver module. The autodialer does not care if the devices are a real PLC network or a computer mimicking a PLC network. However, master/slave protocols will require the autodialer to assume the role of master.

The Verbatim autodialer may read or write any data register within the PLC network. The data registers accessed by the autodialer may be in a single PLC or may be arbitrarily spread over a number of PLCs on the network.

Obviously, the number of data table locations in even a single PLC may number into the thousands. To relieve the user of having to deal with a huge number of precisely notated data table addresses, the autodialer uses the artifice of Remote Channels (RCs). Simply stated, RCs are nothing more than a kind of speed-dial number like you might set up on your telephone. Once the full number sequence has been entered into memory, a shorter sequence of numbers may be used as an abbreviation for the long sequence stored in memory.

Through the Verbatim autodialer, the user associates the address of a PLC data register to a RC. Thereafter, the RC becomes a shorthand designation for that data register's address. Any register, whether digital, analog, or other miscellaneous type, may be associated with an RC.

Data registers may actually be spread over a network of PLCs. The autodialer does not care if RC #2 is associated with a data register in a different PLC from the data register associated with RC #1. Therefore, when programming the autodialer to associate a PLC data register with a RC, the node number of the PLC may be included in the description for the location of the data register.

Additionally, the amount of User Recorded Speech Memory is increased appropriately for each Remote Channel configuration. These different quantities of memory yield total message recording times consistent with each of the available RC configuration options.

F.2 General Operation

This section describes configuring the Verbatim autodialer to continuously monitor any data register on the PLC network. Additionally, under user command, the autodialer may read and write to any PLC data register. The autodialer will only perform these functions after it has been properly installed, connected to the PLC network, and programmed.

F.2.1 Associating a Remote Channel with a PLC Data Register

In order for the Verbatim autodialer to read, write or continuously monitor a PLC data register the address of the data register must be associated with a Remote Channel (RC). After a data register address has been associated with a RC the Verbatim autodialer then knows where to direct queries for the contents of a data register on the PLC network.

The data register's complete address description is called the ***net address***. See section F.4.2 for information about net address formats.

Once a data register's net address has been associated with a RC, the alarm criteria may then be programmed. Only after an alarm criteria is entered will the PLC data register be scanned continuously by the Verbatim autodialer. When the content of the data register changes to match the alarm criteria, the RC associated with the data register goes into the alarm state.

RCs in the alarm state behave in exactly the same way as Verbatim autodialer internal or "physical" channels.

The Verbatim autodialer may be called at any time to receive an annunciation of the status of channels monitored. PLC registers associated to RCs may be read and written over-the-phone. Additionally, programming activities may be performed via the buttons on the user's phone.

When an operator calls the autodialer, the status of RCs will be reported and the user may reprogram parameters of RCs over-the-phone. When accessing the autodialer over-the-phone, all user functions that could result in the alteration of ANY data register can be made subject to correct entry of an access code.

Alarm criteria, trip delays and alarm call groupings are established in a fashion similar to normal physical channels. RCs associated with PLC discrete data registers support the normally open or closed criteria. RCs associated with PLC analog or integer data registers support high and low set points.

Associating a net address to a RC implicitly establishes the channel as digital or analog. For RCs, the default alarm criteria for both digital and analog channels is 'disarmed'. Attempts to set analog criteria on digital channels, and vice versa will cause an error announcement. If the net address for an RC already configured is re-programmed so that the type (analog or discrete) of data changes, the criteria will automatically be set to 'no alarm'. There is no run-time or totalizer capability for any of the RCs.

At the front panel, the LED channel status display shows all Remote and Physical Channels. Since the count of total Physical and Remote channels is greater than the usual 32 status LEDs, channels are combined into groups so that the status of all channels may be observed.

F.3

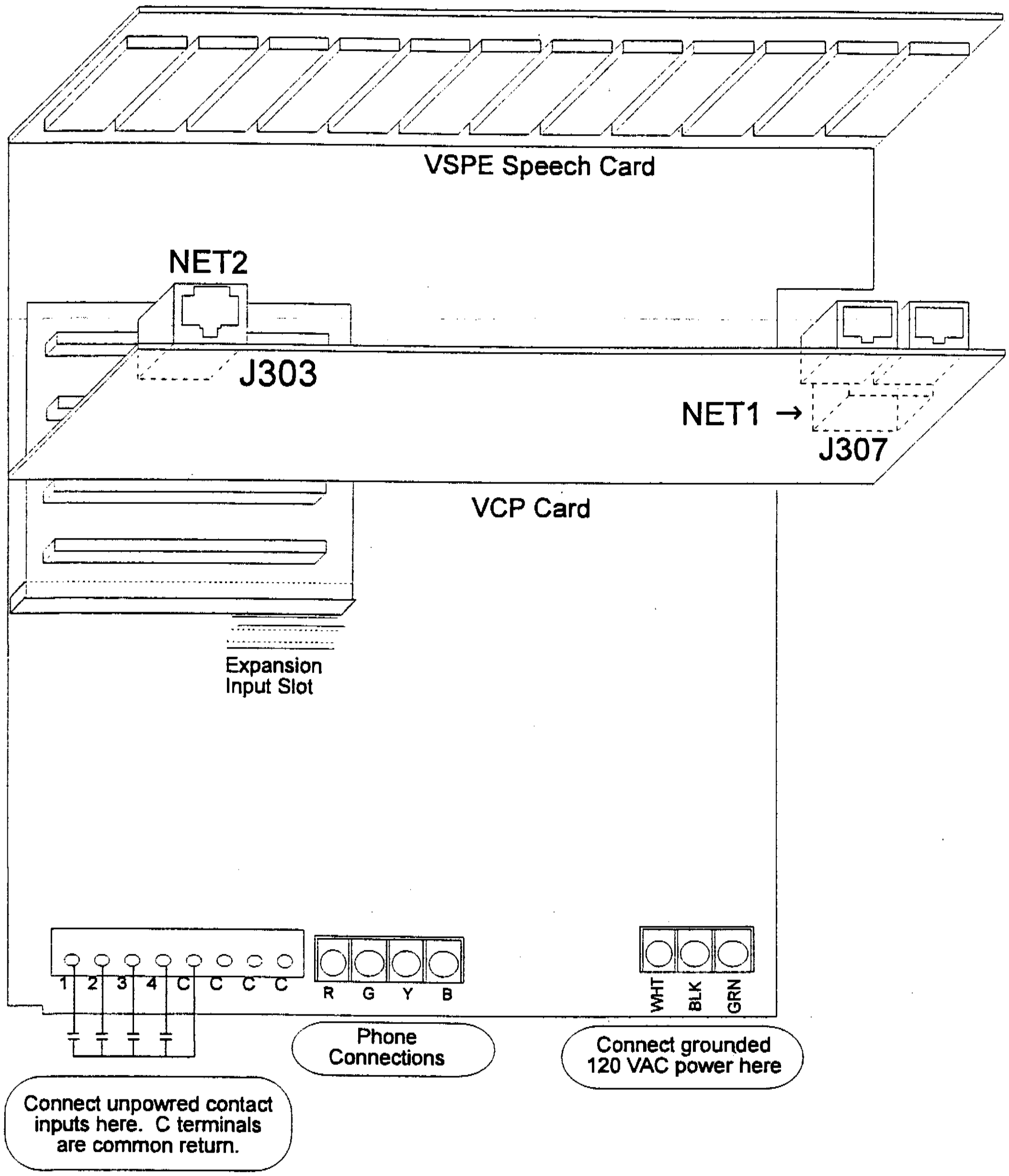
Connecting to the PLC Network

In most cases, the cable supplied by RACO will already be connected at the Verbatim autodialer end to a modular jack inside the unit. If this is not the case, please refer to the drawings in appendix H.

Note:

Refer to the cable drawings in the appendices to identify your type of PLC network connection.

Electrical Connection Diagram for PLC Network Connection



Phone Connections

Connect grounded 120 VAC power here

Connect unpowred contact inputs here. C terminals are common return.

Cable connections for various PLC network protocols

NET1	NET2
Modbus	NONE
Modbus	Serial LDL

F.3.1 Before Calling Technical Service Assistance

Programmable Logic Controllers have been used for several decades for process control applications. There is a large body of knowledge germane to using PLCs. RACO assumes that the user needing to monitor a PLC network with the Verbatim autodialer is already familiar with the PLCs being used for the application. It may also be assumed that the user has access to a PLC expert to help accurately identify the addresses of a PLC data register.

Before consulting the RACO Customer Service Department or your local RACO Representative for assistance in installation and configuration, please insure that the PLC details described in the next paragraph are readily available.

The user must have access to the PLC ladder logic program listing and know the location and properties of all data table locations which will be monitored by the Verbatim autodialer. Also the user must be able to determine the basic operating parameters of the PLC communications channel. This means being able to configure the PLC's parameters such as the node address, baud rate, data bits, parity and stop bits. Setting these parameters at the PLC may require the use of a PLC Hand Held Terminal, or a Personal Computer running PLC programming software available from the PLC's manufacturer.

The MODBUS communications protocol is a Verbatim autodialer firmware option and must have been properly configured at the factory. Parameters concerning link, frame and packet-level interfaces are configurable in the field.

F.4 Programming for Remote Channels

F.4.1 Remote Channel Programming Overview

The Remote Channels (RCs) behave fundamentally the same as their physical channel (PC) counterparts. Procedures for programming and recording messages for remote channels are very similar to the procedures described in the previous sections of this manual. There are some differences, however. These differences will be discussed in this section.

In general, all Verbatim autodialer commands that operate on remote channels will begin with the digit '4'. Commands that perform functions similar to non-Remote Channel specific commands use the same key sequence, preceded by the digit '4'.

- For example: to interrogate the alarm status for Physical Channel number 1 1, enter the command:

  `0 1 1 then <ENTER>`

- To interrogate the alarm status for Remote Channel number 1 1 enter the command:

```
4 0 1 1 <ENTER>
```

The existing commands that apply globally to all channels will apply uniformly to the RCs as well. Specifically, these codes are: 900, 902, 904, 917N, 923N, 927N, 930, 935N, 966N, 9403, 9404. The 'CHECK STATUS' function, either from the front panel or over-the-phone, reports channel status for all channels both physical or remote.

The sub-sections that follow itemize all programming key sequences available to the user. A short description of each function is provided, together with longer notes when necessary. If a programming key sequence is not recognized by the Verbatim autodialer, or any parameter is invalid, the Verbatim autodialer simply says "Enter program code".

All commands that use a full network address may omit the network ID and/or the node address, in which case the default values (codes 4910, 4911) will be used. The user should then also omit the '*' delimiter associated with the omitted component. If the user does omit a field then all preceding fields must also be omitted. (See Section F.4.2 for more information on net address formats.)

The RCs on any specific network may be globally inactivated without erasing any of their configuration. An individual RC may be inactivated without erasing the network address by setting the no alarm or disarmed criterion. In this case, it will be necessary to reprogram the criterion in order to re-activate the channel.

F.4.2 Associating a Net Address with a Remote Channel

Note:

Remember that * = POINT when referenced in this manual.

The most important operation in configuring your Verbatim autodialer is associating a data register's net address to a RC. The net address is actually part of the complete command sequence entered by the user when programming the association of a RC and a data register. Consider the following example. Suppose the Verbatim's NET 1 is configured for the Modbus protocol and node 2 on that net is a PLC. To associate RC #01 with the16 bit data register whose address is 40001 you would enter the following command sequence:

```
4 5 0 1 * 1 * 2 * 40001 *  then ENTER.
```

The first 4 digits from the above example are the programming command for RC association or RC alarm criteria. Thus, the sequence 4 5 0 1 refers to programming for RC #01. The net address portion of this command sequence is the remaining digits plus the '*' used for delimiting. The 16 bit data register has the address of 40001. The PLC's node number is 2 and the Verbatim's NET is 1.

The general net address syntax has the following form:

```
* NET * node * address *
```

where:

NET is NET Number - 0, 1, or 2

Net 0 is Physical Channels

Net 1 is Modbus

Net 2 is serial printer

node is PLC's Node Number

Modbus - 1 to 256

address is Data Register Address - may be numbers. Syntax for the register address is very specific to the PLC brand.

In the previous example, certain simplifications were made. Simplifications in the net address may be made by using programmed defaults. The usual default for the Verbatim's NET number is 1. The default node number may be set to any value allowed by protocol. Therefore, in the previous example, the entry may be simplified further to the following:

```
4 5 0 1 * 40001 * <ENTER>
```

F.5 General MODBUS Requirements

This appendix provides information specific to Modicon's Modbus network. There are sections on PLC data table addressing, net address format, and global data. The paragraphs here describe general requirements and hints.

Modicon PLCs: Be sure that the DEF/MEM switch on compact 984 PLCs is set to 'MEM'. Otherwise, it will be impossible to change network communications parameters from the defaults.

Modbus Networks: All nodes on a Modbus network must use RTU protocol. There can be only one master on the network. The master must be the Verbatim Autodialer.

Use the link-level timer (command 4908) to insert a delay between query/response cycles. This will only be necessary if talking to a slow device.

F.6

PLC Address Format

The table below shows how to address specific objects in Modicon PLCs. 'x' represents a digit in the range 0-9. The Verbatim autodialer User Interface will accept any values for 'xxxx'. If a value is out of range for a particular PLC, that PLC will issue an error diagnostic, which will be passed on to the user. This is to say, the remote PLCs enforce the validity of PLC addresses on their own.

Notes:

◆ Extended memory access is not currently implemented.

◆ Inputs may be written by the Verbatim autodialer, but will most likely be overwritten immediately by the PLC when it does its next scan of the ladder logic.

◆ The PLC memory protect switch will prevent a coil or register from being written.

Addressing Modicon PLC Objects

Address	*Description*
0xxxx	Coil (1-bit Output) number xxxx
1xxxx	Input point (1-bit) number xxxx
3xxxx	Input register (16-bit) number xxxx
4xxxx	Output (holding) register (16-bit) number xxxx

F.7

Potential Effects of Network Communications Failures

Physical channels only go into alarm state when their input matches programmed alarm criteria. Remote channels also support these criteria-based alarms.

It must be remembered however, that the channel data compared against the criteria must first be received from the network being monitored. Since the remote channel's data is being transferred over a network, alarming may be affected by various network failures.

If such a failure occurs, and the data cannot be received, it is no longer possible to reliably compare the channel against the alarm criteria. As a result, the remote channels will enter the alarm state even though their channel data may not have changed. The term "COMALARM" is used to distinguish this sort of alarm scenario from the criteria based alarms.

More precisely, an RC will register a COMALARM whenever the following two conditions are met:

1. The RC is configured with alarmable criteria.
2. All attempts to poll the RC have failed for the COMALARM trip delay period (code 4907).

For status reports, alarm calls, LED indicators and acknowledgments, the COMALARMs are treated in the same way as criteria alarms. They are annunciated in the following manner:

1. The COMALARM message will override any criteria alarm message.
2. The COMALARM message is not user recordable. It always consists of "Remote Channel Number ZZ Communication Failure Code XXX."

The failure code annunciated by the Verbatim autodialer serves as an aid in troubleshooting the network problem causing the failure. They are listed in section F.17.

To further assist in network troubleshooting several diagnostic commands are provided. It is possible to:

1. Perform a complete network self-test.
2. Read the communications status for any RC.
3. Read and reset the COMALARM count for any RC.
4. Read a list of the last 10 COMALARM codes on the network.
5. List all RCs currently in the COMALARM state.
6. List the nodes (PLCs) on the net that have all of their RCs in the COMALARM state.

The Verbatim autodialer provides several other features to help the user with the inevitable complexities of a networked environment. One is the ability to suspend/resume all queries initiated by the Verbatim autodialer without altering any RC programming. The status reports will inform the user when a network is globally disabled in this fashion.

Another diagnostic tool is the front panel Network Status Indicator LED for each network. Each LED is like a channel which monitors the overall health of each network. This is accomplished by accumulating all the COMALARM codes into a single value. The value is compared against a threshold. See code 492 in Section F.16 for details.

If the threshold is exceeded, then the LED will blink and status reports will annunciate the current value of the network status code. If the network has been globally disabled the LED is off. Otherwise the LED is steadily ON, indicating the network is operating within programmed parameters. See Section F.17.

The Verbatim autodialer keeps a count of the threshold violations. Programming commands are available to announce and reset these counts. It is also possible to announce the current value of the status code and set the threshold to any severity level. See section F.16 for details.

F.7.1 Abbreviations and Typographic Conventions

In the following sub-sections, the verbal response expected from the Verbatim autodialer will be given following the program code that the user is to enter for each programmable function. This verbal response will be differentiated by being in italics in the following way: *Remote Channel Number TEN, Alarm, Acknowledged.* The following table describes the abbreviations used in the code listings and elsewhere in this document:

Code Listing Abbreviations

Code	*Description*
ZZ	Any two-digit remote channel number, from 01 to 96, depending on the hardware configuration.
yy	Same as above
N	An integer from 0 to 65535, or as specifically noted.
net	The network ID: 1 to 5
node	The node address, as appropriate for a given network.
addr	The PLC address, as appropriate for the given PLC. (Details on specific PLCs and protocols are found in the appendices.)
DN	A two-digit code indicating a specific phone number.
V	An arbitrary floating point number of the form: 1.23. If 3 or more digits to the right of the decimal point, V is truncated to the nearest .005.
*	Same as 'point' key
#	Same as 'minus' key

F.8 Remote Channel Status, Reading, and Writing

4 0 ZZ

Function	Read alarm status of Remote Channel ZZ. (See code 49402 for Network Alarm Status)
Response	*remote channel <ZZ> <alarm status>*

If ZZ=00 in the following two commands, then the command applies to the net address specified by the most recent 4500 command. In that case, the "remote channel ZZ" responses are replaced with the explicit net address.*

4 0 ZZ *

Function	directly read PLC address associated with Channel ZZ

Response	*remote channel <ZZ> is <N>* or *remote channel <ZZ> communications error <code>*

*4 0 ZZ * N*

Function	write value N to PLC address associated with channel ZZ
Response	*remote channel <ZZ> set to <N>* or *remote channel <ZZ>communications error <code>*

Notes:

- This command will execute without any "are you sure?" checking. Users must make sure the address and value being written will not create an unsafe condition.
- Writing a value greater than 1 to a digital or net address will result in the value 1 being written.

F.9 Remote Channel Message Recording and Reviewing

4 1 00 net

Function	Record network ID message for specified net. Append a '*' to the command to return to default network ID message.
Response	whatever was recorded or the default message: *NET <net>*

Notes:

- For the following 2 commands, N is optional. If present, it must be in range 1-4 and sets the recording rate for that particular message. User Messages for the remote channels are used in the same way as user messages for the physical channels.
- For analog channels, the alarm message is always the default: "<high> <low> set-point exceeded". The user messages form a preamble and epilogue for the data value recitation during alarm messages. The default epilogue for remote channels is null.

4 1 ZZ N

Function	Record channel ZZ alarm/preamble message. *N*, if present, specifies the recording rate to use. If *N* is not present, the default recording rate is used. Append command with a '*' or '0' to return to default alarm message
Response	whatever was recorded or the default message: *remote channel <ZZ> alarm*

4 2 ZZ N

Function	Record channel ZZ normal/epilogue message. *N*, if present, specifies the recording rate to use. If *N* is not present, the default recording rate is used. Append command with a '*' or '0' to return to default normal message.

	Response	whatever was recorded. The default message for discrete channels is: *remote channel <ZZ> normal*. The default message for analog channels is silence (no epilogue).
4 3 ZZ		
	Function	Review both messages for channel ZZ. If ZZ is 00 then all network ID messages are reviewed.
	Response	whatever was recorded or the default messages.

F.10 Remote Channel Configuration

Commands in the series "4 5 ZZ," are used for Remote Channels as follows:

- Associate a PLC net address to a Verbatim Remote Channel. This step tells the Verbatim autodialer where on the PLC network to look for the point to be monitored.
- Establish the alarm criteria for a Remote Channel. This step tells the Verbatim autodialer what constitutes an alarm condition in the monitored PLC point.
- Link a Remote Channel to a phone number or group of phone numbers. When an alarm occurs in the monitored PLC point only the phone numbers linked to the Remote Channel will be called. (By default, all phone numbers will be called.)

Note that you must first assign a net address to a Remote Channel before any alarm criteria may be configured.

F.10.1 Assigning PLC Net Addresses to Remote Channels

Command "45ZZ" associates a remote channel with a network address and, as such, is essential for activating an RC. When issued, this command will cause the Verbatim autodialer to immediately access the specified network address. Any communications errors at this point will generate the message: *communication error code <diagnostic>*. Any command in this section will support ZZ=00.

If the data type (analog, discrete) of the new address is incompatible with the existing alarm criteria, then the NOALARM criteria will replace them. Otherwise, the existing criteria are untouched. The Verbatim will announce this action. Any links to other RCs are always preserved.

Notes:

See section F.4.2 for an overview of net addresses.

_4 5 ZZ *_

Function	Read the network address which is currently associated with RC number ZZ.
Response	_remote channel <ZZ> NET <net> NODE <node> ADDRESS <addr>_ or _communication error code <diagnostic>_

4 5 ZZ * net *node *addr *

Function	Associate RC <ZZ> with specified network address. Does not alter any other parameters.
Response	_remote channel <ZZ> NET <net> NODE <node> ADDRESS <addr>_ or _communication error code <diagnostic>_

F.10.2 Remote Channel Alarm Criteria

_4 5 00_

Function	The criteria for all "eligible" RCs are set so that the channel is normal in its current state. An RC is NOT eligible if any of the following conditions apply: Channel's net address type is analog or floating point Channel has NOALARM criteria already configured Channel is already the destination channel in a linked pair
Response	_present input condition is programmed to be normal for all remote channels_

_4 5 ZZ_

Function	Read alarm criteria for channel ZZ
Response	_remote channel <ZZ> <criteria> or remote channel <ZZ> no net address programmed_

_4 5 ZZ 0_

Function	Disarms <ZZ> (i.e. eliminates all status reporting for the channel). All other configuration information is preserved.
Response	_remote channel <ZZ> disarmed_

_4 5 ZZ 1_

Function	Set channel number ZZ alarm criteria to normally 1.
Response	_remote channel <ZZ> normally 1_

_4 5 ZZ 2_

Function	Set channel number ZZ alarm criteria to normally 0.
Response	_remote channel <ZZ> normally 0_

_4 5 ZZ 3_

Function	Set channel number ZZ alarm criteria to no alarm. The channel is still listed in all status reports.
Response	_no alarm condition for remote channel <ZZ>_

_4 5 ZZ 4_

Function	Set channel number ZZ to NETERR mode — alarm if and only if a communications alarm occurs.
Response	_remote channel <ZZ> alarm on communication failurec._

4 5 ZZ 5 N

Function	Set channel number ZZ analog low alarm set point to N. Use N = -0 to clear. Omit N to read current set point value.
Response	*remote channel <ZZ> low set point is <N>*

4 5 ZZ 6 N

Function	Set channel number ZZ analog high alarm set point to N. Use N = -0 to clear. Omit N to read current set point value.
Response	*remote channel <ZZ> high set point is <N>*

F.10.3 Linking Remote Channels to Phone Numbers

4 5 ZZ 9

Function	Read RC number ZZ alarm call grouping linkage.
Response	*remote channel <ZZ> calls <list>*

4 5 ZZ 9 DN

Function	Link RC number ZZ to phone number list DN
Response	*remote channel <ZZ> calls <list>*

*4 5 ZZ 9 **

Function	Clear all RC number ZZ phone number linkages
Response	*remote channel <ZZ> calls all phone numbers*

Note:

Linking Remote Channels to phone numbers is different than linking one Remote Channel to another Remote Channel. The latter is discussed in section F.12.

F.11 Alarm Trip Delays

The alarm trip delay commands here apply only to criteria violations. See code 4907 for the COMALARM trip delay. See codes 4921 and 4922 for network alarming.

4 6 ZZ

Function	Reads channel number ZZ alarm trip delay.
Response	*remote channel <ZZ> alarm trip delay is <v> seconds*

*4 6 ZZ **

Function	Sets channel number ZZ alarm trip delay to 2.0 seconds.
Response	*remote channel <ZZ> alarm trip delay is 2.0 seconds*

4 6 ZZ V

Function	Sets RCZZ individual alarm trip delay to V.
Response	*remote channel <ZZ> alarm trip delay is <V> seconds*

F.12 RC Linking/Network Bridging

The commands detailed in this section allow data to be passed between any two remote channels. Applications include passing data between nodes on compatible and incompatible networks, updating status registers in DCS systems, or exporting the Verbatim physical I/O to remote nodes. One channel acts as a data "source" and the second as a data "destination". Data is read from the source channel's net address and then written to the destination channel's net address once per scan loop. The destination and source are said to be "linked".

F.12.1 Linking Modes

The linking functions can work in one of two modes. In Data Link mode, the data read from the source is written directly to the destination. In the absence of communication problems, each destination channel is updated with a frequency equal to the Verbatim scan time. If there is a communications problem reading data from the source, then nothing is written to the destination.

In Alarm Link mode, the source channel data is first interpreted against the configured alarm criteria. If any alarm condition exists at the SRC channel, then a 1 is written to the DST. Otherwise, 0 is written. Any communications problem reading from the source will be reflected.

For both modes, the reads and writes are attempted once per scan loop. Any required protocol conversions are handled automatically. Any problems getting data for or writing data to the destination will appear as communications errors on the source or destination RCs. The data read or written is subject to RC initialization and the worst-case scan loop latencies. See Section F.7 for details.

F.12.2 Commands & Limitations

The commands below establish the channel linkage configurations. There are several rules and restrictions as follows:

1. Both the source and destination RCs must already be configured with net addresses. If this is not the case, then an error message is given. The net address for either channel in a linked pair may be reconfigured at any time, without altering the link.
2. If the RC specified as source is already configured as destination for any other linked pair, then an error message is given. Similarly, if the RC specified as destination is already configured as source for any other linked pair, an error message is given. This prevents "chaining" of linked pairs.

3. If the RC specified as destination is already configured as the destination for another source, then the new configuration supersedes the old one. No error message is given. This prevents the configuration of multiple sources for a single destination. The user must take care that distinct destination channels do not have identical net addresses. Multiple destinations for a single source are allowed.
4. If either the source or destination RC are "DISARMED", then its criteria will be reset to "NETERR". This alteration will be announced. All other existing criteria are accepted without alteration. Once a link is configured, any attempt to DISARM either the source or destination results in an error message. All other criteria modifications are allowed. Note however that it rarely makes sense to have destination criteria of anything other than "NETERR" or "NOALARM".
5. The linking of channels with different data types is allowed. For example, it is OK to have a discrete source linked to an analog destination. Special data conversion rules apply and are presented in the table below.

Conversion Rules

Source	*Dest.*	*Destination Value*
16 or 32 bit	1 bit	0 if source is 0, otherwise 1
1 bit	16 bit	0 if source is 0, otherwise 1
1 bit	32 bit	0.0 if source is 0, otherwise 1.0
16 bit	32 bit	floating point number with integer value equal to the source value
32 bit	16 bit	garbage: least significant 16 bits of the source value, however encoded

6. If the destination channel is read-only (i.e. a PLC input register) then a COMALARM will result.

*4 7 ZZ * YY*

Function	Establishes an alarm mode link with RC ZZ as the source channel and YY as the destination channel. Channel ZZ's alarm status will be written to YY's net address once per scan loop. A 1 is written if any alarm exists, otherwise zero.
Response	*remote channel ZZ alarm link to remote channel YY* or, *remote channel (ZZ,YY) not programmed*, if no net address, or, *remote channel (ZZ,YY) already linked*, if multiple sources, or link chain would result.

*4 7 ZZ * YY **

Function	Establishes a data mode link with RC ZZ as the source channel and YY as the destination. The value from ZZ's net address is written to YY's net address once per scan loop.

Response	*remote channel ZZ data link to remote channel YY* or, *remote channel (ZZ,YY) not programmed*, if no net address, or, *remote channel (ZZ,YY) already linked*, if a link chain would result.

The commands listed below report or clear existing link configurations. When a link is cleared, the net address and criteria for both channels are untouched. Operation of the source channel is unchanged. In fact, the only change is that the destination channel will no longer write any data to the remote address. Rather, it begins to read the remote address and will alarm according to the existing criteria, just like the source or any other remote channel.

4 7 ZZ

Function	Reports all linked channel pairs using ZZ as either source or destination channel. If ZZ is 00, then the set of all linked channel pairs is listed.
Response	*remote channel <ZZ,XX> <data,alarm> link to remote channel <YY,ZZ>*

4 7 ZZ-0

Function	Clears all linked channel pairs using ZZ as either source or destination channel. If ZZ is 00, then the set of all linked channel pairs is cleared.
Response	*remote channel ZZ link to remote channel YY is cleared* or, *remote channel ZZ is not linked*, if no such link existed, or, *all remote channel links cleared*, if ZZ is 00.

*4 7 ZZ * YY-0*

Function	Clear specific link using ZZ as source and YY as destination.
Response	*remote channel ZZ <data,alarm> link to remote channel YY is cleared.* or, *no link*, if such a link does not exist.

F.13 Communications Parameters

All commands in this section allow the 'net' parameter to be omitted, in which case the default network is used. If either 'net' or the default net (see code 4910) is 0, the command has no effect. If the '*' is omitted, then the current setting is spoken. If '*' is present and 'N' omitted, then the parameter is set to it's default. If 'N' is present, then '*' must precede it.

If the protocol currently configured on any specific net forbids alteration of a parameter, then the command is ignored and the "Enter program code" message is announced. The defaults for each parameter are also network dependent.

4 9 00 net

Function	Announces the current setting of all applicable parameters.
Response	See all codes below

*4 9 00 net **

Function	Resets all applicable parameters to their factory default.
Response	See all codes below

F.13.1 Serial Port Parameters

*4 9 01 net * N*

Function	Read/set baud rate for net to N. If present, N must be: 50, 75, 110, 150, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 7200, 9600, 14400, 19200, 28800, 57600. Any other values are ignored.
Response	*<net ID message> baud rate is <N>* .

*4 9 02 net * N*

Function	Read/set data bits for net to N. If present, N must be one of: 5, 6, 7, or 8. Any other values will be ignored.
Response	*<net ID message> data bits are <N>*

*4 9 03 net * N*

Function	Read/set stop bits for net to N. N must be 1 or 2. Any other values will be ignored.
Response	*<net ID message> stop bit is <N>*

*4 9 04 net * N*

Function	Read/set parity for net. If present, N=0 is NO parity, N=1 sets ODD parity and N=2 sets EVEN parity for net, N=3 for SPACE parity, N=4 for MARK parity. Any other values will be ignored.
Response	*<net ID message> parity is <even, odd, space, mark>*

F.13.2 Network Parameters

*4 9 05 net * N*

Function	Read/set local node address for net to N. The allowable range for N is protocol dependent. Illegal values are ignored.
Response	*<net ID message> node number is <N>*

4 9 06 net

Function	Read protocol for network.
Response	*<net ID> protocol is <current protocol>*

F.13.3 Timing Parameters

*4 9 07 net * V*

Function	Reads/sets communications alarm trip delay. Communications errors for all RCs on net must persist continuously for V seconds before a COMALARM violation is registered.
Response	*<net ID> communication alarm trip delay is <V> seconds*

*4 9 08 net * N*

Function	Reads/sets link-level timer. Units are milliseconds. Usage of this timer is protocol dependent and described in the appendices. In general, this parameter is the maximum time the Verbatim will wait for the response from a communications co-processor or interface module.
Response	*<net ID> link limit time is <N> mseconds*

*4 9 09 net * N*

Function	Reads/sets application-level timer. Units are milliseconds. This value is the maximum amount of time the Verbatim will wait for another node to respond to any command.
Response	*<net ID> message limit time is <N> mseconds*

F.14 Miscellaneous

*4 9 **

Function	Repeats the previous command which began with a '4'. It is possible to add key strokes after the * and before enter, subject to limit of 65 total keystrokes. The added key strokes are not concatenated for subsequent 49* commands.
Response	appropriate to actual command resulting

In the following, N may be omitted, in which case the current value is only announced, not altered. The values apply to all commands expecting a net or node value to be specified. They allow fewer keystrokes to be used when programming net addresses and other commands.

4 9 10 N

Function	Read/set default net number to N. N must be 0-5, consistent with the hardware options.
Response	*Default net address network is N*

4 9 11 N

Function	Read/set default node number to N. Allowable values for N are protocol dependent.
Response	*Default net address node is <N>*

F.15 Clear-Out Operations

*4 9 3 * net*

Function	Globally disables/enables RC polling on the specified network. Acts as a toggle, so two consecutive entries cancel each other out. No RC programming is erased.
Response	*<net ID> communication is (off, on)*

4 9 35 4

Function	Clears all RC user recorded messages.

Response	*All remote Channel messages cleared*

4 9 35 5

Function	Clears all RC configuration data: network addresses, criteria, links.
Response	*All remote channels reset*

4 9 35 8

Function	Clears out all communications failure codes and counts.
Response	*Communication error count overall reset*

4 9 35 9

Function	Does all the 4935 functions. NOTE, ONLY the RC configuration is affected.
Response	*Verbatim RC programming requires Firmware Revision*

F.16 Diagnostic Readouts

In the following, N may be omitted, in which case the current value is only announced, not altered.

4 9 2 <net>

Function	Reads current value for Network Failure threshold. The LED indicator will blink and a Network Failure Alarm will register when this value is exceeded.
Response	*<net ID> network status alert setpoint is <N>*

4 9 2 <net> <<N>>*

Function	Sets current value for Network Failure threshold. Use N=200 to disable the network failure indicator.
Range for N	0-200
Default	0
Response	*<net ID> network status alert setpoint is <N>*

*4 9 30 * net*

Function	Perform a diagnostic self-test on specified network. Depending on protocol and LDL configuration, diagnostic counters may be printed and/or reset.
Response	*<net ID> communication test is <normal, errcode>*

4 9 40

Function	Read all 4940x diagnostic info for all networks.
Response	See error/diagnostic code list in section F.17.

Note:

In the following, 'net' may be omitted, in which case the information for the default network is annunciated.

*4 9 40 * net*

Function	Read all 4940 diagnostic info for <net>
Response	see commands below

4 9 40 1

Function	Read time to complete RC table scan
Response	*scan time is <time> seconds*

4 9 40 2 net

Function	Read network status code for specified network
Response	*<net ID > network status code is <code>*

4 9 40 3 net

Function	Read network alert count.
Response	*<net ID > network alert count is <count>*

4 9 40 4 net

Function	List all the node addresses whose RCs are currently experiencing communication failure.
Response	*<net ID > communication failure at node(s) <list>*

4 9 40 5 net

Function	List all RCs on net currently having communications failure.
Response	*<net ID > remote channel(s) now in communication alarm are <list>*

Note:

49405 does not report criteria-tripped alarms. The check status command (4 0 ZZ) checks all alarm conditions, communication or otherwise.

4 9 40 6 net

Function	Read diagnostic codes for last 10 network problems. Append -0 to clear the history stack.
Response	*recorded error numbers are code <n>...*

4 9 41 ZZ

Function	Read current communications status for channel number ZZ. Status reported is result of latest scan loop poll, not the communications alarm status (see 40zz)..
Response	*remote channel <ZZ> communication alarm code is <diag code>*

*4 9 41 ZZ **

Function	Read count of communication alarms for RC ZZ (add -0 to clear)
Response	*remote channel <ZZ> communication alarm count is <count>*

4 9 42 net

Function	Read list of disarmed (see code 45ZZ0) RCs
Response	*<net ID> remote channels now disarmed are <list>*

4 9 43

Function	Read list of uninitialized RCs.
Response	*remote channel(s) not programmed are <list>*

Continued on next page . . .

4 9 44

Function	Read list of all RCs not using the default criterion.
Response	*remote channels armed are <list>*

4 9 45 ZZ

Function	Reports net address, criterion, setpoints, links, and alarm status for channel number ZZ.
Response	See commands 45zz*, 45zz, 47zz*, 4941zz

F.17 Status, Diagnostic & Error Code Listing

This section lists all network status, diagnostic and communications error codes likely to be of use for customer troubleshooting. Other codes may be reported in rare instances, and information about their interpretation may be obtained from RACO customer support.

F.17.1 Network Status Codes

The Network Status code reflects the overall health of all devices connected to a specific net. The values for these codes are used both for programming the alert threshold and in reporting the current status. Whenever a specific network's status code exceeds the alert threshold the network status LED will blink and an alert message is included in all reports. There is a distinct LED and status code and threshold for each net.

The table below lists the values and interpretation for the Network Status codes and thresholds.

0	No error. All RCs and scanned nodes are operating within scan timing parameters.
1-96	Some RCs are in communications failure and have not been successfully scanned for the COMALARM trip delay period. The number of such failed RCs is equal to the code value.
101-196	Some nodes on the net have quit responding to scanning. The number of such failed nodes is computed by subtracting 100 from the code. All RCs on those nodes are in COMALARM.
200	The scan of all nodes on the network is failing.

F.17.2

Diagnostic & Communications Error Codes

The diagnostic and communications error codes are registered whenever the scan for a particular RC fails. When such an event occurs, the code is pushed onto the diagnostic history stack (see code 49406) and copied into the RC status word (see code 4941zz). These may be interrogated at any time.

If the problem occurs during selftesting or configuration, the code is reported immediately. During normal scanning, the problem must continue for the COMALARM trip delay period before a communications alarm for that RC is triggered. The report for that alarm will then mention the code. The network status code is then updated appropriately. See table on next page.

The table below lists the values and interpretations for the most common error situations. Note that some codes are derived directly from standard error codes supported by specific protocols. The documentation for those products is then necessary for interpretation.

0	no error condition detected
352	specified net is invalid
354	protocol doesn't support the net address format
356	request timed out with no feedback
357	node address is invalid for selected protocol
359	node/driver incompatible with address mode
360	miscellaneous error parsing address string
361	some field was duplicated in address string
362	file type specifier in address string not supported
363	couldn't parse file number field in address string
364	couldn't map the I/O slot specified in address string
365	couldn't parse element field in address string
366	couldn't parse subelement field in address string
367	couldn't parse bit field in address string
368	too many routing nodes specified in address string
369	some routing node has illegal syntax
370	transaction aborted at user request
390	source channel data not available for RC link
410	no traffic received from the net
430	timeout with no recognizable response
431	timeout with no response at all
501	transaction took too long to transmit
601- 608	AEG/MODICON exception codes. That code can be determined by subtracting 600 from this code.

Refer to F.5, "General Modbus Reauirements," for details.

Continued on next page . . .

700	device has not been opened
705	DUART not present
710	net not configured with PLC-type protocol
715	bad serial io configuration parameter
725	background noise on network substrate
730	another modbus master already active
731	mbplus peer in monitor-on-line state
732	mbplus peer never getting token
735	diagnostic loopback test failed
750	a remote node has same node address
755	could not find any nodes on network
1540	NAK count limit exceeded for transmit msg
1541	ENQ count limit exceeded for transmit msg
1561	timeout waiting for response to command
2278	RAM allocation failed
2279	hardware failed self-test at warmstart
2280	cannot access net hardware

PLC Programming Code Table (Page 1 of 4)

Code	*Description*	*Default*	*Range*	*Section*
Remote Channel Status, Reading and Writing to PLC Data Register				
40ZZ	Read alarm status of Remote Channel ZZ		ZZ=0 to 96	F.8
40ZZ*	Read data register associated with RC ZZ		ZZ=0 to 96	F.8
40ZZ*N	Write value N to data register associated with RC ZZ		ZZ=0 to 96, N=0 to 65535	F.8
Remote Channel Message Recording and Reviewing				
4100 net	Record network ID message		net=1 to 5	F.9
41ZZ N	Record Remote Channel ZZ ALARM/PREAMBLE message at recording rate N (N is optional)	See Code 913	ZZ=1 to 96, N=1 to 4	F.9
42ZZ N	Record Remote Channel ZZ NORMAL/EPILOGUE message at recording rate N (N is optional)	See Code 913	ZZ=1 to 96, N=1 to 4	F.9
43ZZ	Review both Remote Channel ZZ messages (ZZ=0 for network ID messages)		ZZ=1 to 96	F.9
Remote Channel Programming (Configuration)				
4500	Sets current status as NORMAL for all RCs			F.10.2
45ZZ	Reads alarm criteria for RC ZZ		ZZ=1 to 96	F.10.2
45ZZ * net *node *addr *	Associate RC ZZ with specified network address		ZZ=1 to 96	F.10.1
45ZZ *	Read back the net address (net/node/addr) assoc. with RC ZZ		ZZ=1 to 96	F.10.1
45ZZ0	Disables Remote Channel ZZ		ZZ=1 to 96	F.10.2
45ZZ1	Sets alarm criteria to NORMALLY 1		ZZ=1 to 96	F.10.2
45ZZ2	Sets alarm criteria to NORMALLY 0		ZZ=1 to 96	F.10.2
45ZZ3	Sets alarm criteria to NO ALARM Status reporting only		ZZ=1 to 96	F.10.2
45ZZ4	Sets alarm criteria to NETERR mode		ZZ=1 to 96	F.10.2
45ZZ5 N	Sets analog low setpoint to N		ZZ=1 to 96, N=0 to 65535	F.10.2
45ZZ6 N	Sets analog high setpoint to N		ZZ=1 to 96, N=0 to 65535	F.10.2

PLC Programming Code Table (Page 2 of 4)

Code	Description	Default	Range	Section
Alarm Call Grouping				
45ZZ 9	Reads RC ZZ alarm call grouping linkage			F.10.3
45ZZ 9 DN	Links RC ZZ to phone numbers DN			F.10.3
45ZZ 9 *	Clears all RC ZZ alarm call linkages.			F.10.3
Alarm Trip Delays				
46ZZ	Reads Remote Channel ZZ alarm trip delay			F.11
46ZZ V	Set RC ZZ individual alarm trip delay to V	none	.1 - 9999.9 sec	F.11
46ZZ *	Resets RC ZZ individual alarm trip delay back to default of 2.0 sec.			
Remote Channel Linking/Network Bridging				
47ZZ * YY	Establish Alarm Link. ZZ source, YY destination			F.12
47ZZ * YY *	Establish Data Link. ZZ source, YY destination			F.12
47ZZ	Report all linked channel pairs using ZZ as source or destination. If ZZ=0 reports all linked channel pairs.			F.12
47ZZ -0	Clears all linked pairs using ZZ as source ordestination If ZZ=0 clears all linked channel pairs.			F.12
47ZZ * YY -0	Clear Specific Link using ZZ as source and YY as dest.			F.12
Serial Communications Parameters				
Note: See Code 4910 for default value for "net" in all of the following				
4900 net	Announces the current settings of all serial parameters for "net"			F.13
4900 net *	Resets all serial parameters for "net" to their factory defaults		See Below	F.13
4901 net *N	Read/Set baud rate for net to N	9600	50-57600	F.13.1
4902 net *N	Read/Set data bits for net to N	8	7 or 8	F.13.1
4903 net *N	Read/Set stop bits for net to N	1	1 or 2	F.13.1

PLC Programming Code Table (Page 3 of 4)

Code	Description	Default	Range	Section
Serial Communications Parameters . . . *Continued from p. F-26*				
Note: See Code 4910 for default value for "net" in all of the following				
4904 net *N	Read/Set parity for net	protocol dependent	odd, even, none	F.13.1
4905 net *N	Read/Set local node address for net to N	1	1-256	F.13.2
4906 net	Read protocol type for net N	Factory Configured	Not user settable	F.13.2
4907 net *N	Read/Set COMALARM Trip Delay	30 sec.	N=0.1-999.9 sec.	F.13.3
4908 net * V	Read/Set link-level timer.	Protocol Specific	V is in msec.	F.13.3
4909 net * V	Read/Set applications-level Timer	Protocol Specific	V is in msec.	F.13.3
49 50	Reads/Sets all protocol	varies	See applicable notes	F.13.4,
Miscellaneous				
49 *	Repeat the previous command which began with a '4'			F.14
4910 N	Read/Set default net to N	1	1 to 5	F.14
4911 N	Read/Set default node to N	1	protocol dependent	F.14
Clearout Operations				
493 *net	Globally disables/enables network communications		Acts as toggle	F.15
4935 4	Clears all RC user recorded speed messages			F.15
4935 5	Clears all RC net addresses and criteria			F.15
4935 8	Clears out all communications failure codes and counts			F.15
Diagnostic Readouts				
Note: See Code 4910 for default value for "net" in all of the following				
49 2 net	Reads current Network Failure threshold for net			F.16
49 2 net *N	Set Network Failure threshold to N		0 - 200	F.16
49 30 *net	Perform diagnostic self-test on specified net			F.16
49 40	Reads all 4940 X diagnostic for all networks			F.16
49 40 *net	Reads all diagnostic information for net			F.16

PLC Programming Code Table (Page 4 of 4)

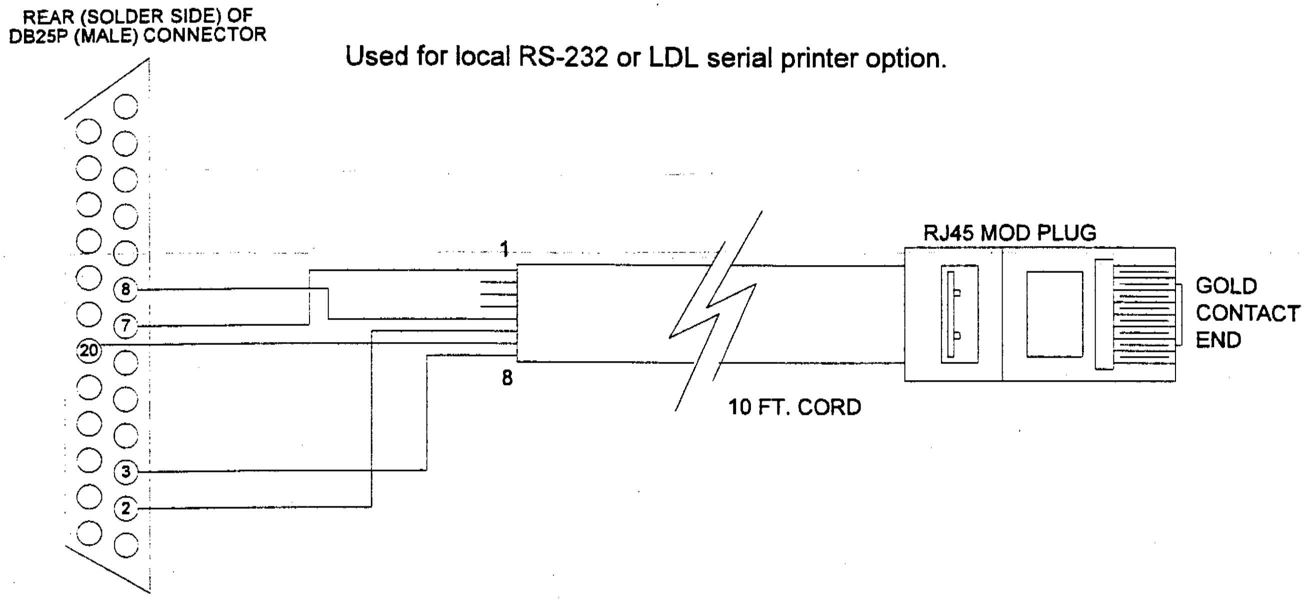
Code	Description	Default	Range	Section
Diagnostic Readouts . . . *Continued from p. F-27*				
Note: See Code 4910 for default value for "net" in all of the following				
49 40 1	Reads time to complete RC table scan			F.16
49 40 2 net	Reads communications alert status for net			F.16
49 40 3 net	Reads communications alert count for net (Append with 0 to clear count)			F.16
49 40 4 net	Reads all node address whose RCs have current communications failure			F.16
49 40 5 net	Reads all RCs on net currently having communications failure			F.16
49 40 6 net	Reads diagnostic codes for last 10 network problems			F.16
49 41 ZZ	Reads communicatons status for RC ZZ			F.16
49 41 ZZ*	Reads count of COMALARMS for RC ZZ			F.16
49 42 net	Reads list of disarmed (code 45ZZ0) RCs			F.16
49 43	Reads list of uninitialized RCs			F.16
49 44	Reads list of all RCs not using the default alarm criteria			F.16
49 45 ZZ	Reports net address, alarm criteria, setpoints, links and alarm status for RC ZZ			F.16

G

Cabling Diagrams

G.1 RACO VSER-01 Serial Cable Connection Diagram

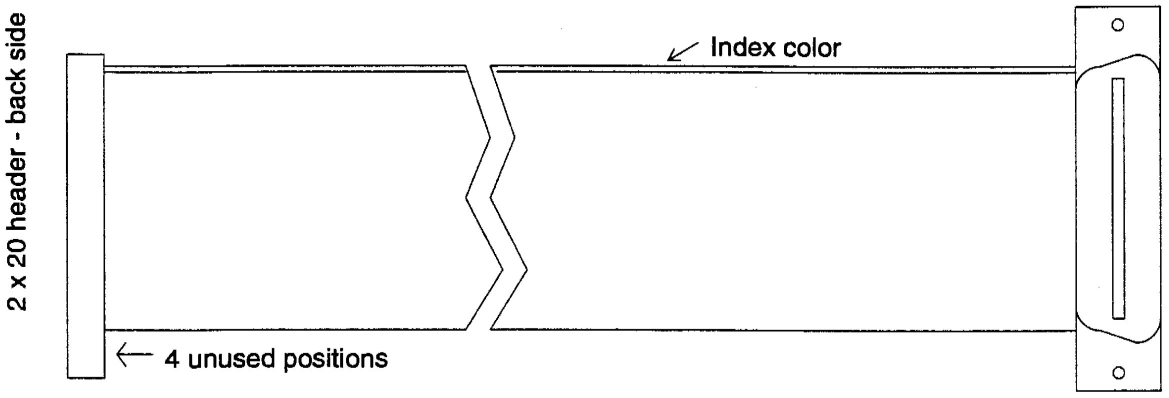
Used for local RS-232 or LDL serial printer option.

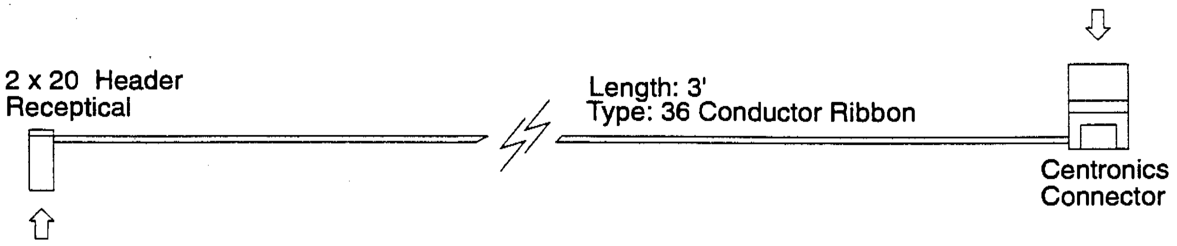


25 Pin Connector Pin-Out		
2	RXD	Data to VB
3	TXD	Data from VB
7	SGND	Signal Ground
8	DCD	Carrier Detect - Handshake Out (not used)
20	DTR	Data Terminal Ready - Handshake In (not used)

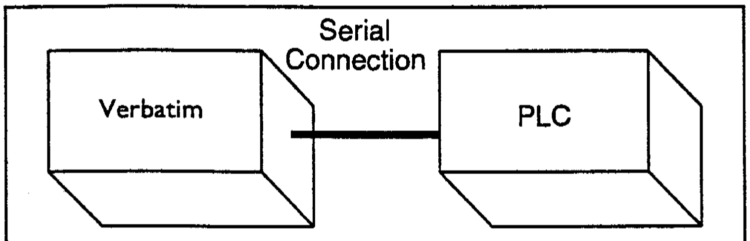
G.2 RACO VPPC-1 Parallel Cable Connection Diagram

Used for LDL parallel printer option

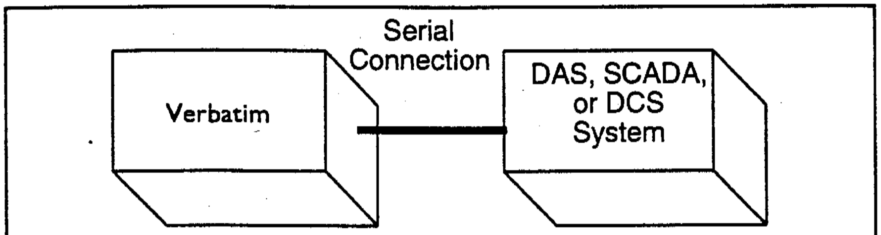




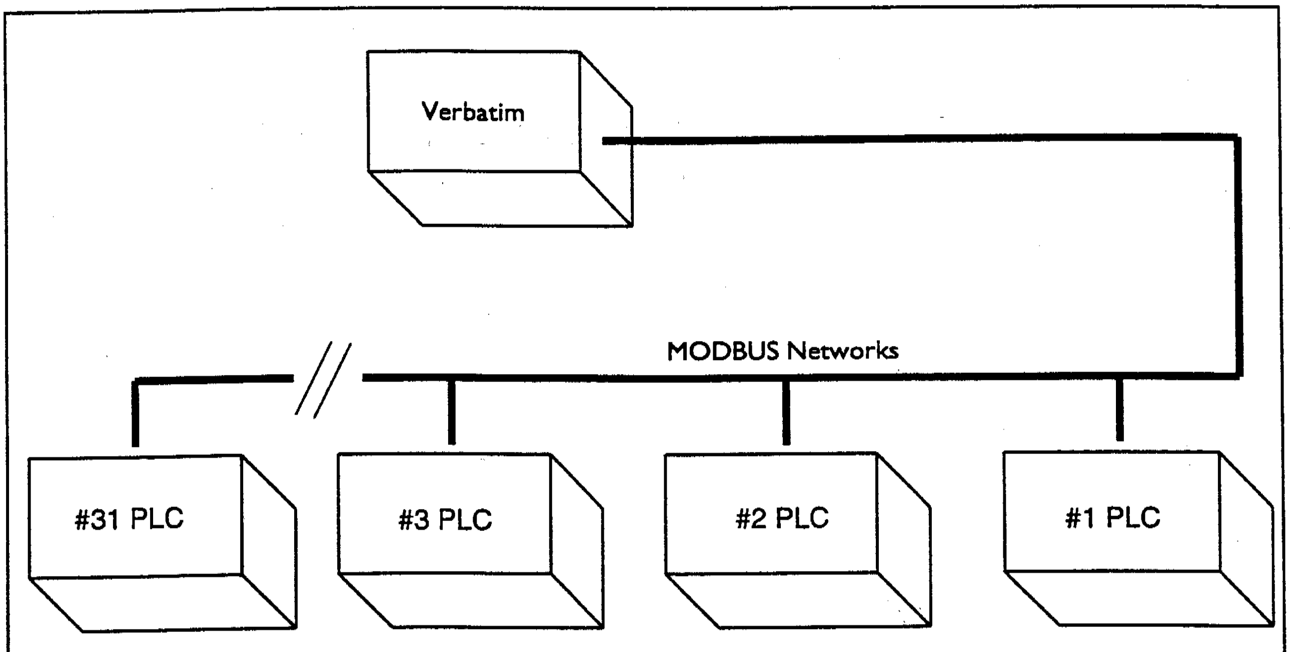
G.3 Verbatim PLC Network Connections Diagram



Monitoring a single PLC



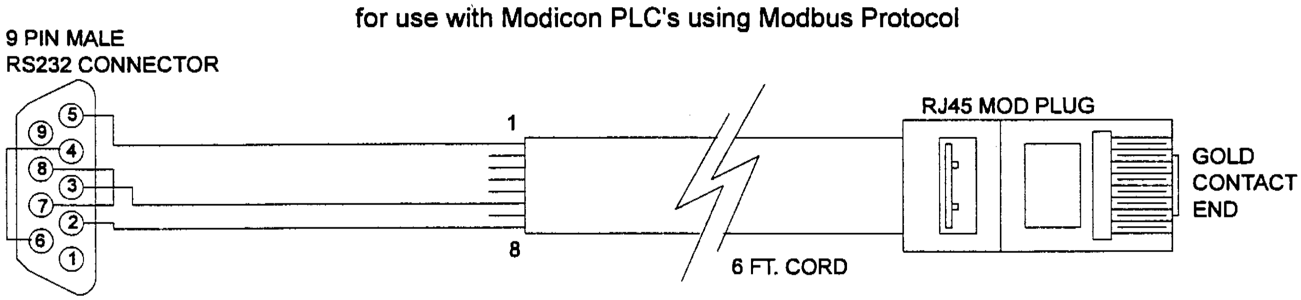
Monitoring a system with compatible device interface



Monitoring a PLC Network

G.4 RACO VMB-2 Serial Cable Connection Diagram

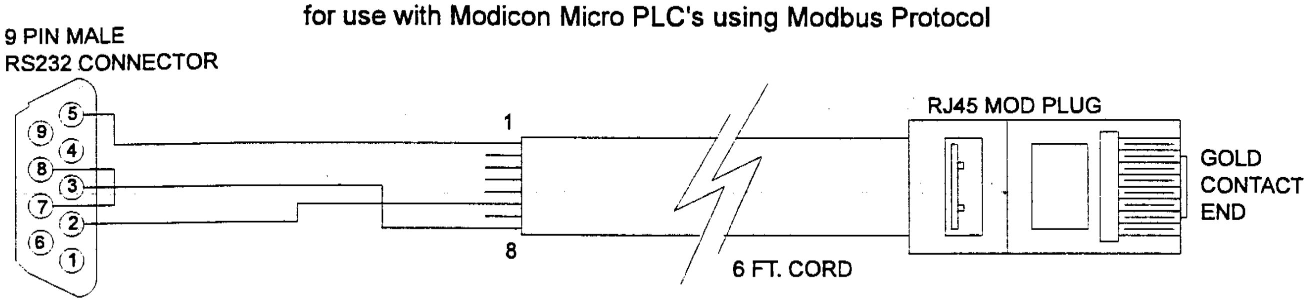
for use with Modicon PLC's using Modbus Protocol



9 Pin Connector Pin-Out		
2	TXD	Data from Verbatim
3	RXD	Data to Verbatim
4	DSR	Data Set Ready - Jumpered to DTR at 9 pin conn. only
5	SGND	Signal Ground
6	DTR	Data Terminal Ready - Jumpered to DSR at 9 pin conn. only
7	RTS	Request to Send - Jumpered to CTS at 9 pin conn. only
8	CTS	Clear To Send - Jumpered to RTS at 9 pin conn. only

G.5 RACO VMBM-1 Serial Cable Connection Diagram

for use with Modicon Micro PLC's using Modbus Protocol



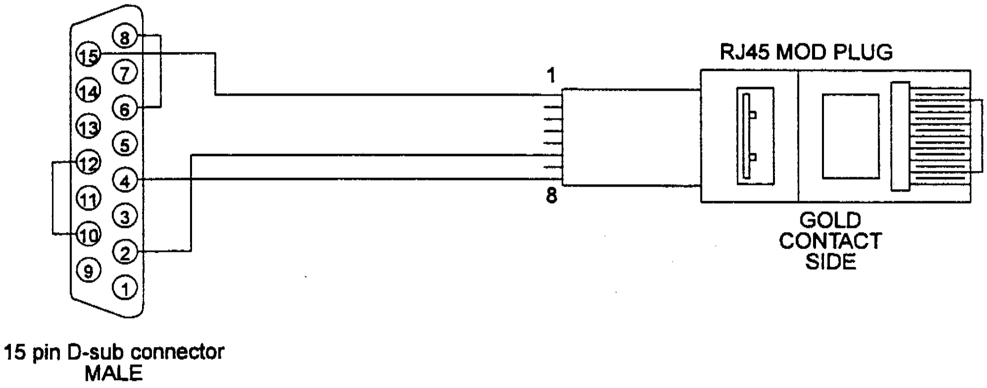
9 Pin Connector Pin-Out		
2	RXD	Data to Verbatim
3	TXD	Data from Verbatim
5	SGND	Signal Ground
7	RTS	Request to Send - Jumpered to CTS at 9 pin conn. only
8	CTS	Clear To Send - Jumpered to RTS at 9 pin conn. only

Note:

Connection to Modicon Micro PLC requires use of Modicon Cable Part Number 110XCA28201, 110XCA28202, or 110XCA28203 plus adaptor 110XCA20300. This combination of cable plus adaptor mates with above RACO cable. The Modicon cable is a flat, eight wire cable with RJ-45 male connectors on each end. The Modicon adaptor is an RJ-45 female to D-sub 9 Pin female adaptor.

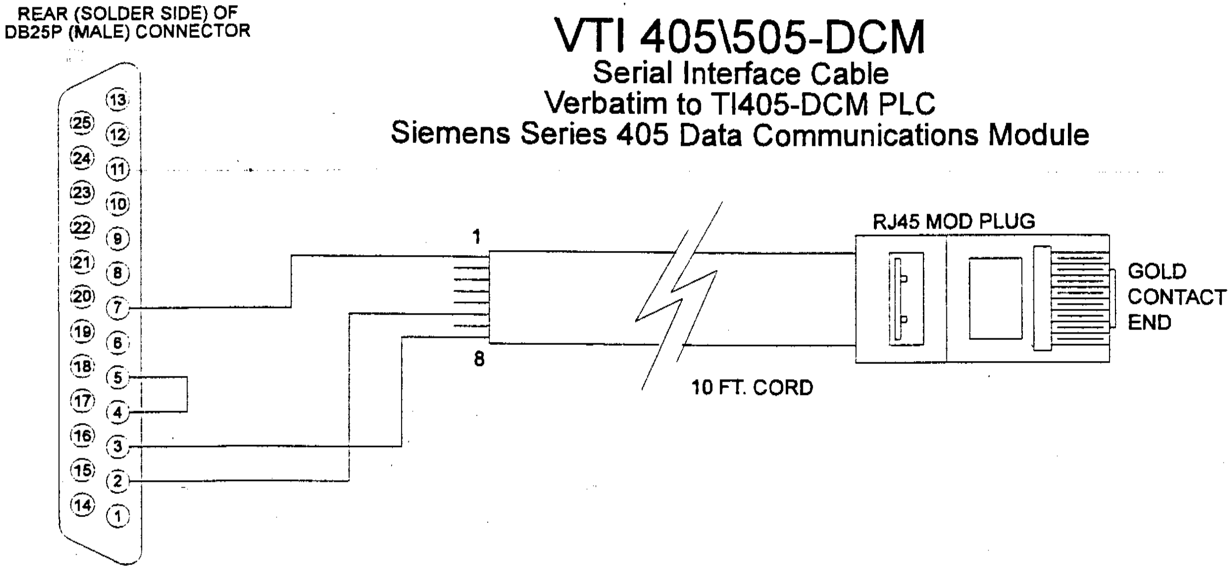
G.6 RACO VBB-1 Serial Cable Connection Diagram

for use with Bristol Babcock DPC 3330 or 3335



15 Pin Connector Pin-Out		
2	RXD	Data to Verbatim
4	TXD	Data from Verbatim
6	JUMP	Jumpered to pin 8
8	JUMP	Jumpered to pin 6
10	JUMP	Jumpered to pin 12
12	JUMP	Jumpered to pin 10
15	SGND	Signal Ground

G.7 VTI 405/505-DCM Serial Cable Connection Diagram



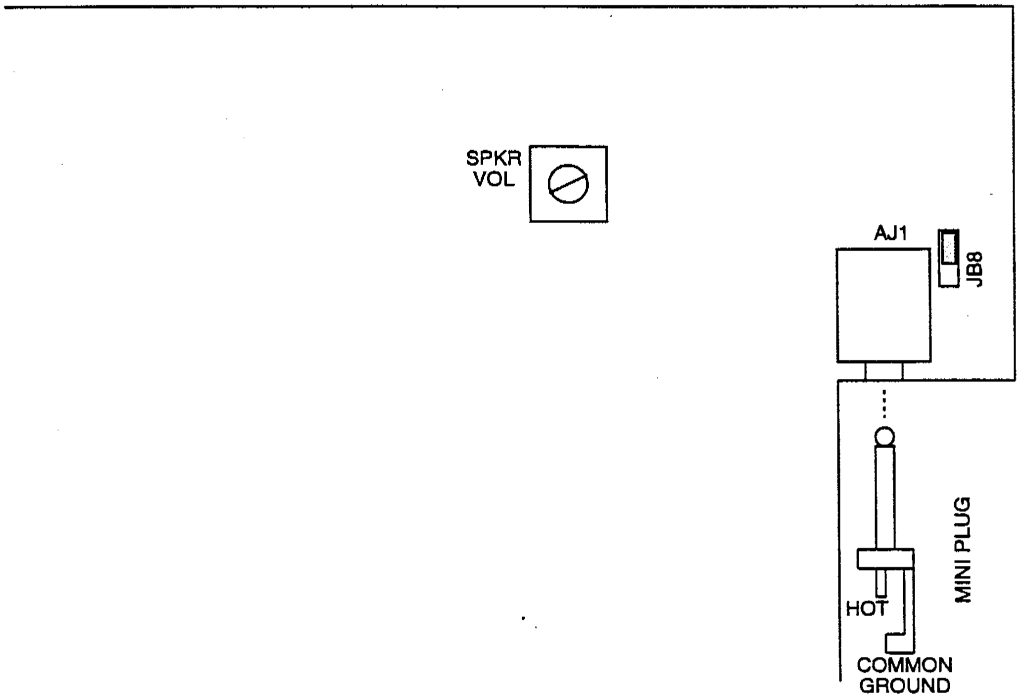
25 Pin Connector Pin-Out		
2	RXD	Data to VB
3	TXD	Data from VB
7	SGND	Signal Ground

H Verbatim Floobydust

H.1 Adjusting Internal Speaker Volume

Speaker volume may be adjusted via the trimpot marked SPKR VOL located in the upper right hand area of the main circuit board.

This trimpot also adjusts the level of the audio signal that can be obtained via jack AJ1. However, sensitive audio systems may require an additional signal level attenuator in order to prevent overloading.



H.2 External Speaker Connections

An audio output suitable for driving an external speaker of 4 to 16 ohms impedance, headphones, or other audio system, is available via jack AJ1, located in the upper right hand area of the main circuit board. This jack must be configured to deliver audio signal output by placing a jumper shunt across the upper pair of pins on the three-pin header JB8, located next to AJ1.

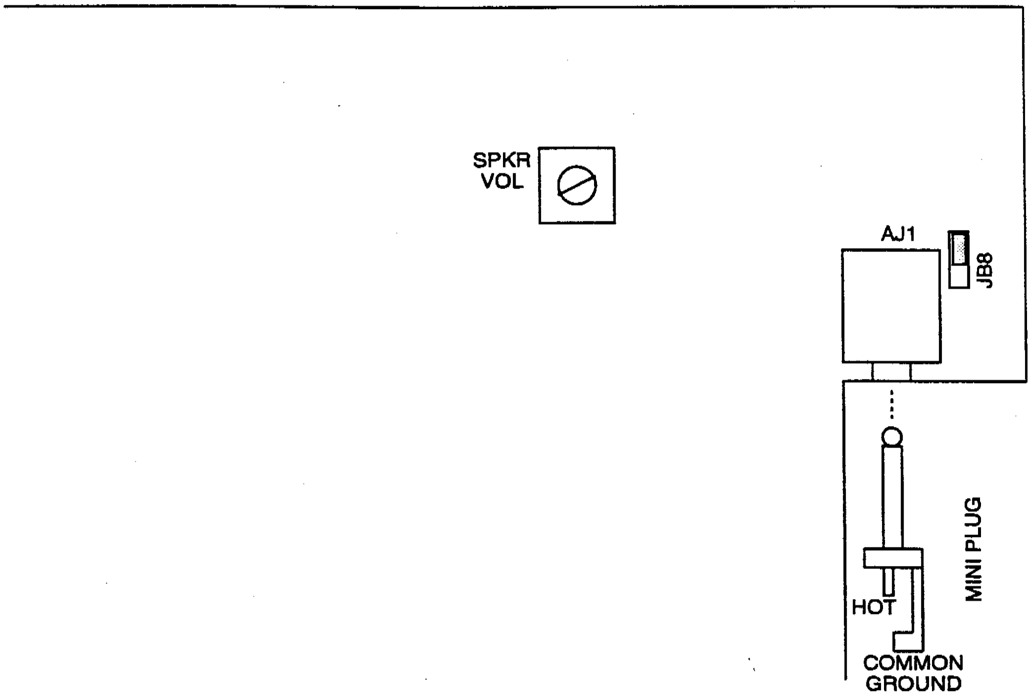
Note that AJ1 is a dual purpose jack which may be used either for audio output or DC power input, but not for both simultaneously.

To make connection with AJ1, use a standard single-circuit "MINI" plug. The tip end will be the audio signal; the shell will be ground.

The output signal has a nominal impedance of 8 ohms and a nominal average amplitude of 1 volt RMS, when the audio level trimpot, described below, is set to full clockwise position.

H.2.1 Specifications for Audio Output from Jack AJ1

Nominal output impedance	8 ohms
Nominal average output amplitude with 8 ohm load	1 VRMS



H.3

Alternative Power Sources

As an alternative to the 120 VAC input, an external DC power source can be used. The DC power source should have a current capacity of at least 500 ma DC and a voltage from 8 to 14 VDC. Actual current consumption will be approximately 250 ma standby and 375 ma while phoning and speaking, plus whatever current is required to charge the internal 6 volt, 4 AH gel-cell battery. This supplemental charging current will be roughly 25 ma when the battery is already fully charged, and up to 200 ma if the battery is being recharged after a discharge. Option cards such as analog, remote supervisory control etc. will also moderately increase the current being drawn.

DC power should be connected via a standard single-circuit "MINI" plug, inserted into jack AJ1 located in the upper right hand corner of the main circuit board. This jack must be configured to accept DC power input by placing a jumper shunt across the lower pair of pins on the three-pin header JB8, located next to AJ1. **The positive (plus) side of the power source must go to the end "tip" of the plug; reversing this polarity can damage the product.**

Note:

Note that AJ1 is a dual purpose jack which may be used either for audio output or DC power input, but not for both simultaneously. Note also that the AC power fuse FU1 is bypassed with this configuration. It should be removed to avoid confusion.

The front panel ON/OFF control will operate as with standard 120 VAC power input. If the external power source is interrupted, the unit will switch to gel cell battery power and go into power failure alarm.

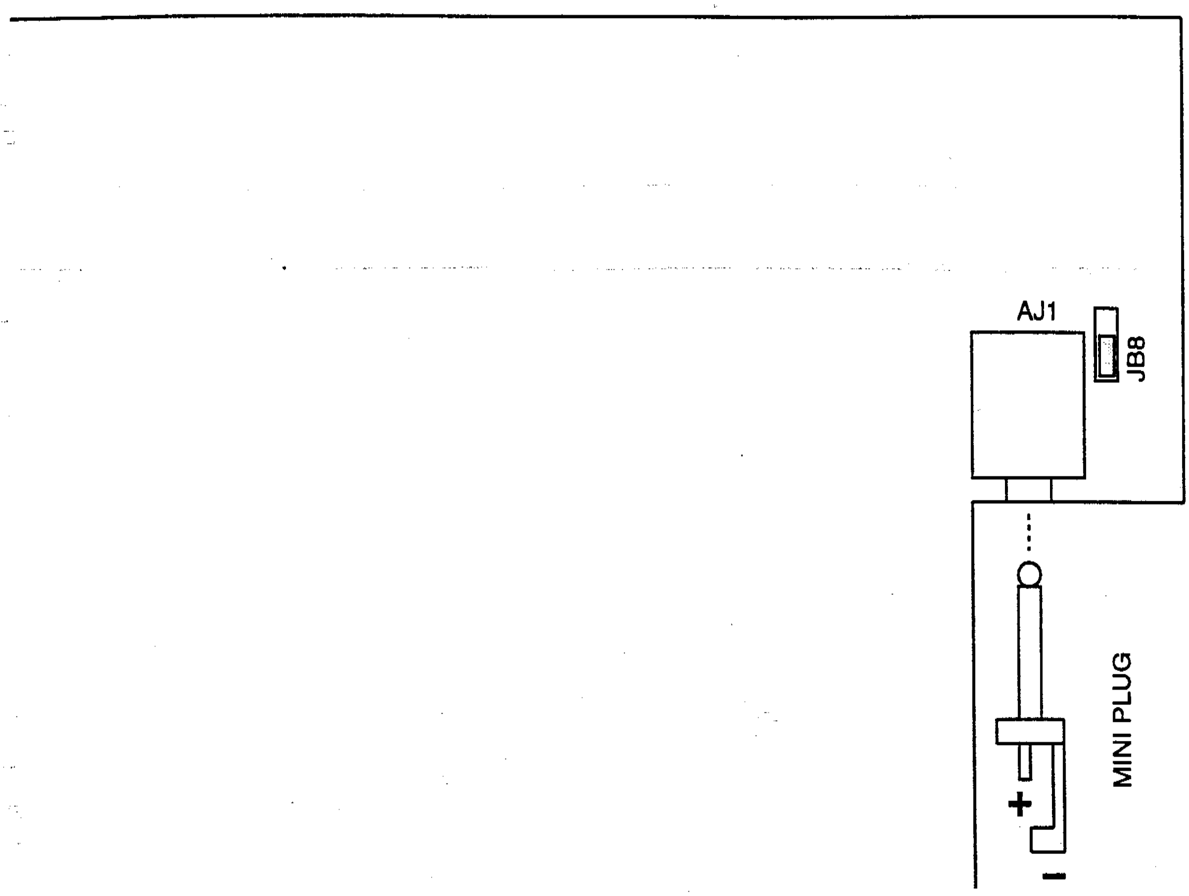
The Verbatim autodialer is capable of being powered by other types of power source, including 240 VAC, on special order. Contact factory for details.

H.3.1

Standard DC Power Power Specifications

Input voltage range	8-14 VDC
Recommended minimum current capacity	500 ma DC
VSS-4C-32 current drawn, less battery, standby	275 ma
VSS-4C-32, less battery, phoning/talking	400 ma
Added current to maintain charged battery	25 ma
Added current to charge discharged battery	200 ma

DC Power Connection Diagram



H.4 Speech Recording Times

The following is a table of available speech recording times on Verbatim autodialer.

To find the available amount of speech recording time, first determine the total number of channels on the unit, then find the corresponding row indicating the number of seconds of speech recording time at the various recording rates.

Example: A VSS-4C-32, has a total of 36 channels (4 contact and 32 plc channels). Therefore the available recording times are 130, 200, 270 or 399 seconds, depending upon which recording rate is selected by the user.

Total# OF Channels	# OF RAM CHIPS	# OF Seconds @ Rate1	# OF Seconds @ Rate2	# OF Seconds @ Rate3	# OF Seconds @ Rate4
1-8	1	26	40	54	79
9-16	2	52	80	108	159
17-24	3	78	120	162	237
25-32	4	104	160	216	318
33-40	5	130	200	270	399
41-48	6	156	240	324	476
49-56	7	182	280	378	555
57 UP	8	208	320	432	624

The above table indicates the recording times that are shipped standard. However on special order, the available recording time can be increased to correspond with any row in the table.

H.5 PBX Support

Interfacing the Verbatim to PBX or PABX phone systems can occasionally present problems. Some PBXs have a non-standard dialtone. Additionally, in many PBXs, you must first press a special key, like a '9' to get an outside line. After pressing the '9' there may be a short delay followed by the dialtone for the outside line.

By turning OFF Phone Fault Detection you can avoid problems with non-standard dialtones from your PBX system. Then Phone Fault Detect will not falsely indicate a telephone line interruption.

Even with Phone Fault Detect OFF you can still accomplish dialtone detection on outside lines. Simply add the Tone Detect key sequence to the phone number string after the '9' or other digit to request an outside line.

H.5.1 Cautionary Notes About Interfacing to PBXs

Must Be an Analog Line

Some PBX systems are either partially or entirely digital. That is, voice and signaling information is converted to a digital representation. Voice information arriving at the PBX from the outside is converted from analog to digital. Voice information leaving the PBX to the outside is converted from digital to analog. Phone sets within a digital system may be interfaced by digital signals only. In such systems it may be difficult, but usually not impossible, to obtain a "standard" analog phone line to use in interfacing devices such as a Verbatim . It may be necessary to contact the vendor of your PBX system for information on addition of analog lines.

Lines Can Cause Damage

Caution is advised. Some telephone lines within digital PBXs present voltages which can be dangerous to RACO's equipment. If you are attempting to interface a Verbatim inside of a PBX it would be a good practice to have the phone line you intend to use checked for "unusual" voltages and signals.

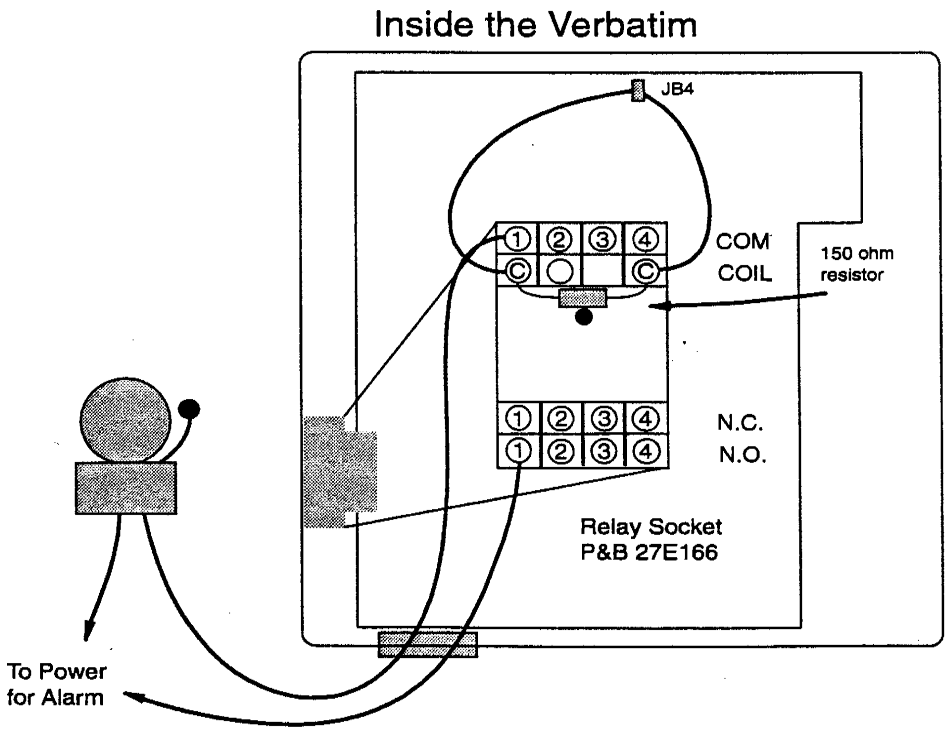
With few exceptions, if you can get a standard telephone set to word on a PBX line then you will be able to make the Verbatim work as well.

H.6 Local Alarm Relay Option

The Verbatim provides a 5 volt output that is turned on whenever the unit goes into alarm. This is available at JB4, located at the top center of the main board. Use a molex style 2 pin connector to plug onto the JB4 pins. This output can activate a sensitive (500 ohm +) relay such as a Potter & Brumfield KHU-17D11-6). Connect a 150 ohm,1/4 watt resistor across the relay coil. The Potter & Brumfield relay plugs into a socket (#27E166) which is shown in the accompanying figures. Note that it has four separate circuits in SPDT form. This relay may be used for local alarm, line seizure, or both.

H.6.1 Local Alarm Relay Configuration

1. Wire the relay coil as described in the introduction.
2. Wire the local alarm to one of the four circuits of the relay. In the illustration, the numbers refer to the four separate circuits, and C refers to the coil terminals.
3. Note that the Verbatim does not provide the power for the alarm, it functions only as a switch.
4. The program code for Local Alarm Relay configuration is
   `960 00` ENTER
   which is the factory default.



H.7 Line Seizure Option

Line Seizure is a feature that ensures that the dialer will seize the phone line when it goes into alarm, cutting off any phones, FAX, or answering machines that may be on line at the time (these are called the *downstream* phones, as they are *downstream* from the Verbatim). The unit waits two seconds to allow a dial tone to come up, then dials out. These phones will remain cut off until the alarm is acknowledged.

The Verbatim provides a 5 volt output that is turned on whenever the unit goes into alarm. This is available at JB4, located at the top center of the main board. Use a molex style 2 pin connector to plug onto the JB4 pins. This output can activate a sensitive (500 ohm +) relay such as a Potter & Brumfield KHU-17D11-6. Connect a 150 ohm, 1/4 watt resistor across the relay coil. The Potter & Brumfield relay plugs into a socket (#27E166) which is shown in the accompanying figures. Note that it has four separate circuits in SPDT form. This relay may be used for local alarm, line seizure, or both.

The phone jack must be an RJ-31X, which is available from the phone company or a phone supply outlet. In operation, the Verbatim plugs into the RJ-31X jack and makes contact with the middle four pins, which are the standard red, green, yellow and black wires.

Note that you may combine the Local Alarm Relay with Line Seizure feature simply by using one of the spare circuits (3 or 4) for the local alarm. It breaks the downstream connections, thereby seizing the line, then waits two seconds to allow a dial tone to come up, then dials out.

H.7.1 Line Seizure Installation

1. Wire the relay coil as described in the introduction.
2. Wire the four terminals of the telephone input terminal strip to the relay a follows (please refer to accompanying figures):

Terminal Strip	Relay
R	COM circuit #2
G	COM circuit #1
Y	N.C. circuit #1
B	N.C. circuit #2

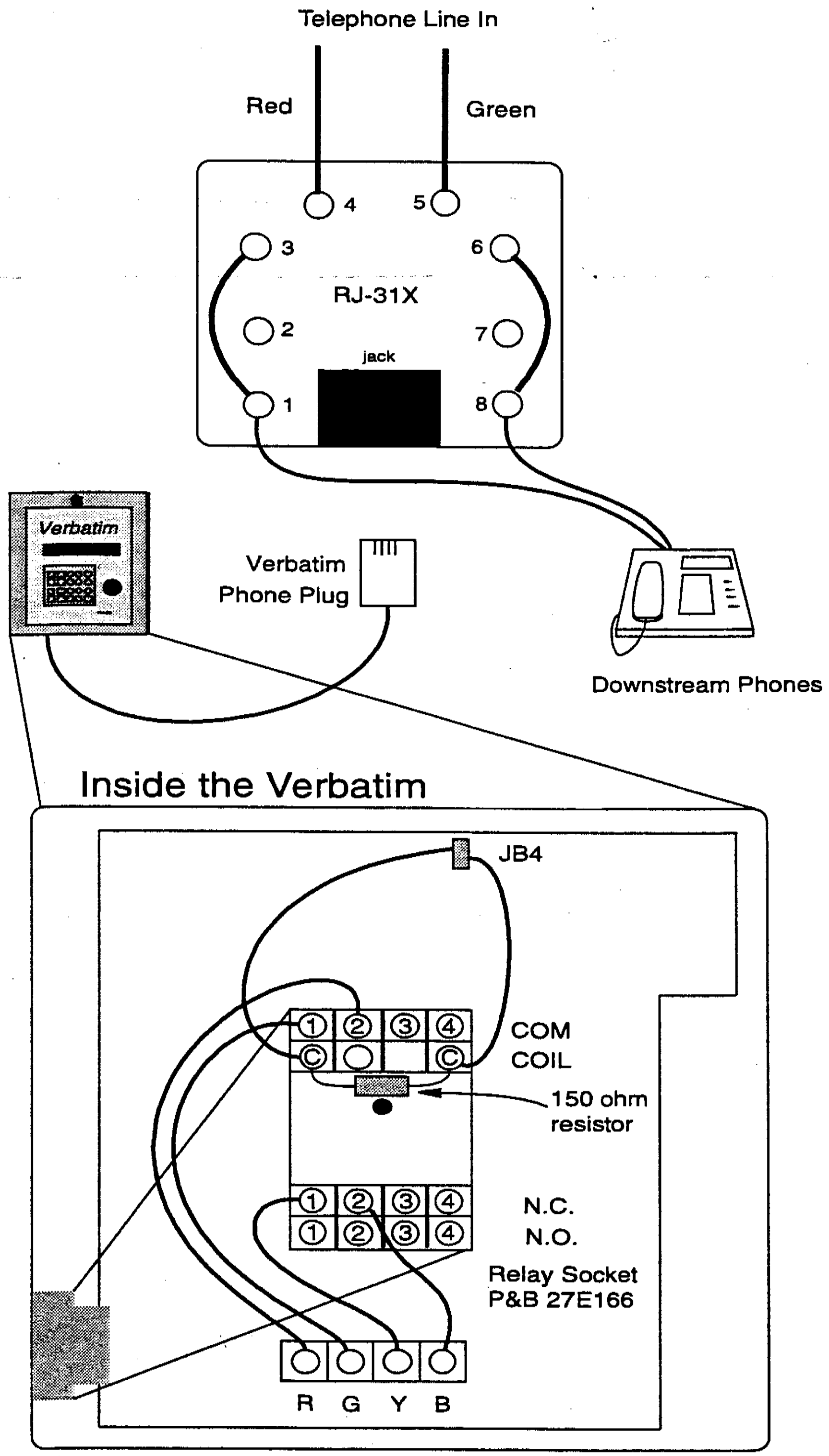
3. Wire the special RJ-31X line seizure jack as follows (refer to the accompanying figures):

   Connect a jumper wire from terminals 1 to 3 and a second jumper wire from terminals 6 to 8.

   Connect the incoming telephone line red wire to terminal 4 and the green wire to terminal 5.

   Connect the downstream extension phones to terminals 1 and 8.
4. Plug the Verbatim into the RJ-31X socket.
5. Program the Verbatim with code:
   `960 01` ENTER
   This is the code for Line Seizure configuration of the Local Alarm Relay.

Wiring the RJ-31X Line Seizure Jack Diagram



H.8 Heater / Thermostat Option

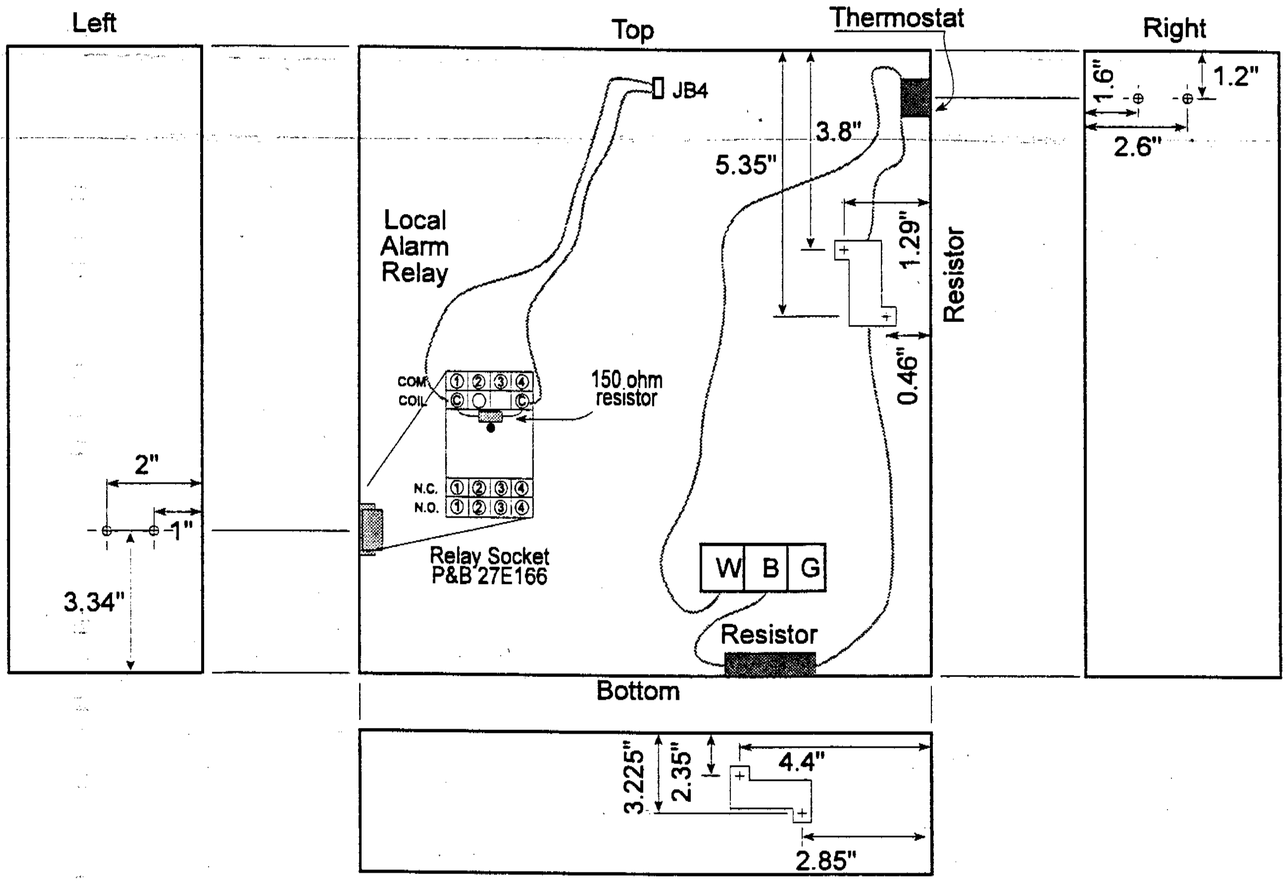
The heater/thermostat option is intended to provide warming of the product when it is exposed to particularly cold ambient temperatures.

The thermostat applies 120 VAC power to two chassis-mounted resistors, when it senses temperatures below approximately 40 degrees F. The resistors dissipate a combined 75 watts of power. The amount of temperature elevation above ambient temperature that this provides depends on the thermal insulation of the enclosure and "heat sinking" into the surface which the unit is mounted to. The unit's aluminum enclosure provides relatively little thermal insulation by itself. However if RACO's fiberglass NEMA 4X enclosure option is used, a temperature elevation of about 75 degrees is provided.

If the unit is to be powered by something other than 120 VAC and you need a heater/thermostat, consult factory.

Heater/Thermostat Option	
Power source required	120 VAC
Power dissipated when activated	75 watts
Nominal activation temperature	40 deg F
Nominal heat rise in fiberglass NEMA 4X enclosure	75 deg F

Heater/Thermostat Mounting and Wiring Diagram



H.9 Connecting to a Radio Transmitter

If you have a radio transmitter that can provides for external connection of an audio signal input and also for connection of an external contact closure to key on the transmitter, you may connect it to the Verbatim autodialer. However you should also consider the alternative of using RACO's CELLULARM cellular phone system, which provides a superior means of signalling where regular land line phone service is not available.

Note that the radio operation described below is not compatible with installation of the Telephone Line Seizure option.

To obtain the contact closure used to key on the transmitter, it is necessary to solder some special connections on the back of the main circuit board. **This step is not necessary if your unit has been supplied from the factory with the RF Interface option.**

First, disconnect the gel cell battery and remove all AC power connections. Remove any option cards. Then carefully remove the speech card located at the top of the unit, via its two mounting screws. Be careful to retain the plastic spacers located behind these screws, for use when replacing this speech card. Flex the card slightly to clear the two mounting pegs and pull the card straight outward.

Remove the main circuit board by removing the six 6-32 mounting screws. You may also wish to unplug the contact input terminal strips and the ribbon cable which leads to the front panel. Solder a pair of jumper wires to the back of the board as indicated in the Jumper Wires for RF Link Diagram. This step connects the auxiliary contacts of off-hook relay K1, to the Y and B terminals of telephone terminal strip TS2.

Re-assemble the unit and restore any connections which were removed. Be sure that the ribbon cable's connector is accurately and firmly seated.

Connect the Y and B terminals on TS2, to the external keying input of your transmitter. The transmitter will now be keyed on whenever the off-hook relay is activated.

The method of audio connection depends on whether the product is to be connected to a regular phone line in addition to the radio transmitter. If a sensitive microphone input is used, additional attenuation may be required to avoid overloading the audio input.

If phone line operation is required in addition to radio operation, establish the audio connection into the transmitter via jack AJ1, as described in the section on EXTERNAL SPEAKER CONNECTIONS.

If no phone line operation is required, you may instead remove the phone cord and obtain an isolated 600 ohm, line-level audio signal at the TIP and RING terminals of TS2.

In operation, the transmitter will be keyed on whenever the off-hook relay is activated -- i.e. whenever the product is attempting to place or answer a phone call. Thus, if an ordinary phone line is also used, all phone activity will also be transmitted.

If no phone line is used, it will still be necessary to program a "dummy" phone number consisting of a single digit "1", using program code 7 0 1 1. Also, program for touch tone dialing using program code 9 0 1 1. When the unit goes into alarm, it will activate the off-hook relay and therefore the transmitter. Then it will issue the single digit tone, and a few seconds later it will begin the speech message, continuing as it would for a regular phone call. The number of message repeats may be altered if desired, using program code 907.

If a phone line is also used, program the appropriate phone numbers as you would ordinarily do. All phone calls will also be transmitted by radio. If you desire to have selected "calls" go out only over the air and not to any real phone number, program the single "dummy" phone number as described above. This single digit will silence the dial tone which would otherwise be broadcast along with the speech message.

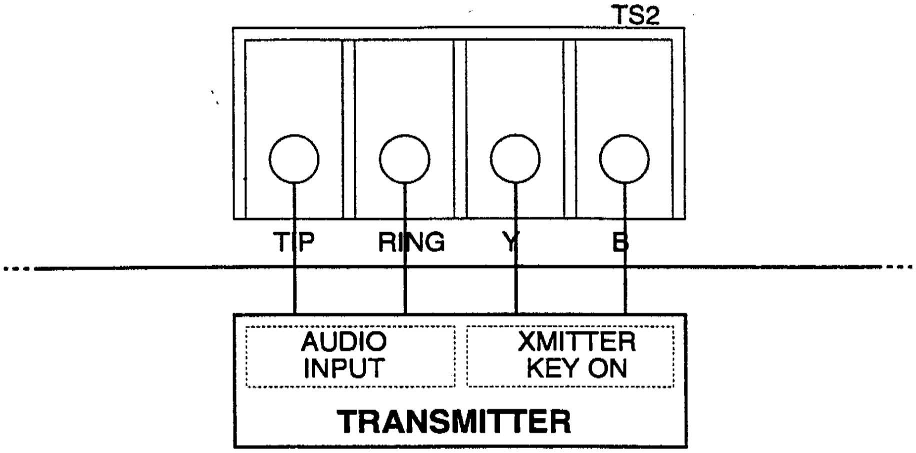
Alarm calls will continue until acknowledged, unless the unit is programmed to cease calling when the alarm violation ceases, using program code 9 2 3 2.

In order to acknowledge alarms, it will be necessary to phone the unit back (if a phone line connection is also being used), or else press one of the keys on the front panel.

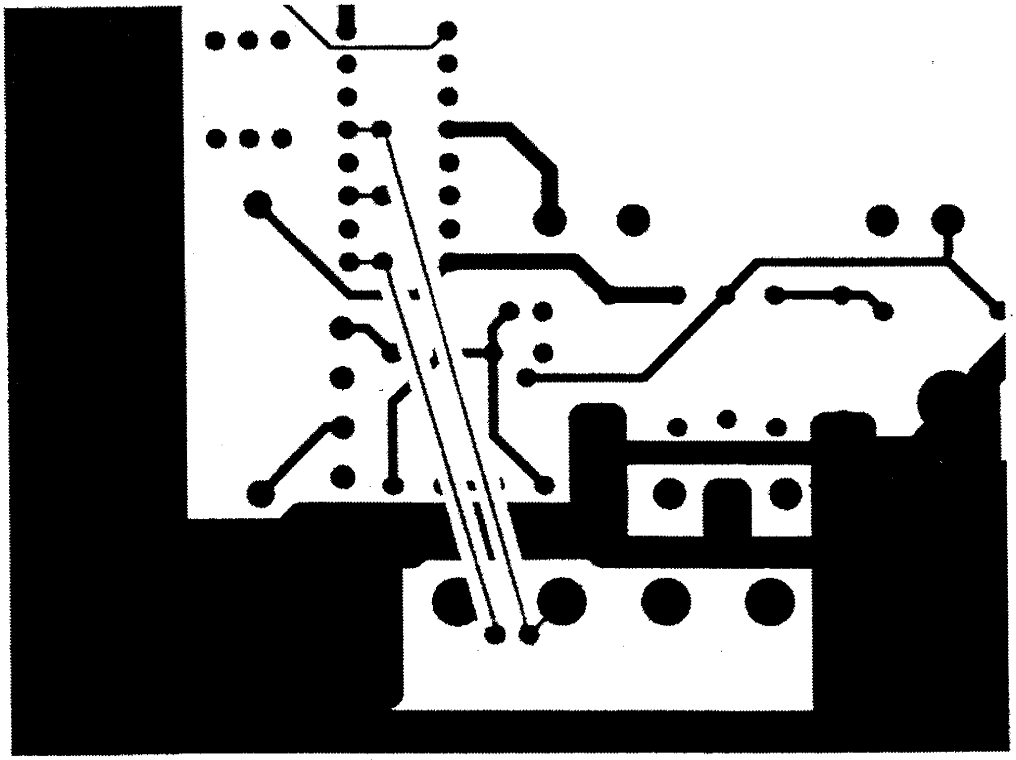
If a two-way transceiver is available which includes some kind of tone signalling and detection feature that results in momentary closure of a local relay contact at the autodialer locations, this contact may be used to place inquiry calls to the unit and also to acknowledge alarms, by radio. Contact factory for details.

Note that it will not be possible to perform remote programming of the unit with these radio connections.
A CELLULARM cellular system eliminates all such contraints.

TS2 Connection Diagram



Jumper Wires For RF Link Diagram



H.10

Calling a Pager

H.10.1

Introduction

It has become fairly common to have the autodialer call a pager system with an alarm call. The dialer is well equipped to handle many of the current pager protocols, and an overall understanding of the sequence of events will make the required programming go smoother.

Typically, a call to the pager is placed. After a short period (usually 5-12 seconds), the pager answers then gives a beep or a short burst of beeps. This is the signal to begin entering the number you want to be received and displayed by the beeper. When the information is complete, the pager terminal will hang up.

Note:

RACO strongly recommends that you program other personnel phone numbers at the appropriate place in the dialing list. This is to insure that if for some reason the pager system cannot be activated, you will get a timely warning from your autodialer.

H.10.2

General Programming Considerations

In most cases, the entire pager calling sequence is handled within the dialing string of the Verbatim. That is, it is all part of the phone number. The unit will handle up to 60 digits, including any timing delays you insert. The dialer must be programmed for touch tone dialing (program code 9011), as a pager terminal will not recognize pulse dialing.

Numeric Pager Support

Support for Numeric Pagers is comprised of a number of Verbatim autodialer features:

- Ability to add delays into a phone number string

  Often needed to pause after dialing the pager system's digits and emitting the caller's ID digits in the phone string.

- Ability to add DTMF # (or DTMF*) into a phone number string

  Often needed as a terminator character to inform the paging system that the last digit has been entered.

- Ability to add a pause for tone detect anywhere in the phone number string

  Sometimes used to detect the paging system's beep(s) heard after it answers.

- Ability to defeat voice annunciation for a specific phone number

  Often just dialing the pager system and emitting a DTMF ID sequence is sufficient for that phone call. Voice reports only delay the calling of subsequent numbers.

- Ability to add DTMF A, B, C, and D tones to phone number string

  These DTMF characters don't appear on standard telephones and may be used to differentiate automation equipment from humans calling the paging system.

Except for simple delays, entry of these additional digits into a phone number string requires a two key sequence. For example, to enter a '#' character into a phone number string, either at the front panel or over the phone, press the '*' key followed by the 8 key. This two key sequence will enter the single '#' character into phone number string.

The complete list of special digits is as follows:

Desired Result	User Enters	Voice Speaks
DTMF 'A' in phone string	*1	A
DTMF 'B' in phone string	*2	B
DTMF 'C' in phone string	*3	C
DTMF 'D' in phone string	*4	D
No voice annunciation for this number	*5	PHONE
Pause for tone detect	*6	TONE
DTMF '*' in phone string	*7	STAR
DTMF '#' in phone string	*8	POUND

Case 1: Simplest Case Pager

The simplest case is when you only have to call the pager and can hang up as soon as it answers, with no information being passed to the pager except that someone called. If you have only one dialer (and no one else uses the number!) you assume that any call from the pager is a Verbatim alarm call, and proceed from there. Of course, if you had two possible callers, you wouldn't know which one had called.

Example:

Set the first phone number to call the pager, the second phone number to call the plant foreman. Program 701 9 *6 1 713 235 3456 ENTER. (here, 701 signifies the first phone number, 9 to get an outside line, *6 to get an outside line dial tone, 1 713 235 3456 our hypothetical long distance call to a pager, and ENTER to complete the phone number). Program 702 9 *6 548 7632 ENTER (this is the second phone number, to call the foreman in case the pager call doesn't get through).

Case 2: Passing a Phone Number to a Pager

Some pager systems will allow the caller to enter a phone number (or other ID number), which is then relayed on to the beeper. When the person with the beeper gets the call, he will know immediately from the number which dialer has called. This is a good system if you are using multiple dialers, or have other pager calls in addition to autodialers.

Example:

Consider the following example of initiating a call to a paging system. We will assume here we don't have to dial 9 to get an outside line for this example. The paging terminal phone number is entered, followed by a CPM wait *6 to wait for the pager to beep. After that, an ID number is entered. Often the ID number is simply the phone number at the Verbatim autodialer site.
A # terminator *8 is inserted. Finally, the characters *5 are added to designate this phone session as a pager call and not a voice annunciation. Entry of additional delay digits may be required for proper timing of the pager call session.

The phone number string for this example with the first phone number calling a pager, is:

```
701 2352456 *6 5481234 *8 *5
```

Program 702 548 7632 ENTER (this is the second phone number, to call the foreman in case the pager call doesn't get through).

Exception:

With some pager systems, Call Progress Monitoring (CPM) on may cause a delay that will not allow the pager message to be transmitted in the time allowed. If this is the case with your paging system, either have CPM in the default off state or, if you want CPM on, time delays can be used in the place of *6 pause for tone detect. The critical task here is to time the delay from the last digit dialed until the pager beeps. The delay time needed can be determined by using a stopwatch or a clock with a second hand. You want to time this delay to the nearest second, then add 1 second to be sure. Consult the diagram on page H-20 to see the time line of events, then program the dialer.

Example 1:

MINUS #

Delays are added by pressing the MINUS # key on the front panel. Each delay is normally 1 second, but can be programmed (using 928 N) to be any length from 1 to 10 seconds.

We made each delay 2 seconds long by programming code 928 to be 2 seconds for each delay used: program 928 2 ENTER. We then called the pager, and determined timed the delay between the last digit dialed and the pager beep was 6 seconds.

We programmed our pager phone number: 701 6586713 ### 18007226999 *8 *5, where # are delays inserted.

Example 2:

In this example we will enter an ID number before entering a phone number into the pager. The pager phone number is 1 713 2352456. The ID number is 7711. The dialer is at 5481234. Calling the pager by hand from the dialer site, we find the following:

- dial pager
- wait for pager to answer (6 seconds)
- pager beep
- enter ID (7711)
- wait for new pager prompt (2 seconds)
- enter dialer phone number (5481234)
- hang up

  The phone number to enter will look something like:

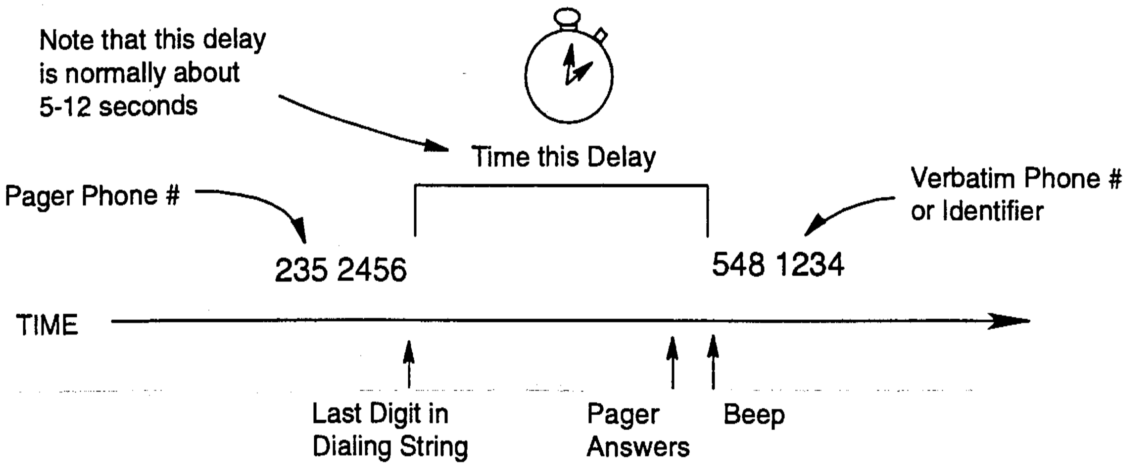
  1 713 235 2456 (delay 1) 7711 (delay 2) 548 1234
- In our example we programmed Phone #1:

  701 1 713 235 2456 ### 7711 # 548 1234 ENTER

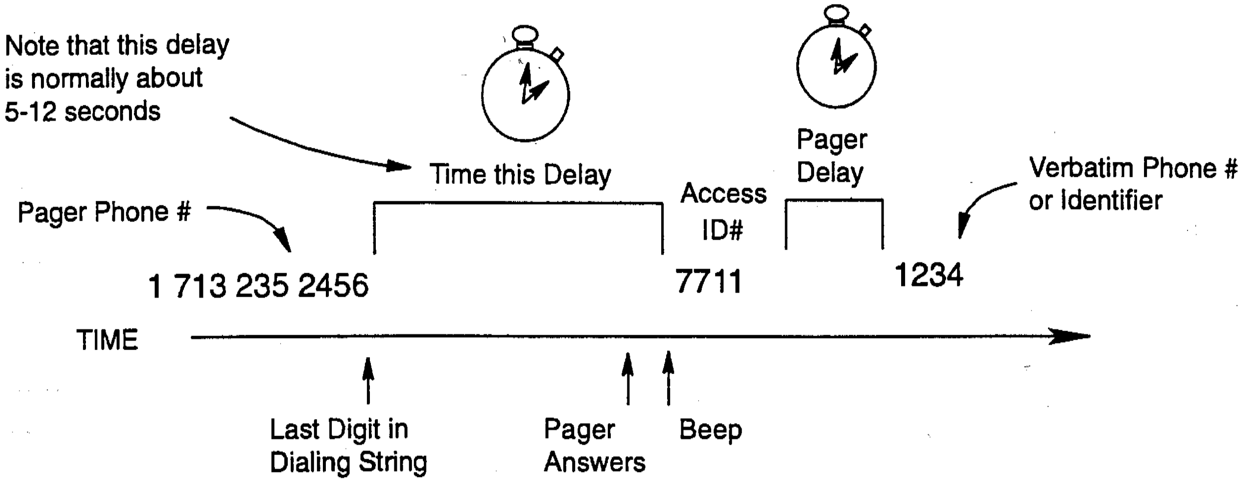
  (Remember that each # represents a 3 second delay).
- and Phone #2:

  702 548 7632 ENTER (our foreman again)

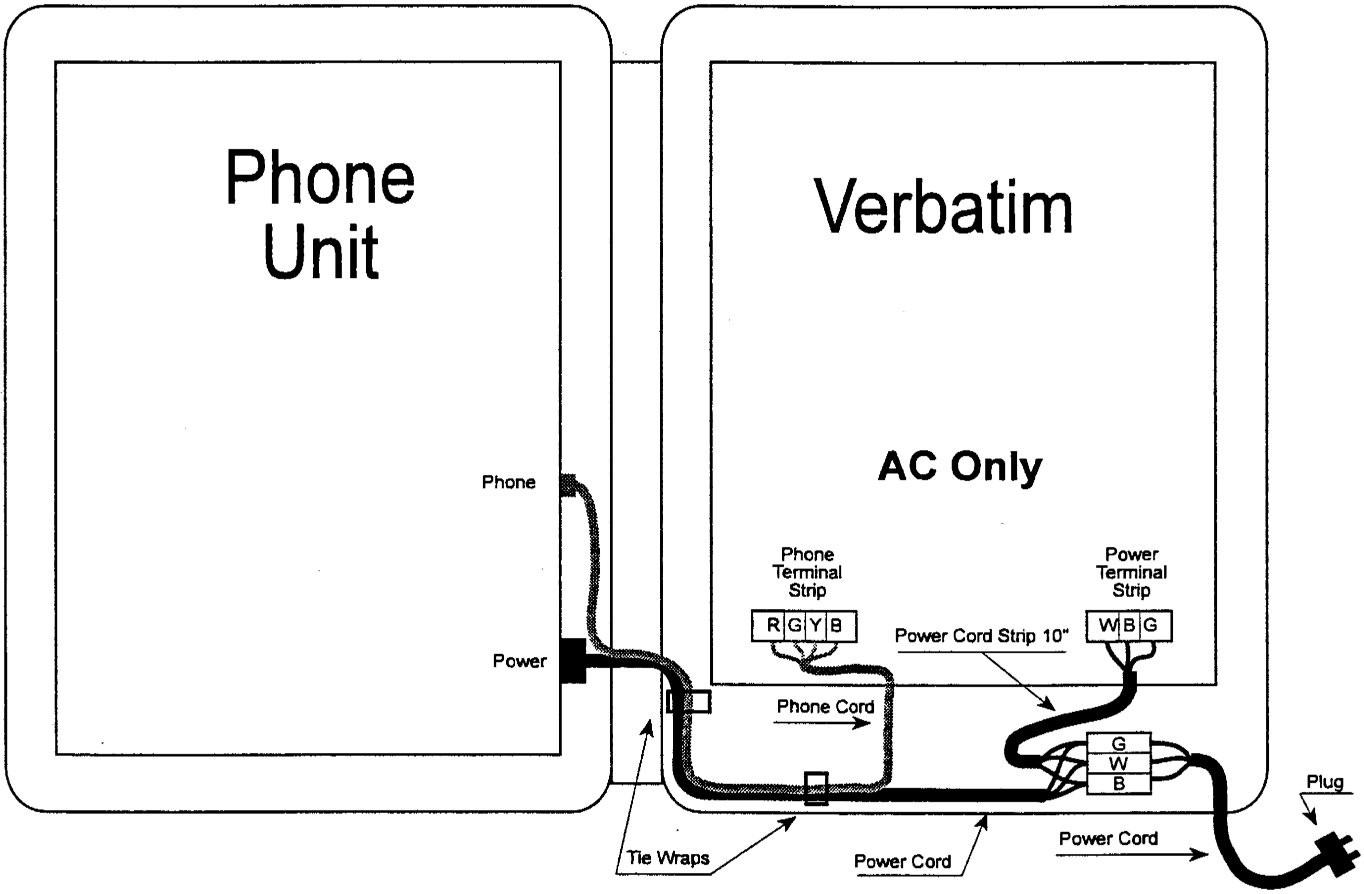
Case 2: Pager Calling Sequence Using Delays (Example 1)



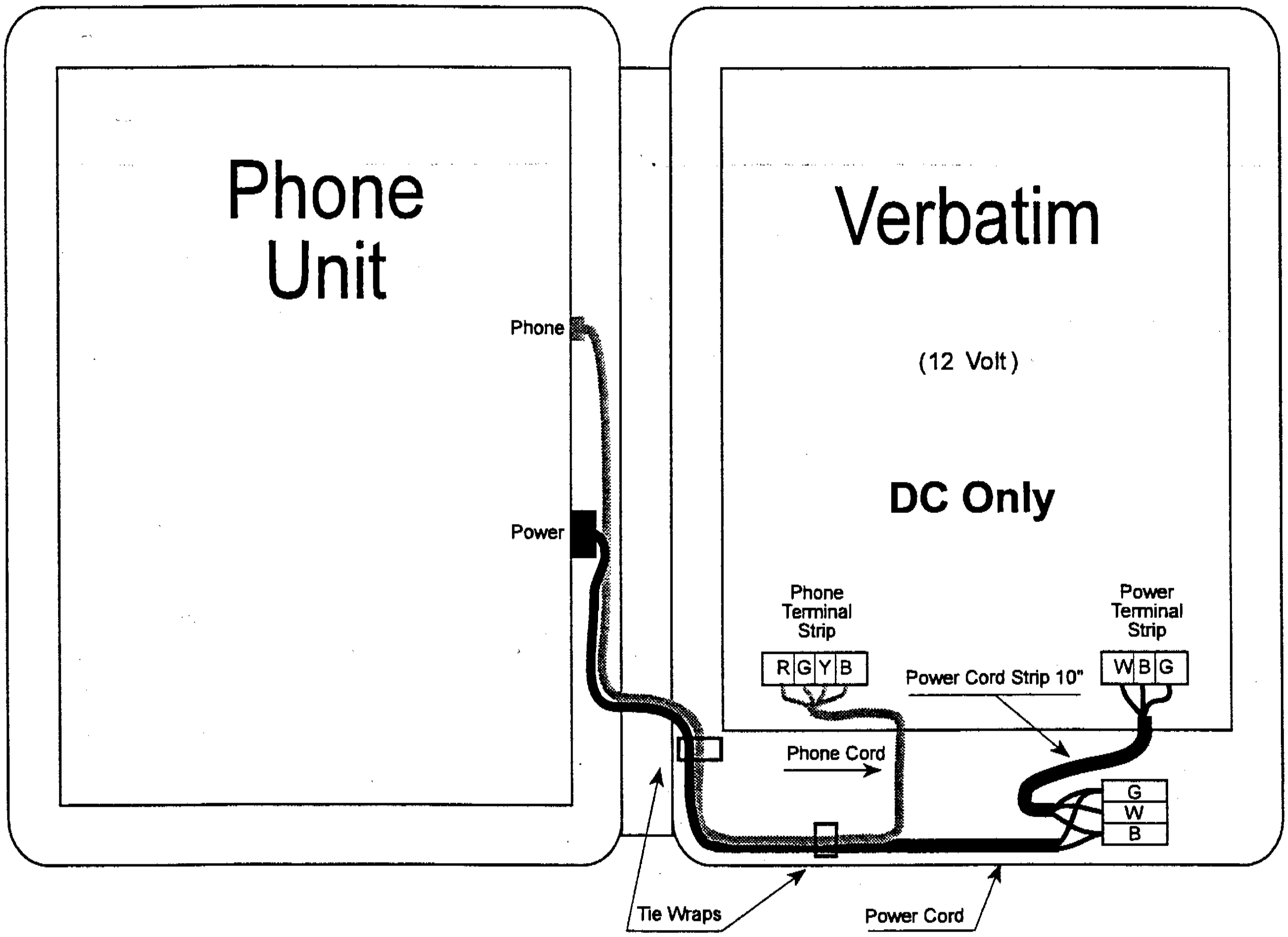
Case 2: Pager Calling Sequence Using Delays (Example 2)



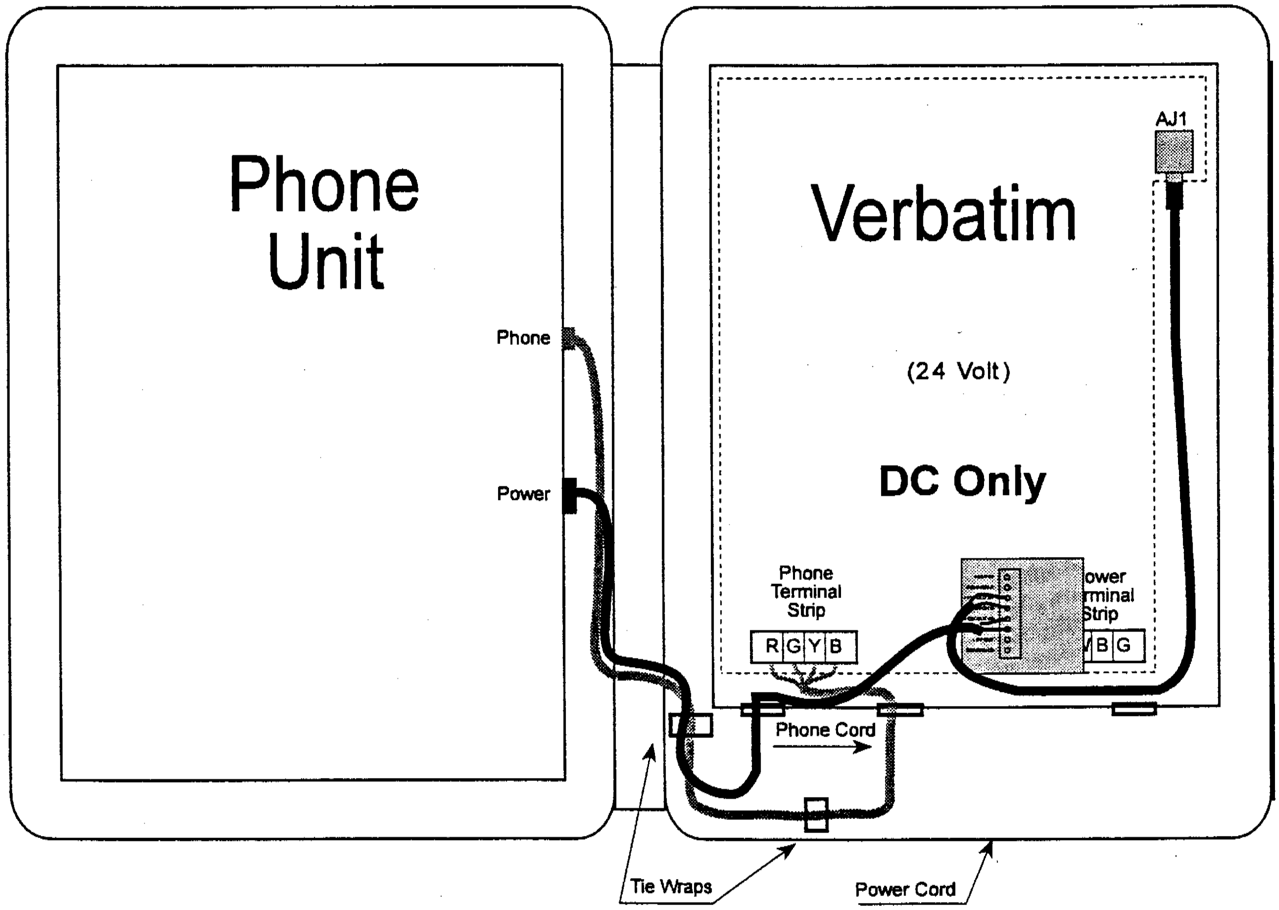
Cellularm Cellular Communications Diagram (AC Only)



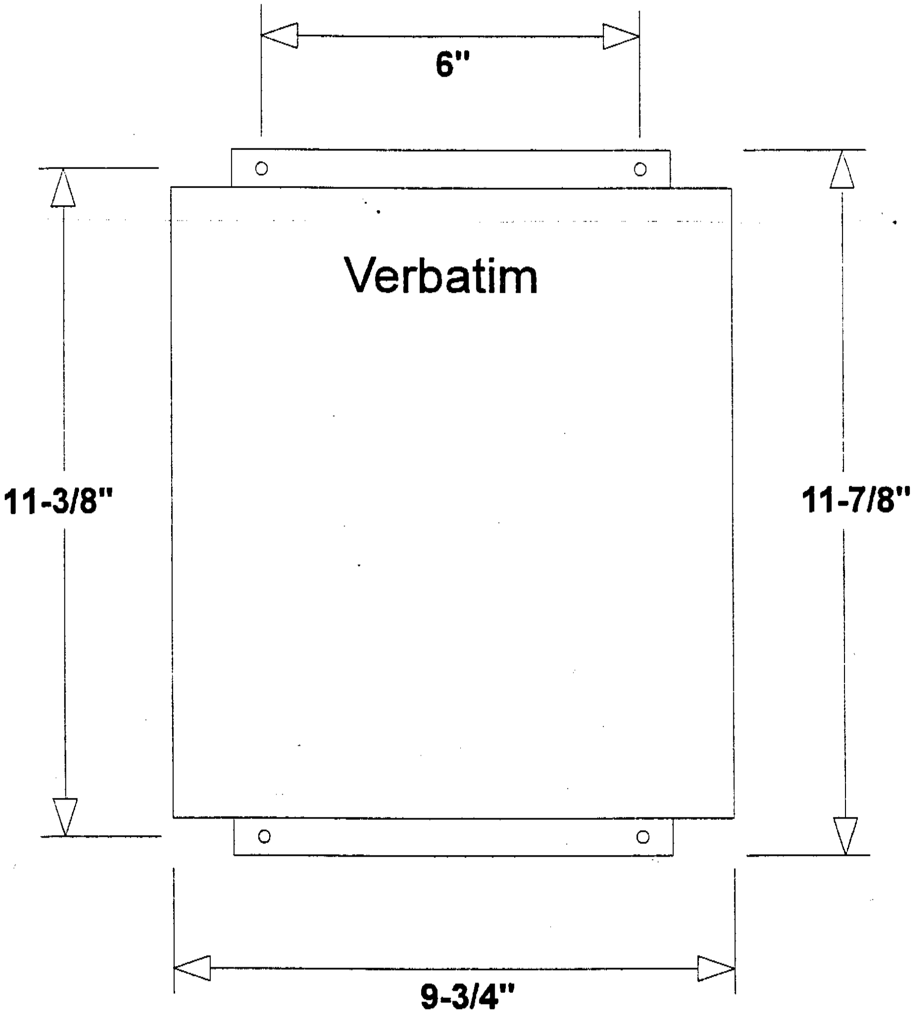
ˈularm Cellular Communications Diagram (12V DC Only)



'ellularm Cellular Communications Diagram (24V DC Only)

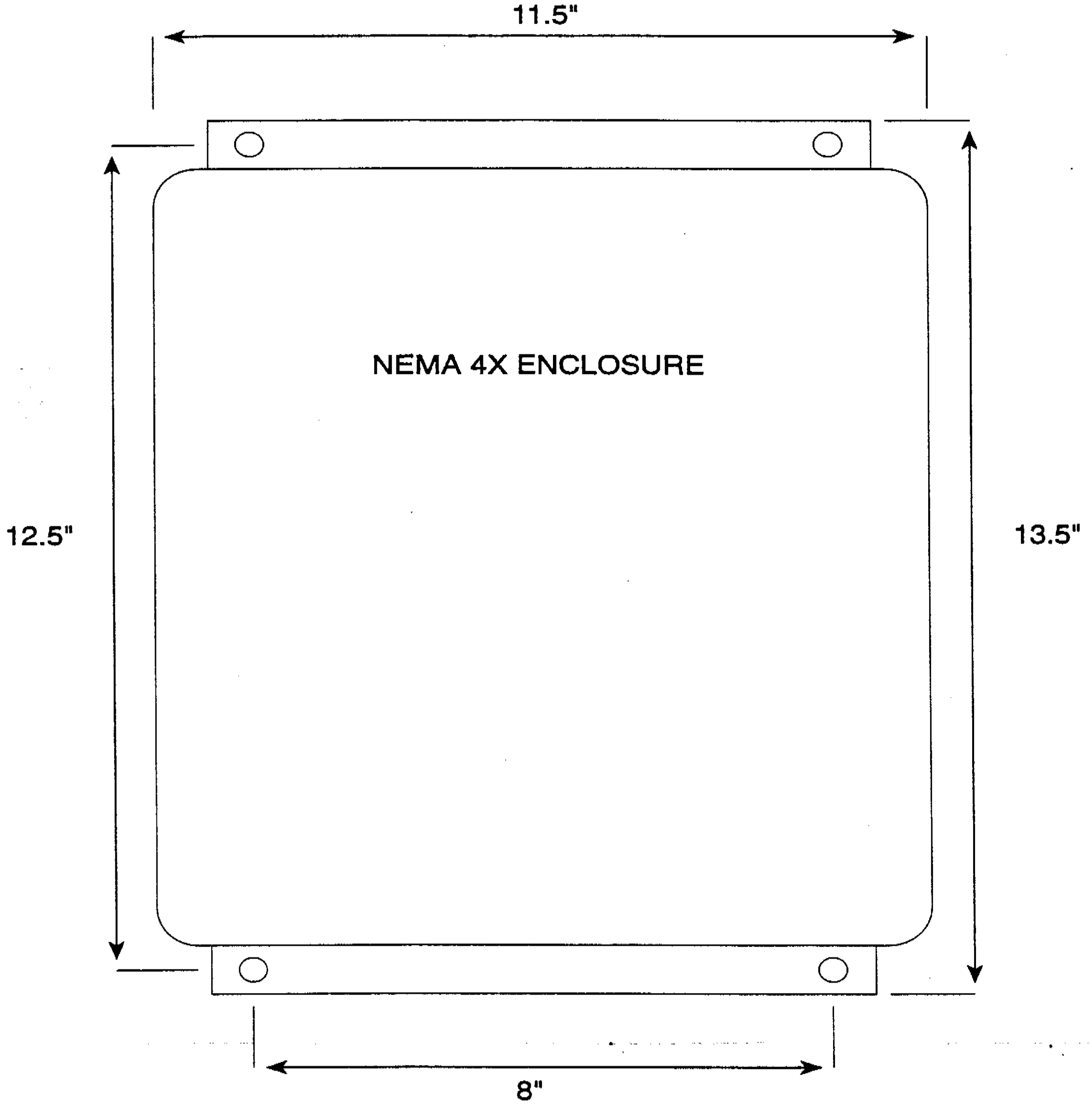


Verbatim Enclosure Diagram



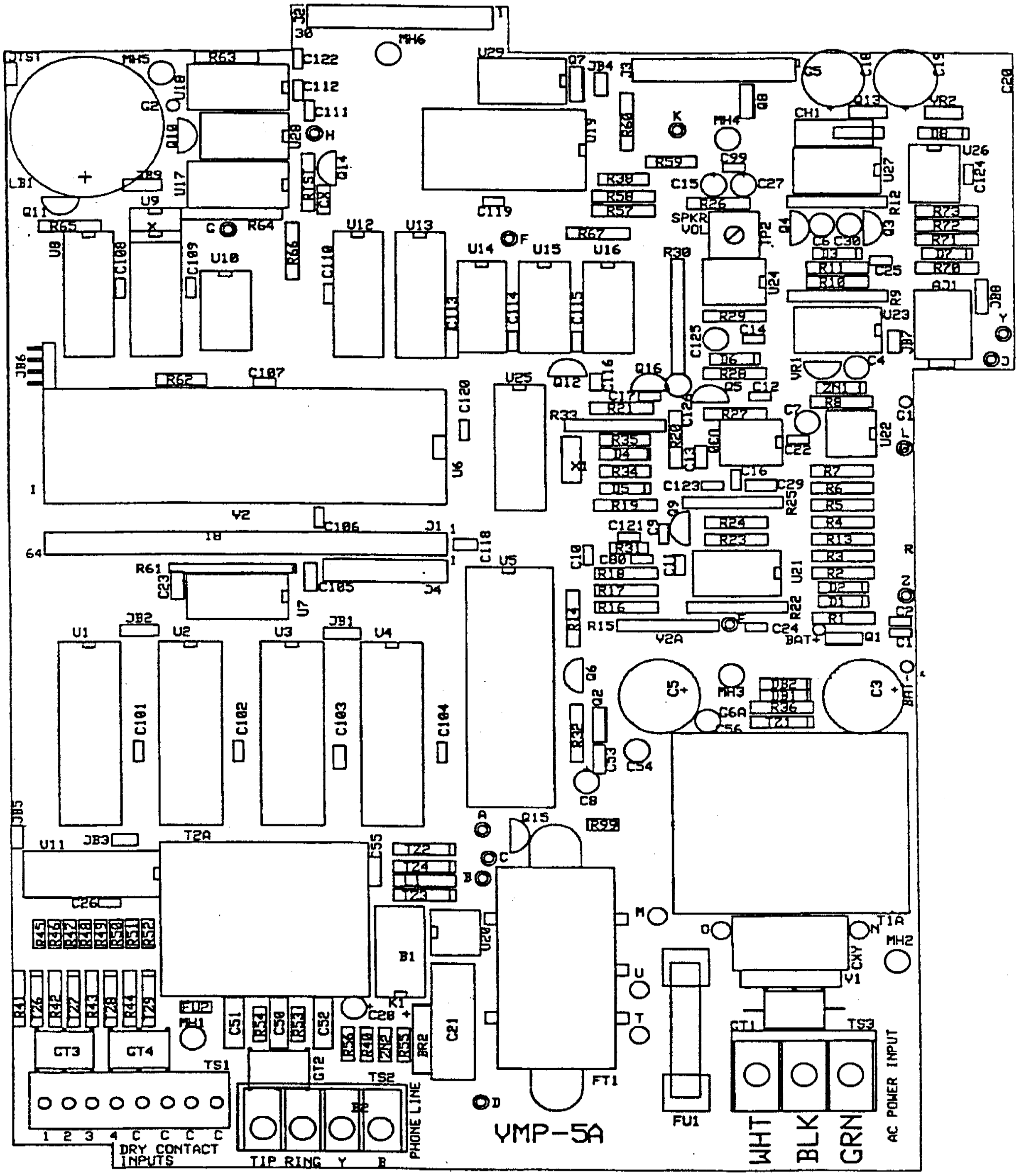
RECTANGULAR MOUNTING CENTERS: 6" W x 11-3/8" H
OVERALL DIMENSIONS: 9-3/4" W x 11 7/8" H x 5" D

NEMA 4X Enclosure Diagram

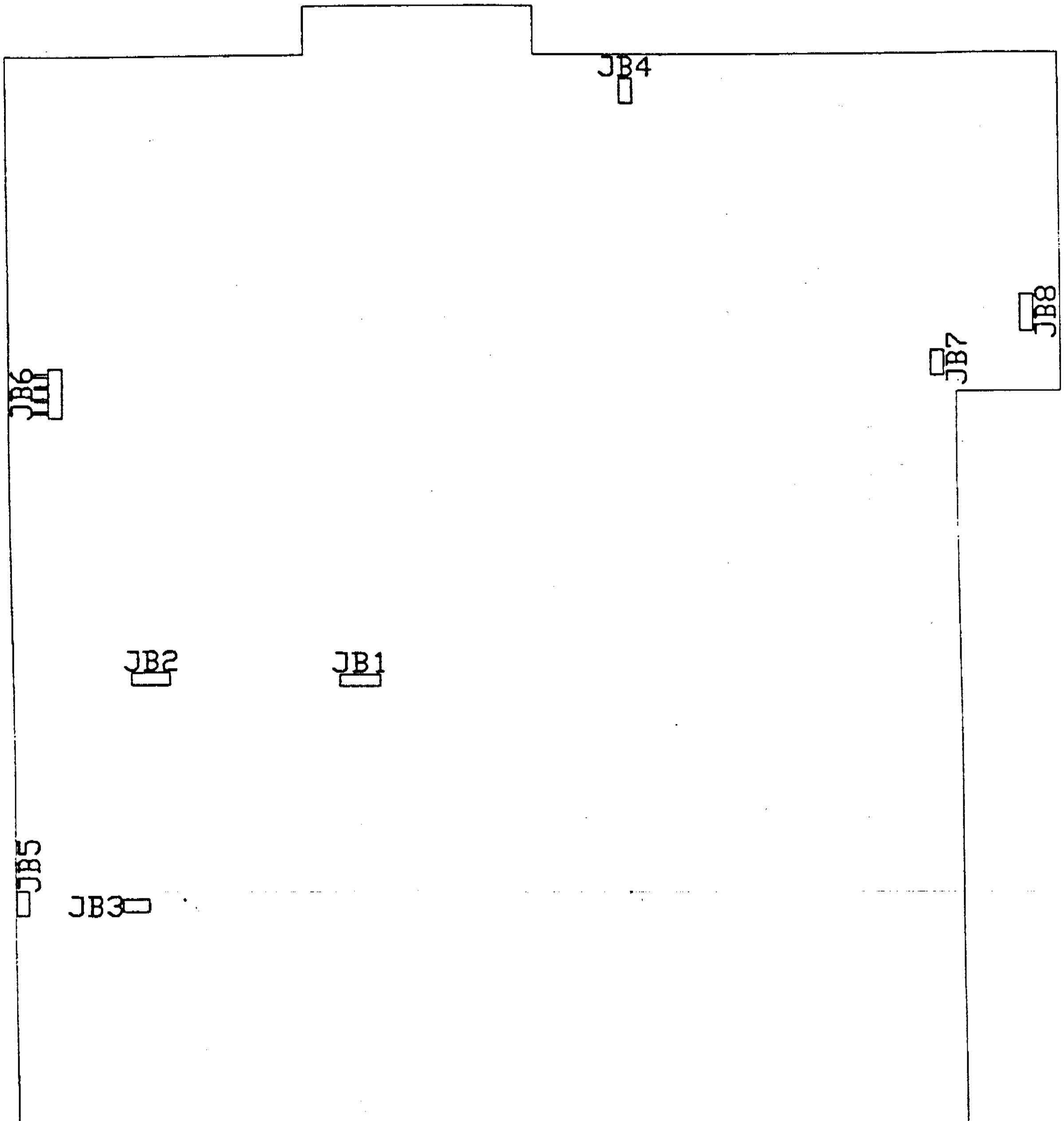


RECTANGULAR MOUNTING CENTERS: 8" W x 12.5" H
OVERALL DIMENSIONS 11.5" W x 13.5" H x 5.5" D

Motherboard Component Diagram



Jumper Block Diagram



H.11 Jumper Configurations

Main Board VMP-5A

◆ JB1 - configures sockets U3 and U4 for the size of EPROM chip used.

Placement of shorting block:
- left hand two pins- 2 meg EPROMs (for future use)
- right hand two pins- 1meg and 512k EPROMs (factory default)

◆ JB2 - configures sockets U1 and U2 for the size of RAM chip used.

Placement of shorting block:
- left hand two pins- 1 meg or 256k RAMs (factory default)
- right hand two pins- 2 meg RAMs (for future use)

◆ JB3 - RESET. Short these two pins together for about 2 seconds (a screwdriver works fine) to clear the programming back to factory defaults.

◆ JB4 - Local Alarm Relay/ Line Seizure Relay output. Upper pin is ground, lower pin supplies 5vdc on alarm to activate the relay.

◆ JB5 - SYSTEM RESET. Short these two pins together for about two seconds to reset the system hardware.

◆ JB6 - factory use only

◆ JB7 - factory use only

◆ JB8 - configures jack AJ-1 to be either an audio output jack or a 12vdc power input jack.

Placement of shorting block:
- upper two pins makes AJ-1 an audio output jack, for using an external speaker or connecting to another audio system.
- lower two pins makes AJ-1 a 12vdc power input jack for powering the unit from an external source.

◆ JB9 - factory use only

Speech Board VSPE-2

- JB101 - position of jumper varies with the firmware version
  Placement of shorting block:
  - left hand two pins if the firmware version is 2.00 or higher. Speech RAM is to be placed in the board beginning with U103 then U104 and so on up to 8 RAM chips.
  - right hand two pins if the firmware version is 1.36 or below. A maximum of two speech RAM may be used. If using just one RAM chip, it goes in socket U104. A second one if used can go in U105 (U103 is skipped).

I Verbatim™ Series VSS Autodialer Specification

I.1 Description & Phone Number Dialing

The autodialer shall be a solid state component capable of dialing up to 16 phone numbers, each up to 60 digits in length. Phone numbers and Standard pulse dialing or Touch Tone DTMF dialing are user programmable via the system's keyboard or Touch Tone phone. Further, the autodialer shall be capable of connecting, via a single serial interface cable, to a variety of Programmable Logic Controllers (PLCs), Distributed Control Systems (DCSs) & SCADA systems. Serial interfacing methods shall incorporate commonly used standard industrial network protocols such as Modicon, Inc. Modbus RTU

I.2 Solid State Voice Message Recording and Playback

The unit shall have two different categories of speech message capability, all implemented with permanent non-volatile solid state circuitry with no mechanical tape mechanisms. The unit shall allow for message recording from a remote telephone as well as from the front panel.

I.2.1 User Field Recorded Messages

The user may record and re-record his own voice messages, for each input channel and for the Station ID.

1. *There shall be no limit on the length of any particular message*, within the overall available message recording time, which shall be 409 seconds for 36 total channel units and 624 seconds for 57 total or more channel units.
2. The unit shall allow selective recording of *both Normal and Alarm advisory messages* for each input channel.
3. The unit shall provide for *automatic setting of the optimum speech memory usage rate* for the total set of messages recorded, in order to achieve optimum recording sound quality.
4. Circuit board switches or jumper straps shall not be acceptable means of manipulating message length or recording rates.

I.2.2 Permanent Resident Non-Recorded Messages

Permanent built-in messages shall be included to support user programming operations, to provide supplemental warning messages such as advising that the alarms have been disabled, and to allow the unit to be fully functional even when the installer has not recorded any messages of his own.

I.3 Local & Remote Programming Capabilities

The user may optionally elect to alter the following parameters from their standard normal default values via keyboard entry or remotely from any Touch Tone phone.

Capability	Setting/Description
Alarm Call Grouping	On alarm, system shall selectively call the correct phone numbers according to the current alarm(s).
Alarm response delay	.1 to 9999.9 seconds.
Delay between alarm call outs	.1 to 99.9 minutes.
Alarm reset time:	0.1 to 99 hours or "NO RESET".
Incoming ring response (answer) delay	1 to 20 rings.
Input alarm criteria	Each channel shall be independently configured for "Normally Closed," "Normally Open," "No Alarm," or "Disabled."
Autocall Test	When enabled, the unit shall place a single round of test calls, both at the time this function is enabled and also at regular subsequent intervals until this function is disabled at the keyboard.
Run Time Meter	Selected physical channel inputs shall accumulate and report the number of hours that its input contacts have been closed.
Remote system microphone activation.	
Remote and local arming and disarming of system.	
Pulse Totalizer Function.	Selected physical input channels shall be capable of counting pulses of up to 100Hz. at 50% duty cycle.

I.4 Nonvolatile Program Memory Retention

User-entered programming and voice messages shall be kept intact even during power failures or when all power is removed for up to ten years.

I.5 Acknowledgment

Acknowledgment of an alarm phone call is to be accomplished by pressing a Touch Tone® "9" as the alarm call is being received, and/or by returning a phone call to the unit after having received an alarm call.

I.6 Remote (PLC) Channel Monitoring Function

The unit shall continuously scan all properly configured Remote Channels. The unit shall monitor remote channels which physically reside in other industrial equipment interfaced to the Verbatim via the serial interface. The unit shall be capable of interfacing to at least two PLC networks simultaneously. The unit shall be capable of monitoring any PLC data register regardless of register type, whether digital, analog, input, output or status point. Alarm criteria shall be settable according data register type. For digital remote channels, alarm criteria shall be settable for normally '0' or normally '1'. For analog remote channels, both a high setpoint and a low setpoint alarm criteria shall be settable. Violation of alarm criteria at any remote channel shall cause the unit to go into alarm state and begin dial-outs. All remote channel alarm criteria shall be settable either at the front panel of the unit of over the telephone using touch-tone commands. The unit shall be capable of writing data to any PLC data register to which writing data is a legal operation. The unit shall monitor any failure of the active serial communications channels. Upon failure of any communications channel the unit shall enter the alarm state and begin dial-outs. The unit shall be capable of transferring data between one remote channel on one serial communications network and another remote channel on a second serial communications network. The unit shall also be capable of transferring data between remote channels on a serial communications network and physical channels within the unit. The unit shall be optionally upgradable to incorporate provision for 32, 64 or 96 total remote channels.

I.7 Input Monitoring Function

The unit shall continuously monitor the presence of AC power and the status of four contact closure inputs. Unit shall optionally be field upgradeable to incorporate a total of 8, 16, 24, or 32 dry contact inputs. AC power failure, or violation of the alarm criteria at any input, shall cause the unit to go into alarm status and begin dial-outs. Unit shall, upon a single program entry, automatically accept all input states as the normal non-alarm state, eliminating possible confusion about Normally Open versus Normally Closed inputs. Further, as a diagnostic aid, unit shall have the capability of directly announcing the state of any given input as currently "Open Circuit" or "Closed Circuit," without disturbing any message programming. Each input channel shall also be independently programmable, *without need to manipulate circuit board switches or jumpers*, as Normally Open or Normally Closed, or for No Alarm (Status Only), or for Pulse Totalizing, or for Run Time Metering.

I.8 Run Time Meter Inputs

Any dry contact input can be programmed to accumulate and report the number of hours their respective input circuits have been closed. Any such channels will never cause an alarm, but on inquiry will recite the channel's message according to the status of the input and then report the closed circuit time to the tenth of an hour. The input will accumulate and report in tenths of hours up to a total accumulated running time of 99,999.9 hours. The initial value of the Run Time Meter shall be programmable in order to agree with existing electromechanical Run Time Meters. Up to a total of 8 Run Time Meters may be programmed.

I.9 Pulse Totalizer Inputs

Any dry contact input can be programmed to accumulate the number of pulses (momentary contact closures) occurring at the input. The maximum input pulse rate must not exceed 100 pulses per second, and if the rate is over 50 pulses per second, the pulses must have a 50% duty cycle. The user shall be able to program an initial starting value and a scale factor for each pulse totalizer input. The pulse totalizer input shall cause an alarm call upon reaching a user defined alarm setpoint.

I.10 Alarm Message

Upon initiating an alarm phone call, the system is to "speak" only those channels that are currently in "alarm status".

I.11 Communications Protocol

The unit shall interface to standard networks commonly used in industrial installations. The unit shall be capable of network communications using the Modbus RTU protocol.

I.12 Diagnostics

The unit shall include user commands to execute diagnostics of the PLC network to determine the health of the network. The unit shall inform the user of the length of scan time for the set of all configured remote channels. The unit shall provide a complete verbal report of all programmable functions and their programmed values on command form any remote Touch Tone phone.

I.13 Speakerphone

The unit shall be capable of dialing any phone number on command and function as a speakerphone.

I.14 Inquiry Message and Function

Inquiry phone calls can be made directly to the unit at any time from any telephone, locally or long distance, for a complete status report of all variables being monitored, including power status.

I.15 Power Battery Backup

Normal power shall be 105-135 VAC, 15 watts nominal. The product is to contain its own gel cell rechargeable battery which is automatically kept charged when AC power is present. The system shall operate on battery power for a minimum of 13 continuous hours in the event of AC power failure. A shorter backup time shall not be acceptable. The built-in charger shall be precision voltage controlled, not a "trickle charger," in order to minimize recharge time and maximize battery life available.

I.16 Phone Line

The autodialer is to use a standard rotary pulse or Touch Tone "dial-up" phone line (direct leased line not to be required) and is to be F.C.C. approved. Connection to the telephone is through a 4-pin modular jack (RJ-11).

the main circuit board shall not be an acceptable substitute. The installer shall provide a good electrical ground connection point near the unit to maximize the effectiveness of the surge protection.

I.17 Local Data Logging

The system shall include a parallel printer interface for local data logging. The local printer will automatically print out, with date and time stamp, each activity that occurs; alarms, acknowledgements, programming entries, inquiry calls, etc.. For the purpose of easy program review the user shall be able to printout on demand all user entered programming.

I.18 Public Address Broadcast

The standard dialer shall provide a mini phone jack for optional connection to a local public address system. If connected to the PA system the dialer shall broadcast all alarm messages over the PA system and the telephone simultaneously.

I.19 Integral Surge Protection

All power, phone line, dry contact, and analog signal inputs shall be protected at the circuit board to IEEE Standard 587, category B (6,000 volts open circuit/ 3,000 amps closed circuit). Gas tubes followed by solid state protectors shall be integral to the circuit board for each such line. Protectors mounted external to the main circuit board shall not be an acceptable substitute. The installer shall provide a good electrical ground connection point near the unit to maximize the effectiveness of the surge protection.

I.20 Warranty

The dialer shall be covered by a five (5) year warranty covering parts and labor performed at the Factory.

I.21 Modular Upgrades

The system shall include expansion connectors to accommodate field upgrades for additional internal dry contact inputs, remote supervisory control outputs, and internal analog inputs, CDL, SCADA.

1.22 Additional Features: Sealed Switches, LED Indicators, Alarm Disable Warning, TalkThrough

All keyboard and front panel switches shall be sealed to prevent contamination. Front panel LED's shall indicate: Normal Operation, Program Mode, Phone Call in Progress, Status for each channel, AC Power Present, AC Power Failure, and Low, Discharging or Recharging Battery. On any Inquiry telephone call or On Site status check, the voice shall provide specific warning if no dialout phone numbers are entered, or if the unit is in the "alarm disable" mode, or if AC power is off or has been off since last reset. A built-in microphone shall allow anyone at a remote phone to listen to local sounds and have a two-way conversation with personnel at the dialer.

1.23 Special Order Items

The following options shall be available on specific order:

a) 4, 12, 20, or 28 extra contact channels (8,16,24, or 32 respectively, total.)
b) 32, 64, 96 remote channels
c) 1, 4, 8, or 16 analog channels.
d) Remote supervisory control (4 or 8 outputs).
e) Cellular telephone communications.
f) Radio communications interface.
g) NEMA 4X (sealed) enclosure.
h) Thermostatically controlled heater.

Specifications subject to change without notice.

J

Worksheets

Worksheet A Programming

Part 1: Phone Number Programming

2-Digit Phone Number Designation	Use Program Code	Phone Number (Including any necessary prefixes or area codes)	Person
01 (First)	701		
02 (Second)	702		
03 (Third)	703		
04 (Fourth)	704		
05 (Fifth)	705		
06 (Sixth)	706		
07 (Seventh)	707		
08 (Eighth)	708		
09 (Ninth)	709		
10 (Tenth)	710		
11 (Eleventh)	711		
12 (Twelfth)	712		
13 (Thirteenth)	713		
14 (Fourteenth)	714		
15 (Fifteenth)	715		
16 (Sixteenth)	716		

Part 2: Optional Programing

Record of any optional programming to alter selected parameters from their normal default values. *(Sample highlighted)*

Program Code	Parameter Description	Default Value	Write In Any Altered Values YouProgram
902	***Alarm Trip Delay***	***2 seconds***	***40 seconds***

Worksheet B Alarm Call Grouping Programming

Purpose: To "link" certain input channels to call only selected phone numbers.
See Section 6.2.13

Part 1: Group Description Naming

As an organizational step, write in a Group Description Name (Electrical, Security, etc.) for each of your phone number groups, and the two-digit designation number of the phone numbers you want included in each group. Refer to the filled-in example below. This should be done only after you have already entered your entire list of up to 16 phone numbers on Worksheet A. (*Sample highlighted*)

Group Description (Electrical, etc.)	2-Digit Phone # Designation (Taken from Worksheet A)
Maintenance	***01, 04, 05, 06***
Electrical	***03, 04***
Security	***02, 05***

Worksheet B Alarm Call Grouping Programming Cont. . .

Part 2: Linking Channels To Groups

For each input channel that you wish to have "linked" to one of your groups, write in your chosen Group Description Name (Electrical, etc.), and the corresponding set of 2-digit Phone Number Designations which you established above. Finally, write in these same sets of 2-digit codes, without the separating commas, to the right of the printed program code (501, etc.). This establishes the complete program code to enter for each channel that you want "linked" to call only a selected group of phone numbers. (*Sample highlighted*)

The filled-in sample, below, is for an 8-channel unit. Three groups were established, and 5 of the channels were linked to a group. The remaining 3 channels were not linked to any group, and therefore, those 3 "unlinked" channels would dial the entire list of phone numbers in regular order.

Note:

Any channels that you do not enter such a program code for, will cause dialing of the entire list of phone numbers, when that channel goes into alarm.

Channel	Linked to Group	Corresp. Phone # Desig's Est. Above	Program Code to Enter
01	*Security*	*02, 05*	*501 9 02 05*
02	*Security*	*02, 05*	*502 9 02 05*
03	*Electrical*	*03, 04*	*503 9 03 04*
04	*Maintenance*	*01, 04, 05, 06*	*504 9 01 04 05 06*
05	—	—	~~*505 9*~~
06	*Electrical*	*03, 04*	*506 9 03 04*
07	—	—	~~*507 9*~~
08	—	—	~~*508 9*~~

Worksheet B Alarm Call Grouping Programming Cont. . .

(Page 1 of 6)

Internal Input Channels	Linked to Group	Corresp. Phone # Desig's Est. Above	Program Code to Enter
01			*501 9*
02			*502 9*
03			*503 9*
04			*504 9*
05			*505 9*
06			*506 9*
07			*507 9*
08			*508 9*
09			*509 9*
10			*510 9*
11			*511 9*
12			*512 9*
13			*513 9*
14			*514 9*
15			*515 9*
16			*516 9*
17			*517 9*
18			*518 9*
19			*519 9*
20			*520 9*
21			*521 9*
22			*522 9*
23			*523 9*
24			*524 9*

Worksheet B Alarm Call Grouping Programming Cont. . .

(Page 2 of 6)

Internal Input Channels	Linked to Group	Corresp. Phone # Desig's Est. Above	Program Code to Enter
25			*525 9*
26			*526 9*
27			*527 9*
28			*528 9*
29			*529 9*
30			*530 9*
31			*531 9*
32			*532 9*
33			*533 9*
34			*534 9*
35			*535 9*
36			*536 9*
37			*537 9*
38			*538 9*
39			*539 9*
40			*540 9*
41			*541 9*
42			*542 9*
43			*543 9*
44			*544 9*
45			*545 9*
46			*546 9*
47			*547 9*
48			*548 9*

Worksheet B Alarm Call Grouping Programming Cont. . .

(Page 3 of 6)

Remote Channels	Linked to Group	Corresp. Phone # Desig's Est. Above	Program Code to Enter
01			*4501 9*
02			*4502 9*
03			*4503 9*
04			*4504 9*
05			*4505 9*
06			*4506 9*
07			*4507 9*
08			*4508 9*
09			*4509 9*
10			*4510 9*
11			*4511 9*
12			*4512 9*
13			*4513 9*
14			*4514 9*
15			*4515 9*
16			*4516 9*
17			*4517 9*
18			*4518 9*
19			*4519 9*
20			*4520 9*
21			*4521 9*
22			*4522 9*
23			*4523 9*
24			*4524 9*

Worksheet B Alarm Call Grouping Programming Cont. . .

(Page 4 of 6)

Remote Channels	Linked to Group	Corresp. Phone # Desig's Est. Above	Program Code to Enter
25			*4525 9*
26			*4526 9*
27			*4527 9*
28			*4528 9*
29			*4529 9*
30			*4530 9*
31			*4531 9*
32			*4532 9*
33			*4533 9*
34			*4534 9*
35			*4535 9*
36			*4536 9*
37			*4537 9*
38			*4538 9*
39			*4539 9*
40			*4540 9*
41			*4541 9*
42			*4542 9*
43			*4543 9*
44			*4544 9*
45			*4545 9*
46			*4546 9*
47			*4547 9*
48			*4548 9*

Worksheet B Alarm Call Grouping Programming Cont. . .

(Page 5 of 6)

Remote Channels	Linked to Group	Corresp. Phone # Desig's Est. Above	Program Code to Enter
49			*4549 9*
50			*4550 9*
51			*4551 9*
52			*4552 9*
53			*4553 9*
54			*4554 9*
55			*4555 9*
56			*4556 9*
57			*4557 9*
58			*4558 9*
59			*4559 9*
60			*4560 9*
61			*4561 9*
62			*4562 9*
63			*4563 9*
64			*4564 9*
65			*4565 9*
66			*4566 9*
67			*4567 9*
68			*4568 9*
69			*4569 9*
70			*4570 9*
71			*4571 9*
72			*4572 9*

Worksheet B Alarm Call Grouping Programming Cont. . .

(Page 6 of 6)

Remote Channels	Linked to Group	Corresp. Phone # Desig's Est. Above	Program Code to Enter
73			4573 9
74			4574 9
75			4575 9
76			4576 9
77			4577 9
78			4578 9
79			4579 9
80			4580 9
81			4581 9
82			4582 9
83			4583 9
84			4584 9
85			4585 9
86			4586 9
87			4587 9
88			4588 9
89			4589 9
90			4590 9
91			4591 9
92			4592 9
93			4593 9
94			4594 9
95			4595 9
96			4596 9

Worksheet C Message Planning & Recording *(Page 1 of 11)*

Input Channel Message Designation	Program Code	Message Content	Approx. Length
Station ID	***100***		
Ch 01 Alarm	***101***		
Ch 01 Normal	***201***		
Ch 02 Alarm	***102***		
Ch 02 Normal	***202***		
Ch 03 Alarm	***103***		
Ch 03 Normal	***203***		
Ch 04 Alarm	***104***		
Ch 04 Normal	***204***		
Ch 05 Alarm	***105***		
Ch 05 Normal	***205***		
Ch 06 Alarm	***106***		
Ch 06 Normal	***206***		
Ch 07 Alarm	***107***		
Ch 07 Normal	***207***		
Ch 08 Alarm	***108***		
Ch 08 Normal	***208***		
Ch 09 Alarm	***109***		
Ch 09 Normal	***209***		
Ch 10 Alarm	***110***		
Ch 10 Normal	***210***		
Ch 11 Alarm	***111***		
Ch 11 Normal	***211***		
Ch 12 Alarm	***112***		
Ch 12 Normal	***212***		
Ch 13 Alarm	***113***		
Ch 13 Normal	***213***		
Ch 14 Alarm	***114***		
Ch 14 Normal	***214***		

Total estimated recorded message length in seconds, this page ____________

Worksheet C Message Planning & Recording *(Page 2 of 11)*

Input Channel Message Designation	Program Code	Message Content	Approx. Length
Ch 15 Alarm	***115***		
Ch 15 Normal	***215***		
Ch 16 Alarm	***116***		
Ch 16 Normal	***216***		
Ch 17 Alarm	***117***		
Ch 17 Normal	***217***		
Ch 18 Alarm	***118***		
Ch 18 Normal	***218***		
Ch 19 Alarm	***119***		
Ch 19 Normal	***219***		
Ch 20 Alarm	***120***		
Ch 20 Normal	***220***		
Ch 21 Alarm	***121***		
Ch 21 Normal	***221***		
Ch 22 Alarm	***122***		
Ch 22 Normal	***222***		
Ch 23 Alarm	***123***		
Ch 23 Normal	***223***		
Ch 24 Alarm	***124***		
Ch 24 Normal	***224***		
Ch 25 Alarm	***125***		
Ch 25 Normal	***225***		
Ch 26 Alarm	***126***		
Ch 26 Normal	***226***		
Ch 27 Alarm	***127***		
Ch 27 Normal	***227***		
Ch 28 Alarm	***128***		
Ch 28 Normal	***228***		

Total estimated recorded message length in seconds, this page ____________

Worksheet C Message Planning & Recording *(Page 3 of 11)*

Input Channel Message Designation	Program Code	Message Content	Approx. Length
Ch 29 Alarm	*129*		
Ch 29 Normal	*229*		
Ch 30 Alarm	*130*		
Ch 30 Normal	*230*		
Ch 31 Alarm	*131*		
Ch 31 Normal	*231*		
Ch 32 Alarm	*132*		
Ch 32 Normal	*232*		
Ch 33 Alarm	*133*		
Ch 33 Normal	*233*		
Ch 34 Alarm	*134*		
Ch 34 Normal	*234*		
Ch 35 Alarm	*135*		
Ch 35 Normal	*235*		
Ch 36 Alarm	*136*		
Ch 36 Normal	*236*		
Ch 37 Alarm	*137*		
Ch 37 Normal	*237*		
Ch 38 Alarm	*138*		
Ch 38 Normal	*238*		
Ch 39 Alarm	*139*		
Ch 39 Normal	*239*		
Ch 40 Alarm	*140*		
Ch 40 Normal	*240*		
Ch 41 Alarm	*141*		
Ch 41 Normal	*241*		
Ch 42 Alarm	*142*		
Ch 42 Normal	*242*		

Total estimated recorded message length in seconds, this page ____________

Worksheet C Message Planning & Recording *(Page 4 of 11)*

Input Channel Message Designation	Program Code	Message Content	Approx. Length
Ch 43 Alarm	*143*		
Ch 43 Normal	*243*		
Ch 44 Alarm	*144*		
Ch 44 Normal	*244*		
Ch 45 Alarm	*145*		
Ch 45 Normal	*245*		
Ch 46 Alarm	*146*		
Ch 46 Normal	*246*		
Ch 47 Alarm	*147*		
Ch 47 Normal	*247*		
Ch 48 Alarm	*148*		
Ch 48 Normal	*248*		
Remote Channel Message Designation	**Program Code**	**Message Content**	**Approx. Length**
NET 1 ID	*41001*		
Ch 01 Alarm	*4101*		
Ch 01 Normal	*4201*		
Ch 02 Alarm	*4102*		
Ch 02 Normal	*4202*		
Ch 03 Alarm	*4103*		
Ch 03 Normal	*4203*		
Ch 04 Alarm	*4104*		
Ch 04 Normal	*4204*		

Total estimated recorded message length in seconds, this page ____________

Worksheet C Message Planning & Recording *(Page 5 of 11)*

Remote Channel Message Designation	Program Code	Message Content	Approx. Length
Ch 05 Alarm	***4105***		
Ch 05 Normal	***4205***		
Ch 06 Alarm	***4106***		
Ch 06 Normal	***4206***		
Ch 07 Alarm	***4107***		
Ch 07 Normal	***4207***		
Ch 08 Alarm	***4108***		
Ch 08 Normal	***4208***		
Ch 09 Alarm	***4109***		
Ch 09 Normal	***4209***		
Ch 10 Alarm	***4110***		
Ch 10 Normal	***4210***		
Ch 11 Alarm	***4111***		
Ch 11 Normal	***4211***		
Ch 12 Alarm	***4112***		
Ch 12 Normal	***4212***		
Ch 13 Alarm	***4113***		
Ch 13 Normal	***4213***		
Ch 14 Alarm	***4114***		
Ch 14 Normal	***4214***		
Ch 15 Alarm	***4115***		
Ch 15 Normal	***4215***		
Ch 16 Alarm	***4116***		
Ch 16 Normal	***4216***		
Ch 17 Alarm	***4117***		
Ch 17 Normal	***4217***		

Total estimated recorded message length in seconds, this page ____________

Worksheet C Message Planning & Recording *(Page 6 of 11)*

Remote Channel Message Designation	Program Code	Message Content	Approx. Length
Ch 18 Alarm	*4118*		
Ch 18 Normal	*4218*		
Ch 19 Alarm	*4119*		
Ch 19 Normal	*4219*		
Ch 20 Alarm	*4120*		
Ch 20 Normal	*4220*		
Ch 21 Alarm	*4121*		
Ch 21 Normal	*4221*		
Ch 22 Alarm	*4122*		
Ch 22 Normal	*4222*		
Ch 23 Alarm	*4123*		
Ch 23 Normal	*4223*		
Ch 24 Alarm	*4124*		
Ch 24 Normal	*4224*		
Ch 25 Alarm	*4125*		
Ch 25 Normal	*4225*		
Ch 26 Alarm	*4126*		
Ch 26 Normal	*4226*		
Ch 27 Alarm	*4127*		
Ch 27 Normal	*4227*		
Ch 28 Alarm	*4128*		
Ch 28 Normal	*4228*		
Ch 29 Alarm	*4129*		
Ch 29 Normal	*4229*		
Ch 30 Alarm	*4130*		
Ch 30 Normal	*4230*		

Total estimated recorded message length in seconds, this page ___________

Worksheet C Message Planning & Recording (*Page 7 of 11*)

Remote Channel Message Designation	Program Code	Message Content	Approx. Length
Ch 31 Alarm	*4131*		
Ch 31 Normal	*4231*		
Ch 32 Alarm	*4132*		
Ch 32 Normal	*4232*		
Ch 33 Alarm	*4133*		
Ch 33 Normal	*4233*		
Ch 34 Alarm	*4134*		
Ch 34 Normal	*4234*		
Ch 35 Alarm	*4135*		
Ch 35 Normal	*4235*		
Ch 36 Alarm	*4136*		
Ch 36 Normal	*4236*		
Ch 37 Alarm	*4137*		
Ch 37 Normal	*4237*		
Ch 38 Alarm	*4138*		
Ch 38 Normal	*4238*		
Ch 39 Alarm	*4139*		
Ch 39 Normal	*4239*		
Ch 40 Alarm	*4140*		
Ch 40 Normal	*4240*		
Ch 41 Alarm	*4141*		
Ch 41 Normal	*4241*		
Ch 42 Alarm	*4142*		
Ch 42 Normal	*4242*		
Ch 43 Alarm	*4143*		
Ch 43 Normal	*4243*		
Ch 44 Alarm	*4144*		
Ch 44 Normal	*4244*		
Ch 45 Alarm	*4145*		
Ch 45 Normal	*4245*		

Total estimated recorded message length in seconds, this page ____________

Worksheet C Message Planning & Recording *(Page 8 of 11)*

Remote Channel Message Designation	Program Code	Message Content	Approx. Length
Ch 46 Alarm	*4146*		
Ch 46 Normal	*4246*		
Ch 47 Alarm	*4147*		
Ch 47 Normal	*4247*		
Ch 48 Alarm	*4148*		
Ch 48 Normal	*4248*		
Ch 49 Alarm	*4149*		
Ch 49 Normal	*4249*		
Ch 50 Alarm	*4150*		
Ch 50 Normal	*4250*		
Ch 51 Alarm	*4151*		
Ch 51 Normal	*4251*		
Ch 52 Alarm	*4152*		
Ch 52 Normal	*4252*		
Ch 53 Alarm	*4153*		
Ch 53 Normal	*4253*		
Ch 54 Alarm	*4154*		
Ch 54 Normal	*4254*		
Ch 55 Alarm	*4155*		
Ch 55 Normal	*4255*		
Ch 56 Alarm	*4156*		
Ch 56 Normal	*4256*		
Ch 57 Alarm	*4157*		
Ch 57 Normal	*4257*		
Ch 58 Alarm	*4158*		
Ch 58 Normal	*4258*		

Total estimated recorded message length in seconds, this page ___________

Worksheet C Message Planning & Recording *(Page 9 of 11)*

Remote Channel Message Designation	Program Code	Message Content	Approx. Length
Ch 59 Alarm	***4159***		
Ch 59 Normal	***4259***		
Ch 60 Alarm	***4160***		
Ch 60 Normal	***4260***		
Ch 61 Alarm	***4161***		
Ch 61 Normal	***4261***		
Ch 62 Alarm	***4162***		
Ch 62 Normal	***4262***		
Ch 63 Alarm	***4163***		
Ch 63 Normal	***4263***		
Ch 64 Alarm	***4164***		
Ch 64 Normal	***4264***		
Ch 65 Alarm	***4165***		
Ch 65 Normal	***4265***		
Ch 66 Alarm	***4166***		
Ch 66 Normal	***4266***		
Ch 67 Alarm	***4167***		
Ch 67 Normal	***4267***		
Ch 68 Alarm	***4168***		
Ch 68 Normal	***4268***		
Ch 69 Alarm	***4169***		
Ch 69 Normal	***4269***		
Ch 70 Alarm	***4170***		
Ch 70 Normal	***4270***		
Ch 71 Alarm	***4171***		
Ch 71 Normal	***4271***		

Total estimated recorded message length in seconds, this page ____________

Worksheet C Message Planning & Recording *(Page 10 of 11)*

Remote Channel Message Designation	Program Code	Message Content	Approx. Length
Ch 72 Alarm	*4172*		
Ch 72 Normal	*4272*		
Ch 73 Alarm	*4173*		
Ch 73 Normal	*4273*		
Ch 74 Alarm	*4174*		
Ch 74 Normal	*4274*		
Ch 75 Alarm	*4175*		
Ch 75 Normal	*4275*		
Ch 76 Alarm	*4176*		
Ch 76 Normal	*4276*		
Ch 77 Alarm	*4177*		
Ch 77 Normal	*4277*		
Ch 78 Alarm	*4178*		
Ch 78 Normal	*4278*		
Ch 79 Alarm	*4179*		
Ch 79 Normal	*4279*		
Ch 80 Alarm	*4180*		
Ch 80 Normal	*4280*		
Ch 81 Alarm	*4181*		
Ch 81 Normal	*4281*		
Ch 82 Alarm	*4182*		
Ch 82 Normal	*4282*		
Ch 83 Alarm	*4183*		
Ch 83 Normal	*4283*		
Ch 84 Alarm	*4184*		
Ch 84 Normal	*4284*		

Total estimated recorded message length in seconds, this page ____________

Worksheet C Message Planning & Recording *(Page 11 of 11)*

Remote Channel Message Designation	Program Code	Message Content	Approx. Length
Ch 85 Alarm	*4185*		
Ch 85 Normal	*4285*		
Ch 86Alarm	*4186*		
Ch 86 Normal	*4286*		
Ch 87 Alarm	*4187*		
Ch 87 Normal	*4287*		
Ch 88 Alarm	*4188*		
Ch 88 Normal	*4288*		
Ch 89 Alarm	*4189*		
Ch 89 Normal	*4289*		
Ch 90 Alarm	*4190*		
Ch 90 Normal	*4290*		
Ch 91 Alarm	*4191*		
Ch 91 Normal	*4291*		
Ch 92 Alarm	*4192*		
Ch 92 Normal	*4292*		
Ch 93 Alarm	*4193*		
Ch 93 Normal	*4293*		
Ch 94 Alarm	*4194*		
Ch 94 Normal	*4294*		
Ch 95 Alarm	*4195*		
Ch 95 Normal	*4295*		
Ch 96 Alarm	*4196*		
Ch 96 Normal	*4296*		

Total estimated recorded message length in seconds, this page ____________

See next page to complete calculations

Worksheet C Message Planning & Recording Calculations:

Total estimated recorded message length in seconds, page 11 of 11 ________
Total estimated recorded message length in seconds, page 10 of 11 ________
Total estimated recorded message length in seconds, page 9 of 11 ________
Total estimated recorded message length in seconds, page 8 of 11 ________
Total estimated recorded message length in seconds, page 7 of 11 ________
Total estimated recorded message length in seconds, page 6 of 11 ________
Total estimated recorded message length in seconds, page 5 of 11 ________
Total estimated recorded message length in seconds, page 4 of 11 ________
Total estimated recorded message length in seconds, page 3 of 11 ________
Total estimated recorded message length in seconds, page 2 of 11 ________
Total estimated recorded message length in seconds, page 1 of 11 ________

Total estimated recorded message length in seconds, **all** pages ___________
See Code 912 for alternate method of timing spoken messages.

Note:

For any channels that you have programmed for Status Report Only or for Run Time Metering, the message to be spoken on Open Circuit input is recorded with the Program Code ordinarily used for the Alarm Message; the message to be spoken on Closed Circuit input is recorded with the program code ordinarily used for the Normal Message.

K

Annunciator Sequences and Options

This appendix discusses Verbatim operations in the context of the *ANSI/ISA-S18.1 Annunciator Sequences and Specifications* standard. It also describes the options available for configuring the Verbatim to support a variety of sequence models. This information will be useful for users needing calling sequences different from the one discussed in Section 5.

Note that the ANSI specification uses slightly different terminology from that used here and elsewhere in this manual. Hopefully, this won't cause much confusion.

One concept central to this discussion is that of *channel state*. At any given time every armed channel is in one of the following 5 states: *normal, alarm, acknowledged alarm, return to normal (RTN), acknowledged RTN*. The precise meaning of these terms will be clarified later on.

The term *annunciator state* is used here to describe the actions and indications of the Verbatim . These include LED illumination,voice reporting and status logging.

An *annunciator sequence* consists of specifying how transitions between the channel states occur and how they impact the annunciator state. The Verbatim supports three distinct types of annunciator sequences. These are each discussed in the subsections below. The next several paragraphs discuss the properties they all share in common.

The normal, alarm and RTN states are determined by comparing the channel's value with the criteria settings. A transition into these states requires that the condition persist for a time period referred to as the *alarm trip delay*. This provides hysteresis, or debouncing between the real-world signals and the channel state.

The two acknowledged states are determined by operator actions. Unacknowledged alarms and RTNs transit to the acknowledged states by pressing keys on the front panel or entering DTMF tones over the phone.

The Verbatim gives visual indications for the state of each channel or group of channels. If normal, the LED is OFF. When alarmed, the LED is blinking. When acknowledged the LED is steady ON. The visual indications for the RTN states are sequence dependent, and described later.

Audible indications for the channel states are also given. These take the form of voice reports either from the speaker or over the phone. These reports may be requested at any time by pressing the CHECK STATUS key, or phoning the unit.

Whenever any channel is in the unacknowledged alarm or RTN state, the Verbatim will solicit acknowledgment by phoning personel. The calling sequence itself is determined by the alarm call grouping and alarm ready scheduling configuration.

All audible indications can be silenced by pressing the ARM/DISARM key on the front panel. This action will also always acknowledge all unacknowledged conditions. Also, all annunciator state transitions and actions are suspended whenever the box is in program mode. Channel state transitions will still occur.

The annunciator state may at any time be completely reset by pressing the ARM/DISARM key twice. This action will also reset the state of each channel.

In terms of *ANSI/ISA-S18.1*, there is one more property that all Verbatim annunciator sequences share: there is no support for the *first out* sequence designations (**F1, F2, F3**). Groups of alarms and RTNs are always registered, reported and reset without regard to which one tripped out first.

K.1 Standard Annunciator Sequence (Manual Reset)

This section describes the default annunciator sequence used by the Verbatim . It is a minor variant of the *ANSI/ISA-S18.1* designation **M-1** (Manual Reset with silence pushbutton). It may be configured by entering code **923 1** in program mode.

Operations in this sequence are detailed in Section 5. Briefly, channel states transit from normal to alarm when criteria violations persist for the trip delay. The alarm state is then locked in until acknowledgment is made. The transition from acknowledged back to normal happens upon manual reset or expiration of the alarm reset timer. The RTN states are omitted from the sequence.

The annunciator states include only those visual and audible indications described above. Also, the annunciator sequence follows the transitions described there too.

This sequence differs from the vanilla **M-1** designation in two ways. The first involves the operation of the automatic reset timer. The true **M-1** sequence is obtained by turning the alarm reset timers off (code **922**). The second distinction involves configurations where no phone numbers are programmed. Here the transition from alarm to acknowledged happens automatically and immediately. There are never any audible or visual indications of the unacknowledged state. This sequence has ANSI designation **M-1-5-6**.

K.2 Clear On Return To Normal (Automatic Reset)

This section describes annunciator sequence options that are variants of the ANSI designation **A-1** (automatic reset with silence pushbutton). The main distinction of these from the **M-1** sequence is that the alarm state is automatically reset when the channel enters the RTN state. The Verbatim sequences in this category differ amongst themselves mainly in when this RTN transition is allowed to occur.

The basic **A-1** sequence is obtained by executing code **923 3**. Channel states transit from normal to alarm when criteria violations persist for the trip delay. The alarm state is then locked in until acknowledgment is made. If no phone numbers are configured, then this transition happens automatically and immediately (**A-1-5-6**). Otherwise, operator action is required. The transition from acknowledged back to normal happens via manual reset or expiration of the alarm reset timer. It also happens whenever the criteria violation for an acknowledged alarm returns to normal.

Designation **A-1-4** is obtained by code **923 2**. This sequence differs from **A-1** only in that the unacknowledged alarms are not locked in. All visual and audible indications are automatically reset whenever the criteria violations return to normal for the trip delay period.

A minor variant of **A-1-4** is obtained by code **923 4**. Here, the indications for an acknowledged alarm will not be reset until it has been reported once, regardless of RTN status. Unacknowledged alarms will be reset completely without any lock-in whatsoever.

The implementation of these A-designates involves one wrinkle. The check for RTN condition is not performed continuously, but rather only at specific times. Hence, changes that happen in the midst of a report may not be reflected in the annunciator state until some time later.

K.3 Report Return To Normal (Ringback)

This section describes the annunciator sequence option that provides explicit indications of RTN conditions. This is a variant of the **R-1-8** designation (ringback with silence pushbutton and common ringback audible). There are two differences between **R** and **M** or **A** designations. First is that the RTN state can be entered only from the acknowledged alarm state. **M** has no notion of RTN at all, and **A** allows the transition at any time. Second is that **R** locks in RTN states until acknowledged, whereas **A** immediately resets.

A variant of the **R-1-8** sequence is obtained by executing code **981 1**. Channel states transit from normal to alarm when criteria violations persist for the trip delay. The alarm state is then locked in until acknowledgment is made. If no phone numbers are configured, then this transition happens automatically and immediately (**R-1-5-6**). Otherwise, operator action is required.

The transition from acknowledged alarm to unacknowledged RTN is made whenever the criteria violation goes away for the trip delay period. The RTN state is then locked in until acknowledged. RTN acknowledgment is made in the same fashion as alarm acknowledgments. The channel states are reset either manually or by expiration of the reset timer. The reset timer begins running when the original alarm condition is acknowledged. This means that if a sufficiently long interval exists between acknowledgment of the alarm and the RTN, then the reset will happen immediately.

The main differences between this variant and the standard **R-1-8** sequence are as follows. First, there is no registration of momentary alarms once the RTN state is entered. Once the RTN state is acknowledged, no further calls will be triggered until the channel is reset. This is to say transitions in the channel state may continue, but will not be reflected in the annunciator state. Still, all reports will reflect the current state of the channels. Second, there is no visual indication for the RTN states. The LEDs will continue to reflect the acknowledged alarm status. Third, the silence pushbutton stops all flashing LED indications. Fourth, there is the automatic reset timer.

Unlike the implementation for the **A** designations, RTN conditions are checked continuously for all channels. So long as any unacknowledged alarm or RTN condition exists, the Verbatim will be making calls. Alarm conditions have priority. Hence, if an alarm is one call group and an RTN is in another, no calls will be placed to the RTN group until the alarm is acknowledged.

If the trigger for a call is an RTN, then the report will explicitly mention this before reporting the status of all channels in the group. An RTN report mentions RTN conditions only. Any acknowledgment while in RTN calling state acknowledges RTN conditions only. In contrast, any operator acknowledgment during an alarm call will also acknowledge all RTNs. But, the alarm reports do mention all unacknowledged RTN conditions.

If a new alarm occurs on any channel while in the RTN calling state, a change from RTN to alarm calling will occur as soon as possible. This can happen no sooner than the completion of any report in progress. Such reports may or may not include mention of the new condition depending on whether that channel has already been announced.

K.4 Annunciator Sequence Option Summary

The following paragraphs provide a concise summary of the available annunciator sequence options. The ANSI designator is given, along with the Verbatim configuration code, followed by a short functional description.

M-1: Manual Reset with Silence Pushbutton.
Code (923 1)

Alarm states are registered directly from configured criteria without regard for return to normal conditions. Alarm states are locked in and dialer will continue to call until acknowledged. Acknowledged alarms are reset via automatic timer. Total dialer reset andsilence via arm/disarm key.

M-1-5-6: Manual Reset with Silence Pushbutton, No Flashing, and No Audible.
Code (923 1) - with no phone numbers programmed

Same as **M-1**, except the alarm state is immediately converted to acknowledged state.

A-1: Automatic Reset with Silence Pushbutton.
Code (923 3)

Same as **M-1** except the acknowledged alarm state will be cleared if the channel returns to normal. The check for this transition occurs only when all alarms have been acknowledged.

A-1-5-6: Automatic Reset with Silence Pushbutton, No Flashing, and No Audible.
Code (923 3) - with no phone numbers programmed.

Same as **A-1**, except the alarm state is immediately converted to the acknowledged state.

A-1-4: Automatic Reset with Silence Pushbutton and No Lock-in.
Code (923 2)

Same as **M-1** except BOTH the acknowledged and unacknowledged alarm states will be cleared if the channel returns to normal. The check for this transition occurs only in between alarm calls.

A-1-4 variant: Automatic Reset with Silence Pushbutton, No Lock-in, and Single Acknowledge Report.
Code (923 4)

Same as **A-1-4** except the clearing for the acknowledged alarm can't happen until after a single report has been made.

R-1-8: Ringback with Silence Pushbutton and Common Ringback Audible. *Code (981 1)*

Alarm and Return to normal states are registered from criteria and locked-in. Dialer will continue to call until all alarm and RTN states are acknowledged. Acknowledged alarms and RTNS are reset via automatic timer. Total dialer reset and silence via arm/disarm key.

R-1-5-6: Ringback with Silence Pushbutton, No Flashing, and No Audible. *Code (981 1) - with no phone numbers programmed.*

Same as **R-1-8** except all unacknowledged alarm and RTN states are immediately converted to the acknowledged state.

Glossary

ACCESS CODE See Security Access Code.

ACKNOWLEDGMENT The act of advising the Verbatim autodialer that its alarm message has been heard. This is done either by pressing a touch tone 9 at the prompting beep, or by calling the unit back after the alarm call has ended. Once acknowledged, further activity on that particular channel will not cause further dialing until the expiration of the Alarm Reset Time. See Section 5.1, "Placing Inquiry Calls to the Verbatim autodialer," and Section 5.5, "Acknowledging the Alarm Call."

ALARM CALL GROUPING Special programming established to cause specific input channels to cause dialing of only selected phone numbers. Used to provide separate alarm functions according to category of personnel, such as maintenance, security, plumbing, etc. See Section 6.1, "Program Codes."

ALARM CONDITION For contact input channels, the Alarm Condition is the Open or Closed circuit condition opposite to that which was established as the Normal Condition for that channel. For example, for a channel programmed as Normally Open, the Alarm Condition would be Closed Circuit. Also see Violation. See Sections 3.3, "Programming Input Channels" and 5.3, "Receiving Alarm Calls."

ALARM CRITERIA The chosen determination of what will constitute an alarm condition (violation) for a given channel. See Normally Closed.

ALARM READY SCHEDULING A program setting which causes the Verbatim autodialer automatically disarm for certain time periods. This function prevents the product from sending alarm telephone calls during periods when personnel are stationed at the site and are able to deal with the problem directly.

ALARM RESET TIME The period of time, beginning at the moment an alarm is acknowledged, during which alarm dialing on behalf of that specific channel is suspended regardless of further activity of its input circuit. At the end of this period, the Acknowledged Alarm status is cleared for that channel. See Section 5.6, "Alarm Reset Timeout After Acknowledgment" and Section 6, "Advanced Programming."

ALARM TRIP DELAY The time required for an input violation to remain in violation before the unit trips into the Unacknowledged Alarm state. See Section 6, "Advanced Programming."

ANALOG Analog signals have variable values of current or voltage, with the specific value generally representing some physical parameter such as water level or pressure. The most common type of analog signal is a 4-20 milliampere current loop, with a transmitter (transducer and associated power supply) governing the current in a loop. This current is detected by one or more receiving devices in the loop, such as an optional analog input channel on a Verbatim autodialer.

AUTOCALL A special test calling function. When Autocall is turned on, the unit places test calls at regular intervals to provide ongoing assurance of Verbatim autodialer and phone line operation. See Section 6, "Advanced Programming."

AUTODIALER A device which constantly monitors a set of inputs from various external sensors, and places outgoing alarm calls when there is an alarm condition. It also allows inquiry calls.

AUTOEXTEND A unique feature on the Verbatim autodialer which automatically extends the available message recording time as required, selecting the optimum speech memory rate for the user's voice message recording. See Section 4.2.1, "Verifying/Extending Recording Time."

CALL BACK See Call Forward.

CALL FORWARD The unit may be commanded from the panel or over the phone, to place a call to a specific phone number. This is called Call Forwarding. If the number called is that of the person commanding the call from a remote telephone, then it is termed Call Back. This is typically done for test purposes. See Section 5.8, "Dialing Out and Conversing Through the Verbatim autodialer," and Section 6, "Advanced Programming."

CALL OUT The action of the Verbatim autodialer placing calls to outside personnel or facilities.

CDL (Central Data Logger) The combination of a modem, a serial interfaced printer and a special Raco-built interface box is called a Central Data Logger (CDL). A Raco autodialer/RTU may be configured to call and log data to the CDL printer. CDL RTUs first call the CDL printer to log alarm and status information then proceed on to calling personnel by voice.

CLOSED CIRCUIT CONDITION One of two possible states of a contact closure input circuit. Closed Circuit is the condition in which the contacts complete the electrical circuit connection. Open Circuit is the opposite condition, in which the contacts do not complete the electrical circuit connection. The Open Circuit condition is electrically equivalent to having no connection to the input circuit. A Closed Circuit input will measure zero volts DC from the input connection to the common connection point. An Open Circuit input will measure 5 volts DC. The Open or Closed Circuit status may also be read without a voltmeter, by use of Program Code 0 ZZ 0, where ZZ is the 2-digit channel number. See Section 3.3, "Programming Input Channels" and 5.3, "Receiving Alarm Calls".

COMMON The combined electrical return connection point for all contact closure inputs. One side of all contact inputs are connected to Common. Physically, this Common connection point is any of the 4 terminals marked C on terminal strip TS1. The circuit board internally connects Common to the AC ground (GREEN) terminal on terminal strip TS3. See Section 2, "Installation."

DEFAULT Programming values which are built into the unit and remain in effect until the user alters them. Also, permanently available speech messages which are utilized when the user has not recorded his own messages.

DELAY BETWEEN DIGITS In some applications, an extra waiting time is needed between dialed digits. For example in some PBX systems, a 9 must be dialed, followed by a waiting time of several seconds before the main phone number may be dialed. See Section 3.2, "Programming Phone Numbers," Appendix F, "MODBUS Interface," and Section 6, "Advanced Programming."

DESIGNATION NUMBER The two-digit "order number" of a phone number in the overall set of phone numbers programmed. For example, the designation number for the third phone number is 03. See Programming Worksheet A. See Section 3.2, "Programming Phone Numbers," 6.1, "Program Codes," and 6.2, "Programming Operations."

DIALER See autodialer.

DRY Description of a sensor contact circuit that is not connected to any power source.

EXIT DELAY A delay period after a user arms the unit, before the unit will actually accept new alarms. Used to allow user to exit a protected entrance without tripping the unit into alarm. See Section 6, "Advanced Programming."

GLOBAL Essentially "over all" or "universal". Programming that simultaneously sets the same value for all channels, but excluding the Power Failure Alarm function.

GROUPING See Alarm Call Grouping.

ID MESSAGE See Station ID Message.

INQUIRY CALL A call placed by personnel to the Verbatim autodialer. See Section 5.1, "Placing Inquiry Calls to the Verbatim autodialer."

LED A lighted legend indicator on the front panel.

LINK See Alarm Call Grouping.

MEMORY USE RATE See Speech Memory Rate.

MODEM A device which allows digital data (as opposed to voice) to be transmitted between two sites, usually via public telephone lines. In the case of a Verbatim autodialer equipped with the CDL or SCADA option, a modem is built into the option card so that no external modem is required.

NETWORK The physical and higher level protocols for a specific vendor's PLC data communications. The Verbatim can support a maximum of 3 networks simultaneously. The actual number of networks and type of protocol are hardware options.

NETWORK ADDRESS The concatenation of the network ID, node, and PLC address. It is sometimes symbolized by '/net/node/addr' where net is the network ID, node is the node address, and addr is the PLC address. The network address suffices to uniquely identify any data object which the Verbatim can access.

NETWORK ID A voice message identifying a specific network. By default, the message is "Verbatim Net X", where 'X' is a number from 0 to 5. Custom messages, such as "Building 320 LAN" may be recorded. See 'NETWORK' entries below for more details.

NETWORK 0 Refers to the discrete, analog, and RSC points internal to the VSS.

NETWORK 1 Refers to devices connected to the 'NET1' port on the serial communications card. Protocols may vary.

NETWORK 2 Refers to devices connected to the 'NET2' port on the serial communications card. Protocols may vary.

NETWORK 3 Refers to devices connected to the MBPLUS port on the MBPLUS communications coprocessing card.

NETWORK 4 Refers to devices connected to the Parallel port.

NETWORK 5 Refers to devices connected to the Modem port on the serial communications card.

NODE The address of a specific PLC on the network. Each PLC is already configured with a unique integer as its node address. The Verbatim must also be given a unique number as its node address on each network to which it interfaces. The network ID and node together suffice to uniquely identify any PLC.

NORMAL CONDITION For contact closure inputs, the Normal Condition is that condition (open or Closed Circuit) which normally exists. The opposite condition would create an alarm. See Section 3.3, "Programming Input Channels" and 5.3, "Receiving Alarm Calls."

NORMALLY CLOSED Describes a monitored "contact type" input signal circuit, for which the normal, non-alarm state is associated with the circuit being closed (i.e. a completed connection being established between the two conductors of the input circuit). An alarm condition causes the circuit to be opened (broken), which the Verbatim autodialer would detect and begin placing alarm calls. This requires that this input be programmed as Normally Closed on the Verbatim autodialer.

NORMALLY OPEN Opposite of a Normally Closed circuit. The input signal is open in the normal, non-alarm state and closes when an alarm occurs. This requires that this input be programmed as Normally Open on the Verbatim autodialer, which is the default setting for a contact type input.

NON-VOLATILE MEMORY When AC power fails, the unit continues to operate for several hours on its internal Gel Cell battery. When this battery is near discharge, the unit automatically turns itself off. However all the user's programming and all user recorded messages are kept intact by Non-volatile Memory for up to ten years, so when power is later restored, no reprogramming or message recording will be required.

OPEN CIRCUIT CONDITION See Closed Circuit Condition.

PHYSICAL CHANNEL OR PC Internal inputs are sometimes call Physical Channels (PCs). PCs monitor user-supplied external sensors such as float switches, limit switches, etc. In most cases, the outputs of logic controllers may be connected directly to Physical Channel inputs without the need for interfacing relays or other signal conditioning. The normal Verbatim inputs, as distinguished from the RCs when necessary. The semantics are such that all RCs on network 0 are PCs.

PLC ADDRESS The data table location of an object within a specific PLC's internal memory. The format of the PLC address is vendor dependent. For network 0, the PLC address is the physical channel number.

POWER FAILURE The disappearance of 120 VAC power to the unit. The unit will continue to operate under power failure until its internal Gel Cell battery is discharged.

PULSE TOTALIZER The totalizer function accumulates a continuing count of the number of cycles of a train of pulses presented to the input. The pulses may be in the form of an open and closed circuit, or they may be in the form of a 5-volt logic signal.

RECORDING RATE In the process of digitally recording the user's voice messages into speech memory, the message is recorded into memory at one of four possible rates. The faster this rate of memory usage, the higher the recording fidelity. However, this results in less total available recording time than at slower rates. Rate 1 is the fastest rate giving the best sound quality. The Autoextend feature automatically selects the optimum rate to allow adequate recording time for the user's own set of messages at the best possible sound fidelity. See Section 4.2.1, "Verifying/Extending Recording Time," and Section 4.3, "Record Your Messages."

REMOTE CHANNEL OR RC A Verbatim I/O point whose value mirrors the value at some network address. Each active RC is associated with one and only one network address. The RC number can be viewed both as a 'speed dial' abbreviation for the lengthy network address and as a 'virtual' I/O point that supports alarm criteria. Different RCs can refer to the same network address. All data objects referenced by any RC are either 1 or 16 bits in length. 1-bit objects are termed "discrete" or "digital" points. 16-bit objects are sometimes termed "analog" points even though the data may actually be a discrete counter or timer. The type of object is implicit in the RC's network address. This is to say, any RC can be either discrete or analog.

Analog RCs are NEVER scaled to engineering units within the Verbatim Gateway. They can only have decimal integer values in the range 0 to 65535. Any desired must be done within the PLCs program. Floating point, hexadecimal, and octal data formats are not supported.

REPEATS The number of times a series of messages (including Station ID message) is spoken when an alarm call is placed. As used here, this number includes the first recital of the messages. For example, 3 repeats means 3 times total, not 4. See Section 5.3, "Receiving Alarm Calls" and Section 6.1, "Program Codes."

RING ANSWER DELAY The number of rings required before the Verbatim autodialer will answer an inquiry call. See Section 5.3, "Receiving Alarm Calls," and 6.1, "Program Codes."

RTU (Remote Telemetry Unit) A monitoring device, interfaced to a communications medium, whose mission is to communicate conditions at a remote or inaccessible site. RTUs are usually polled by a central computer on some schedule or interval. Additionally, RTUs may request polling to report any exceptions such as alarms or other events which require the attention of the central computer or its operators. When a Raco Verbatim autodialer is configured with the asynchronous communications module it is known as an RTU. The Verbatim RTU does not loose any of the basic features of the Verbatim autodialer. In addition, the Verbatim RTU is capable of receiving polling calls from the Raco SCADA Central Computer. Furthermore, alarms may be communicated to the Raco SCADA Central Computer or to a Raco Central Data Logger (CDL) printer.

RUN TIME METER A feature which, when turned on, accumulates the total number of hours that an input channel is in the Closed Circuit condition. Typically used to monitor equipment operation time, particularly alternating pump systems. See Section 3.3, “Programming Input Channels,” and Section 6, “Advanced Programming.”

SCALE FACTOR A translation factor which may optionally be entered in conjunction with the Pulse Totalizer function. The spoken Totalizer reading will be the actual number of pulses accumulated, divided the programmed scale factor. See Section 6, “Advanced Programming.”

SECURITY ACCESS CODE A code optionally programmed by the user at the front panel. Once programmed, this code is required in order to perform any program operations over the phone. See Section 5.7, “Programming by Phone,” and Section 6, “Advanced Programming.”

SPEECH MEMORY RATE See Recording Rate.

STATION ID MESSAGE A message which is always included in all phone calls to or from the unit, intended to identify the unit. The default Station ID Message is “ID number is 1”. See Section 4.1, “Planning Messages” and 4.3, “Record Your Messages.”

TIME BETWEEN ALARM CALLS With the unit in Unacknowledged Alarm status, the waiting time from the time the unit terminates a given alarm call, until the time when the unit again accesses the phone line to place the next call. During this interval (default 2 minutes), personnel may call the unit back, which will acknowledge the alarm and suspend further calling. See Section 5.4, “Continued Dialing in the Absence of Acknowledgment,” and Section 6, “Advanced Programming.”

VIOLATION For contact closure inputs, a violation (also called Alarm Condition) is the Open or Closed Circuit condition which is opposite the condition which has been programmed as Normal for that channel. For example, if a given input channel is programmed for Normally Open operation, then a Closed Circuit is a violation for that input. If the violation persists for the Alarm Trip Delay time, the unit will go into Unacknowledged Alarm state and begin placing alarm calls. See Section 3.3, “Programming Input Channels, ” 5.3, “Receiving Alarm Calls,” and 5.6, “Alarm Rest Timeout After Acknowledgment.”

Index

FCC Notice to Users

1. You must notify your telephone utility as follows:
    - a. Intention to install an FCC Part 68-registered device.
    - b. The FCC registration number: HKS-23J06304-AL-R
    - c. The ringer equivalence number: 0.3A
    - d. When the device is disconnected from the telco network and will not be reconnected.
2. These units may not be used on party lines.
3. The telco has the right to make changes in their network which may affect the operation of your unit, provided adequate notice is given to you in advance to permit continued correct operation.
4. In the event of operational problems, disconnect your unit by removing the modular plug from the modular telephone jack. To test the phone line, temporarily plug a working rotary-dial telephone into the jack normally used by the Verbatim. If the substitute telephone works correctly, your Verbatim has a problem and should be returned for repairs (in or out of warranty). If the substitute telephone does not work correctly, notify the telco that they have a problem and request prompt repair service (at no cost to the user).
5. The user may not under any circumstances (in or out of warranty) attempt any service or repairs on the Verbatim. It must be returned to RACO for all repairs.

Tyree Organization, Limited
Latham, NY

BOREHOLE LOG

BORING NAME PZ-1A

CLIENT: NYS DEC
PROJECT: Mr. C's
LOCATION: 586 Main St., East Aurora, NY

DATE STARTED/COMPLETED: 11/5/01-11/5/01
LOGGED BY: D. Perriccio
DRILLER: Nothnagle Drillers
RIG: CME 75

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
0	11,5,3,1	0.0	70%	▨	Asphalt/ m Gravel, f Sand and Silt
2	7,6,5,1	0.0	20%	▨	vf-f sand and silt, trace of clay, dry
4	2,3,3,2	0.0	50%	▨	vf sand brown and silt brown trace of clay gray, trace of gravel, dry
6	3,3,3,4	0.0	60%	▨	vf sand brown and silt brown, trace f gravel gray, moist
8	2,8,9,9	0.0	30%	▨	f-m sand brown, some silt brown trace f gravel gray moist
10	3,7,4,4	0.0	100%	▨	f-m sand brown, trace silt brown trace fine gravel moist
12	5,3,3,4	0.0	100%	▨	f-m sand brown, trace silt brown, wet
14	3,3,8,8	0.0	100%	▨ ☷	f-m sand brown, trace silt brown, wet
16	3,3,4,5	0.0	70%	☷ ⁘	f-m sand brown, wet
18	1,2,5,9	0.0	60%	⁘	f-m sand brown, trace silt brown, wet
20	3,5,2,6	0.0	60%	⁘	f-m sand brown, wet
22	6,7,12,15	0.0	50%	⁘	f-m sand brown some medium gravel trace silt brown wet
24	6,12,12,13	0.0	70%	⁘	f-m sand brown and f-m gravel trace silt gray wet
26	5,12,15,13	0.0	70%	⁘	f-m sand brown, some f-m gravel, wet
28	6,7,11,15	0.0	40%	⁘	f-m sand brown, trace f-m gravel, wet
30					
32					
34					

Notes: ppm=parts per million, nd=not detected

WELL CONSTRUCTION DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 Bags
Interval: 30'-17'

GROUT / SEAL

Type: Bentonite/Grout
Volume Used: Bucket/ 4 Bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

▨ Grout
☷ Bentonite
⁘ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Tyree Organization, Limited
Latham, NY

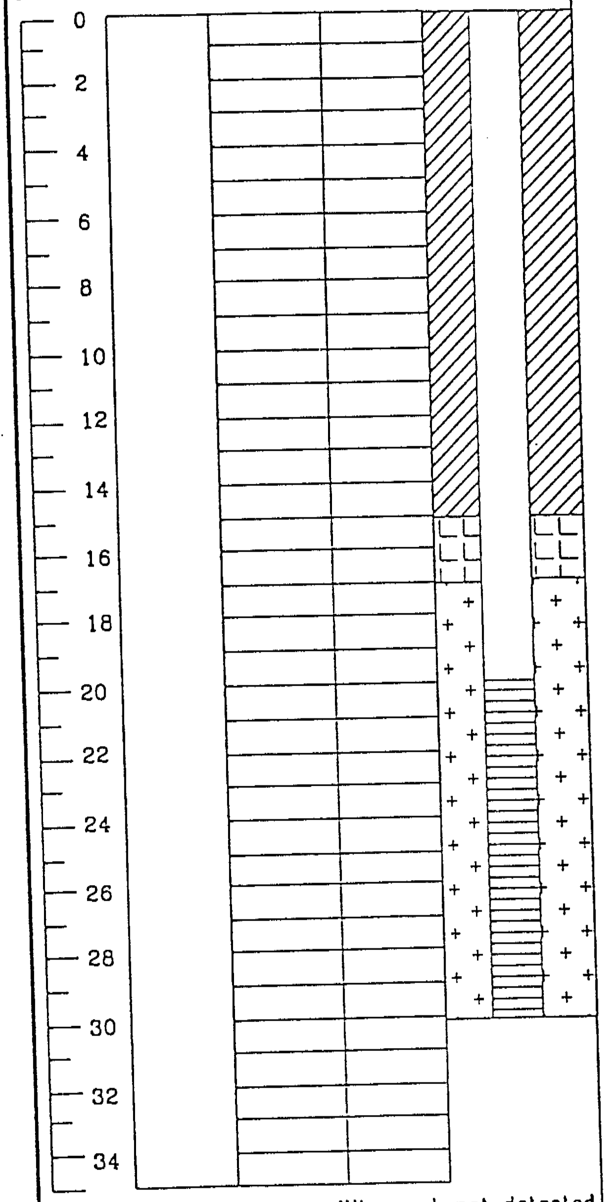
WELL CONSTRUCTION DETAIL

BORING NAME PZ-1B

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-1B
Date Completed: 11/5/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:
▨ Grout
▦ Bentonite
+ + Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

2

Tyree Organization, Limited
Latham, NY

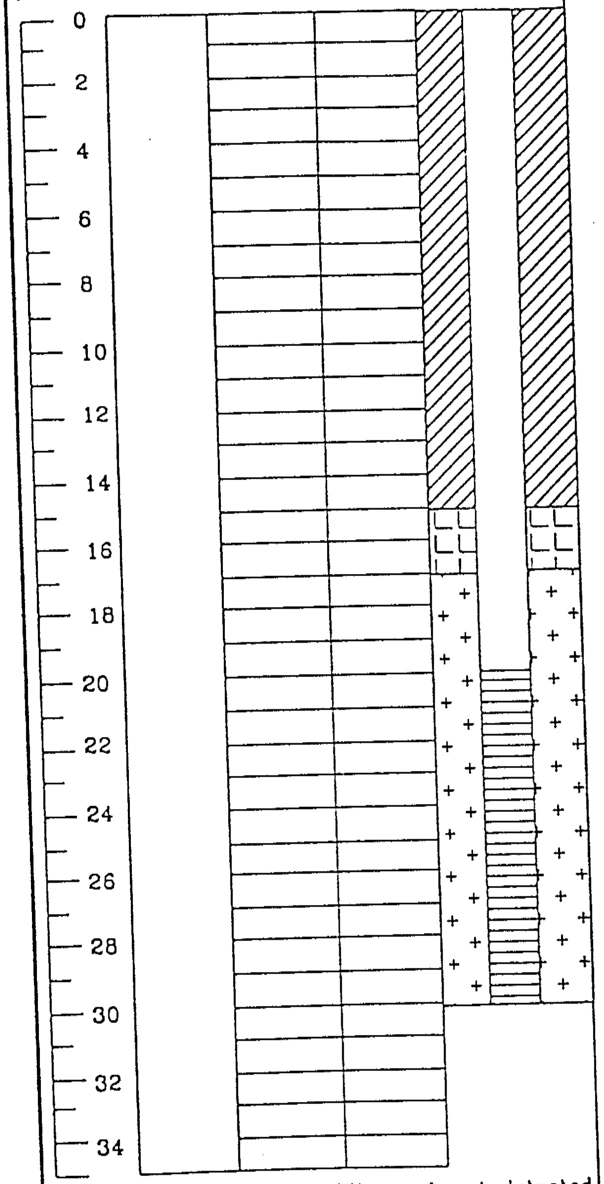
WELL CONSTRUCTION DETAIL

BORING NAME PZ-1C

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-1C
Date Completed: 11/5/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:

▨	Grout
▦	Bentonite
+ +	Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

3

Tyree Organization, Limited
Latham, NY

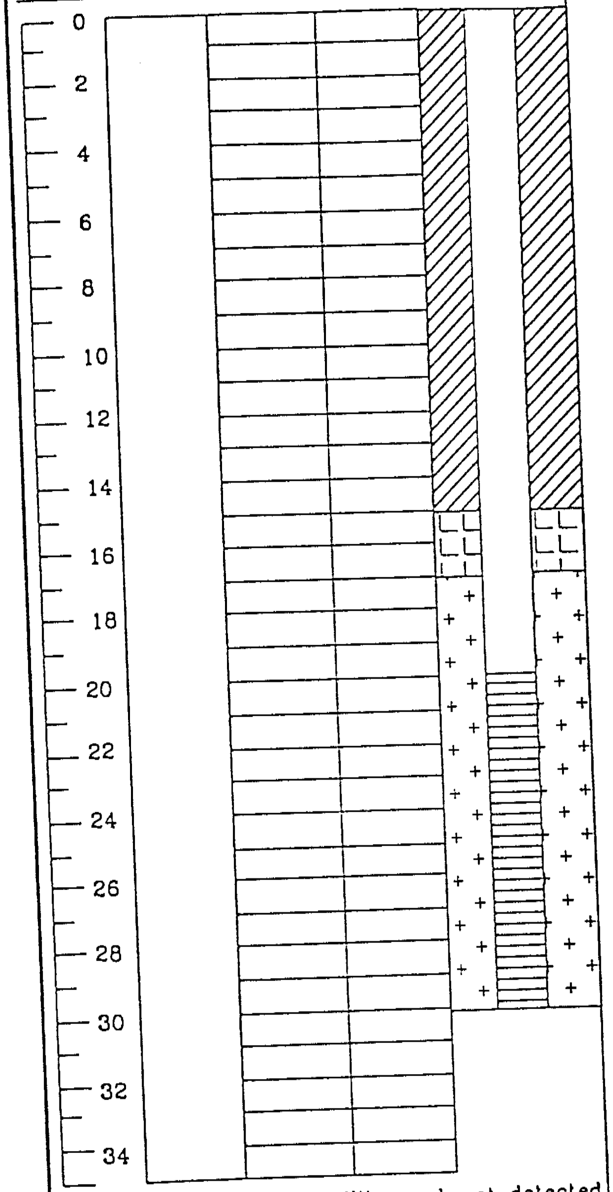
WELL CONSTRUCTION DETAIL

BORING NAME
PZ-1D

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-1D
Date Completed: 11/6/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

LEGEND

Drawn by: D. Pachan
Key:
▨ Grout
田 Bentonite
+ + Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

▽ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

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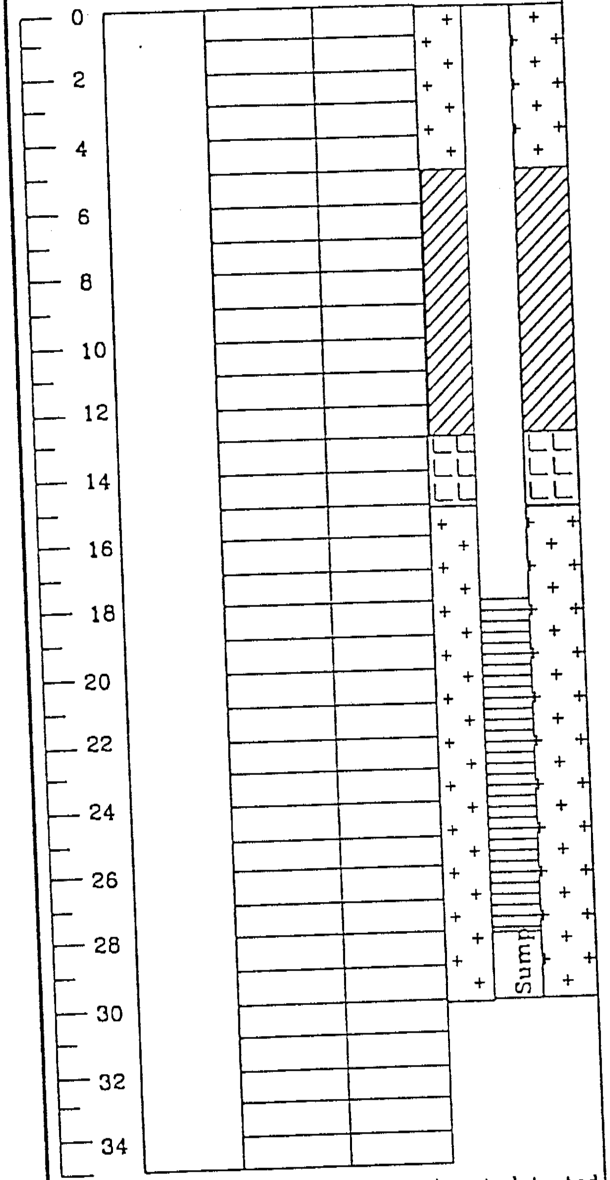
Latham, NY

WELL CONSTRUCTION DETAIL

BORING NAME
PW-2

PROJECT NAME: NYS DEC
SITE: MR. C's
ADDRESS: 586 Main St., East Aurora, NY
PROJECT #: 017301
WELL #: PW-2
DATE COMPLETED: 11/6/01
SUPERVISED BY: D. PERRUCCIO

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 6.25"
Depth: 30'

WELL DATA

Riser Type: Stainless Steel
Riser Dia.: 4"
Riser Length: 18'
Interval: 18'-0'

Screen Type: Stainless Steel
Screen Dia.: 4"
Screen Length: 10'
Slot: 0.010
Interval: 28'-18'

FILTER PACK

Source: Sand
Composition:
Volume Used: 7 bags
Interval: 30'-15'

GROUT / SEAL

Type: Bent/ Grout/Sand
Volume Used: 1.5 bucket/3 bags/2bag
Interval: 15'-13'/13'-5'/5'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

LEGEND

Drawn by: D. Pachan
Key:
▨ Grout
▦ Bentonite
⁘ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

5

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Latham, NY

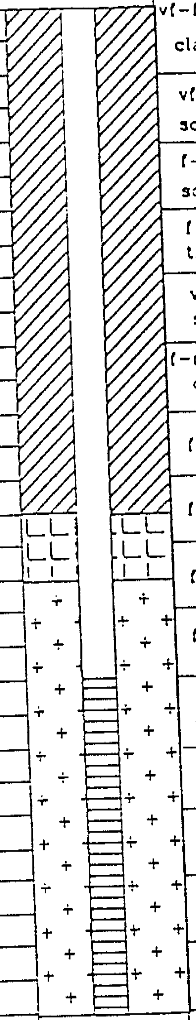
BOREHOLE LOG

BORING NAME
PZ-2A

CLIENT: NYS DEC
PROJECT: MR. C's
LOCATION: 586 Main St. East Aurora, NY

DATE STARTED/COMPLETED: 11/2/01-11/2/01
LOGGED BY: D. Perruccio
DRILLER: Nothnagle Drilling
RIG: CME 75

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
0	10,10,4,5	0.2	60%		vf-f sand brown/ some silt brown, trace clay, trace f-m gravel brown/ dry
2	4,4,7,8	0.0	50%		vf-f sand brown/ some silt brown/ some clay brown/ moist
4	4,5,8,9	0.0	50%		f-m sand brown/ some clay brown/ some f-m gravel brown/ moist
6	4,3,5,5	0.0	50%		f sand brown/ and silt brown/ trace clay brown/ moist
8	4,2,3,4	0.0	60%		vf-f sand brown and silt brown/ some clay brown/ moist
10	4,8,11,13	0.0	50%		f-m sand brown/ some silt brown/ trace clay brown/ trace gravel gray/ moist
12	2,3,4,4	0.0	70%		f-m sand brown, wet
14	1,3,4,6	0.0	90%		f-m sand brown, wet
16	3,5,7,7	0.0	80%		f-m sand brown, wet
18	1,1,3,6	0.0	80%		f-m sand brown, wet
20	1,2,4,5	0.0	80%		f-m sand brown, wet
22	5,5,7,8	0.0	70%		f-m sand brown/ trace silt brown, wet
24	1,2,5,7	0.0	85%		f-m sand brown, wet
26	1,2,3,8	0.0	60%		f-m sand brown/ trace silt brown, wet
28	2,3,4,5	0.0	100%		f-m sand brown, wet
30					
32					
34					



Notes: ppm=parts per million, nd=not detected

WELL CONSTRUCTION DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/ Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

Key:

LEGEND

▨ Grout
▦ Bentonite
⁘ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

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Latham, NY

WELL CONSTRUCTION DETAIL

BORING NAME
PZ-2B

PROJECT NAME: NYS DEC

SITE: Mr. C's Dry Cleaners

Address: 586 Main St., East Aurora, NY

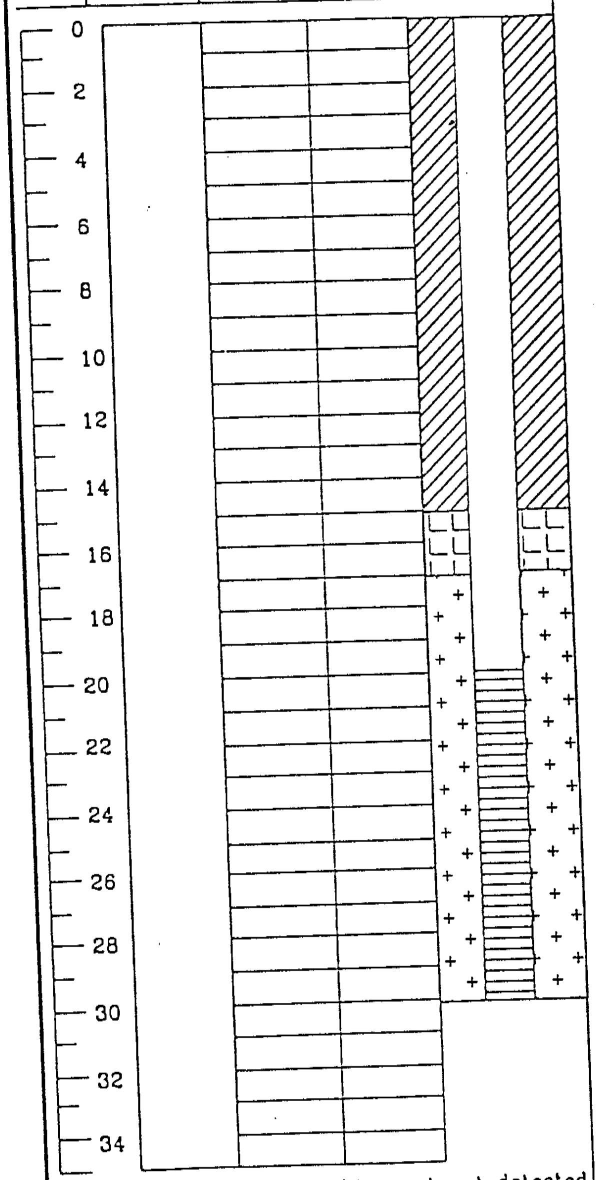
PROJECT #: 017301

WELL #: PZ-2B

Date Completed: 11/1/01

SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil



N/A

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

LEGEND

Drawn by: D. Pachan

Key:

▨ Grout
⊔ Bentonite
+ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

▽ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

7

Tyree Organization, Limited
Latham, NY

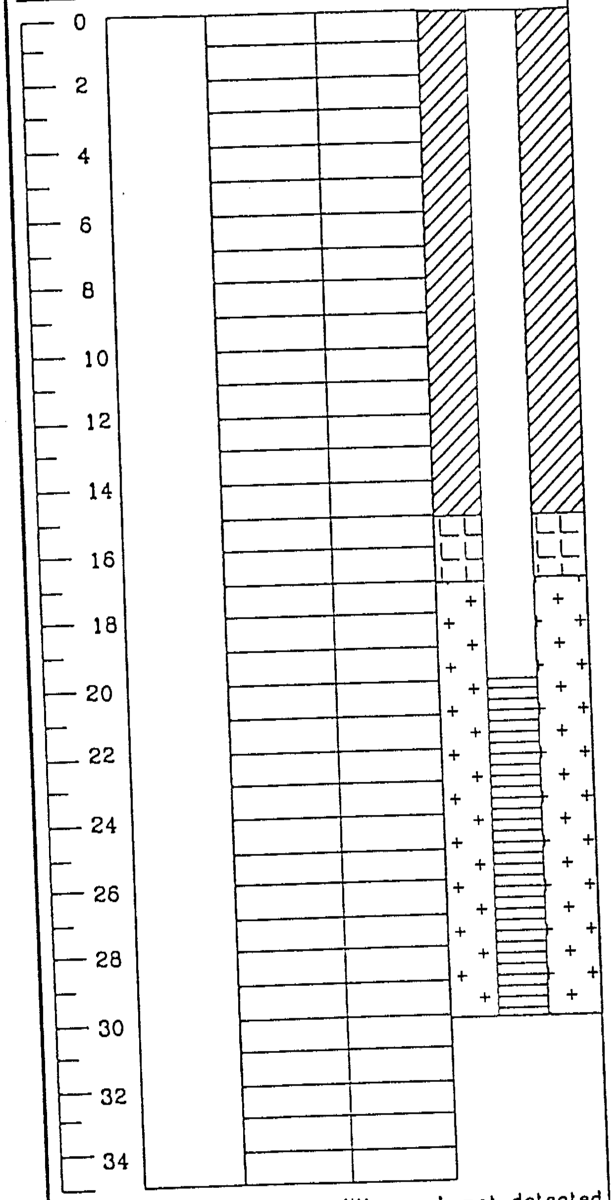
WELL CONSTRUCTION DETAIL

BORING NAME
PZ-2C

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-1C
Date Completed: 11/2/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil



N/A

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:

▨	Grout	trace=1-10%	very fine sand=0.6-0.13mm	∇ = ground water table
⊞	Bentonite	little=10-20%	fine sand=0.13-0.25mm	f-gravel=2-4mm
+ +	Sand	some=20-30%	medium sand=0.25-0.50mm	m-gravel=4-64mm
		and=30-50%	course sand=0.5-1mm	c-gravel=64-256mm
			very course sand=1-2mm	

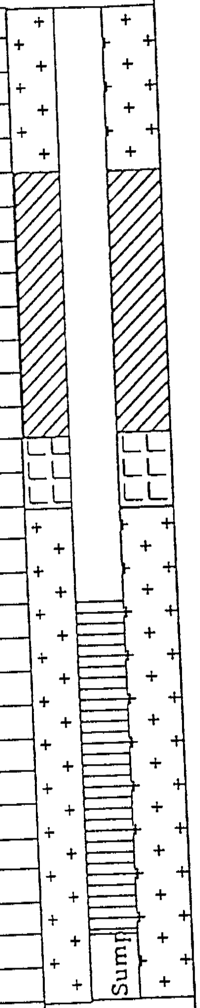
Tyree Organization, Limited
Latham, NY

WELL CONSTRUCTION DETAIL

BORING NAME PW-3

PROJECT NAME: NYS DEC
SITE: MR. C's
ADDRESS: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PW-3
DATE COMPLETED: 11/7/01
SUPERVISED BY: D. PERRUCCIO

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
0					
2					
4					N/A
6					
8					
10					
12					
14					
16					
18					
20					
22					
24					
26					
28					
30					
32					
34					

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 6.25"
Depth: 30'

WELL DATA

Riser Type: Stainless Steel
Riser Dia.: 4"
Riser Length: 18'
Interval: 18'-0'

Screen Type: Stainless Steel
Screen Dia.: 4"
Screen Length: 10'
Slot: 0.010
Interval: 28'-18'

FILTER PACK

Source: Sand
Composition:
Volume Used: 7 bags
Interval: 30'-15'

GROUT / SEAL

Type: Bent/ Grout/Sand
Volume Used: 1.5 bucket/3 bags/2bag
Interval: 15'-13'/13'-5'/5'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

LEGEND

Drawn by: D. Pachan
Key:

▨ Grout
▦ Bentonite
⁙ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

9

Tyree Organization, Limited
Latham, NY

BOREHOLE LOG

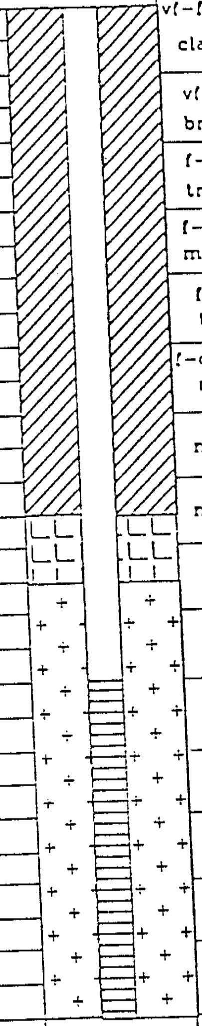
BORING NAME PZ-3A

CLIENT: NYS DEC
PROJECT: MR. C's
LOCATION: 586 Main St. East Aurora, NY

DATE STARTED/COMPLETED: 11/1/01-11/1/01
LOGGED BY: D. Perruccio
DRILLER: Nothnagle Drilling
RIG: CME 75

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Field Description of Soil
0	5,2,2,2	0.0	60%	vf-f sand brown/ some silt brown, trace clay brown/ dry
2	2,6,7,7	0.0	70%	vf sand and silt brown/ some clay brown/ moist
4	3,6,6,3	0.0	40%	f-m sand brown/ some silt brown/ trace clay brown/ moist
6	2,2,1,1	0.0	20%	f-m sand brown/ some silt brown/ moist
8	2,3,3,3	0.0	10%	f-m sand brown/ little silt brown/ trace m gravel/ moist
10	4,6,8,5	0.0	50%	f-c sand brown/ trace silt brown/ moist
12	4,5,4,5	0.0	70%	m-c sand brown, trace silt brown wet
14	3,3,5,5	0.0	70%	m-c sand brown, wet
16	1,5,8,3	0.0	60%	m-c sand brown, wet
18	1,2,5,10	0.0	60%	m-c sand brown, wet
20	2,2,2,6	0.0	70%	m-c sand brown, wet
22	2,6,6,9	0.0	70%	f-m sand brown/ trace silt brown, wet
24	4,7,7,11	0.0	60%	m-c sand brown, and m gravel wet
26	2,4,5,3	0.0	50%	m-c sand brown, wet
28	2,3,3,3	0.0	50%	m-c sand brown, wet
30				
32				
34				

Borehole Completion



Notes: ppm=parts per million, nd=not detected

WELL CONSTRUCTION DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/ Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

LEGEND

Drawn by: D. Pachan
Key:
▨ Grout
▦ Bentonite
⁘ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

▽ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

10

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Latham, NY

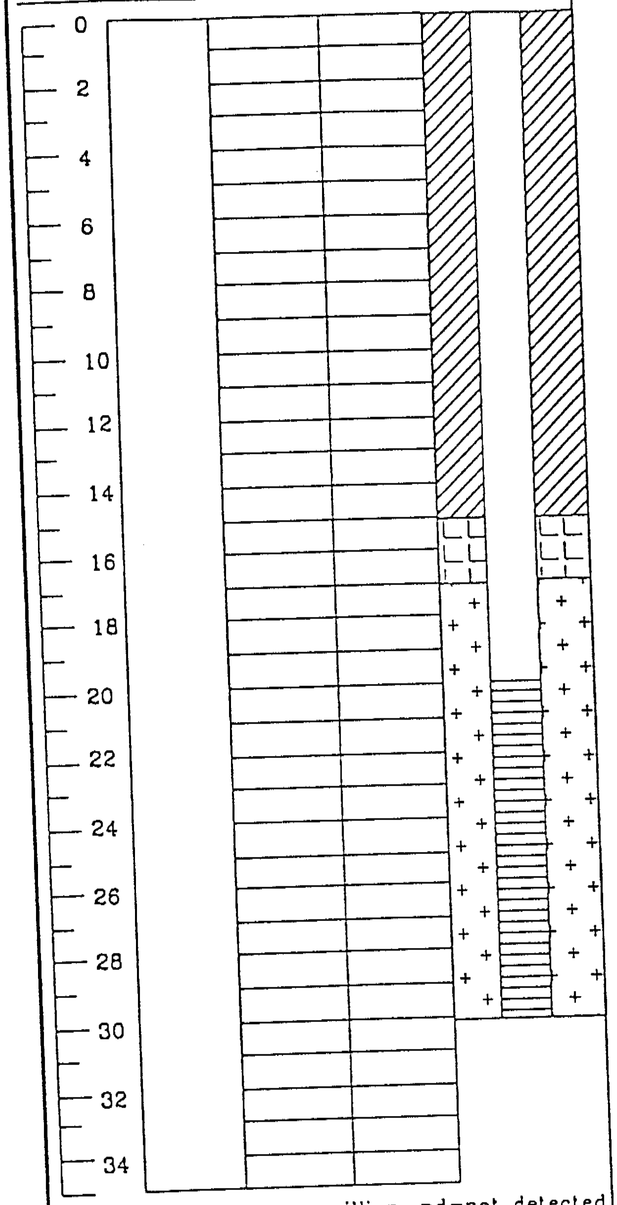
WELL CONSTRUCTION DETAIL

BORING NAME
PZ-3B

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-3B
Date Completed: 10/30/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

LEGEND

Drawn by: D. Pachan
Key:
▨ Grout
Bentonite
+ + Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

\\

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Latham, NY

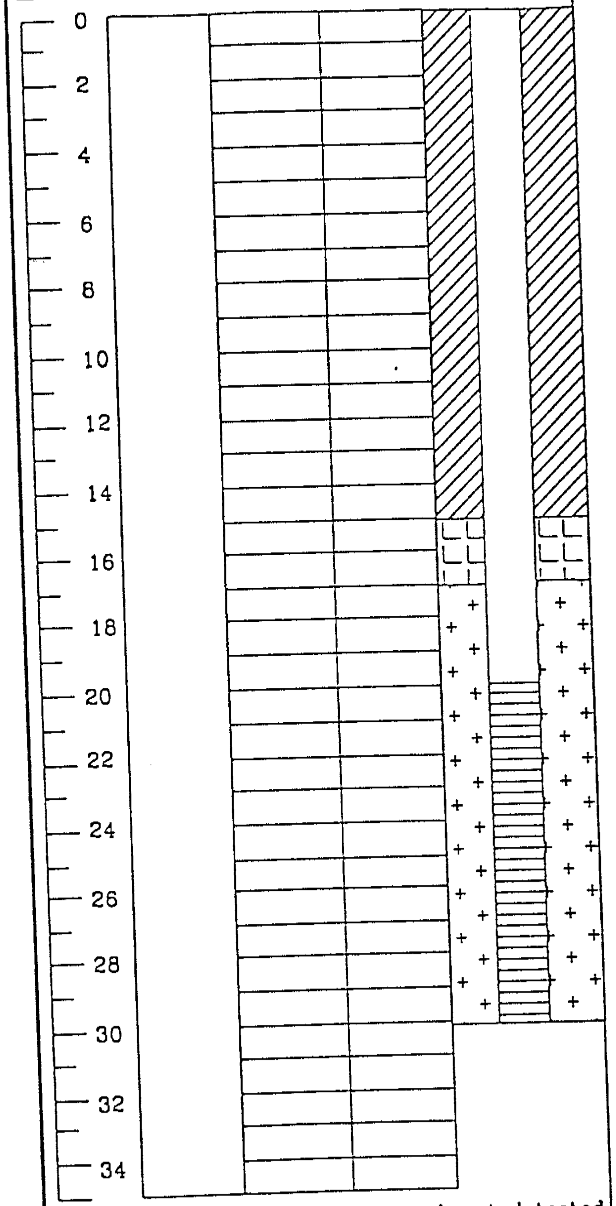
WELL CONSTRUCTION DETAIL

BORING NAME
PZ-3C

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-3C
Date Completed: 11/1/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:

▨ Grout
⊔ Bentonite
+ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

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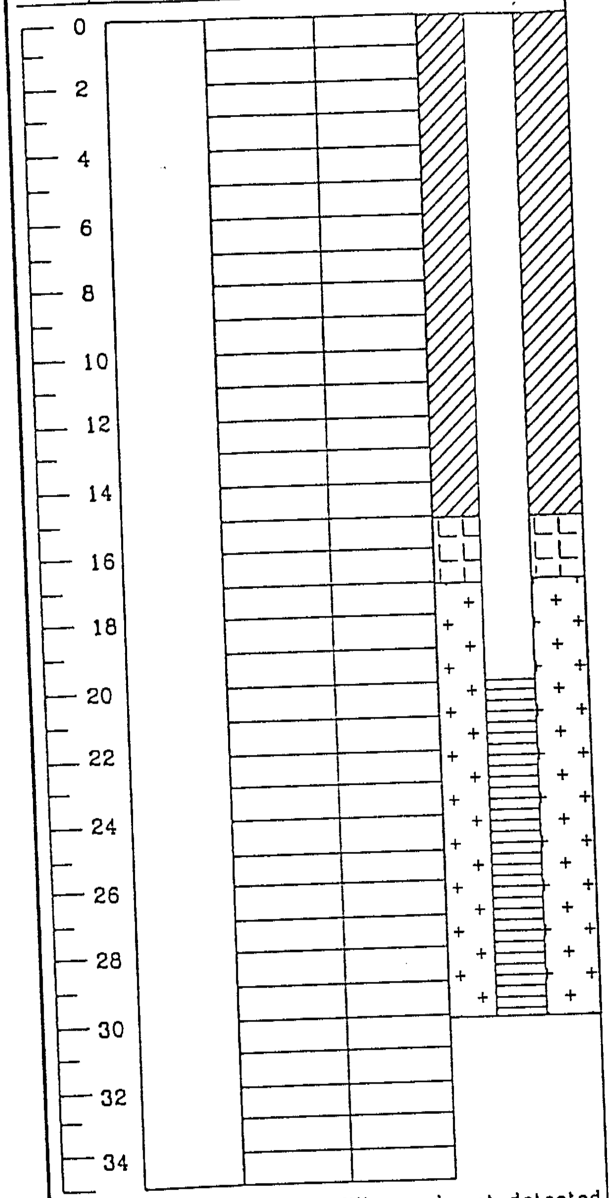
WELL CONSTRUCTION DETAIL

BORING NAME
PZ-3D

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-3D
Date Completed: 10-30-01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:

▨ Grout	trace=1-10%	very fine sand=0.6-0.13mm	∇ = ground water table	
⊞ Bentonite	little=10-20%	fine sand=0.13-0.25mm	f-gravel=2-4mm	
+ Sand	some=20-30%	medium sand=0.25-0.50mm	m-gravel=4-64mm	
	and=30-50%	course sand=0.5-1mm	c-gravel=64-256mm	
		very course sand=1-2mm		

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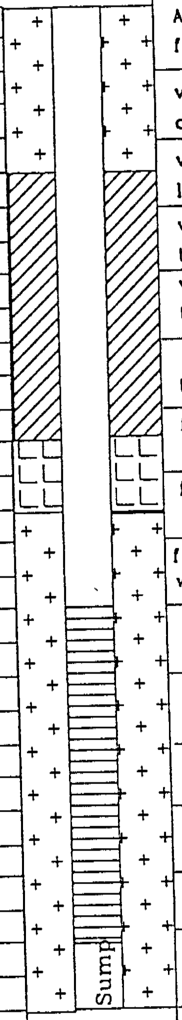
BOREHOLE LOG

BORING NAME
PW-4

CLIENT: NYS DEC
PROJECT: MR. C's
LOCATION: 586 Main St., East Aurora, NY

DATE STARTED/COMPLETED: 11/9/01-11/9/01
LOGGED BY: D. Perruccio
DRILLER: Nothnagle Drilling
RIG: CME 75

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
0	22,8,3,3	0.1	60%		Asphalt medium gravel grey, some f-m sand brown dry
2	1,3,6,8	0.0	70%		vf-f sand brown and silt brown clay brown moist
4	3,3,2,2	0.0	90%		vf-f sand brown and silt brown little clay brown, moist
6	2,2,2,3	0.0	70%		vf-f sand brown some silt brown trace clay brown, moist
8	3,3,2,3	0.0	70%		vf-m sand brown some silt brown trace gravel , moist
10	1,3,4,5	0.0	90%		f-m sand brown some silt brown trace clay brown moist
12	1,3,4,5	0.0	90%		f-m sand brown trace silt brown wet
14	1,2,4,5	0.0	80%		f-m sand brown trace silt brown wet
16	2,4,6,7	0.0	95%		f-m sand brown trace silt brown wet
18	1,1,3,9	0.0	60%		f-m sand brown wet
20	6,5,9,9	0.0	80%		f-m sand grey trace silt brown wet
22	12,5,7,8	0.0	70%		f-m sand grey trace silt brown wet
24	1,4,6,8	0.0	70%		f-m sand grey trace silt brown wet
26	1,3,7,11	0.0	70%		f-m sand grey trace silt brown wet
28	2,7,7,8	0.0	50%		f-m sand grey trace silt brown wet
30					
32					
34					

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 6.25"
Depth: 30'

WELL DATA

Riser Type: Stainless Steel
Riser Dia.: 4"
Riser Length: 18'
Interval: 18'-0'

Screen Type: Stainless Steel
Screen Dia.: 4"
Screen Length: 10'
Slot: 0.010
Interval: 28'-18'

FILTER PACK

Source: Sand
Composition:
Volume Used: 7 bags
Interval: 30'-15'

GROUT / SEAL

Type: Bent/ Grout/Sand
Volume Used: 1.5 bucket/3 bags/2bag
Interval: 15'-13'/13'-5'/5'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan
Key:

▨ Grout
▦ Bentonite
⁙ Sand

LEGEND

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

14

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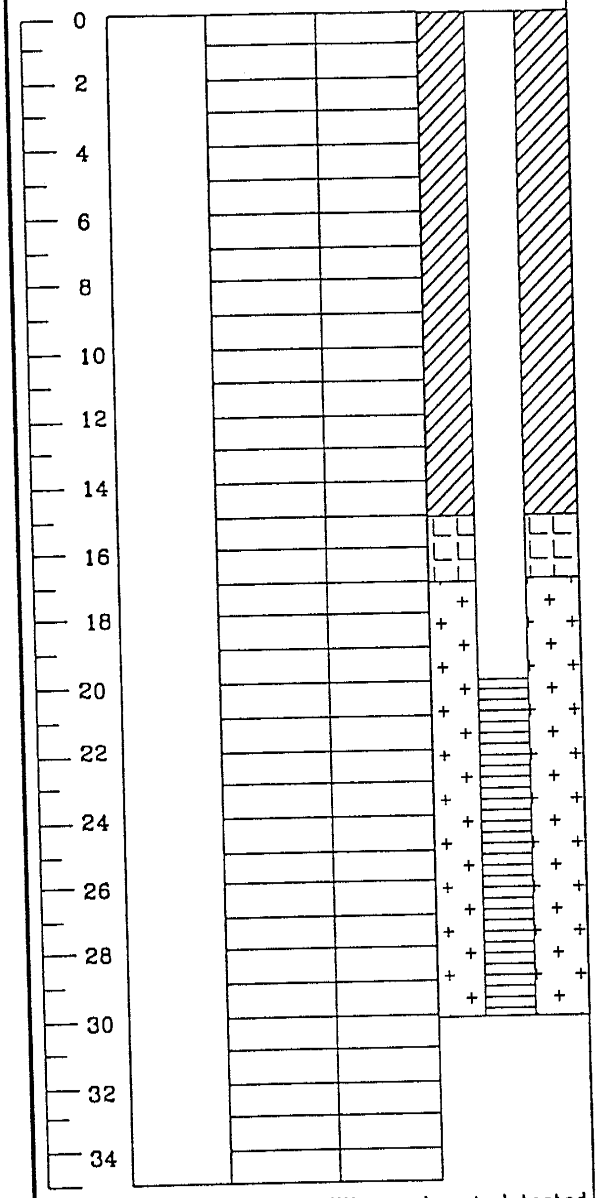
Latham, NY

WELL CONSTRUCTION DETAIL

BORING NAME
PZ-4A

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY
PROJECT #: 017301
WELL #: PZ-4A
Date Completed: 10/31/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:
▨ Grout
Bentonite
+ + + Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

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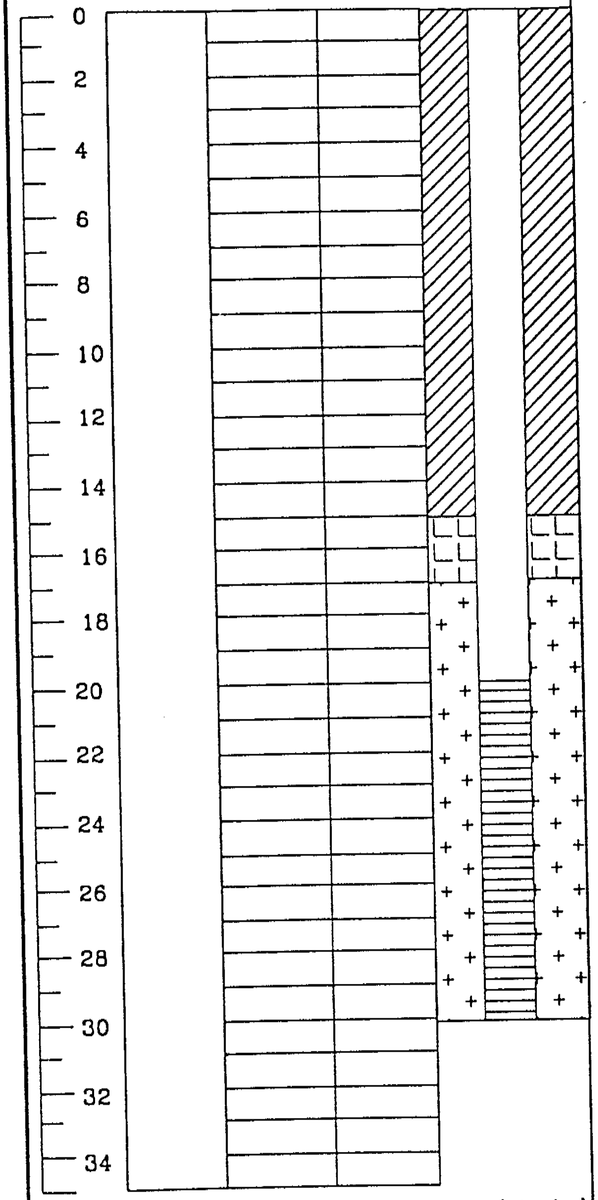
WELL CONSTRUCTION DETAIL

BORING NAME PZ-4B

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY
PROJECT #: 017301
WELL #: PZ-4B
Date Completed: 10/31/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:

▨ Grout
▦ Bentonite
⊞ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

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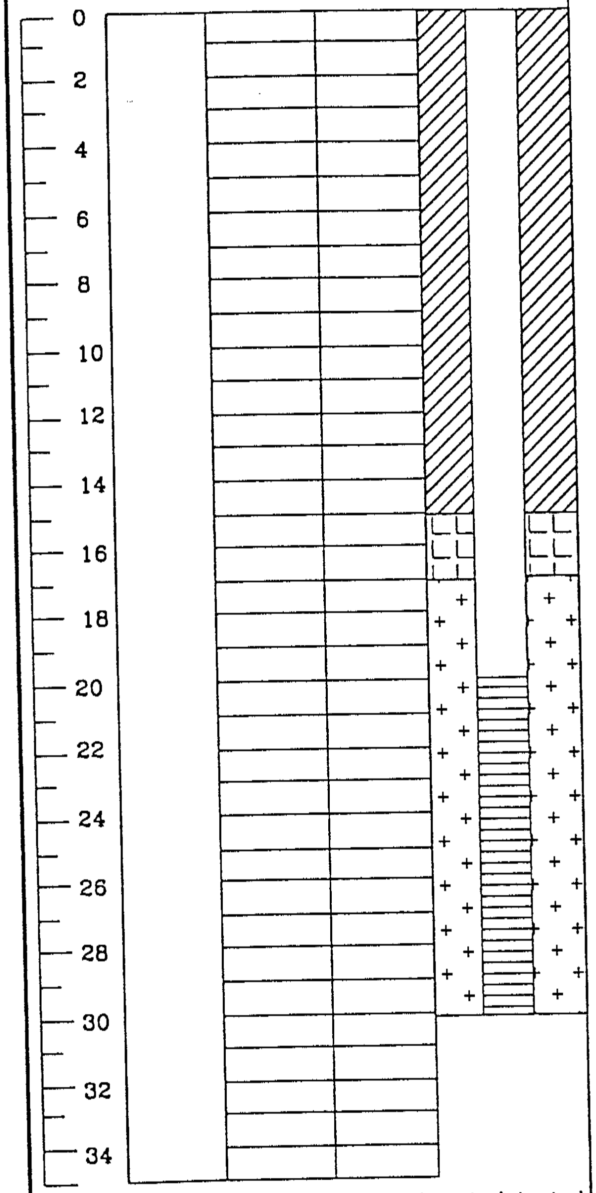
WELL CONSTRUCTION DETAIL

BORING NAME
PZ-4C

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-4C
Date Completed: 10/31/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:

▨	Grout
⊔	Bentonite
+ +	Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

17

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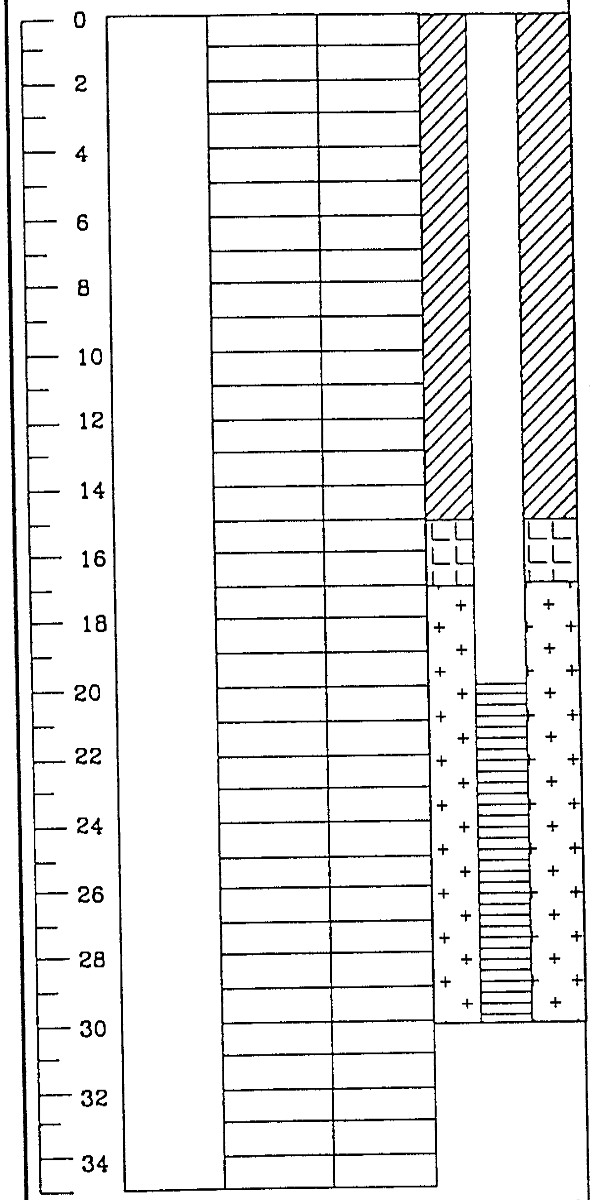
WELL CONSTRUCTION DETAIL

BORING NAME PZ-4D

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-4D
Date Completed: 10/31/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil



N/A

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA
Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA
Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK
Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL
Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION
Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT
Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:
▨ Grout
Bentonite
+ + Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

18

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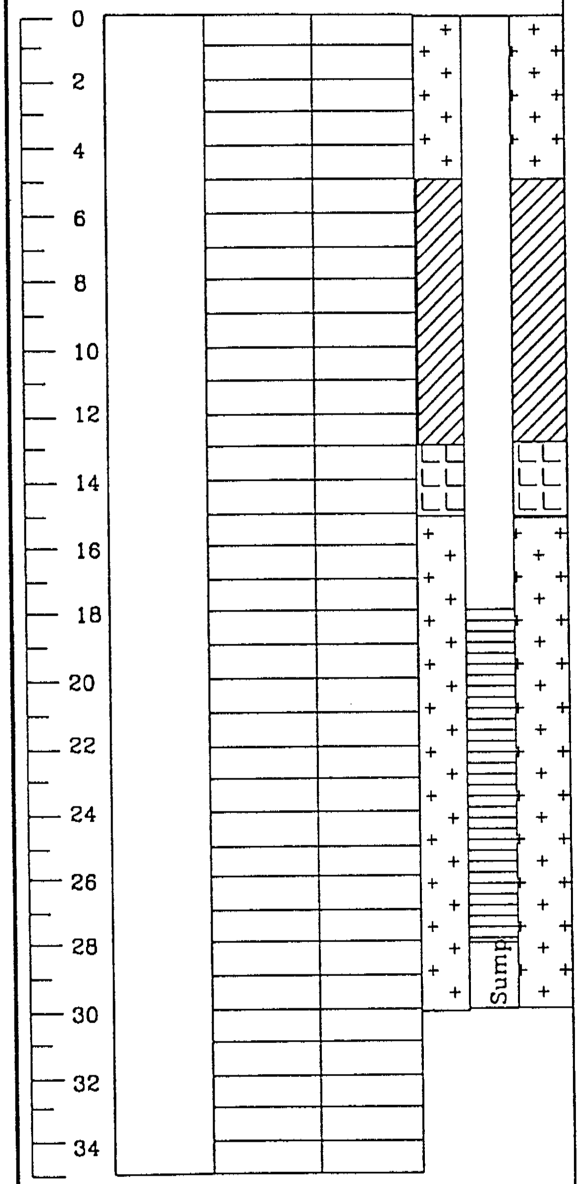
WELL CONSTRUCTION DETAIL

BORING NAME PW-5

PROJECT NAME: NYS DEC
SITE: MR. C's
ADDRESS: 586 Main St., East Aurora, NY
PROJECT #: 017301
WELL #: PW-5
DATE COMPLETED: 11/8/01
SUPERVISED BY: D. PERRUCCIO

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 6.25"
Depth: 30'

WELL DATA

Riser Type: Stainless Steel
Riser Dia.: 4"
Riser Length: 18'
Interval: 18'-0'

Screen Type: Stainless Steel
Screen Dia.: 4"
Screen Length: 10'
Slot: 0.010
Interval: 28'-18'

FILTER PACK

Source: Sand
Composition:
Volume Used: 7 bags
Interval: 30'-15'

GROUT / SEAL

Type: Bent/ Grout/Sand
Volume Used: 1.5 bucket/3 bags/2bag
Interval: 15'-13'/13'-5'/5'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:
▨ Grout
▦ Bentonite
⁙ Sand

trace=1-10%	very fine sand=0.6-0.13mm	∇ = ground water table
little=10-20%	fine sand=0.13-0.25mm	f-gravel=2-4mm
some=20-30%	medium sand=0.25-0.50mm	m-gravel=4-64mm
and=30-50%	course sand=0.5-1mm	c-gravel=64-256mm
	very course sand=1-2mm	

19

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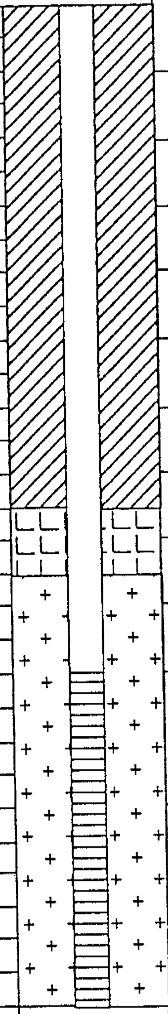
BOREHOLE LOG

BORING NAME PZ-5A

CLIENT: NYS DEC
PROJECT: MR. C's
LOCATION: 586 Main St., East Aurora, NY

DATE STARTED/COMPLETED: 10/23/01-10/23/01
LOGGED BY: C. Dinan
DRILLER: Nothnagle Drilling
RIG: CME 75



Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Field Description of Soil
0	1,2,3,4	120.2	70%	Dark Brown Clay f-vf sand moist but loose little gravel trace organics
2	7,13,23,24	132.4	10%	dark brown fine sand dry loose some gravel (hit a rock)
4	8,13,16,15	150.0	20%	brown fine sand and gravel fragments of rock dry and loose
6	6,6,9,9	17.4	40%	brown- lt. brown fine sand and gravel/ rock fragements dry loose some copper staining
8	5,7,8,8	31.2	60%	brown- lt. brown fine-med sand and rock fragements some gravel dry and loose
10	5,6,9,13	24.6	18%	brown fine sand with some gravel dry and loose
12	3,3,3,5	12.9	80%	Hit H20, dark brown fine-med sand w/ little gravel wet soft
14	3,5,6,8	5.6	70%	dark brown fine-med sand wet soft
16	WR,1,2,5	4.5	60%	dark brown fine-med sand wet soft
18	WR,WR,2,3	8.0	60%	dark brown fine-vf silty sand wet soft soupy
20	WR,WR,2,4	7.6	40%	dark brown fine-vf silty sand wet soft soupy
22	1,1,1,2	0.9	90%	dark brown fine-vf silty sand wet soft soupy
24	WR,WR,WR,3	0.0	80%	dark brown fine-med silty sand wet soft soupy Field Description of Soil
26	5,4,7,11	0.0	100%	top 1/2 dark brown f-m silty sand wet soft soupy bottom 1/2 brown vf-f clay silty sand soft wet
28	WR,WR,WR,1	0.9	20%	brown vf clayey silty sand wet soft soupy
30				
32				
34				

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/ Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☑ YES ☐ NO
Size:
Concrete Pad: ☑ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan
Key:

▨ Grout
▦ Bentonite
⁙ Sand

LEGEND

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Tyree Organization, Limited
Latham, NY

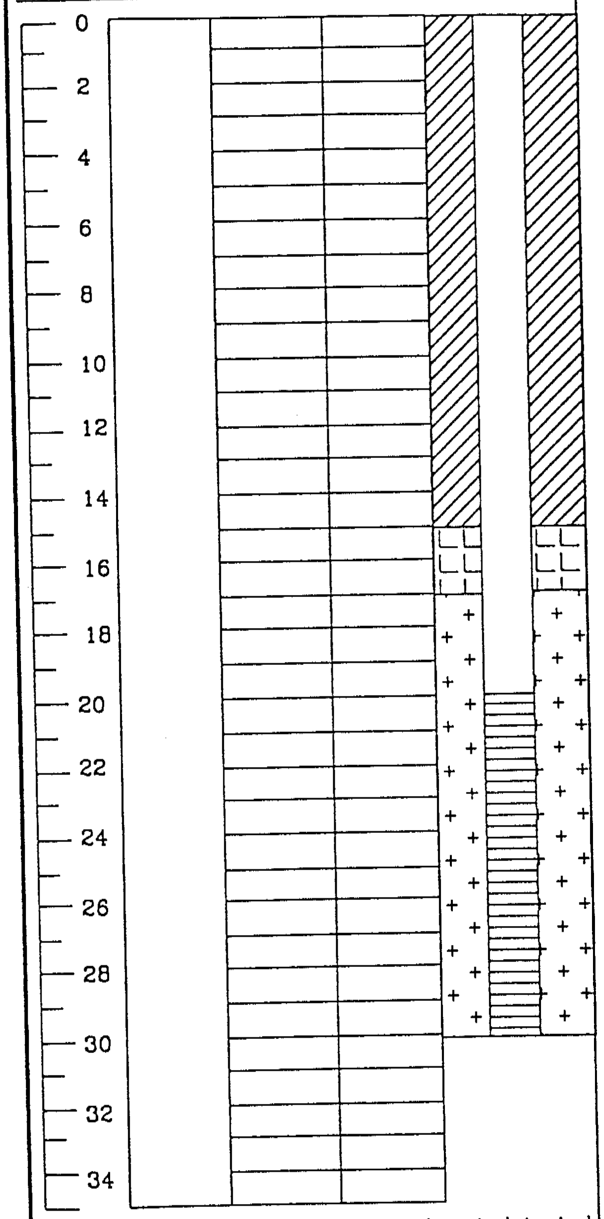
WELL CONSTRUCTION DETAIL

BORING NAME PZ-5B

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-5B
Date Completed: 10/24/01
SUPERVISED BY: C. Dinan

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:

▨	Grout
⊔⊔⊔	Bentonite
+ + +	Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

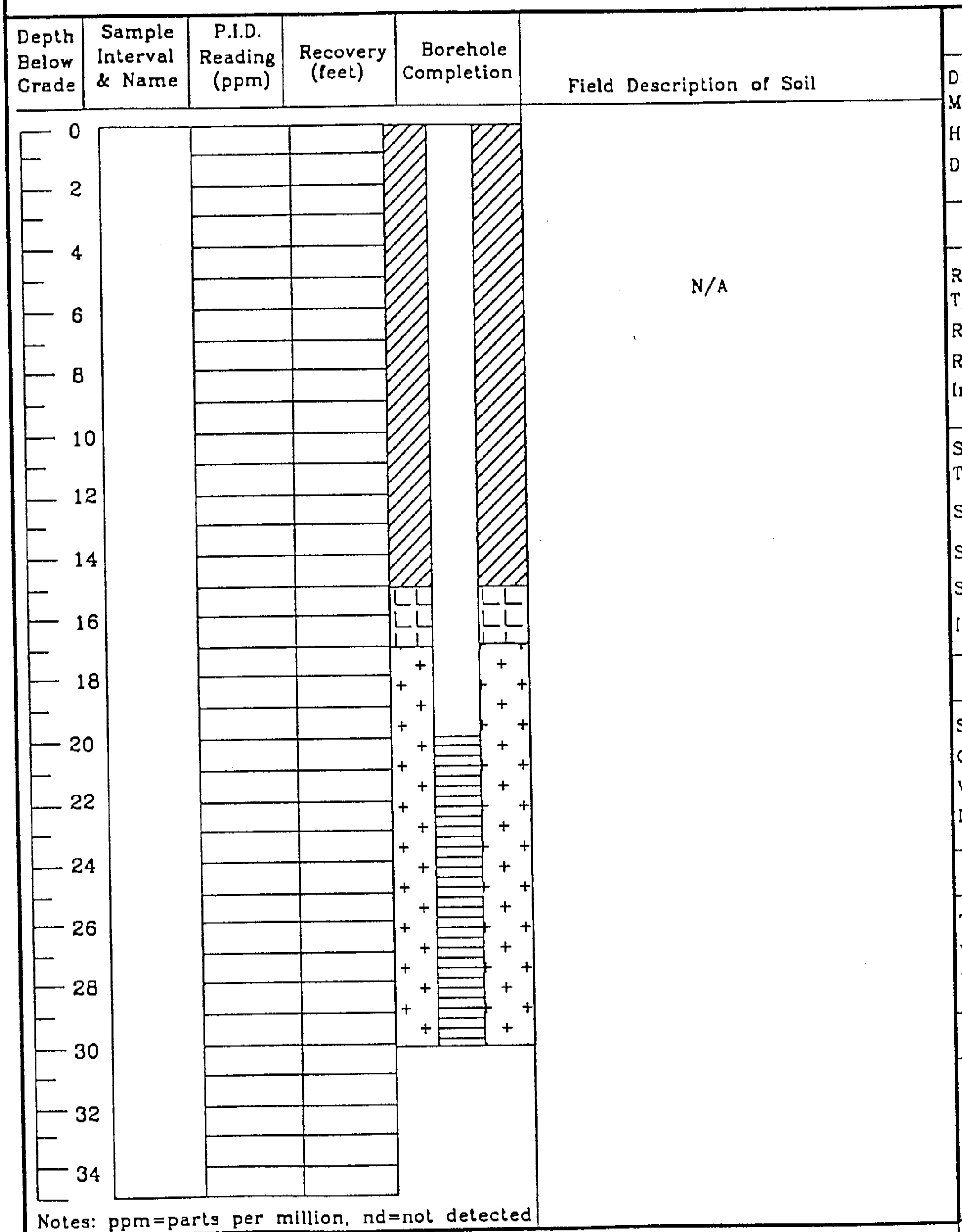
Tyree Organization, Limited
Latham, NY

WELL CONSTRUCTION DETAIL

BORING NAME PZ-5C

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-5C
Date Completed: 10/24/01
SUPERVISED BY: C. Dinan



N/A

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:
▨ Grout
⊞ Bentonite
+ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Tyree Organization, Limited
Latham, NY

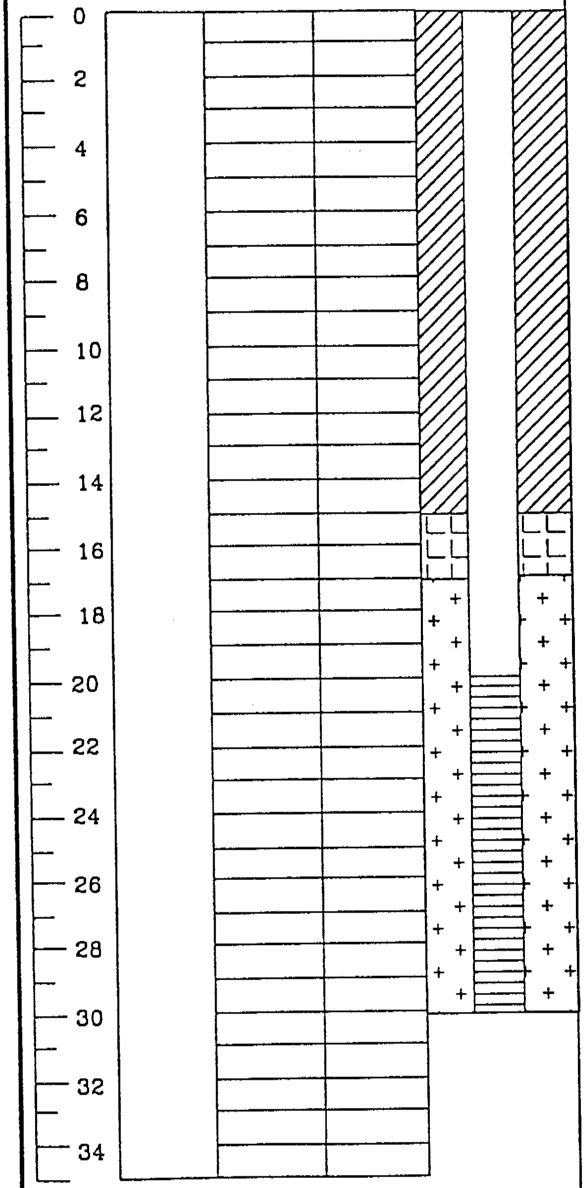
WELL CONSTRUCTION DETAIL

BORING NAME PZ-5D

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-5D
Date Completed: 10/24/01
SUPERVISED BY: C. Dinan

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:

▨	Grout
⊔⊔	Bentonite
+ +	Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Tyree Organization, Limited
Latham, NY

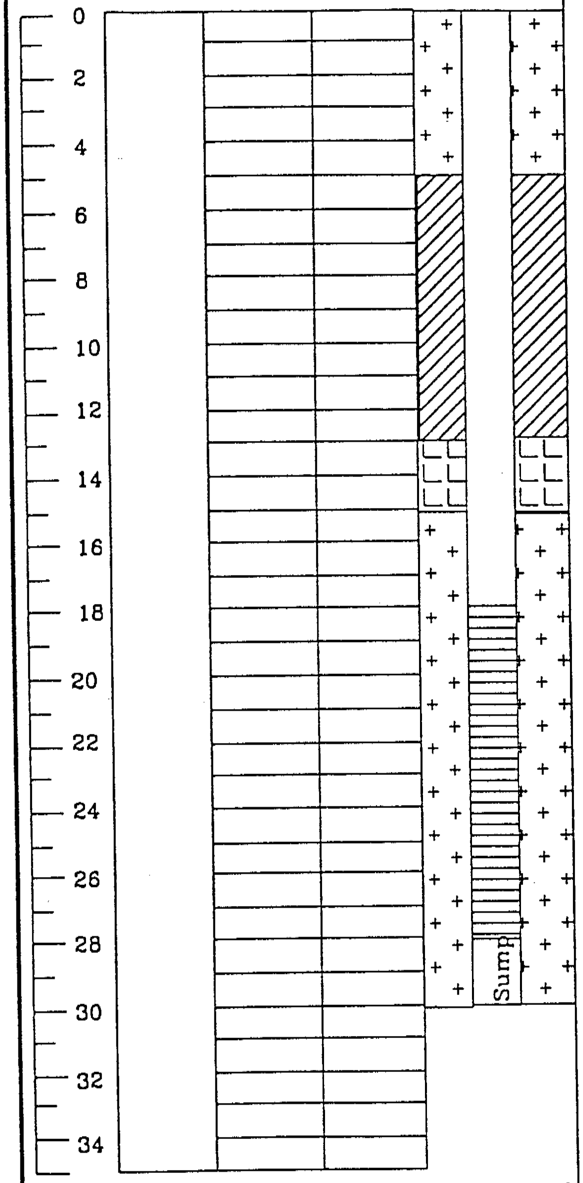
WELL CONSTRUCTION DETAIL

BORING NAME PW-6

PROJECT NAME: NYS DEC
SITE: MR. C's
ADDRESS: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PW-6
DATE COMPLETED: 11/8/01
SUPERVISED BY: D. PERRUCCIO

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 6.25"
Depth: 30'

WELL DATA

Riser Type: Stainless Steel
Riser Dia.: 4"
Riser Length: 18'
Interval: 18'-0'

Screen Type: Stainless Steel
Screen Dia.: 4"
Screen Length: 10'
Slot: 0.010
Interval: 28'-18'

FILTER PACK

Source: Sand
Composition:
Volume Used: 7 bags
Interval: 30'-15'

GROUT / SEAL

Type: Bent/ Grout/Sand
Volume Used: 1.5 bucket/3 bags/2bag
Interval: 15'-13'/13'-5'/5'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan
Key:

▨ Grout
▦ Bentonite
⁙ Sand

LEGEND

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Tyree Organization, Limited
Latham, NY

BOREHOLE LOG

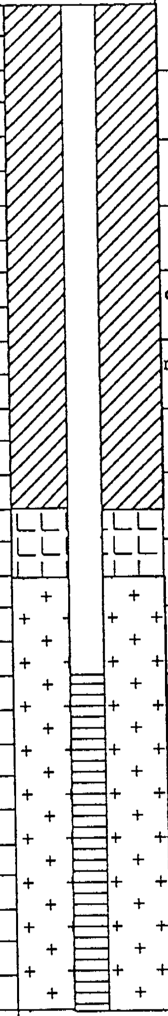
BORING NAME
PZ-6A

CLIENT: NYS DEC
PROJECT: MR. C's
LOCATION: 586 Main St., East Aurora, NY

DATE STARTED/COMPLETED: 10/29/01-10/29/01
LOGGED BY: D. Perruccio
DRILLER: Nothnagle Drilling
RIG: CME 75

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Field Description of Soil
0	10,5,3,3	2.2	70%	asphalt gravel dark gray medium- course sand
2	2,2,6,7	3.5	80%	med. gray f-m sand some silt moist
4	2,3,4,5	0.0	50%	medium gray fine to medium sand and silt moist
6	2,3,6,5	0.0	50%	dark brown medium to course sand fine gravel moist
8	4,5,6,9	0.0	70%	dark brown fine to medium sand some silt w/ grey silty clay moist
10	2,4,6,6	0.0	50%	medium brown medium to course sand f-m gravel wet
12	2,2,5,7	0.0	100%	medium grey m-c sand, f-m gravel trace silty sand wet
14	7,13,11,12	0.0	60%	medium grey m-c sand, f-m gravel trace silty sand wet
16	11,18,11,14	0.0	70%	med. grey, m-c sand, f-m gravel wet
18	5,12,12,10	0.0	60%	med. grey, m-c sand, f-m gravel trace of silty sand wet
20	5,4,5,8	0.0	70%	Medium grey fine to medium sand trace silt wet
22	2,5,6,9	0.0	70%	Medium grey fine to medium sand trace silt wet
24	1,2,6,6	0.0	100%	Medium grey fine to medium sand trace silt wet
26	3,9,5,8	0.0	80%	Medium grey fine to medium sand trace silt wet
28	1,3,5,7	0.0	80%	Medium grey fine to medium sand trace silt wet
30				
32				
34				

Borehole Completion



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/ Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan
Key:
▨ Grout
▦ Bentonite
⁘ Sand

LEGEND

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Tyree Organization, Limited
Latham, NY

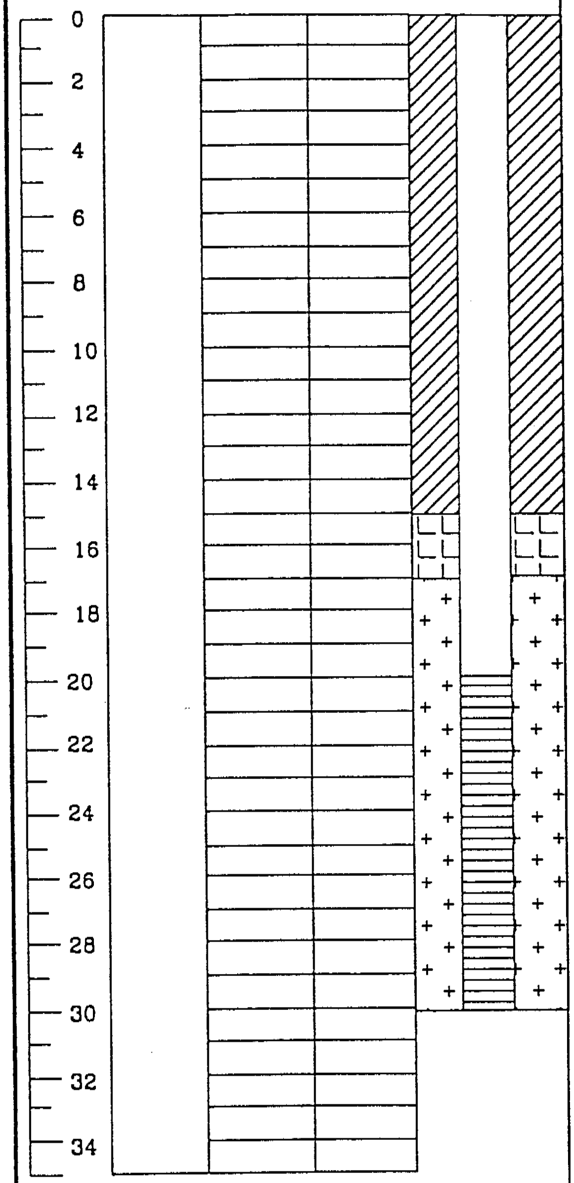
WELL CONSTRUCTION DETAIL

BORING NAME PZ-6B

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-6B
Date Completed: 10/29/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil



N/A

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:

▨ Grout
▦ Bentonite
+ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

▽ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

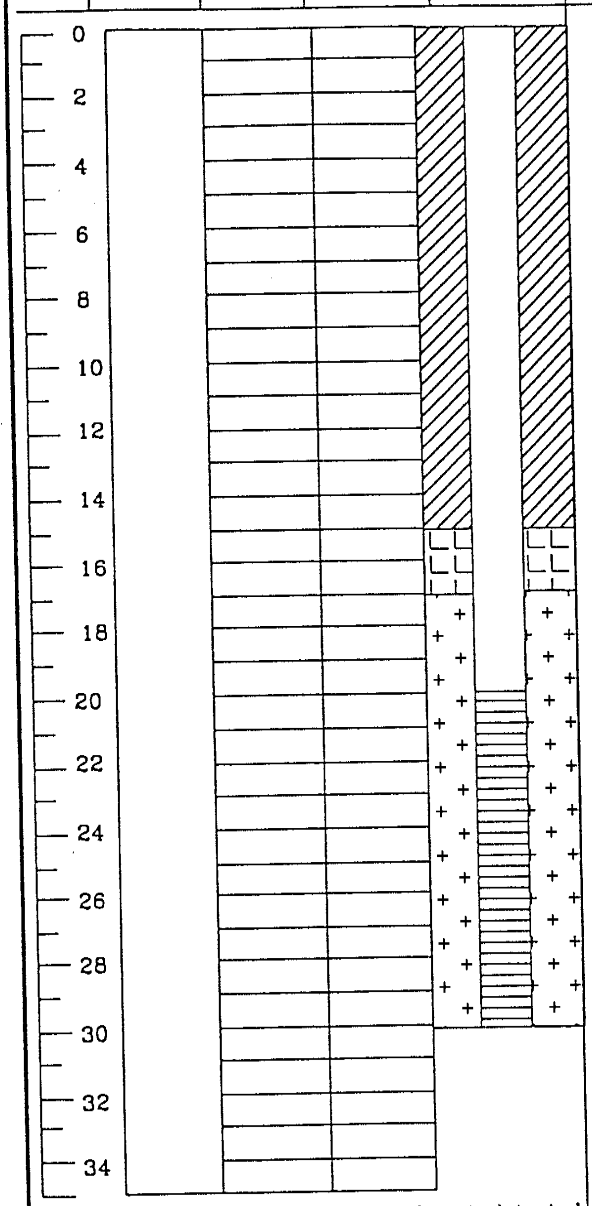
Tyree Organization, Limited
Latham, NY

WELL CONSTRUCTION DETAIL

BORING NAME
PZ-6C

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-6C
Date Completed: 10/25/01
SUPERVISED BY: C. Dinan



Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:
▨ Grout
⊞ Bentonite
+ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

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Limited
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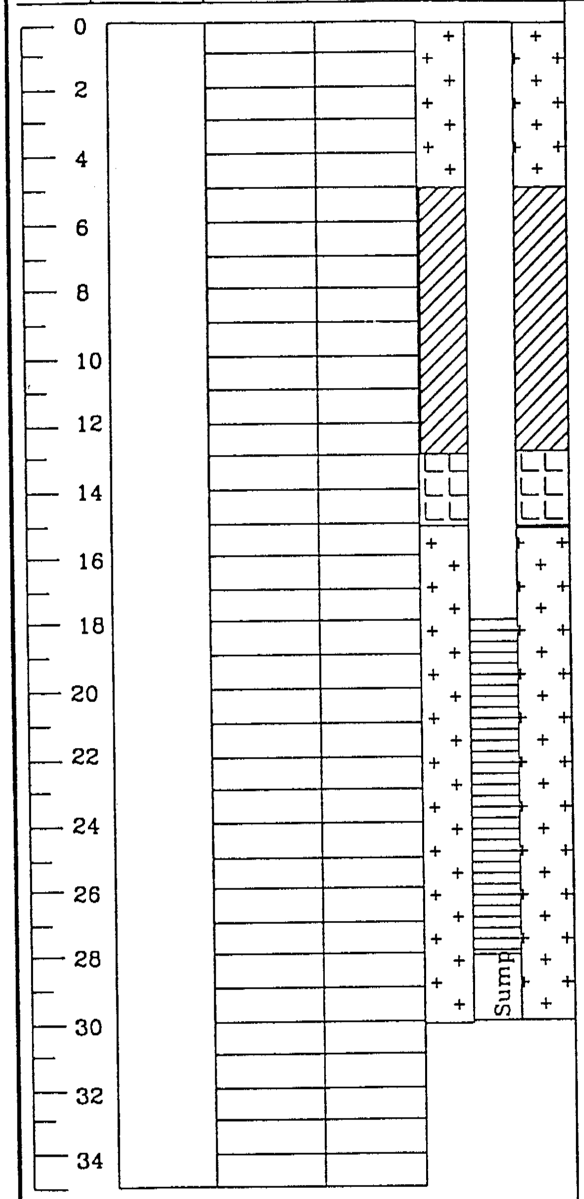
WELL CONSTRUCTION DETAIL

BORING NAME
PW-7

PROJECT NAME: NYS DEC
SITE: MR. C's
ADDRESS: 586 Main St., East Aurora, NY
PROJECT #: 017301
WELL #: PW-7
DATE COMPLETED: 11/5/01
SUPERVISED BY: D. PERRUCCIO

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil



N/A

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 6.25"
Depth: 30'

WELL DATA

Riser Type: Stainless Steel
Riser Dia.: 4"
Riser Length: 18'
Interval: 18'-0'

Screen Type: Stainless Steel
Screen Dia.: 4"
Screen Length: 10'
Slot: 0.010
Interval: 28'-18'

FILTER PACK

Source: Sand
Composition:
Volume Used: 7 bags
Interval: 30'-15'

GROUT / SEAL

Type: Bent/ Grout/Sand
Volume Used: 1.5 bucket/3 bags/2bag
Interval: 15'-13'/13'-5'/5'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:
▨ Grout
▦ Bentonite
⁙ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Tyree Organization, Limited
Latham, NY

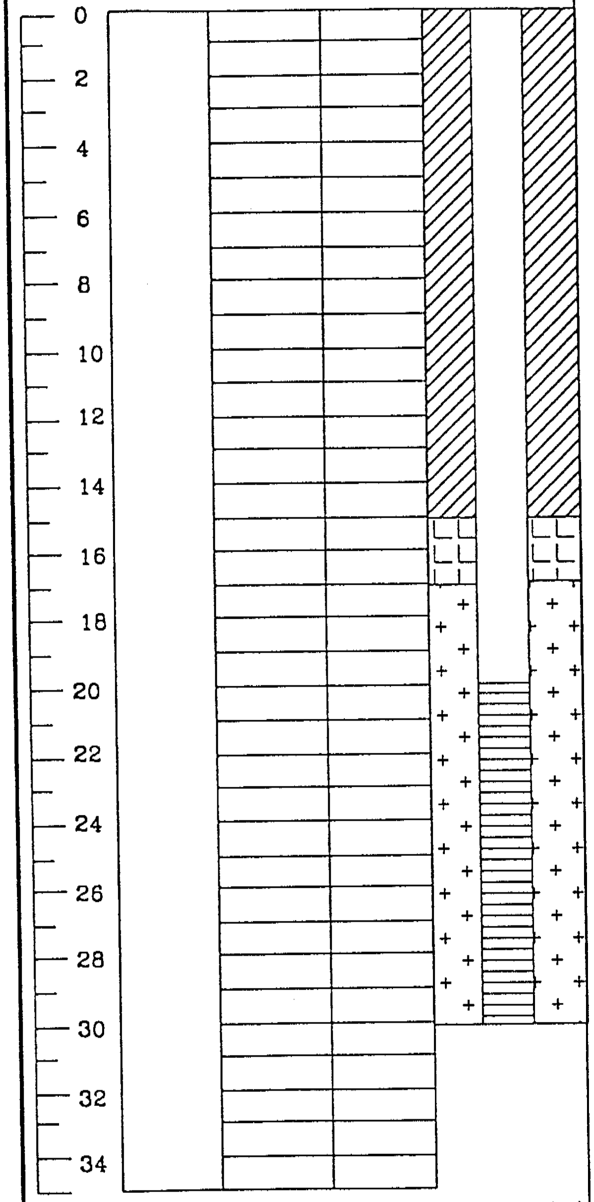
WELL CONSTRUCTION DETAIL

BORING NAME
PZ-7A

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-7A
Date Completed: 11/6/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:

▨ Grout
Bentonite
Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Tyree Organization, Limited
Latham, NY

BOREHOLE LOG

BORING NAME PZ-7B

CLIENT: NYS DEC
PROJECT: MR. C's
LOCATION: 586 Main St., East Aurora, NY

DATE STARTED/COMPLETED: 10/30/01-10/30/01
LOGGED BY: D. Perruccio
DRILLER: Nothnagle Drilling
RIG: CME 75

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
0–2	18,10,9,8	0.0	90%	▨	medium to course sand, some fine to course gravel grey and dry
2–4	13,4,4,6	0.0	95%	▨	fine to medium sand brown, trace silt brown, moist
4–6	4,5,3,3	0.0	60%	▨	fine to medium sand brown, some silt brown, moist
6–8	3,4,3,4	0.0	50%	▨	m-c sand brown, some f-c gravel brown, trace silt brown, moist
8–10	2,4,5,6	0.0	50%	▨	m-c sand brown, some f-c gravel brown, and silt brown, moist
10–12	1,2,4,5	0.0	60%	▨	fine to medium sand grey trace silt grey wet
12–14	6,5,11,10	--	0%	▨	
14–16	6,18,12,18	0.0	10%	▨ ▦	fine to medium sand brown, some silt brown, trace fine gravel brown wet
16–18	2,5,8,9	0.0	50%	▦ ⁙	fine to medium sand grey trace silt grey, wet
18–20	3,4,8,10	0.0	70%	⁙	fine to medium sand grey trace silt grey, wet
20–22	2,3,8,8	0.0	60%	⁙	fine to medium sand grey trace silt grey, wet
22–24	2,4,8,10	0.0	70%	⁙	fine to medium sand grey trace silt grey, wet
24–26	2,5,7,7	0.0	70%	⁙	fine to medium sand grey trace silt grey, wet
26–28	1,1,2,3	0.0	80%	⁙	Medium to course sand grey wet
28–30	13,6,12,9	0.0	50%	⁙	Medium to course sand grey wet
30–32					
32–34					

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/ Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan
Key:
▨ Grout
▦ Bentonite
⁙ Sand

LEGEND

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Tyree Organization, Limited
Latham, NY

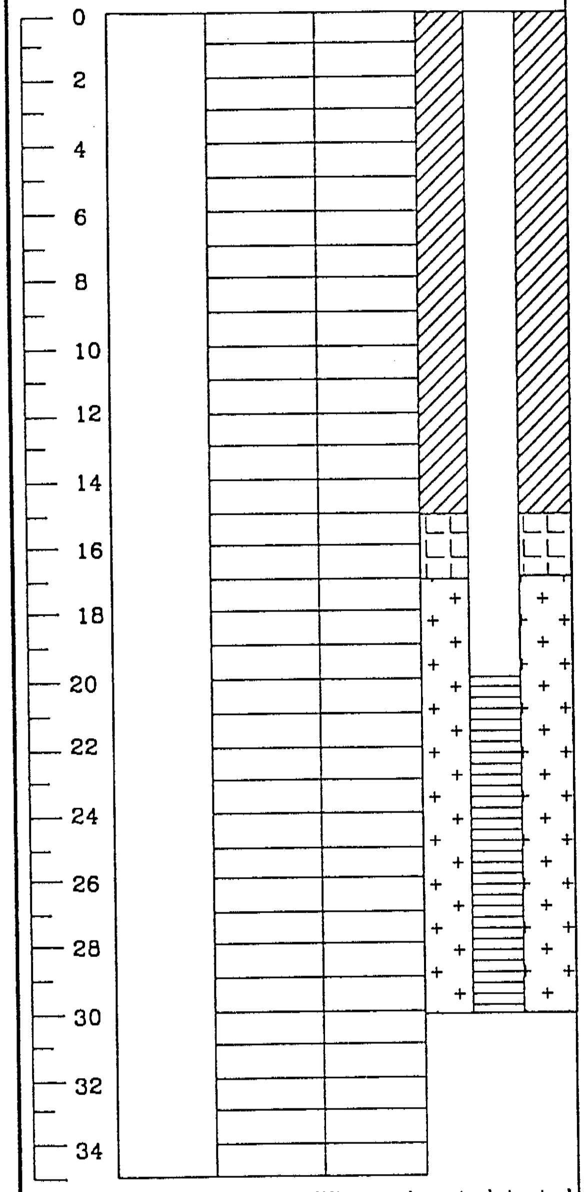
WELL CONSTRUCTION DETAIL

BORING NAME
PZ-7C

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-7C
Date Completed: 11/6/01
SUPERVISED BY: D. Perruccio

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:

▨	Grout
⊔⊔	Bentonite
+ +	Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

Tyree Organization, Limited
Latham, NY

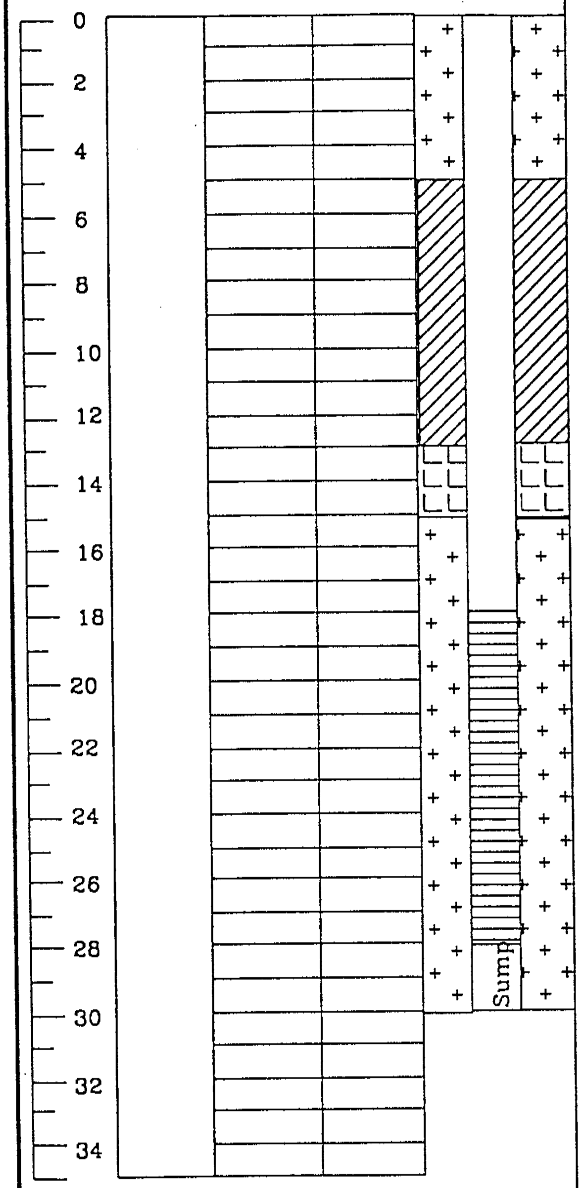
WELL CONSTRUCTION DETAIL

BORING NAME PW-8

PROJECT NAME: NYS DEC
SITE: MR. C's
ADDRESS: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PW-8
DATE COMPLETED: 11/7/01
SUPERVISED BY: D. PERRUCCIO

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil



N/A

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 6.25"
Depth: 30'

WELL DATA

Riser Type: Stainless Steel
Riser Dia.: 4"
Riser Length: 18'
Interval: 18'-0'

Screen Type: Stainless Steel
Screen Dia.: 4"
Screen Length: 10'
Slot: 0.010
Interval: 28'-18'

FILTER PACK

Source: Sand
Composition:
Volume Used: 7 bags
Interval: 30'-15'

GROUT / SEAL

Type: Bent/ Grout/Sand
Volume Used: 1.5 bucket/3 bags/2bag
Interval: 15'-13'/13'-5'/5'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:

▨ Grout
▦ Bentonite
⁘ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

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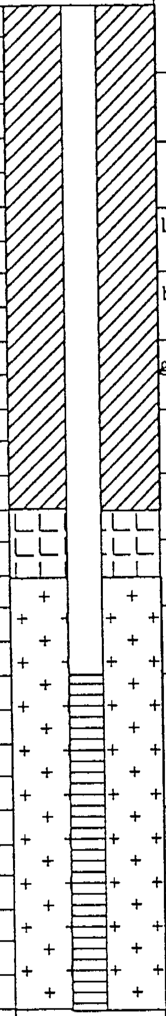
Latham, NY

BOREHOLE LOG

BORING NAME
PZ-8A

CLIENT: NYS DEC
PROJECT: MR. C's
LOCATION: 586 Main St., East Aurora, NY

DATE STARTED/COMPLETED: 10/25/01-10/25/01
LOGGED BY: C. Dinan
DRILLER: Nothnagle Drilling
RIG: CME 75

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
0	2,4,5,7	0.0	90%		Top 3rd dark brown soil w/ organics Bottom v-f to f sand dry loose
2	5,7,11,12	0.0	60%		light brown sand w/ some gravel rock fragements dry loose
4	2,2,5,4	0.0	20%		light brown sand w/ some gravel rock fragements dry loose
6	3,3,3,7	0.0	30%		light brown sand and gravel shale rock fragements loose dry
8	5,7,8,11	0.0	70%		hit H20, top 5" same as above bottom gray wet silty clay stiff
10	3,6,7,11	0.0	70%		grey silty clay wet semi stiff
12	4,8,11,12	0.0	40%		brown vf sand and f-m gravel wet semi loose
14	6,4,3,6	1.6	30%		brown vf sand and f-m gravel wet semi loose
16	4,5,7,6	3.5	50%		f-m gravel with some brown fine sand wet loose
18	9,7,8,10	1.4	40%		f-m gravel with some brown fine sand wet loose
20	3,6,7,8	2.0	50%		top 4"- same as above mid 4" brown sandy silt wet sticky stiff bottom 4"-gray vf-f sand wet
22	4,4,4,4	1.0	50%		grey silty vf sand wet sticky
24	5,5,5,6	0.4	20%		dark grey f-m sand w/ trace gravel wet loose
26	WR,3,5,6	0.0	80%		grey vf-f sand, silty wet and sticky
28	2,3,4,4	0.0	70%		Grey vf-f silty sand wet sticky
30					
32					
34					

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/ Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan
Key:

▨ Grout
▦ Bentonite
⁘ Sand

LEGEND

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

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Limited
Latham, NY

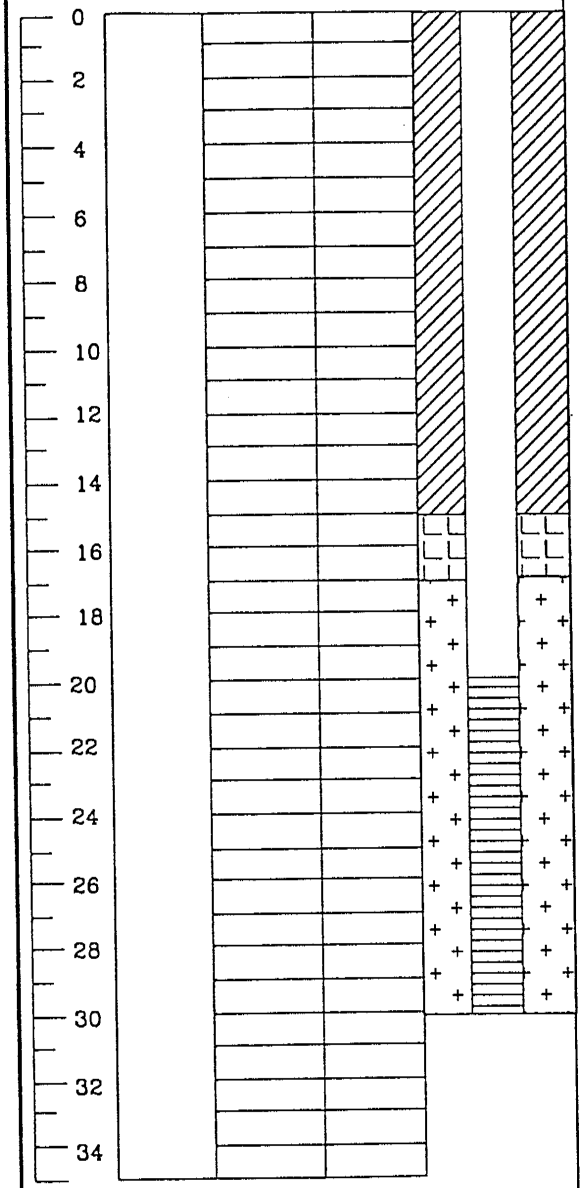
WELL CONSTRUCTION DETAIL

BORING NAME
PZ-8B

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-8B
Date Completed: 10/25/01
SUPERVISED BY: C. Dinan

Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
					N/A



Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:
▨ Grout
▦ Bentonite
+ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

34

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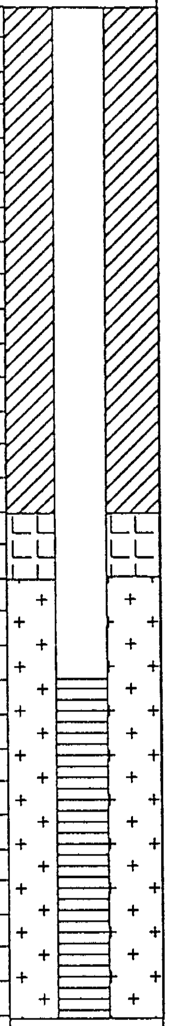
WELL CONSTRUCTION DETAIL

BORING NAME
PZ-8C

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-8C
Date Completed: 10/25/01
SUPERVISED BY: C. Dinan



Depth Below Grade	Sample Interval & Name	P.I.D. Reading (ppm)	Recovery (feet)	Borehole Completion	Field Description of Soil
0					
2					
4					N/A
6					
8					
10					
12					
14					
16					
18					
20					
22					
24					
26					
28					
30					
32					
34					

Notes: ppm=parts per million, nd=not detected

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

WELL DEVELOPMENT

Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

Drawn by: D. Pachan

LEGEND

Key:
▨ Grout
▦ Bentonite
+ Sand

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

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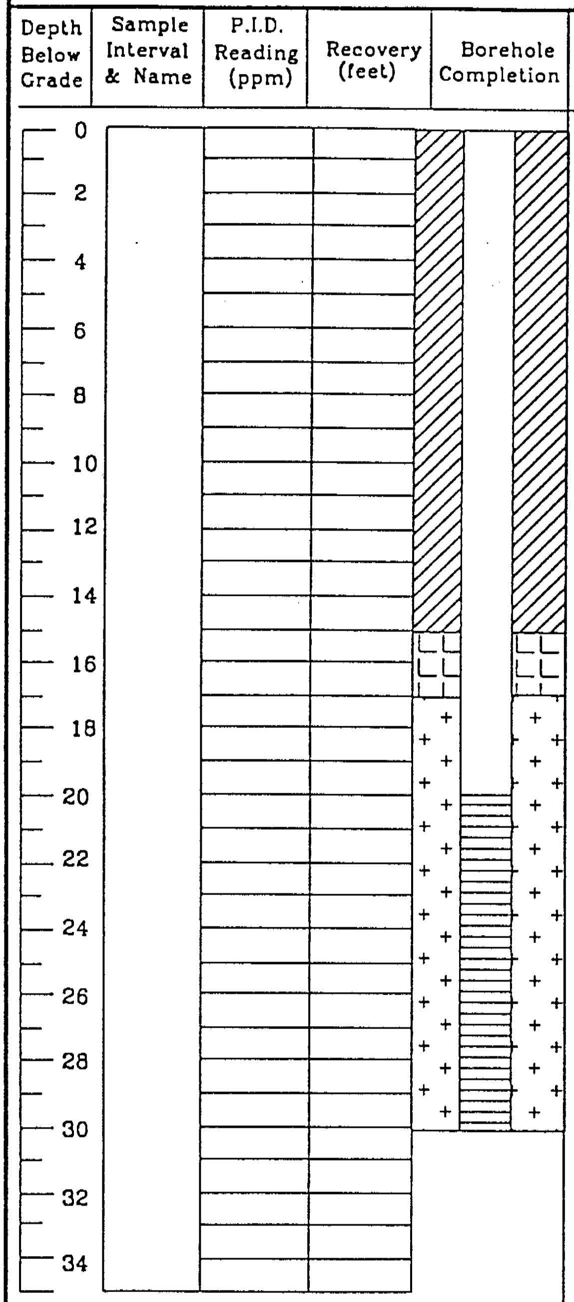
WELL CONSTRUCTION DETAIL

BORING NAME
PZ-8D

PROJECT NAME: NYS DEC
SITE: Mr. C's Dry Cleaners
Address: 586 Main St., East Aurora, NY

PROJECT #: 017301
WELL #: PZ-8D
Date Completed: 10/25/01
SUPERVISED BY: C. Dinan



Notes: ppm=parts per million, nd=not detected

Field Description of Soil

N/A

BORE HOLE DATA

Drilling Method: HSA
Hole Dia.: 4.25"
Depth: 30'

WELL DATA

Riser Type: PVC
Riser Dia.: 2"
Riser Length: 20'
Interval: 20'-0'

Screen Type: PVC
Screen Dia.: 2"
Screen Length: 10'
Slot: 0.010
Interval: 30'-20'

FILTER PACK

Source: Sand
Composition:
Volume Used: 4 bags
Interval: 30'-17'

GROUT / SEAL

Type: Bent/Grout
Volume Used: 1 bucket/4 bags
Interval: 17'-15'/15'-0'

WELL HEAD COMPLETION

Manhole: ☐ YES ☐ NO
Size:
Concrete Pad: ☐ YES ☐ NO
Size:

Drawn by: D. Pachan

Key:

▨ Grout
⊔ Bentonite
+ Sand

LEGEND

trace=1-10%
little=10-20%
some=20-30%
and=30-50%

very fine sand=0.6-0.13mm
fine sand=0.13-0.25mm
medium sand=0.25-0.50mm
course sand=0.5-1mm
very course sand=1-2mm

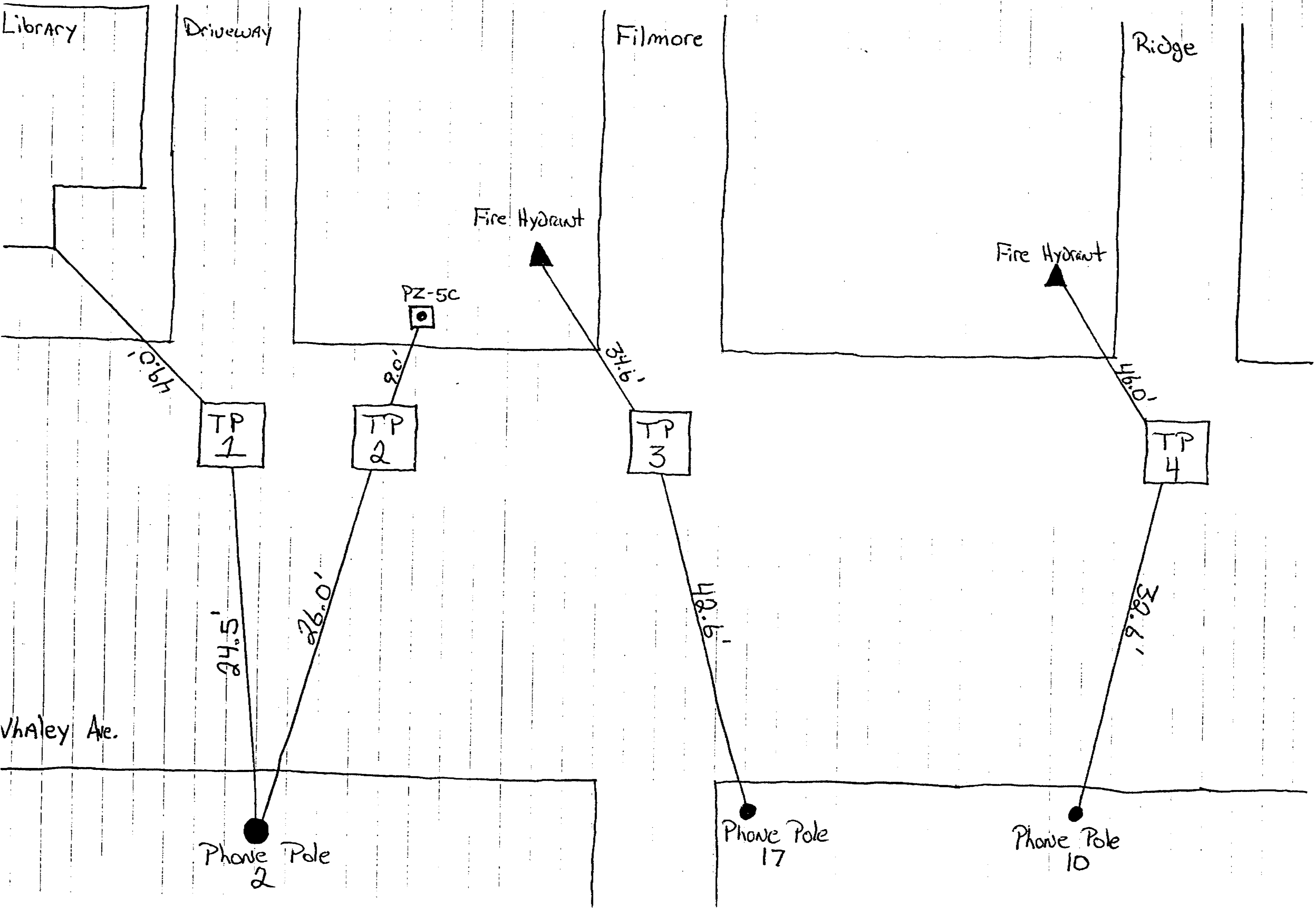
∇ = ground water table
f-gravel=2-4mm
m-gravel=4-64mm
c-gravel=64-256mm

WELL DEVELOPMENT

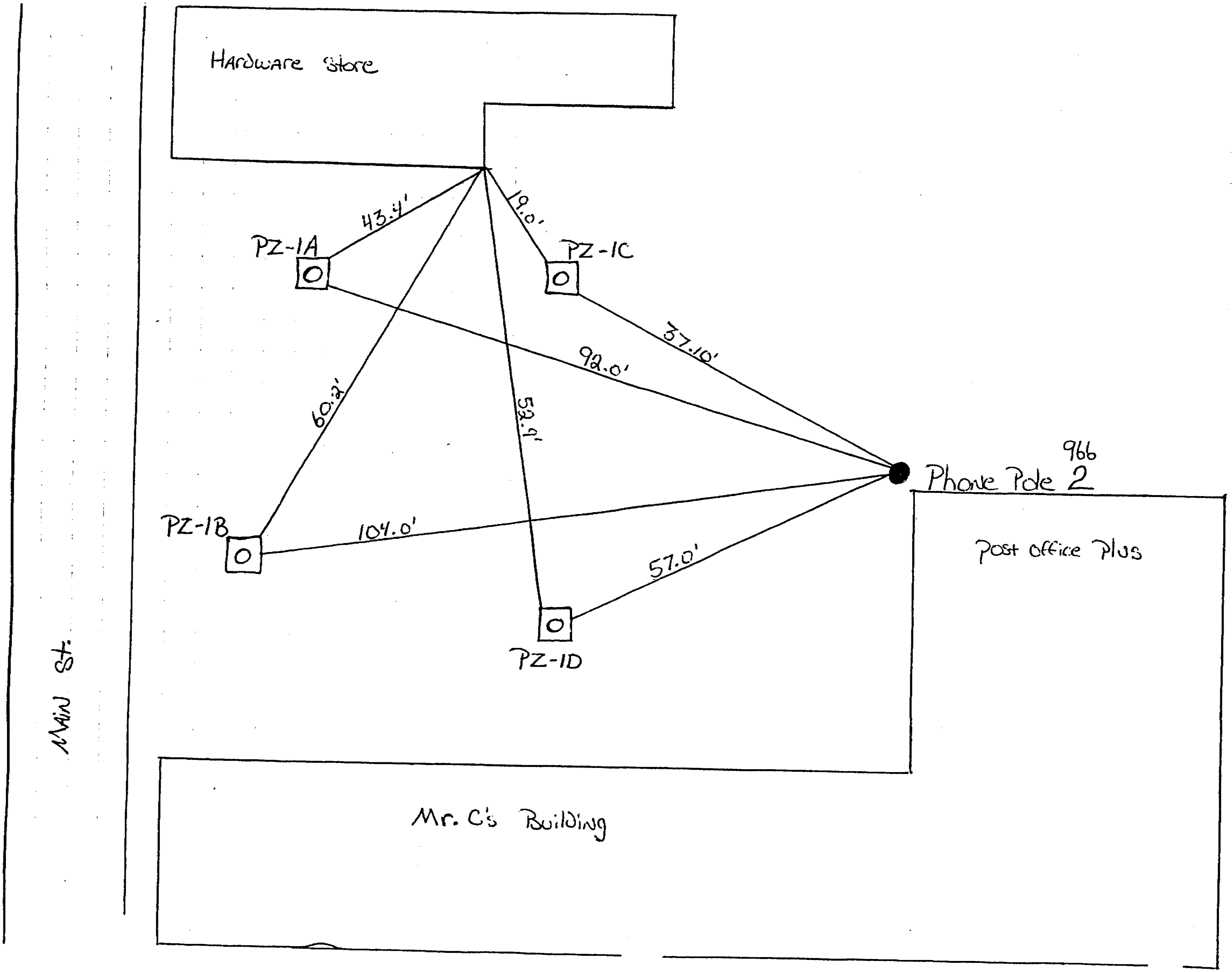
Performed: ☐ YES ☐ NO
Method:
Amt. Purged:
Date:

36

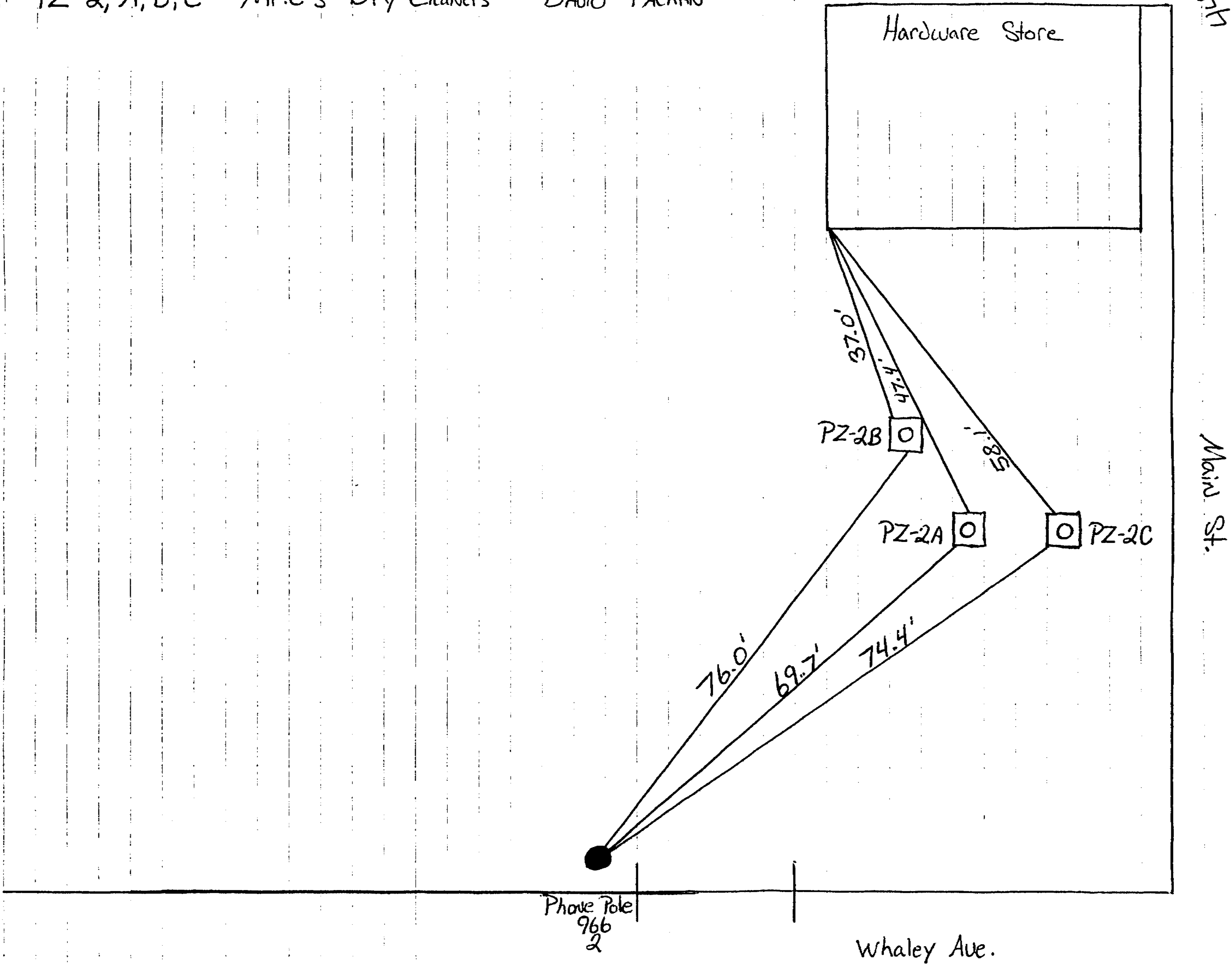
As Builts - Test Pits 10-23-01 Mr. C's Dry Cleaners David Pachan



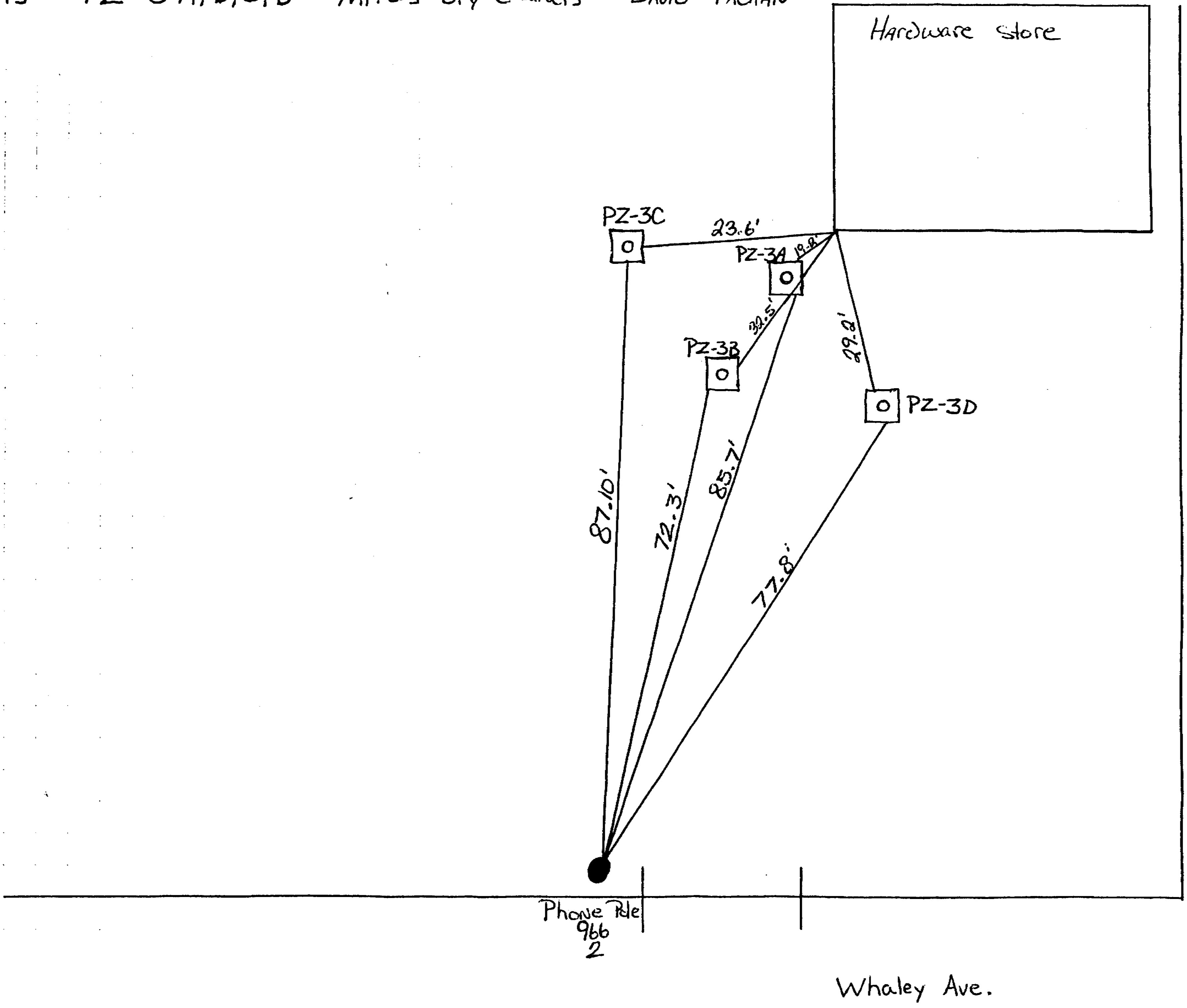
AS Builts PZ-1A, B, C, D Mr. C's Dry Cleaners David Pachon



4S Builts PZ-2, A, B, C Mr.C's Dry Cleaners David Pachan

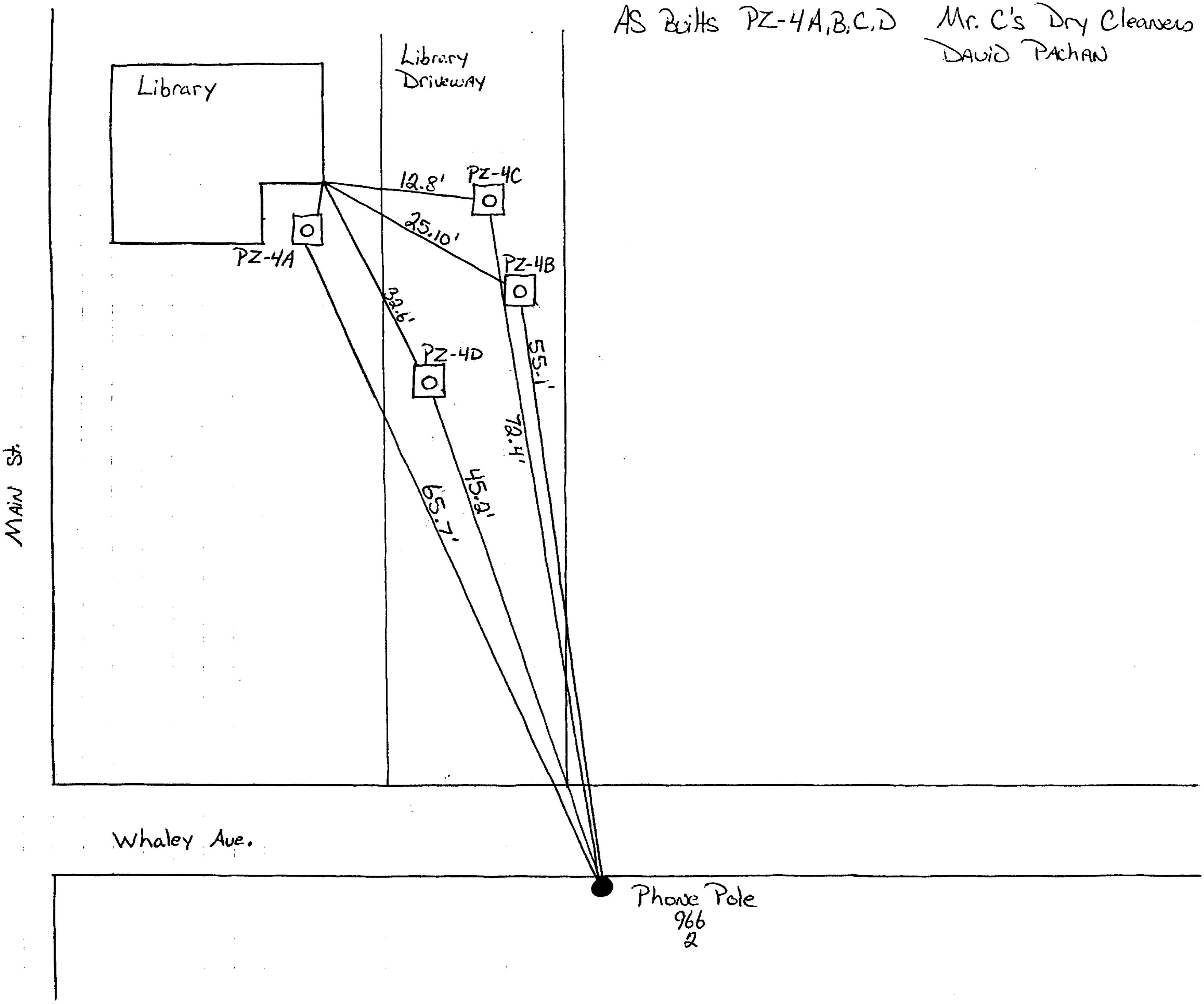


AS Builts PZ-3A,B,C,D Mr.C's Dry Cleaners David Pachan

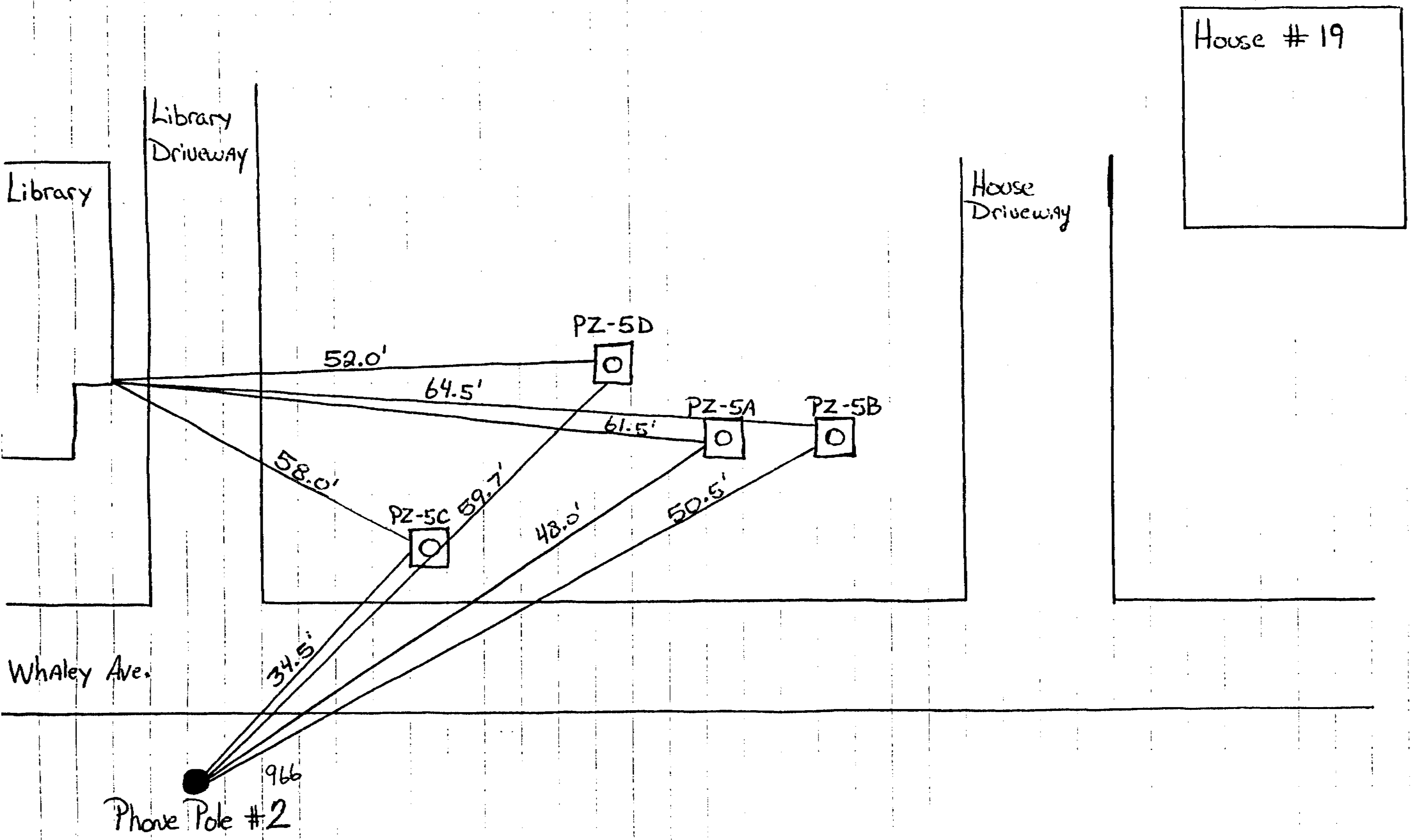


AS Builts PZ-4A,B,C,D Mr. C's Dry Cleaners
DAVID PACHAN

CJ

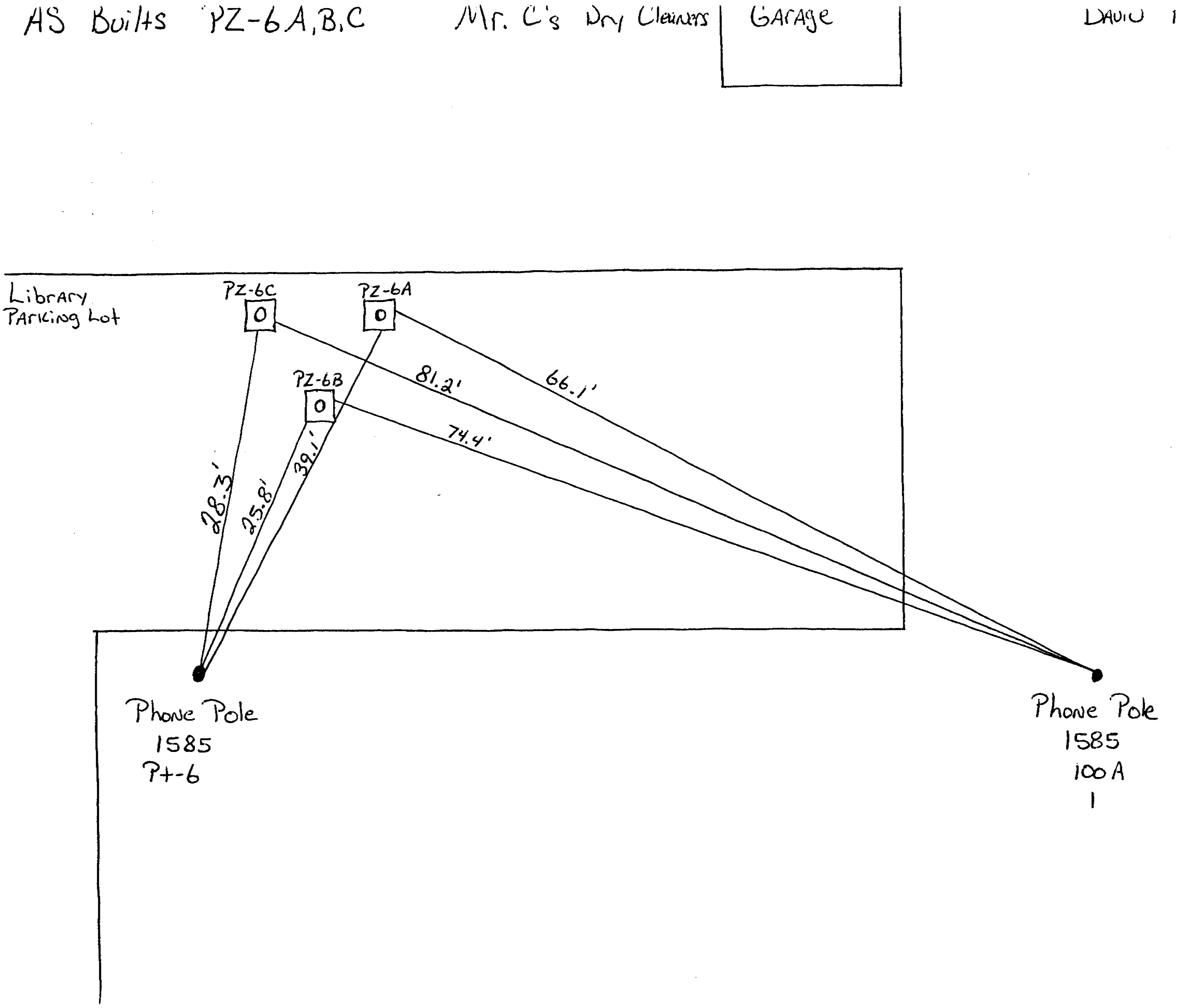


As Builts - PZ-5A,B,C,D Mr. C's Dry Cleaners David Pachan

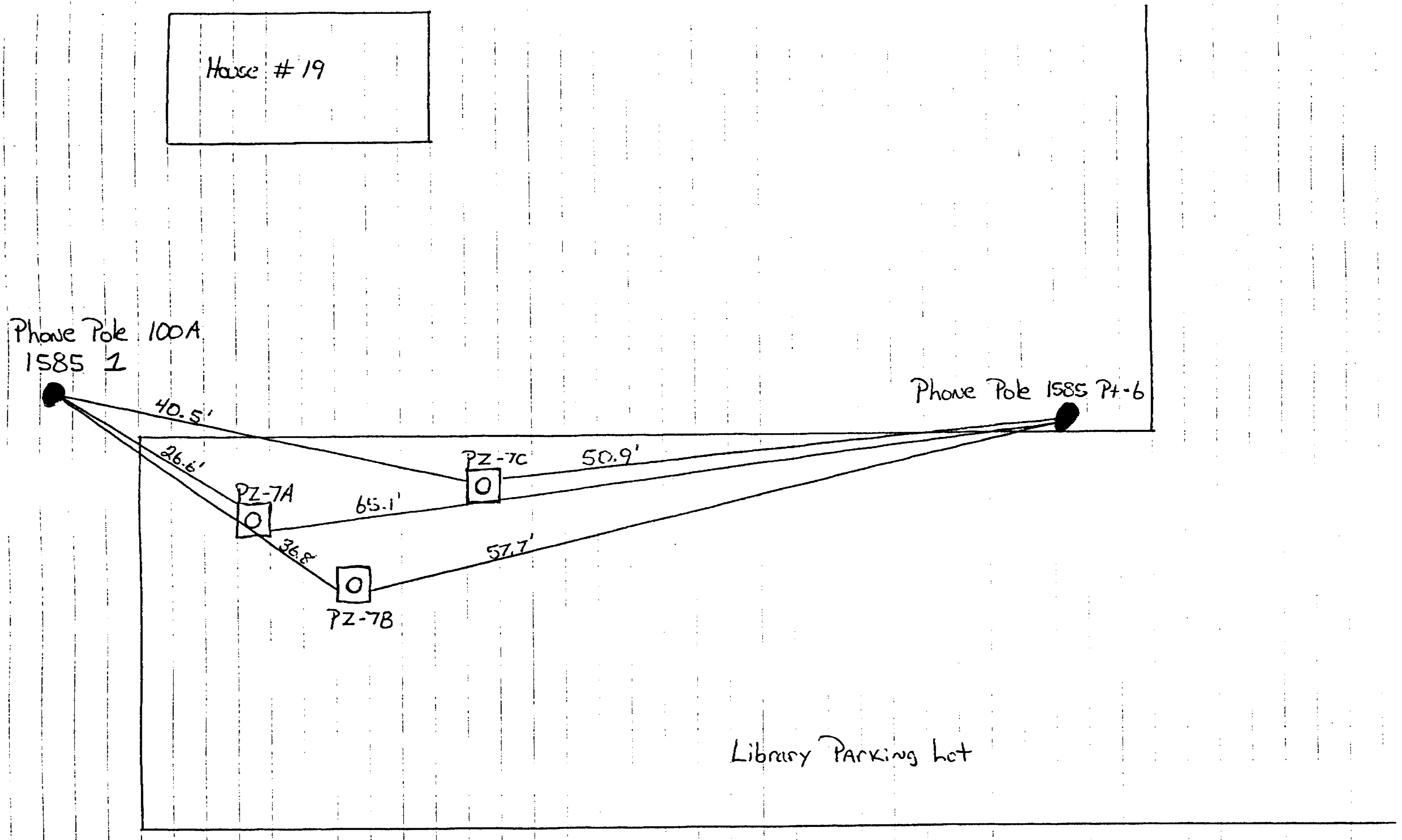


AS Builts PZ-6A,B,C

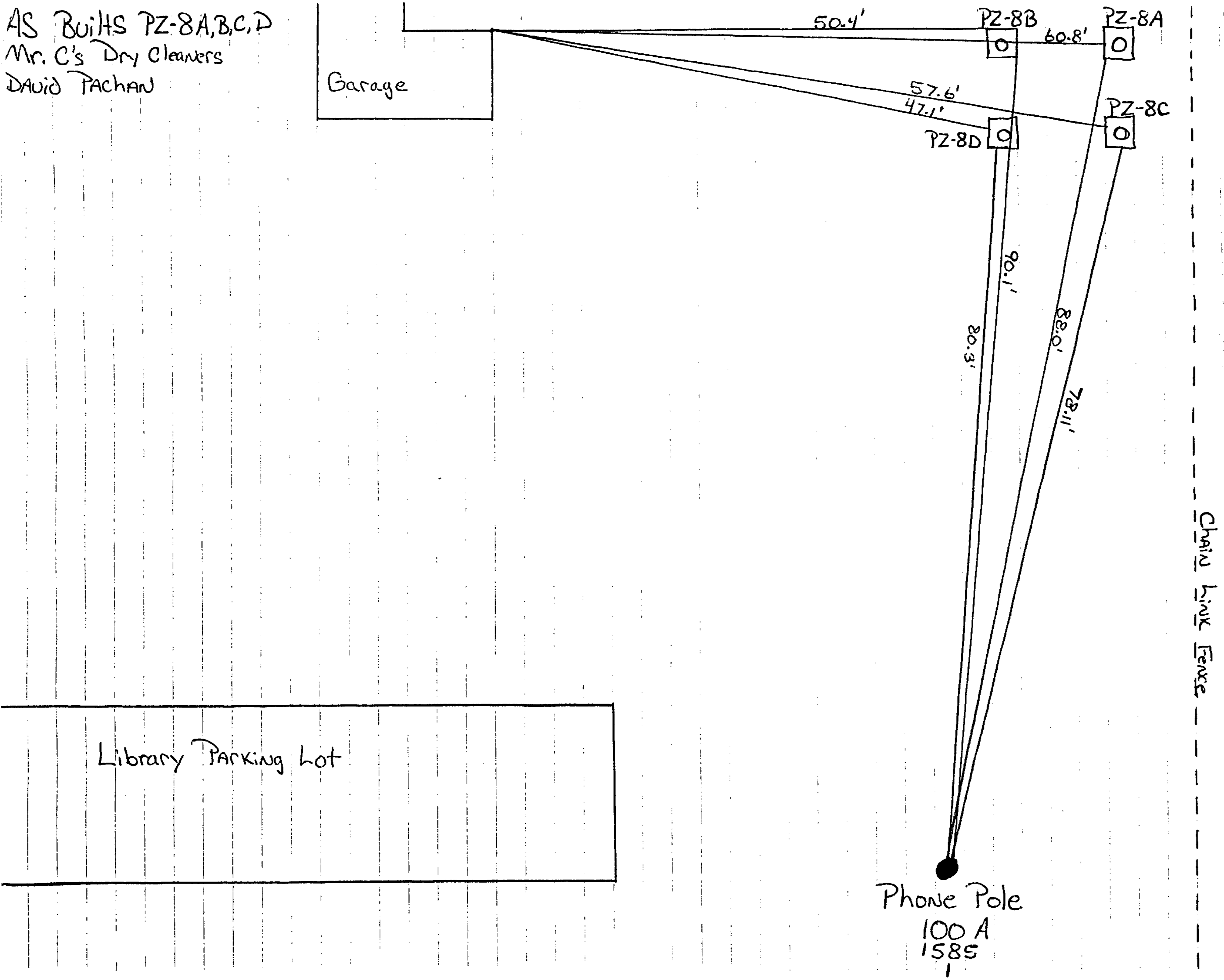
DAVID LACHAN



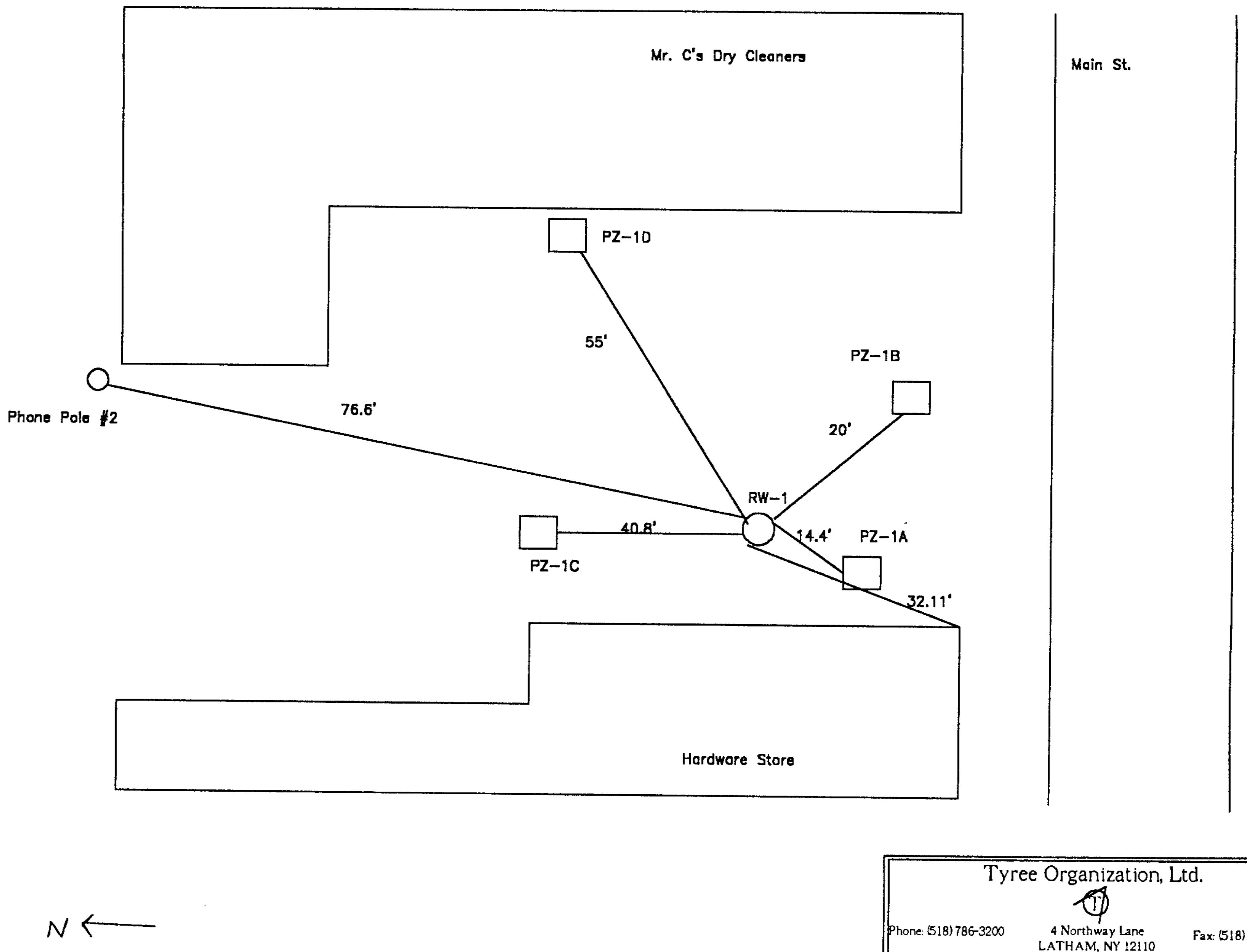
As Builts PZ-7A, B,C Mr.C's Dry Cleaners David Pachan



AS Builts PZ-8A,B,C,D
Mr. C's Dry Cleaners
David Pachan



RW-1 Well Clusters



Tyree Organization, Ltd.

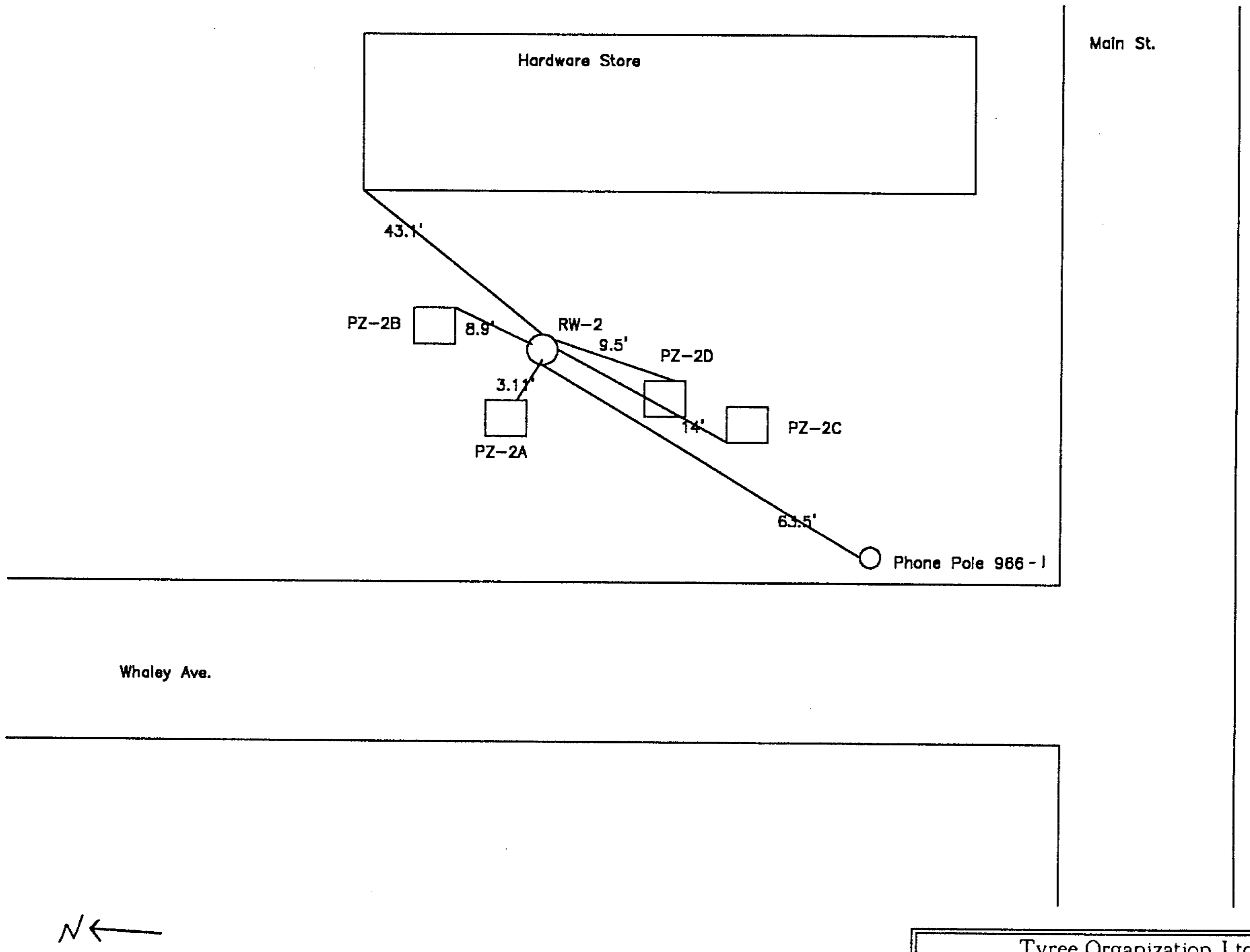
Phone: (518) 786-3200
4 Northway Lane
LATHAM, NY 12110
Fax: (518) 786-7351

Project Number 017301
As Builts

Mr. C's Dry Cleaners
586 Main Street
East Aurora, New York 14052

DRAWN BY: DLP
11-28-01
SCALE: NTS
CLIENT: DEC
PLATE: RW-1

PW-2 Well Cluster



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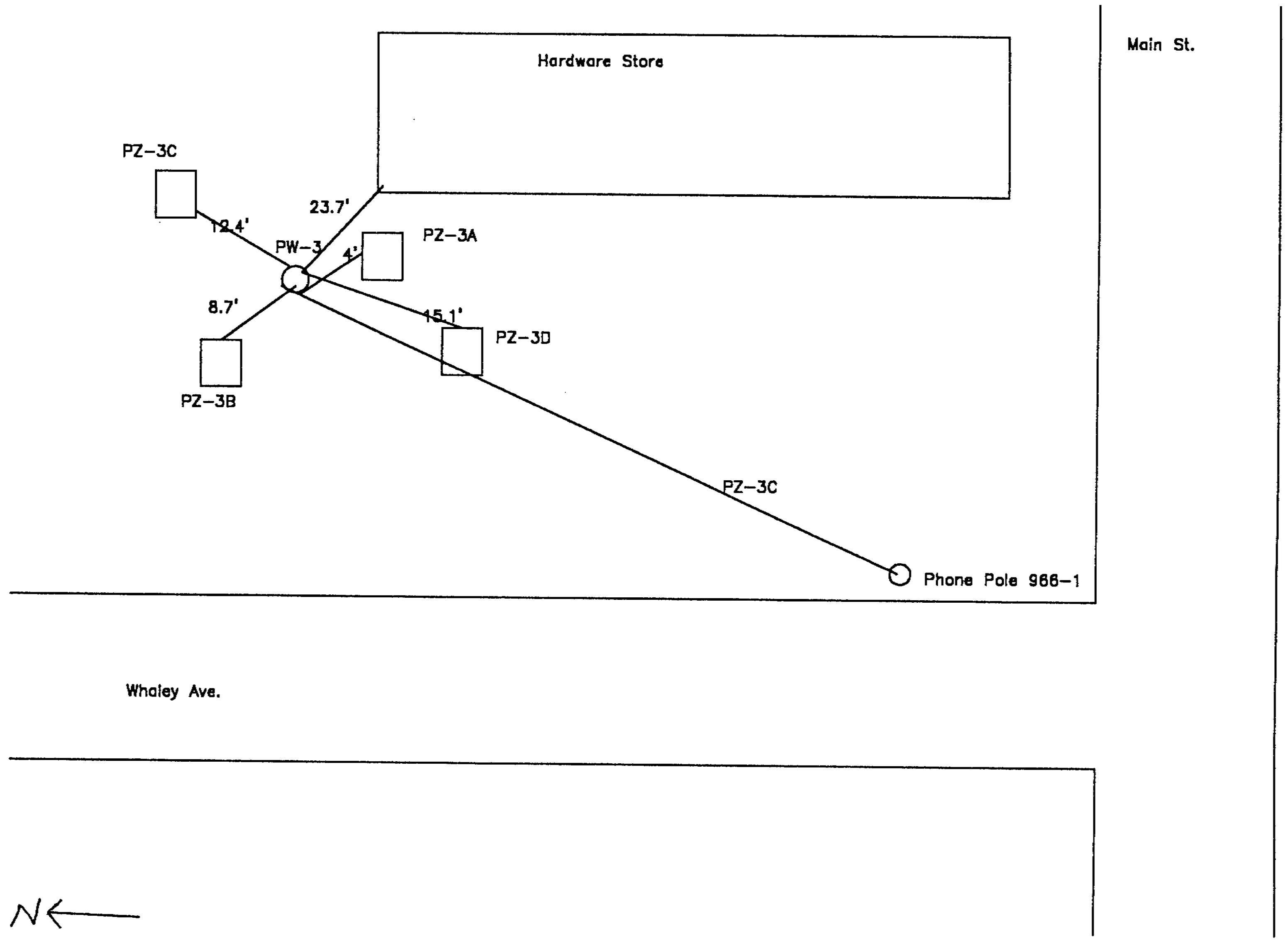
Project Number 017301
As Builts
Mr. C's Dry Cleaners
588 Main Street
East Aurora, New York 14052

DRAWN BY: DLP
11-28-01
SCALE: NTS
CLIENT: DEC
PLATE: PW-2

PW-3 Well Cluster



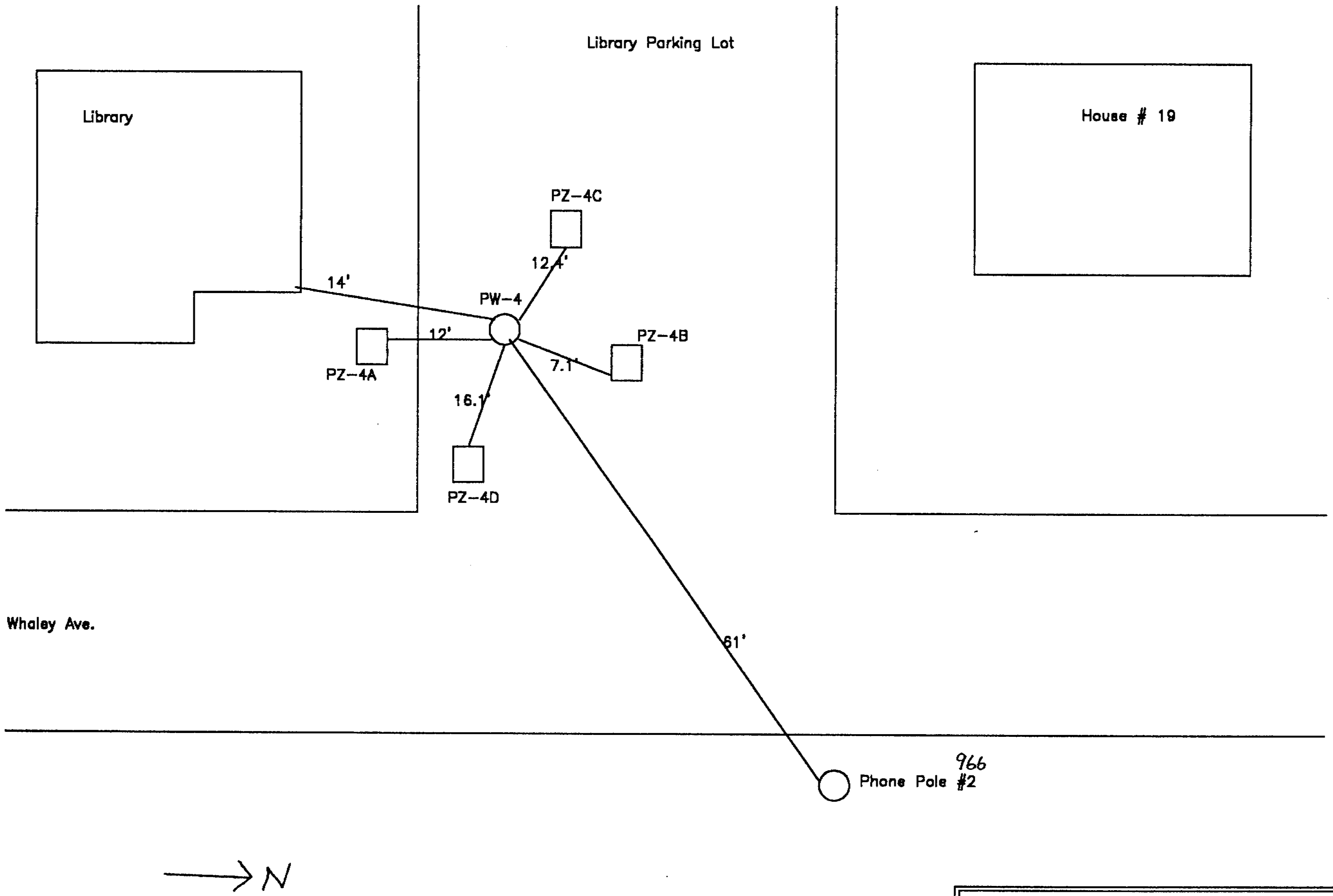
Tyree Organization, Ltd.

Phone: (518) 786-3200
4 Northway Lane
LATHAM, NY 12110
Fax: (518) 786-7351

Project Number 017301 As Builts	DRAWN BY: DLP
Mr. C's Dry Cleaners 586 Main Street East Aurora, New York 14052	11-28-01 SCALE: NTS CLIENT: DEC PLATE: PW-3

5r

PW-4 Well Cluster



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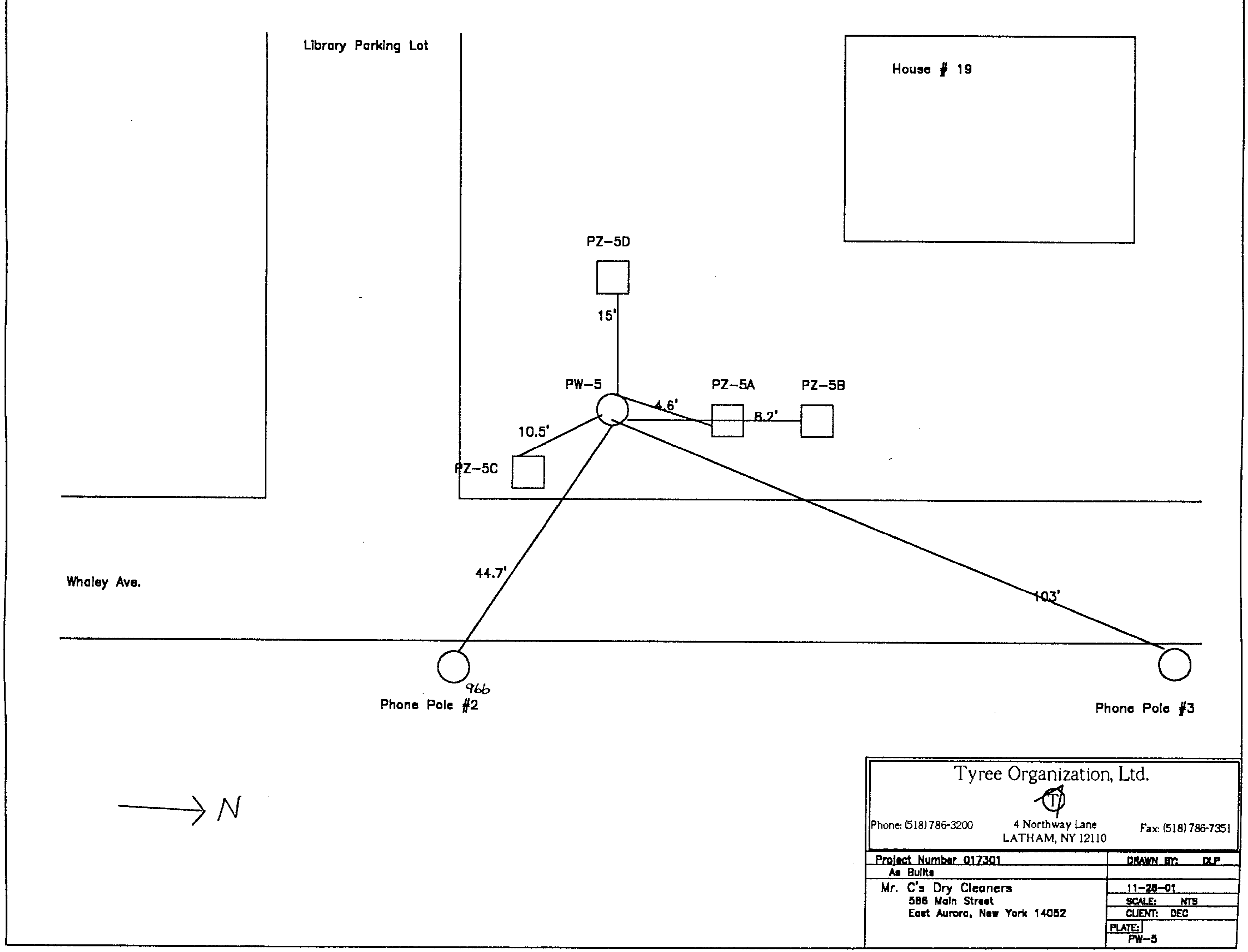
LATHAM, NY 12110
Fax: (518) 786-7351

Project Number 017301
As Builts
Mr. C's Dry Cleaners
588 Main Street
East Aurora, New York 14052

DRAWN BY: DLP
11-28-01
SCALE: NTS
CLIENT: DEC
PLATE: PW-4

PW-5 Well Cluster



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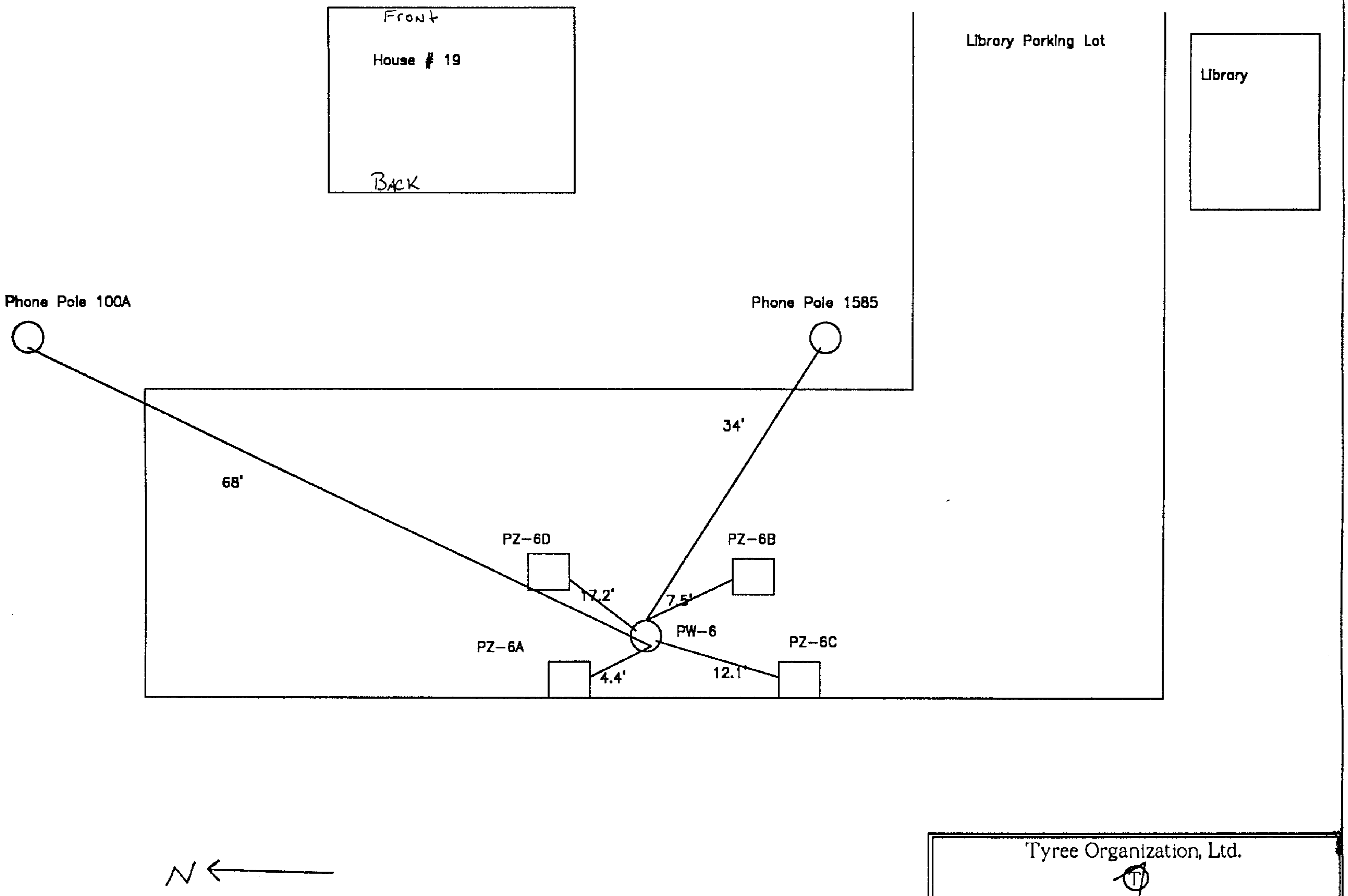
4 Northway Lane
LATHAM, NY 12110
Fax: (518) 786-7351

Project Number 017301
As Builts
Mr. C's Dry Cleaners
586 Main Street
East Aurora, New York 14052

DRAWN BY: DLP
11-28-01
SCALE: NTS
CLIENT: DEC
PLATE: PW-5

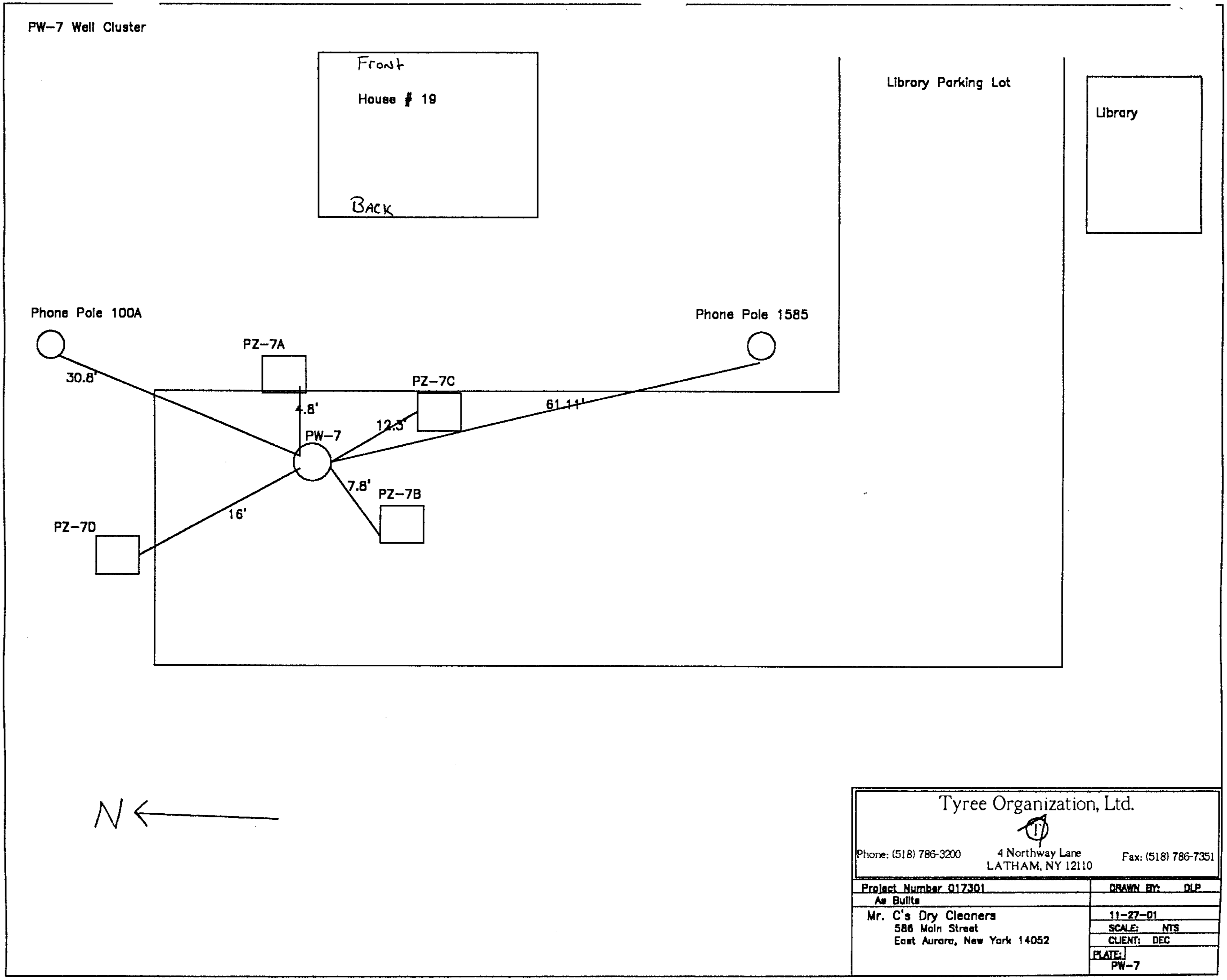
PW-6 Well Clusters



Tyree Organization, Ltd.

Phone: (518) 786-3200
4 Northway Lane
LATHAM, NY 12110
Fax: (518) 786-7351

Project Number 017301 As Builts	DRAWN BY: DLP
Mr. C's Dry Cleaners 586 Main Street East Aurora, New York 14052	11-27-01 SCALE: NTS CLIENT: DEC PLATE: PW-6



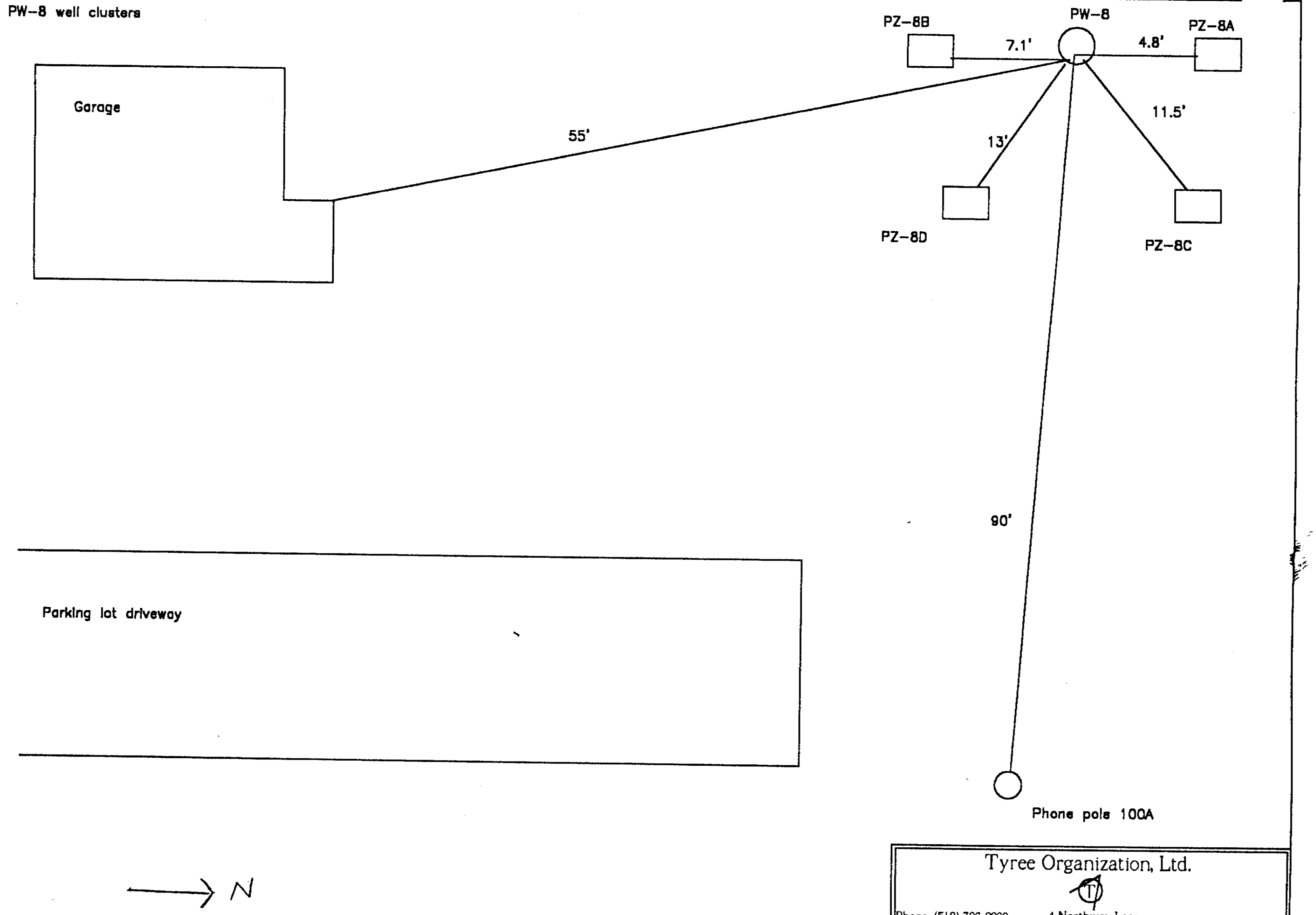
Tyree Organization, Ltd.

Phone: (518) 786-3200
4 Northway Lane
LATHAM, NY 12110
Fax: (518) 786-7351

Project Number 017301
As Builts
Mr. C's Dry Cleaners
586 Main Street
East Aurora, New York 14052

DRAWN BY: DLP
11-27-01
SCALE: NTS
CLIENT: DEC
PLATE: PW-7

PW-8 well clusters



Tyree Organization, Ltd.

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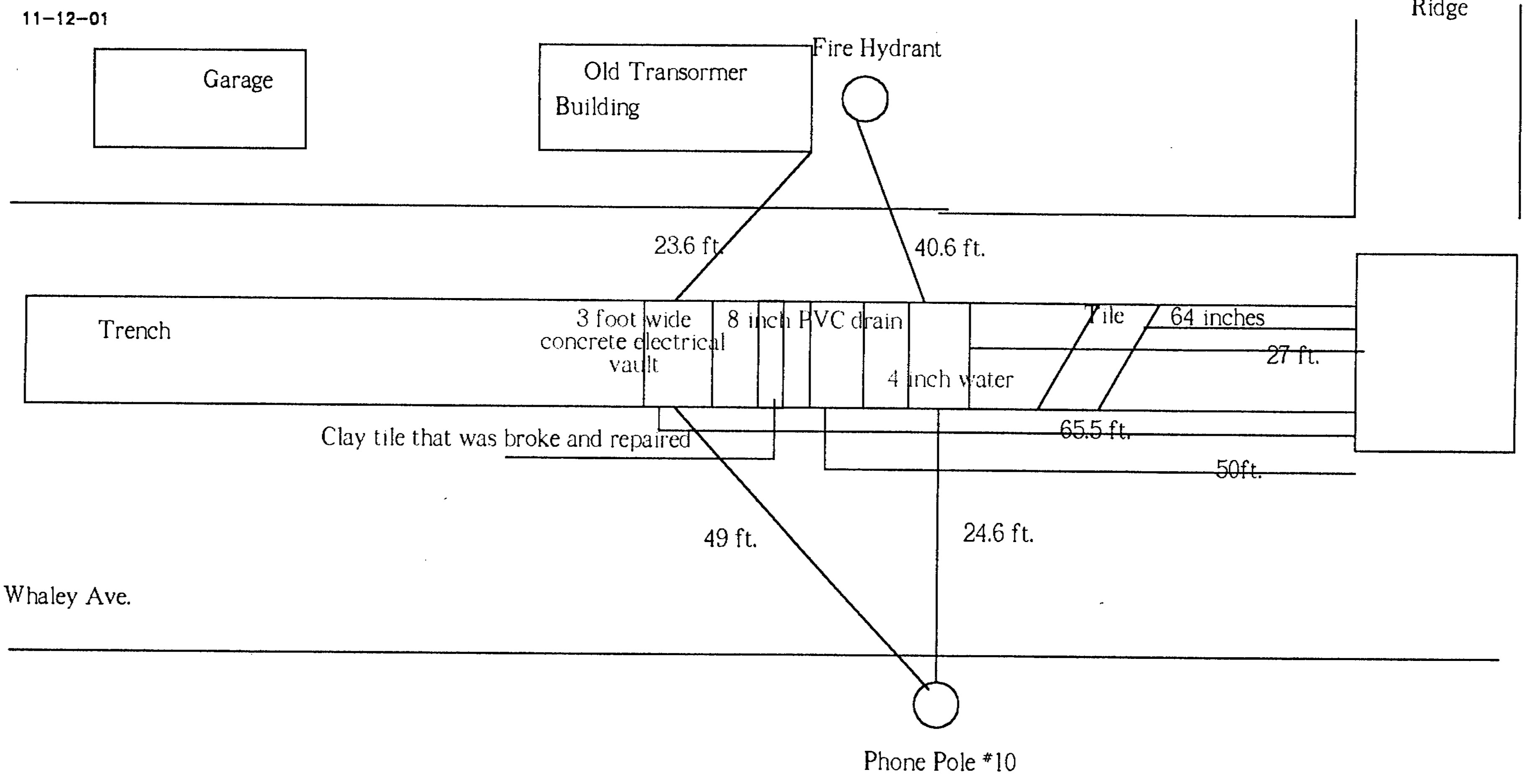
4 Northway Lane
LATHAM, NY 12110
Fax: (518) 786-7351

Project Number 017301 As Builts	DRAWN BY: DLP
Mr. C's Dry Cleaners 586 Main Street East Aurora, New York 14052	11-27-01 SCALE: NTS CLIENT: DEC PLATE: PW-8

5

Force Main
11-12-01



200 feet of 4 inch pipe in the ground

231 feet of trench excavated

6 inches of asphalt no concrete

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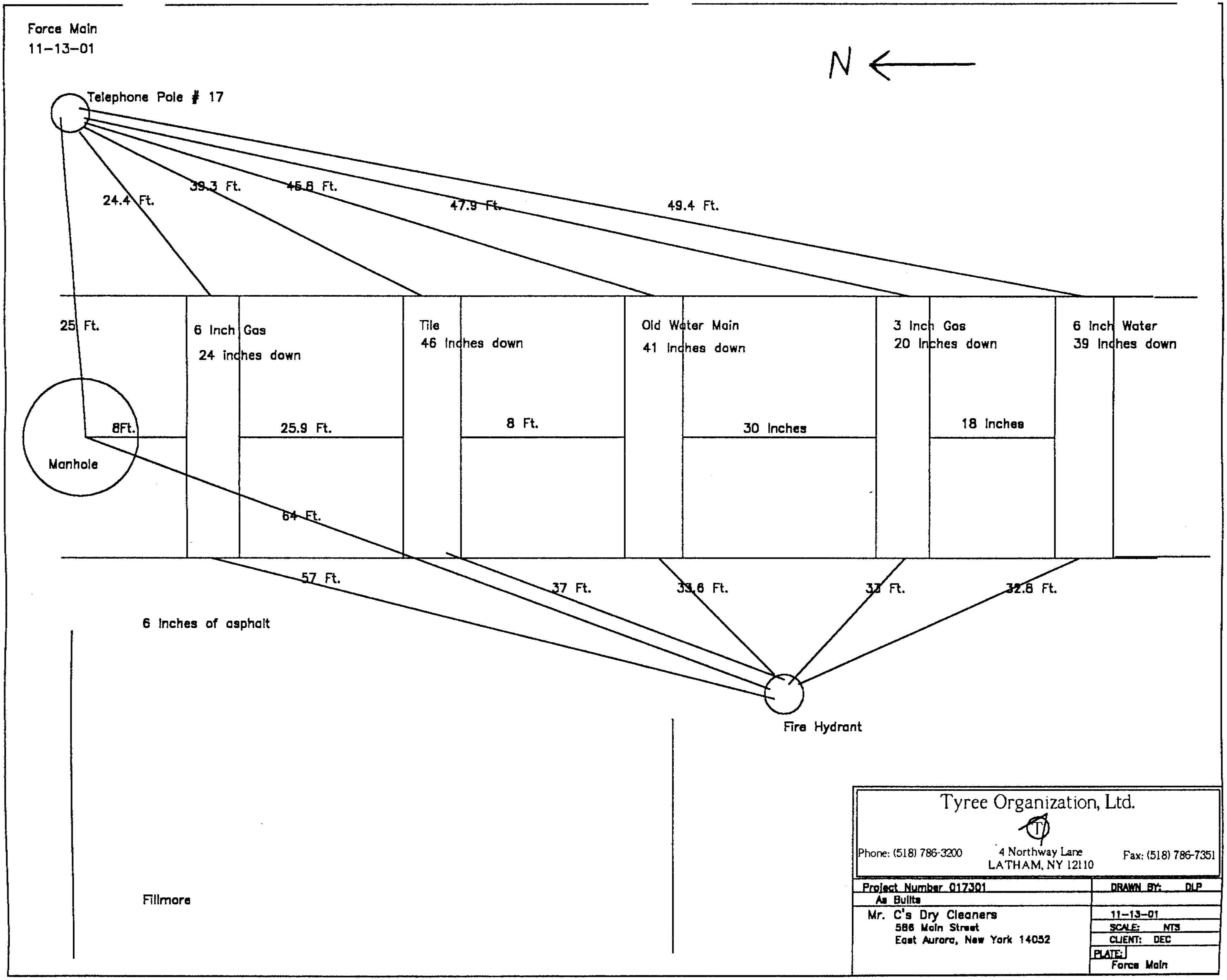
Project Number 017301
As Builts
Mr. C's Dry Cleaners
586 Main Street
East Aurora, New York 14052

DRAWN BY: DLP
11-12-01
SCALE: NTS
CLIENT: DEC
PLATE:
Force Main 11-12-01

Force Main
11-13-01



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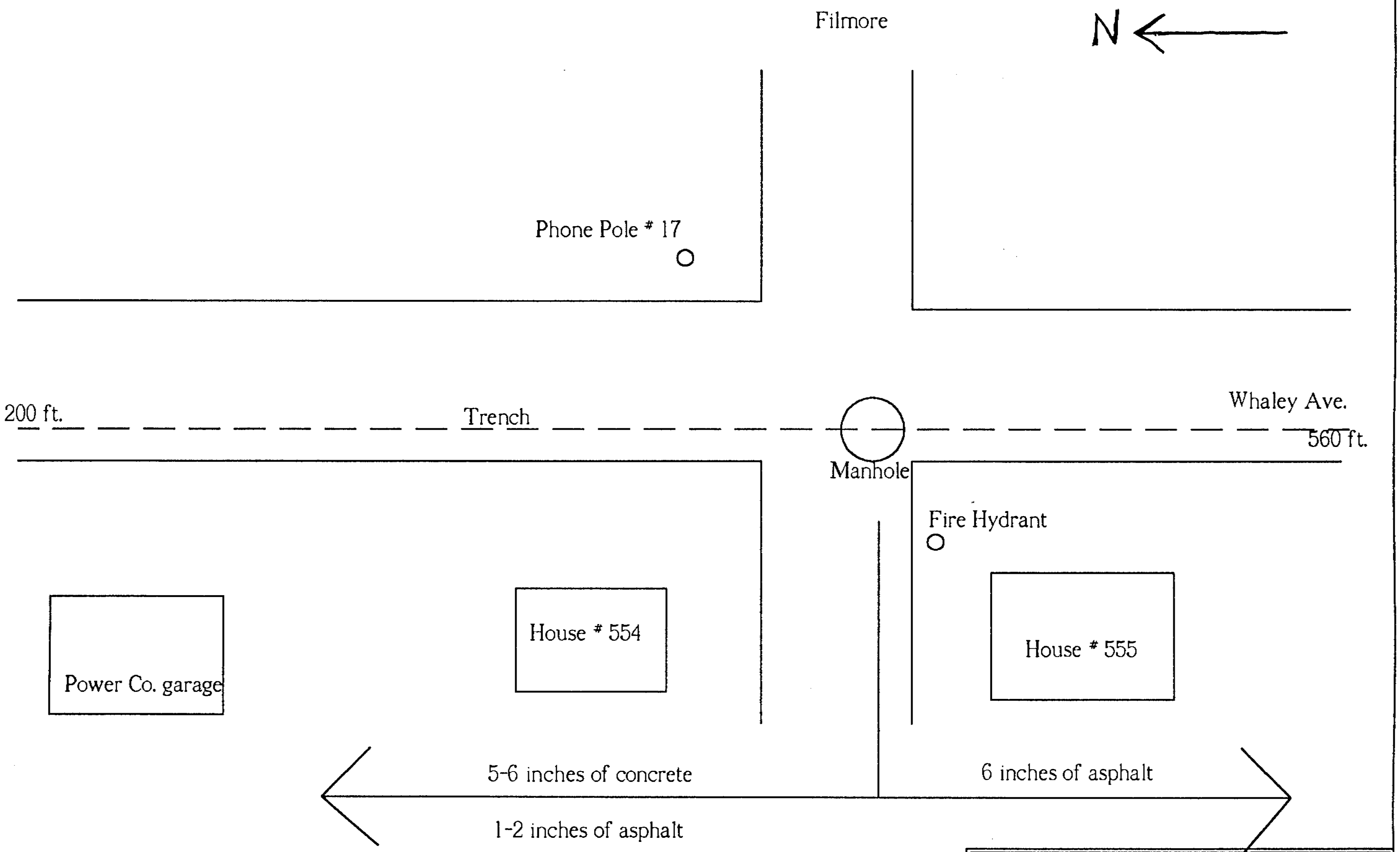
Project Number 017301
As Builts
Mr. C's Dry Cleaners
586 Main Street
East Aurora, New York 14052

DRAWN BY: DLP
11-13-01
SCALE: NTS
CLIENT: DEC
PLATE:
Force Main

Force Main
11-13-01



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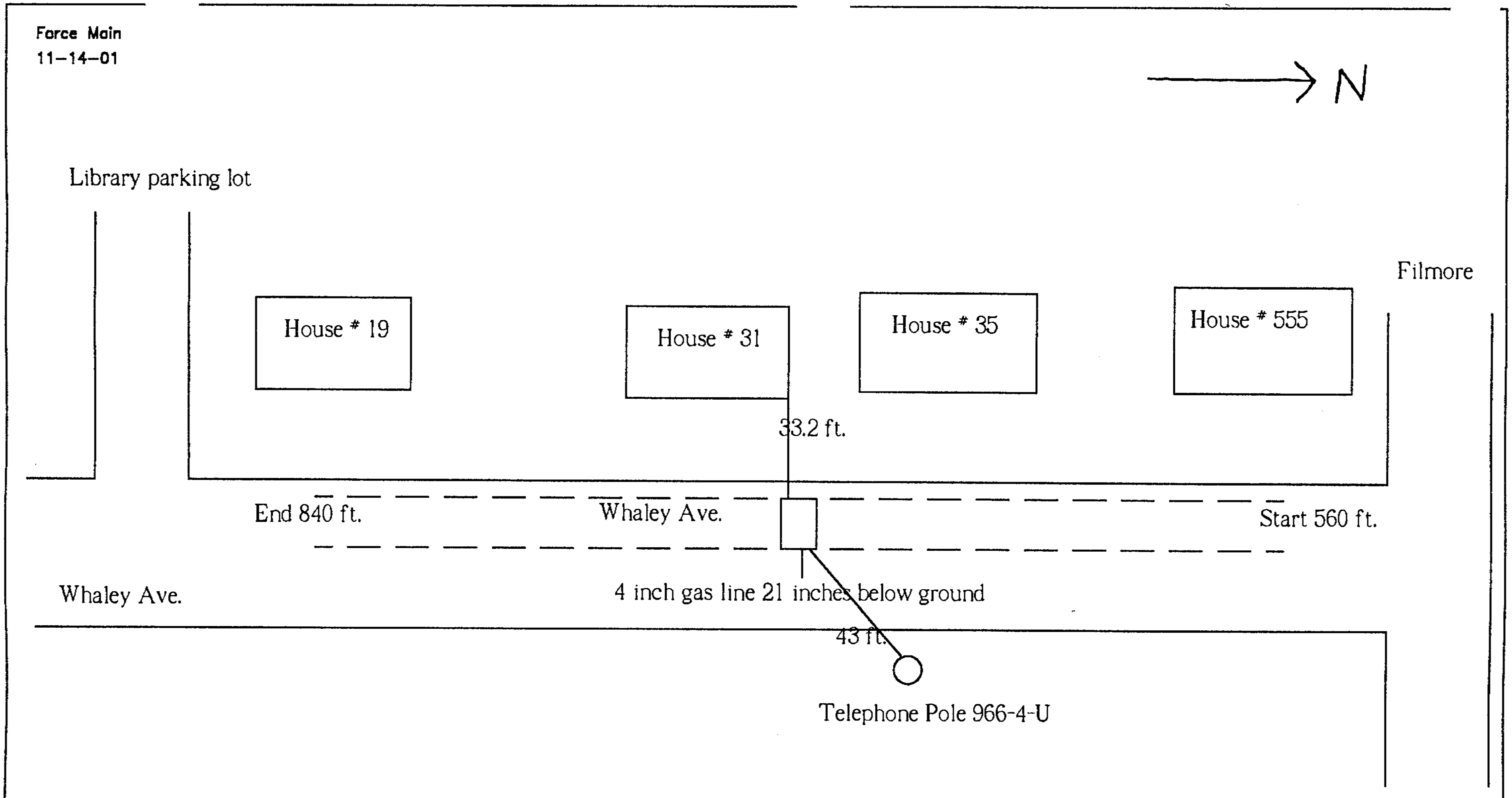
Project Number 017301
As Builts
Mr. C's Dry Cleaners
586 Main Street
East Aurora, New York 14052

DRAWN BY: DLP
11-13-01
SCALE: NTS
CLIENT: DEC
PLATE:
Force Main

Force Main
11-14-01



5-6 inches of concrete

1-2 inches of asphalt

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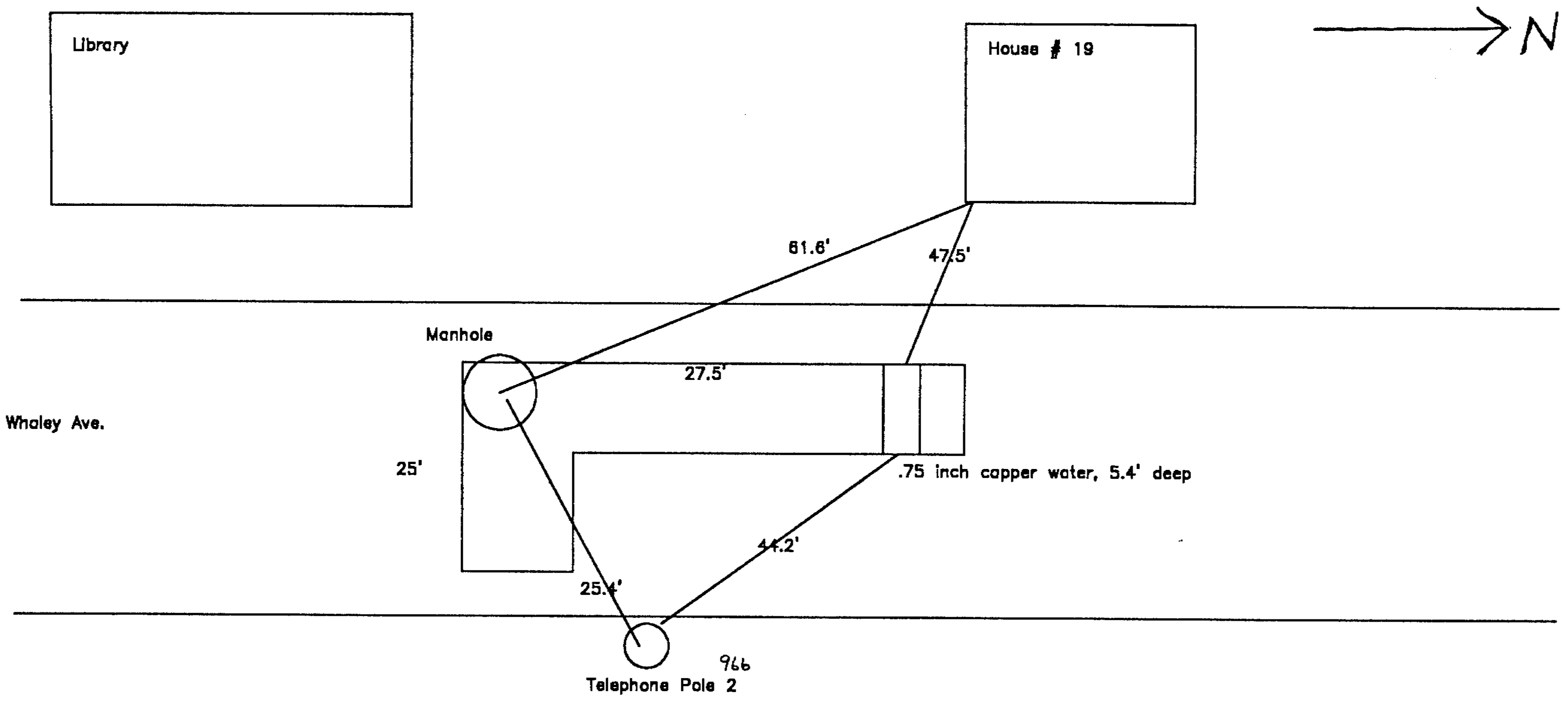
Project Number 017301	**DRAWN BY: DLP**
As Builts	
Mr. C's Dry Cleaners **586 Main Street** **East Aurora, New York 14052**	**11-14-01** **SCALE: NTS** **CLIENT: DEC** **PLATE:** **Force Main**

Force Main
11-15-01



5-6 inches of concrete

1-2 inches of asphalt

Tyree Organization, Ltd.

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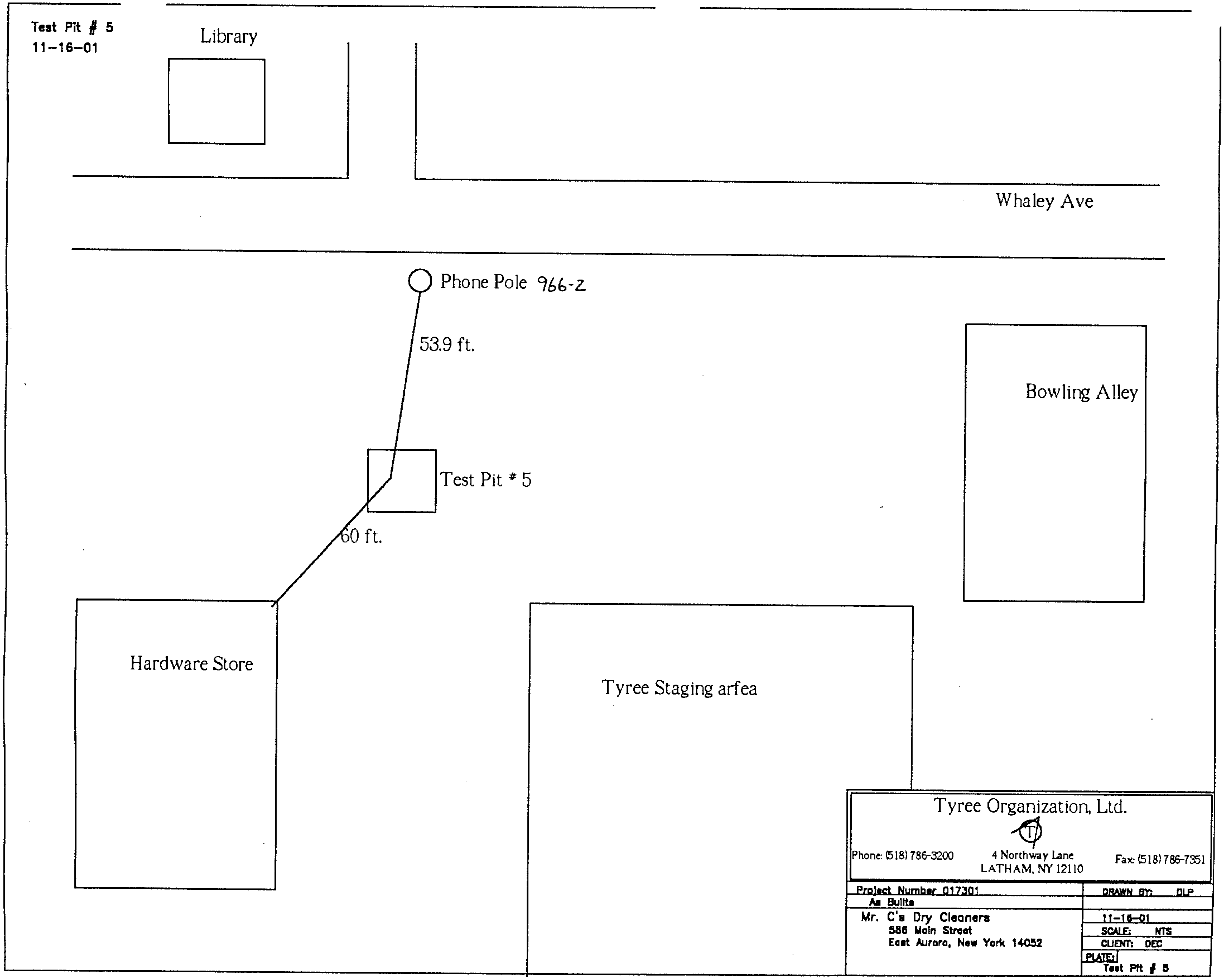
Project Number 017301
As Builts
Mr. C's Dry Cleaners
586 Main Street
East Aurora, New York 14052

DRAWN BY: DLP
11-15-01
SCALE: NTS
CLIENT: DEC
PLATE:
Force Main

Test Pit # 5
11-16-01



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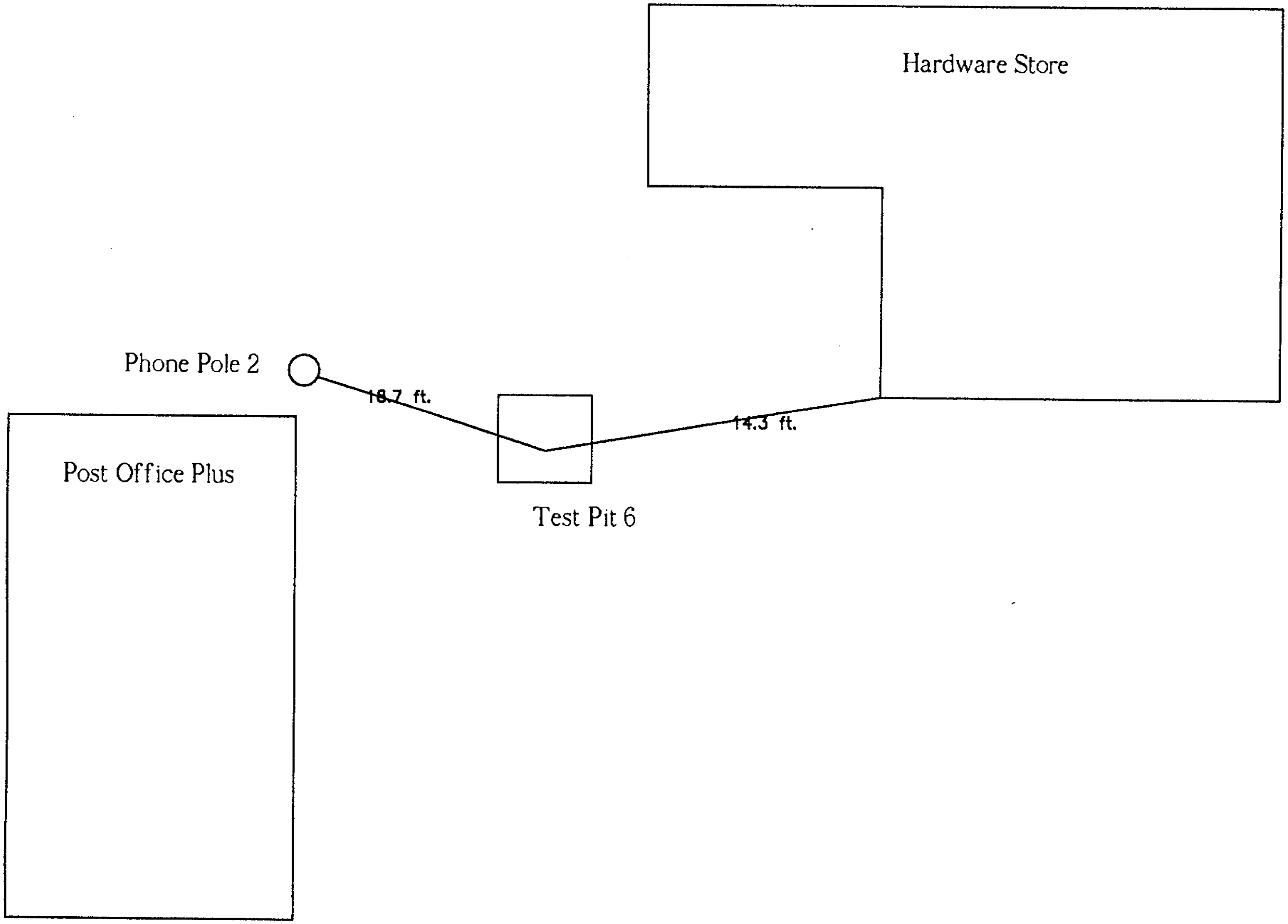
Project Number 017301
As Builts
Mr. C's Dry Cleaners
586 Main Street
East Aurora, New York 14052

DRAWN BY: DLP
11-16-01
SCALE: NTS
CLIENT: DEC
PLATE:
Test Pit # 5

Test Pit 6
11-16-01



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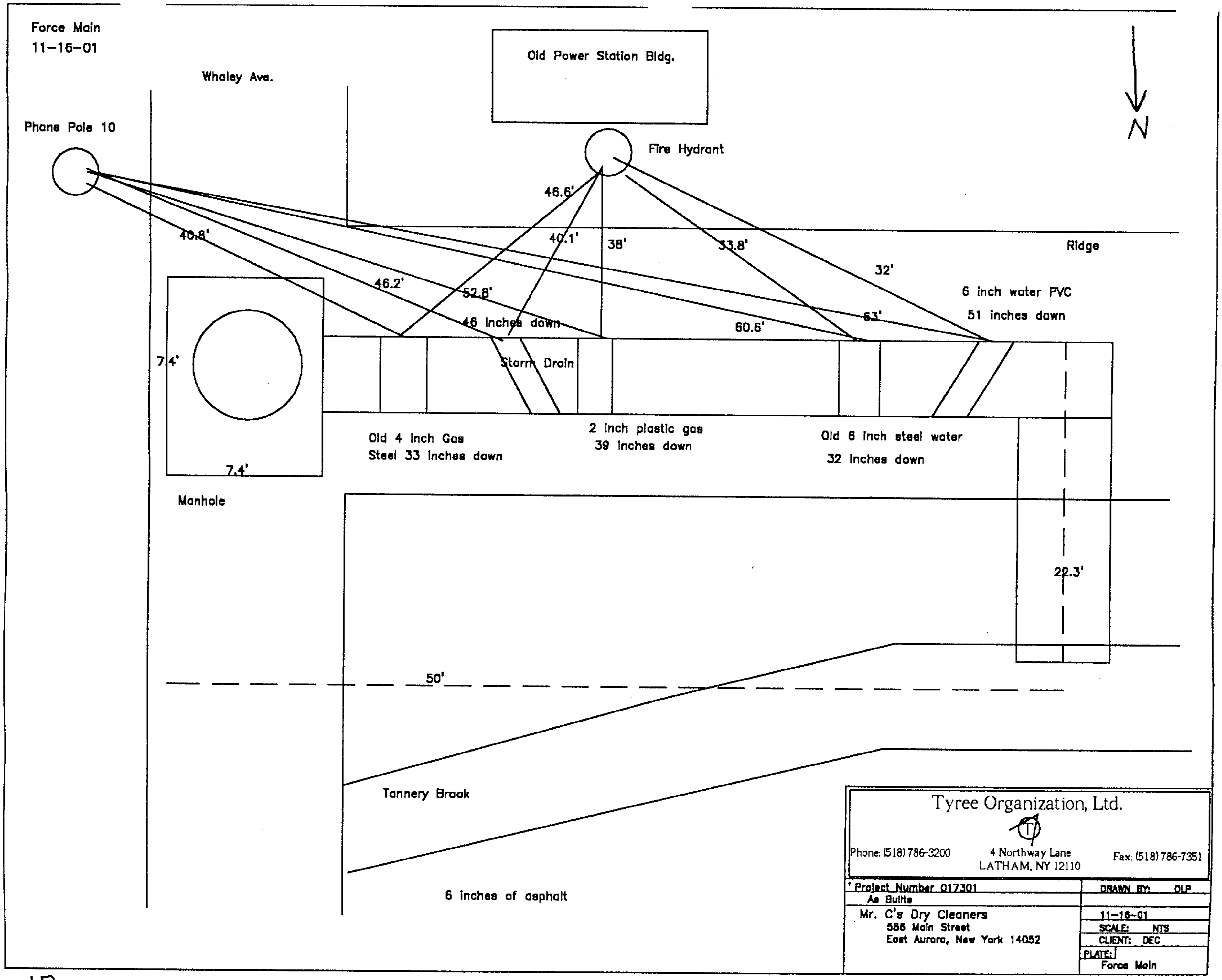
Project Number 017301
As Builts

Mr. C's Dry Cleaners
588 Main Street
East Aurora, New York 14052

DRAWN BY: DLP
11-16-01
SCALE: NTS
CLIENT: DEC
PLATE:
Test Pit # 6

Force Main
11-16-01



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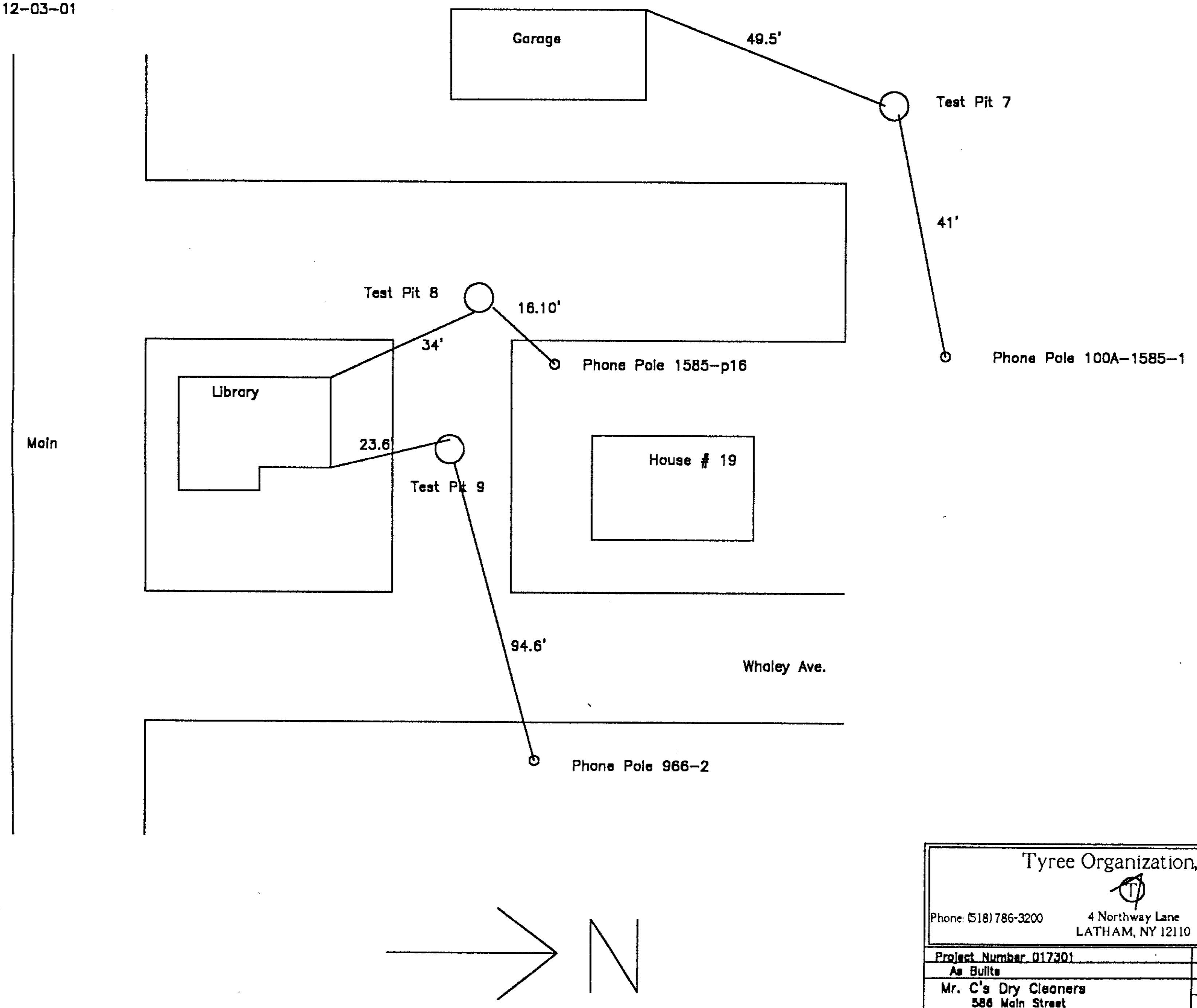
Project Number 017301
As Builts
Mr. C's Dry Cleaners
586 Main Street
East Aurora, New York 14052

DRAWN BY: DLP
11-16-01
SCALE: NTS
CLIENT: DEC
PLATE:
Force Main

Test Pits 7, 8, and 9
12-03-01



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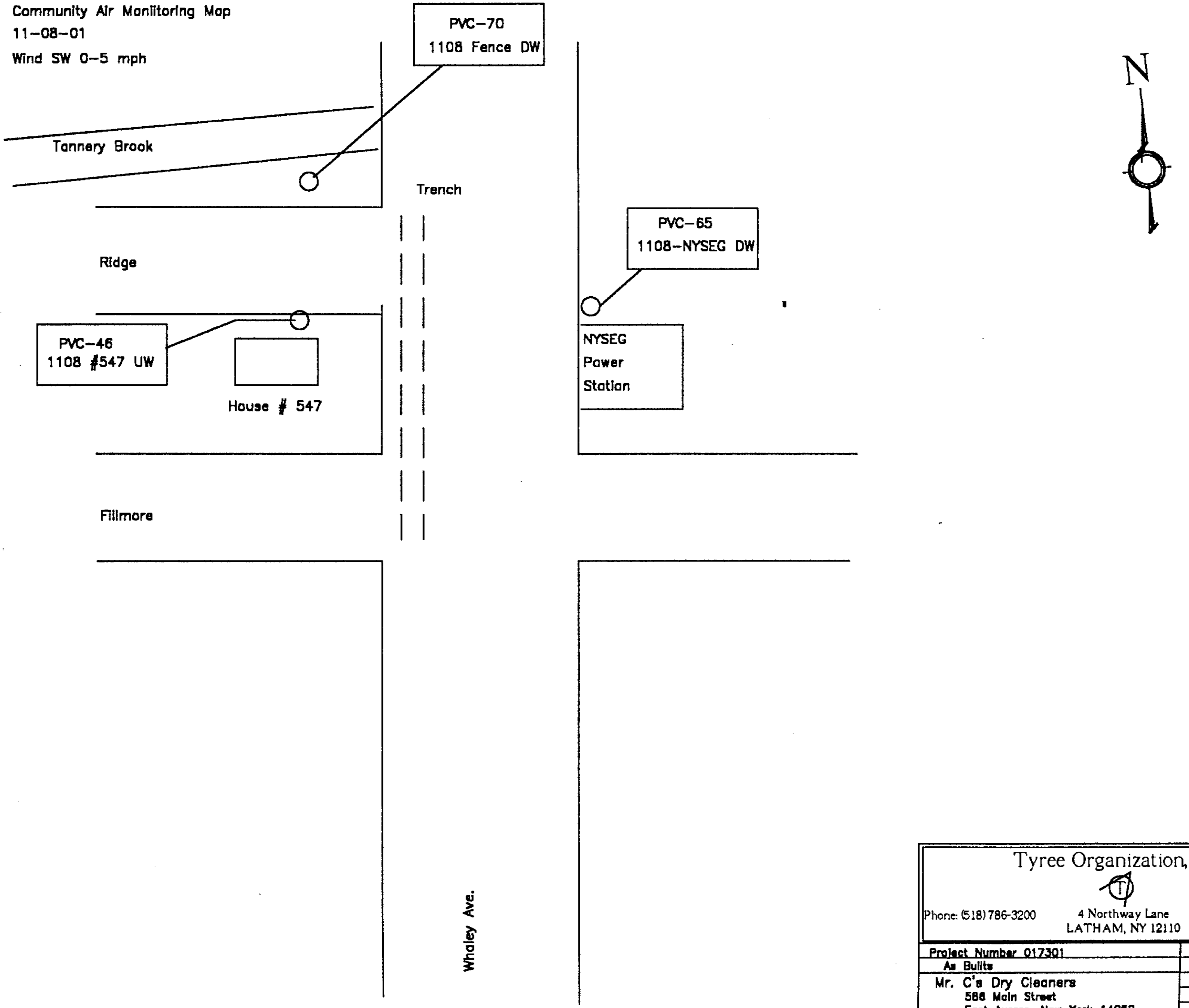
Project Number 017301 As Builts	DRAWN BY: DLP
Mr. C's Dry Cleaners 586 Main Street East Aurora, New York 14052	12-03-01 SCALE: NTS CLIENT: DEC PLATE: Test Pits

6c

Community Air Monitoring Map
11-08-01
Wind SW 0-5 mph



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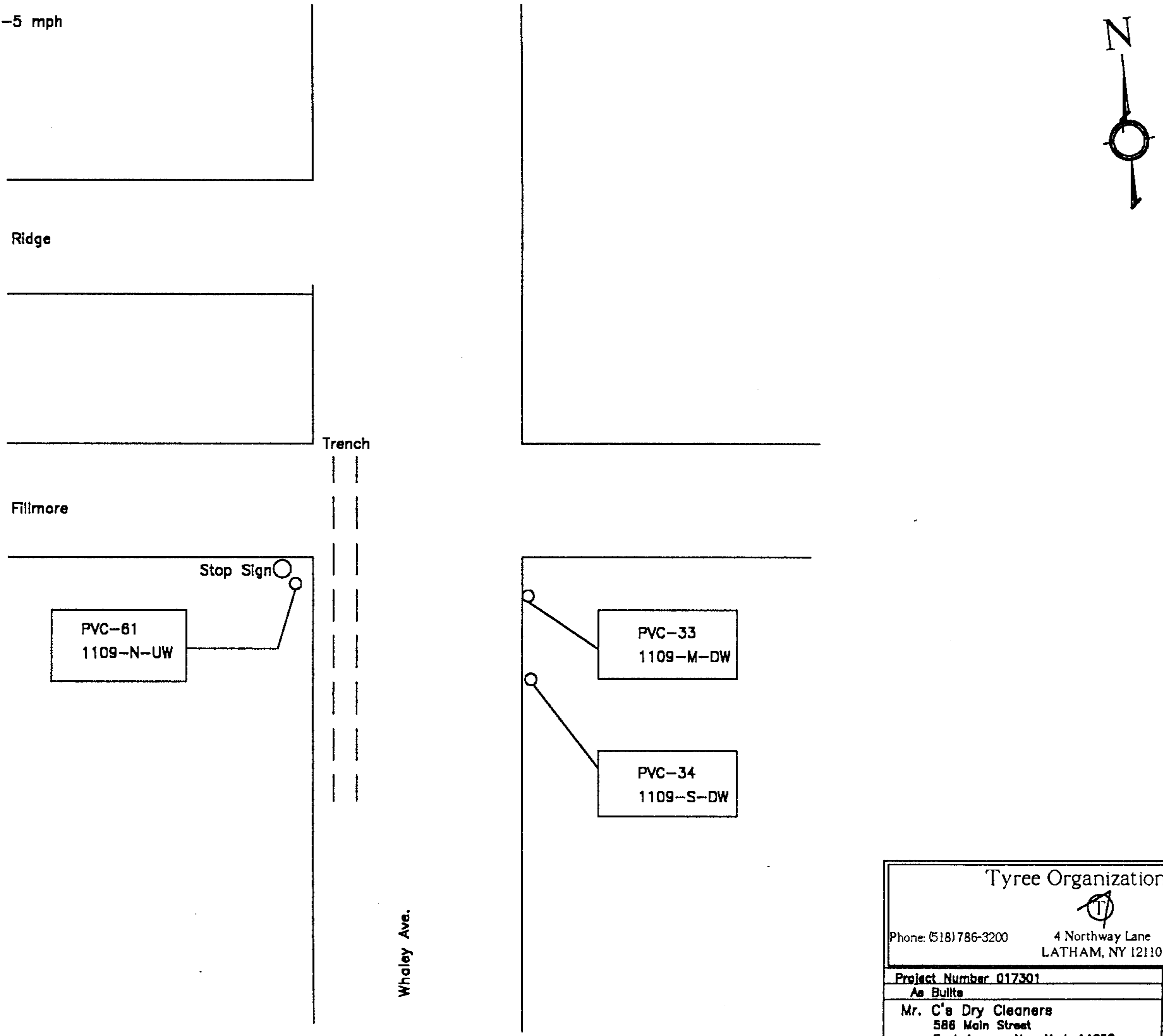
Project Number 017301 As Builts	DRAWN BY: DLP
Mr. C's Dry Cleaners 566 Main Street East Aurora, New York 14052	11-08-01 SCALE: NTS CLIENT: DEC PLATE: Community Air Monitoring

Community Air Monitoring Map
11-09-01
Wind NW 2-5 mph



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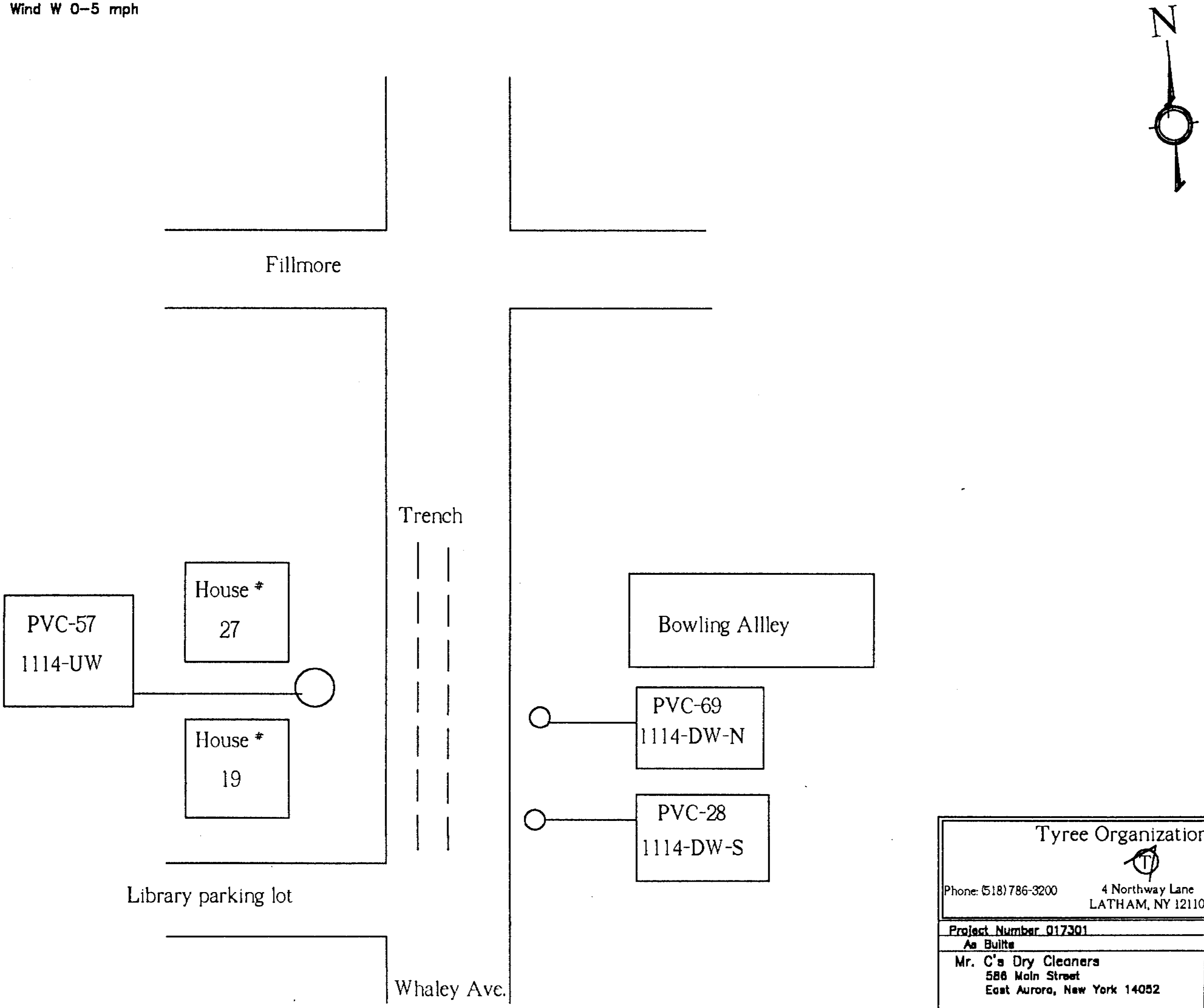
Project Number 017301
As Builts
Mr. C's Dry Cleaners
586 Main Street
East Aurora, New York 14052

DRAWN BY: DLP
11-09-01
SCALE: NTS
CLIENT: DEC
PLATE:
Community Air Monitoring

Community Air Moniitoring Map
11-14-01
Wind W 0-5 mph



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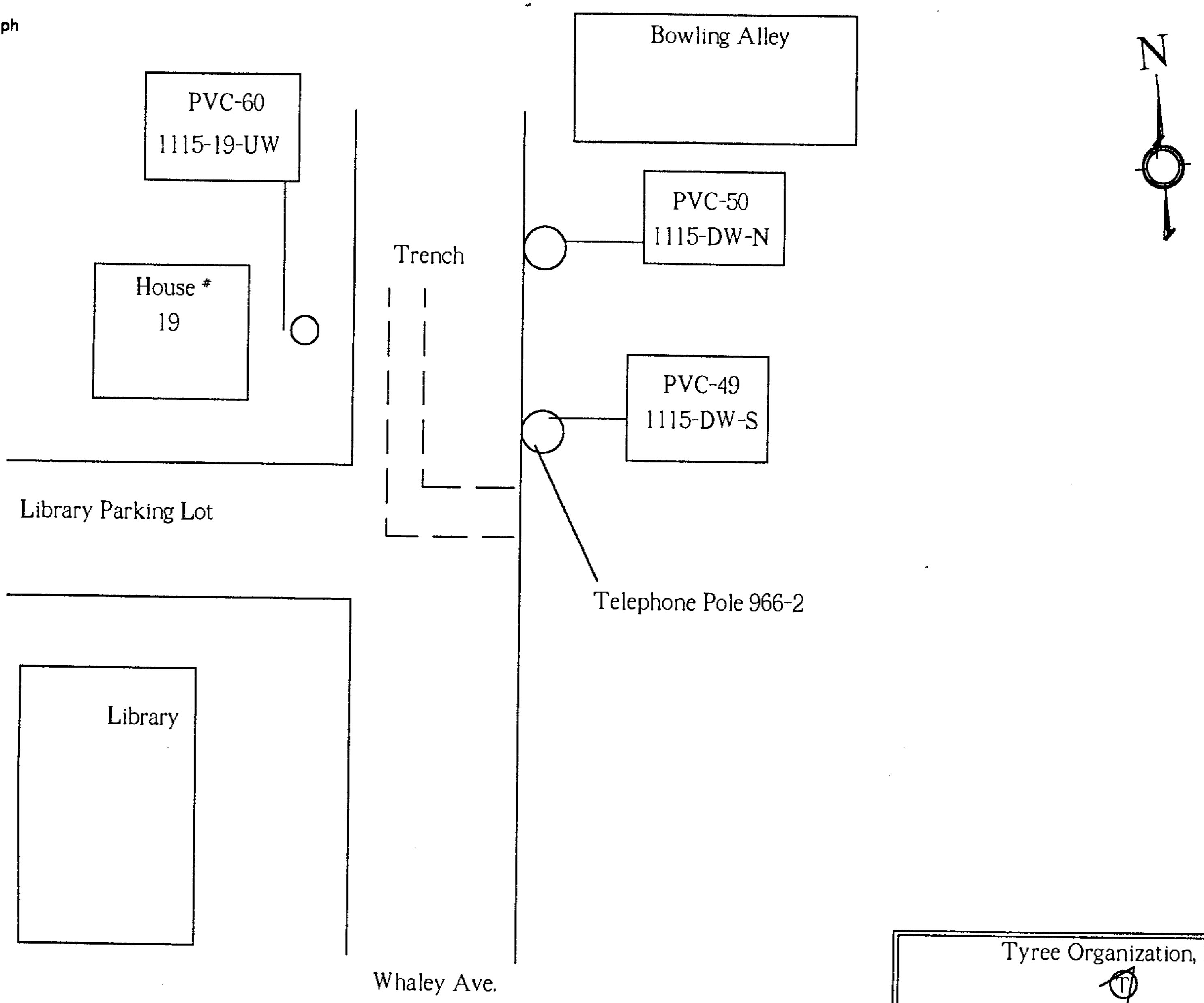
Project Number 017301
As Builts
Mr. C's Dry Cleaners
586 Main Street
East Aurora, New York 14052

DRAWN BY: DLP
11-14-01
SCALE: NTS
CLIENT: DEC
PLATE:
Community Air Monitoring

Community Air Monitoring Map
11-15-01
Wind W 0-5 mph



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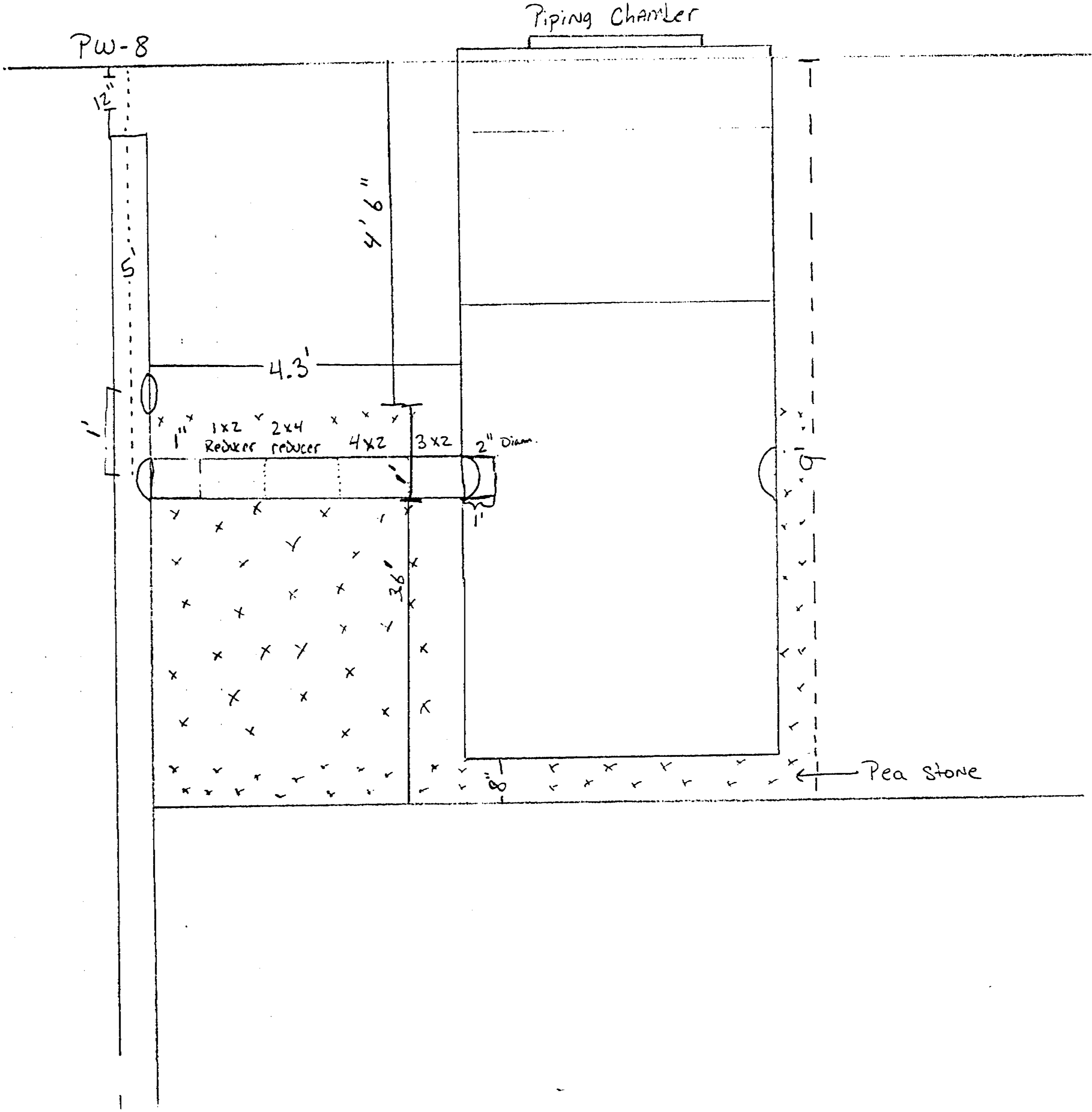
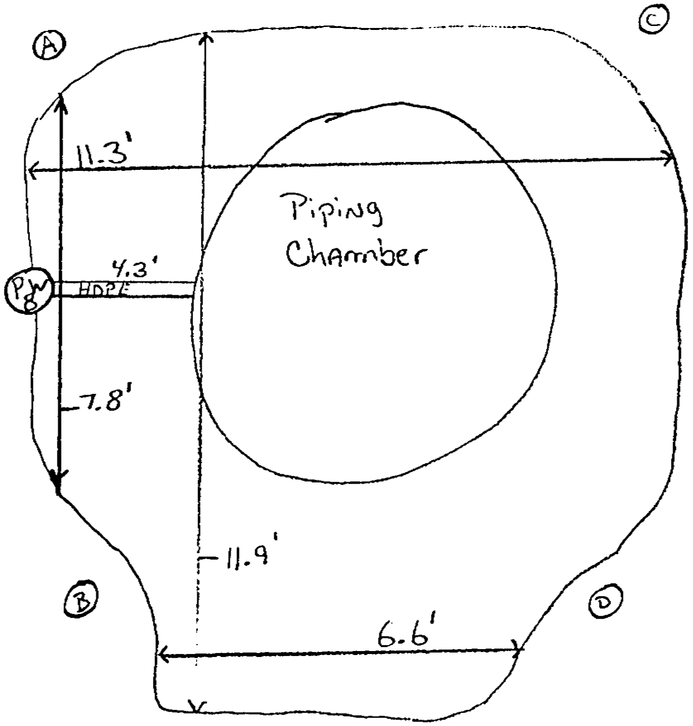
Project Number 017301 As Builts	DRAWN BY: DLP
Mr. C's Dry Cleaners 586 Main Street East Aurora, New York 14052	11-15-01 SCALE: NTS CLIENT: DEC PLATE: Community Air Monitoring

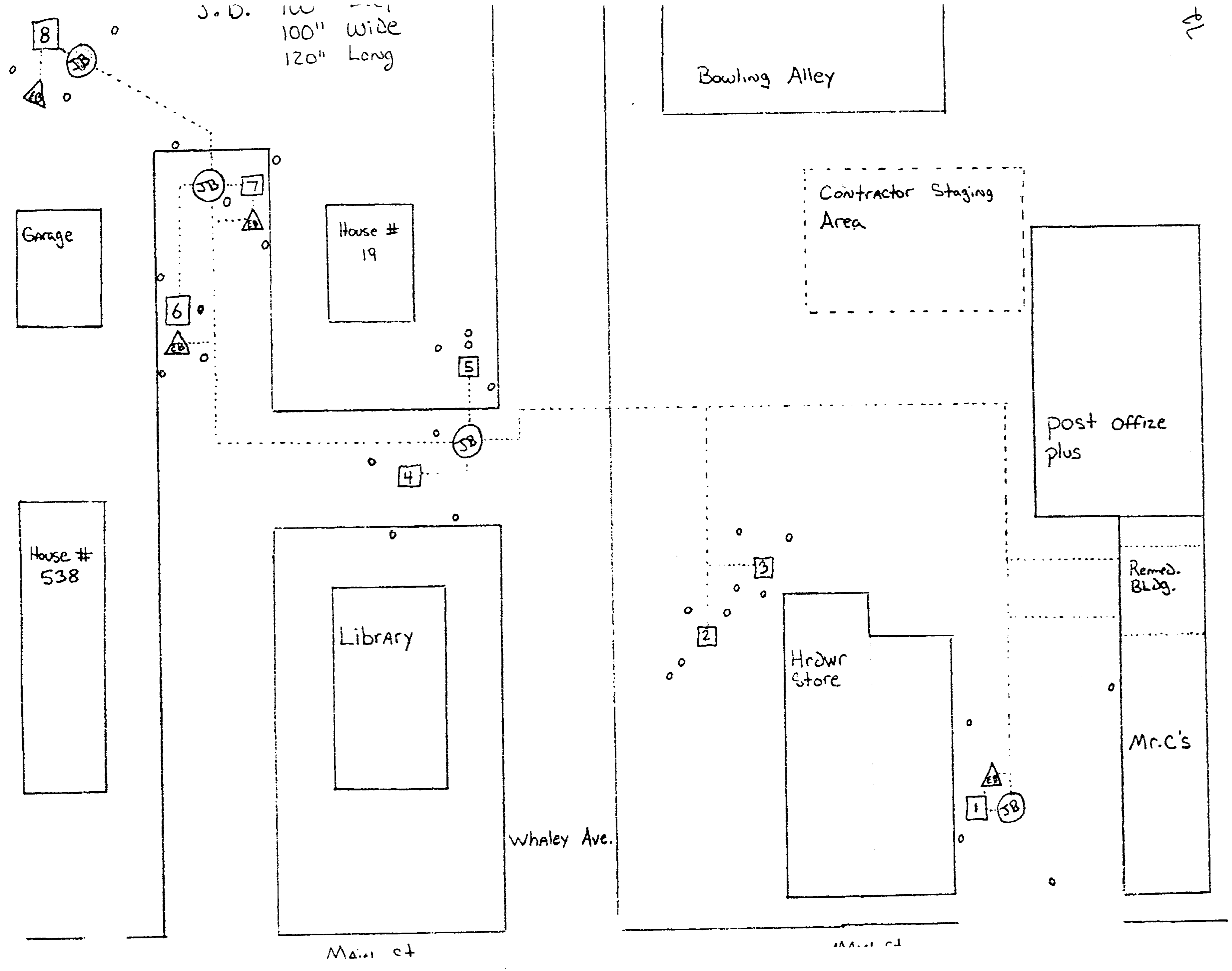
Mr. C's
Piping chamber & well connection



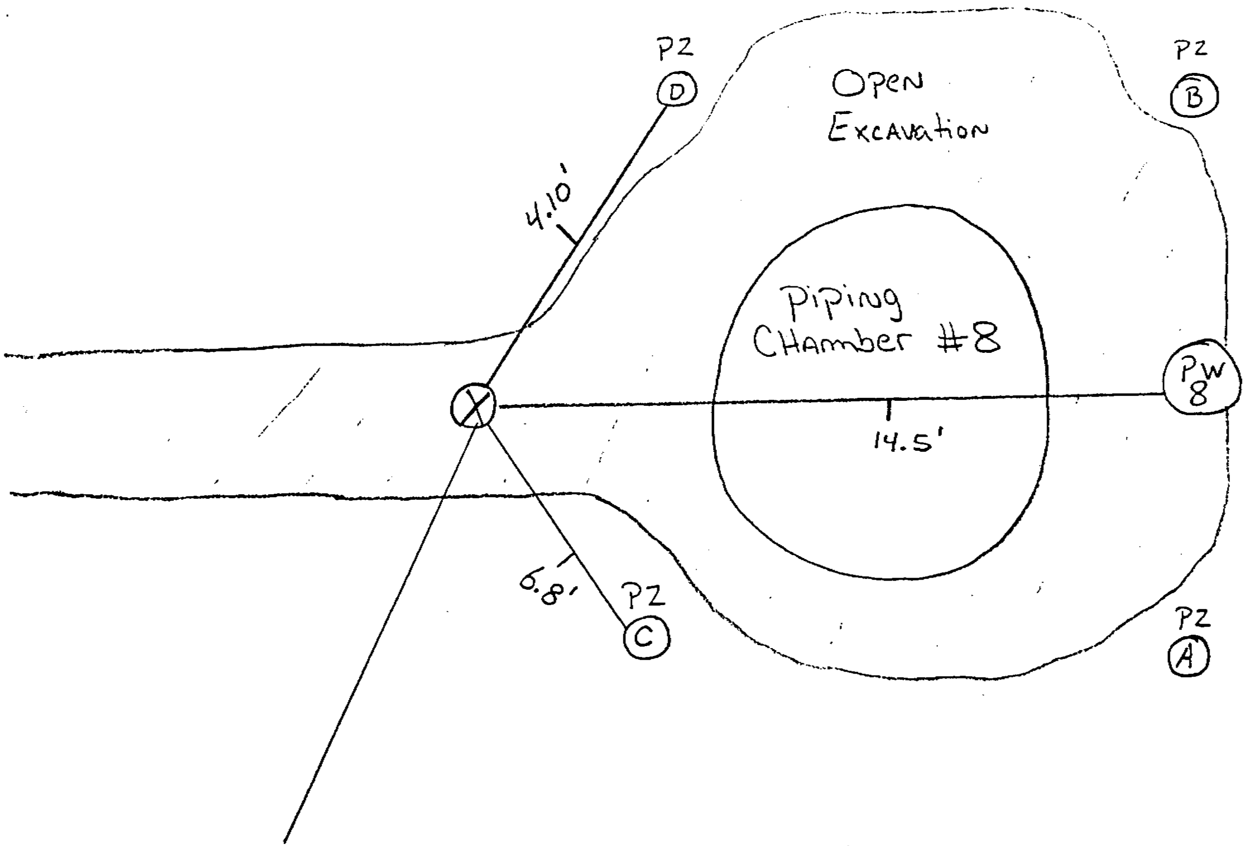
5-10-02
Mr. C's
Piping Chamber + Well Connection



Excavation - 9' Deep
8" Pea stone on Bottom of chamber

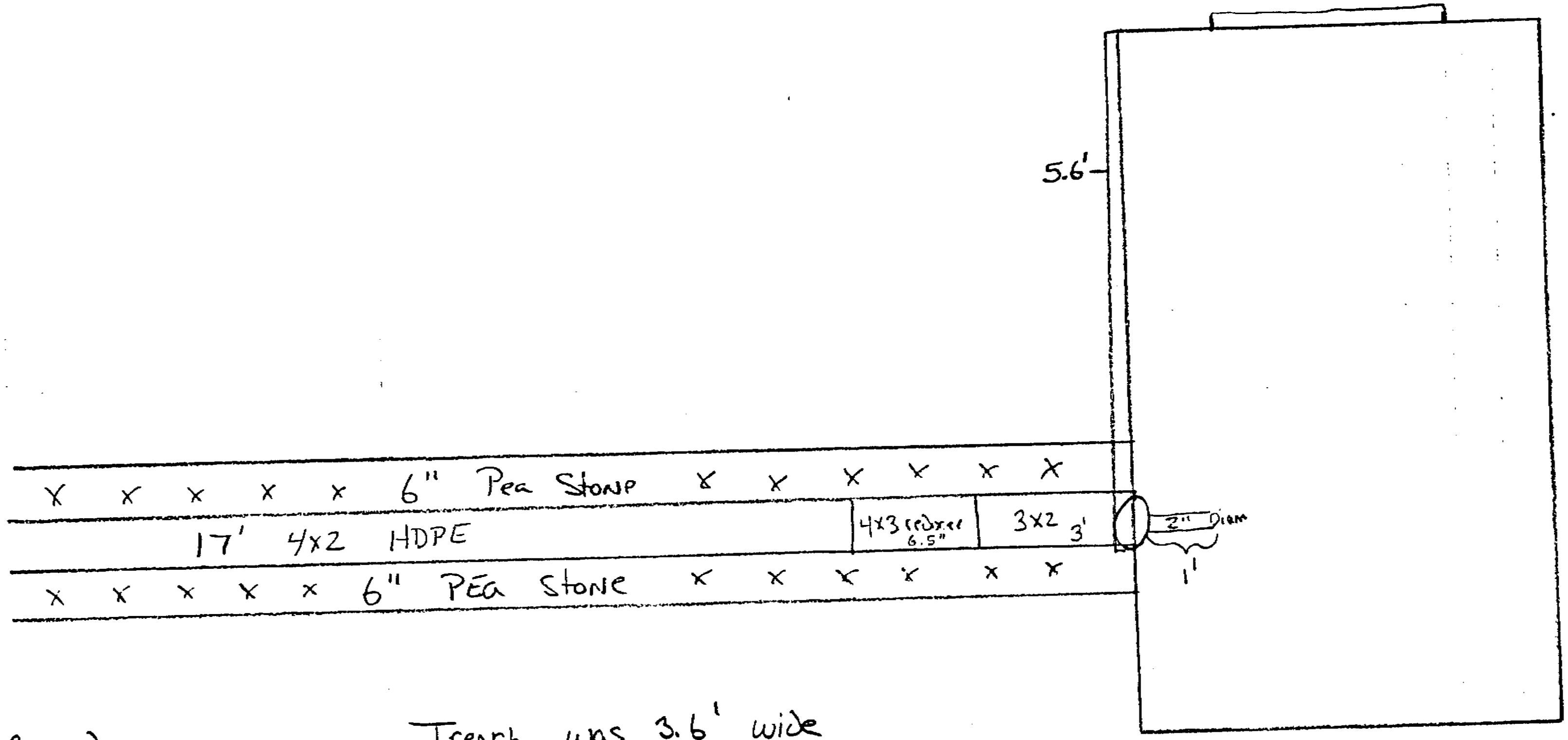

J.D.
100" Wide
120" Long
8
JB
EB
7
6
5
4
3
2
1
Garage
House # 19
House # 538
Library
Bowling Alley
Contractor Staging Area
Post Offize plus
Remed. BLdg.
Mr.C's
Hrdwr Store
Whaley Ave.
Main st

Mr. C's Dry Cleaners
3-25-02
Trench Soil Samples



⊗ 1st Soil Sample taken 14.5' Away from PW-8.
Sample ID 14.5 trench
PID = 0
Analyzed for TCL ASP 95-1 VOC
Trench 5.6' Deep

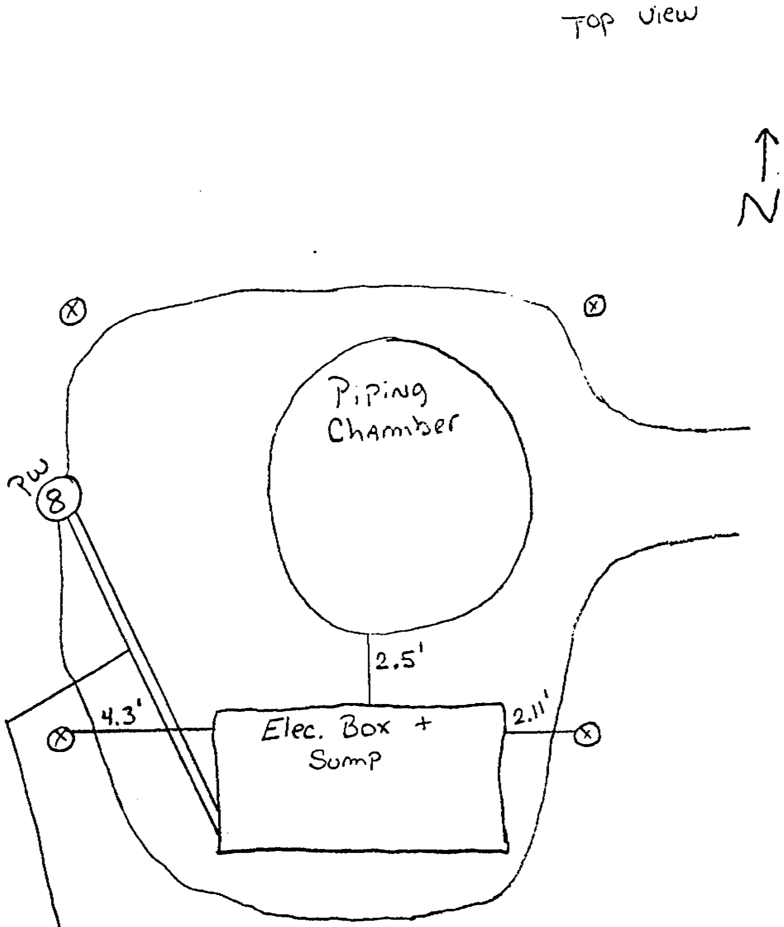
Mr. C.S
3-25-02
Trench from PW-8 to PW-7
4x2 Pipe HDPE



Trench was 3.6' wide
5.6' Deep

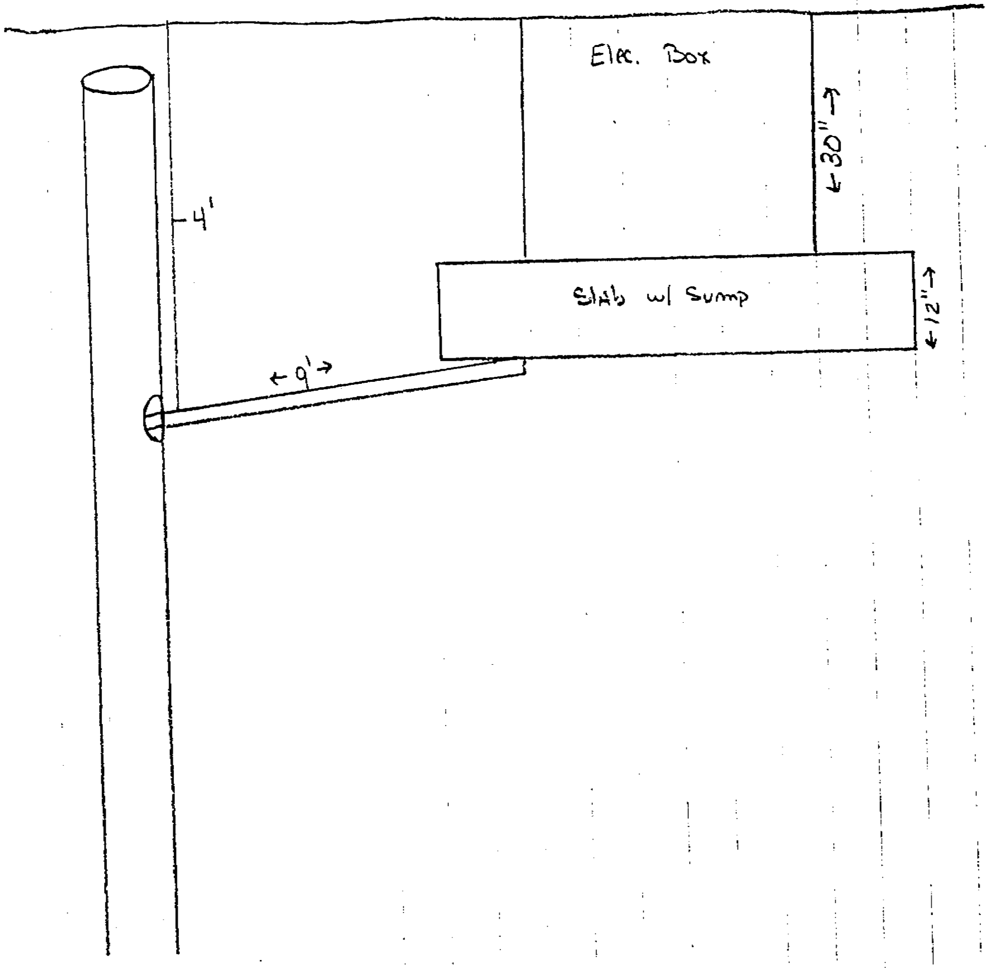
Transit readings
4.81 Top Of Ground
10.56 Bottom trench
10.22 Top of Lower stone

-26-02
r. C's
lectrical Box & Slab



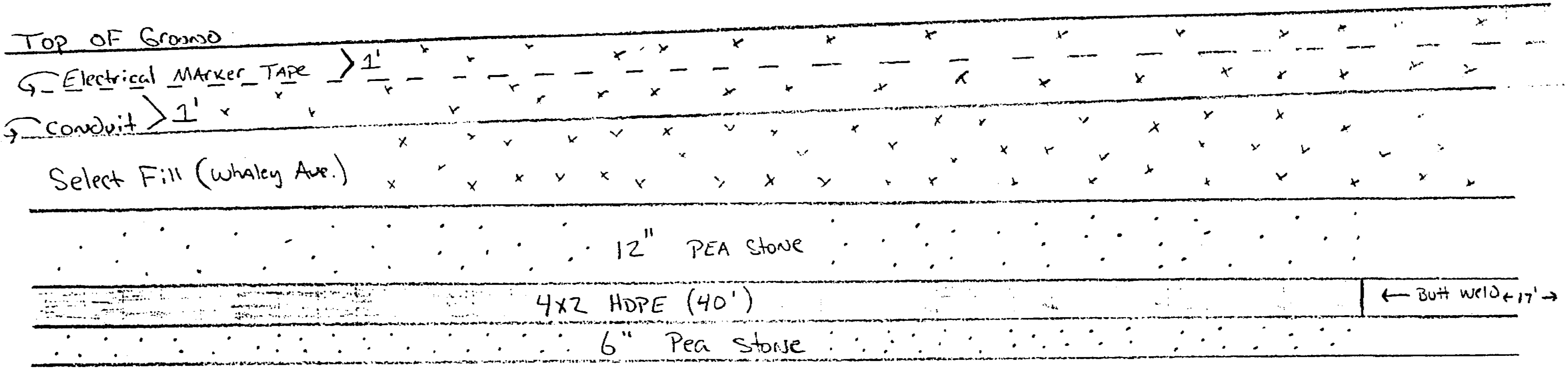
9' - 1" pvc Sch. 80 connecting Sump to PW-8 Pitless Adapter 4' Below ground

1 - 1" 90
2 - 1½" Cupling
1 - 1½"-2" Reducer
1 - 1" female Adapter
11 - Concrete Bricks under slab.



5-27-02
Mr. C's
Trenching PW-8 to PW-7

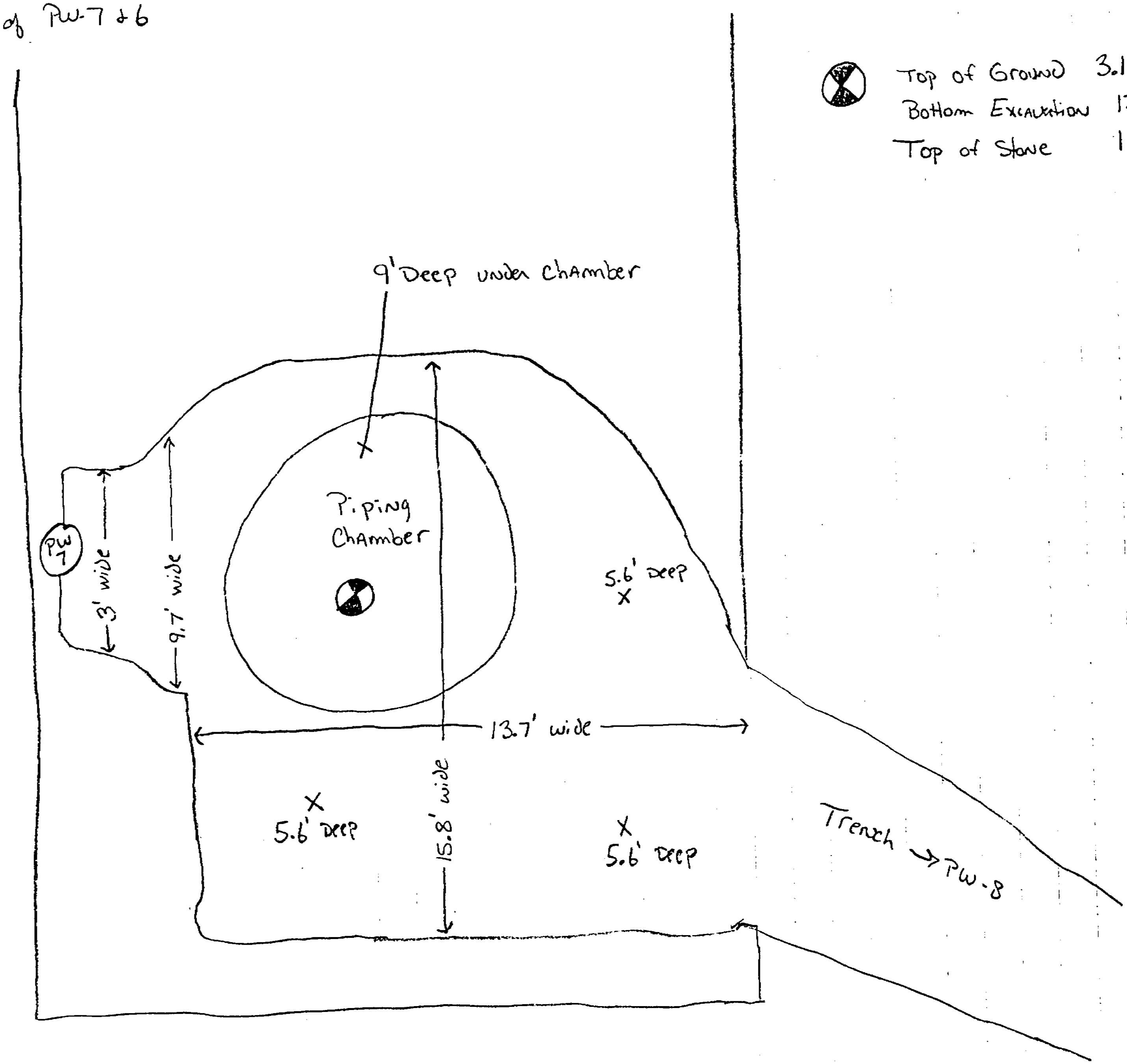
Foot markers	40'	30'	20'	10'	0'
Elev. on top of stone	8.49	8.70	9.20	9.82	9.90
Trench Depth	3.8'	3.6'	4.4'	4.7'	
Trench Width	3.9'	3.6'	3.5'	3.5'	



Electrical Marker Tape - - - - -
Select fill x x x
Pea stone • • •
HDPE ▨

-28-02
Mr. C's
igging for Piping chamber of PW-7 + 6
Set chamber As well

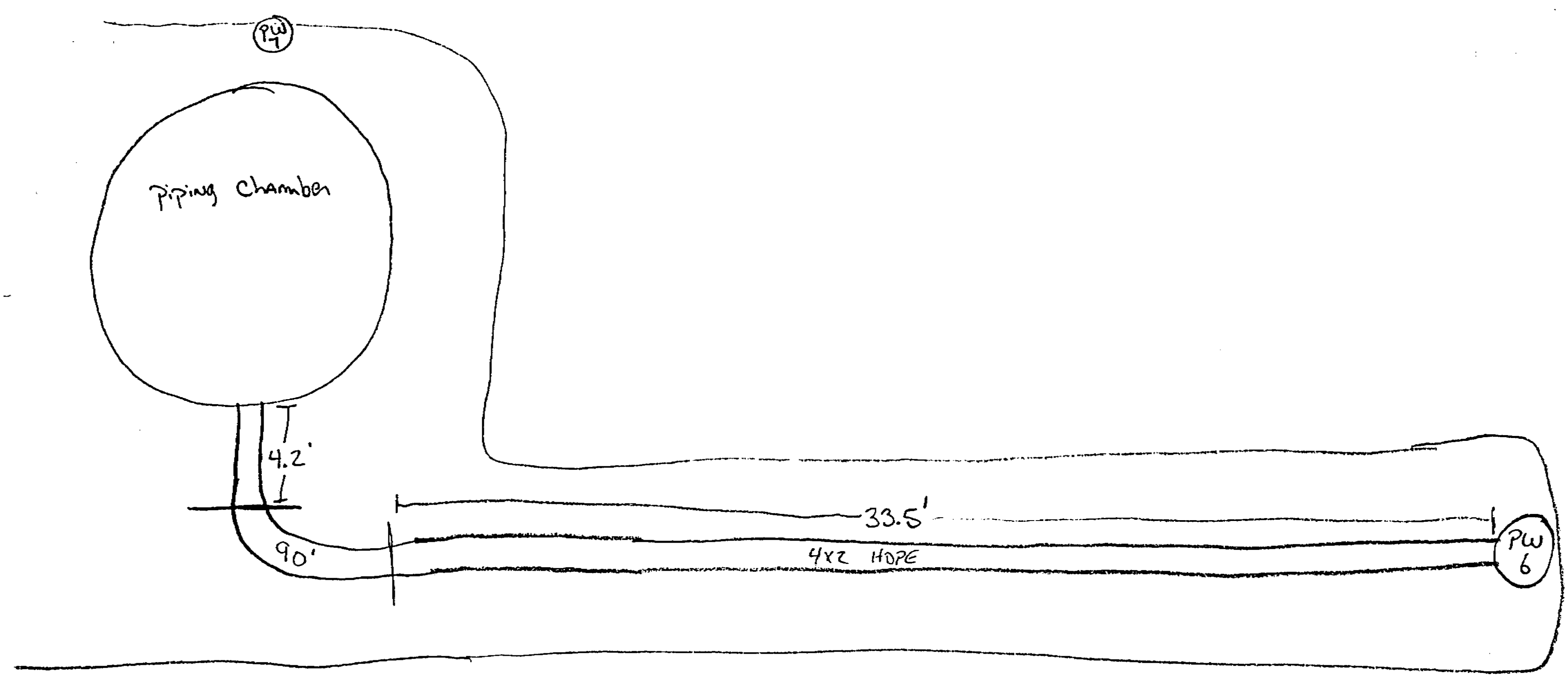
⊗ Top of Ground 3.19'
Bottom Excavation 12.09
Top of Stone 11.56'



4-1-06

Mr. C's

Trenching Piping chamber of PW-7 to PW-6 (Top view)

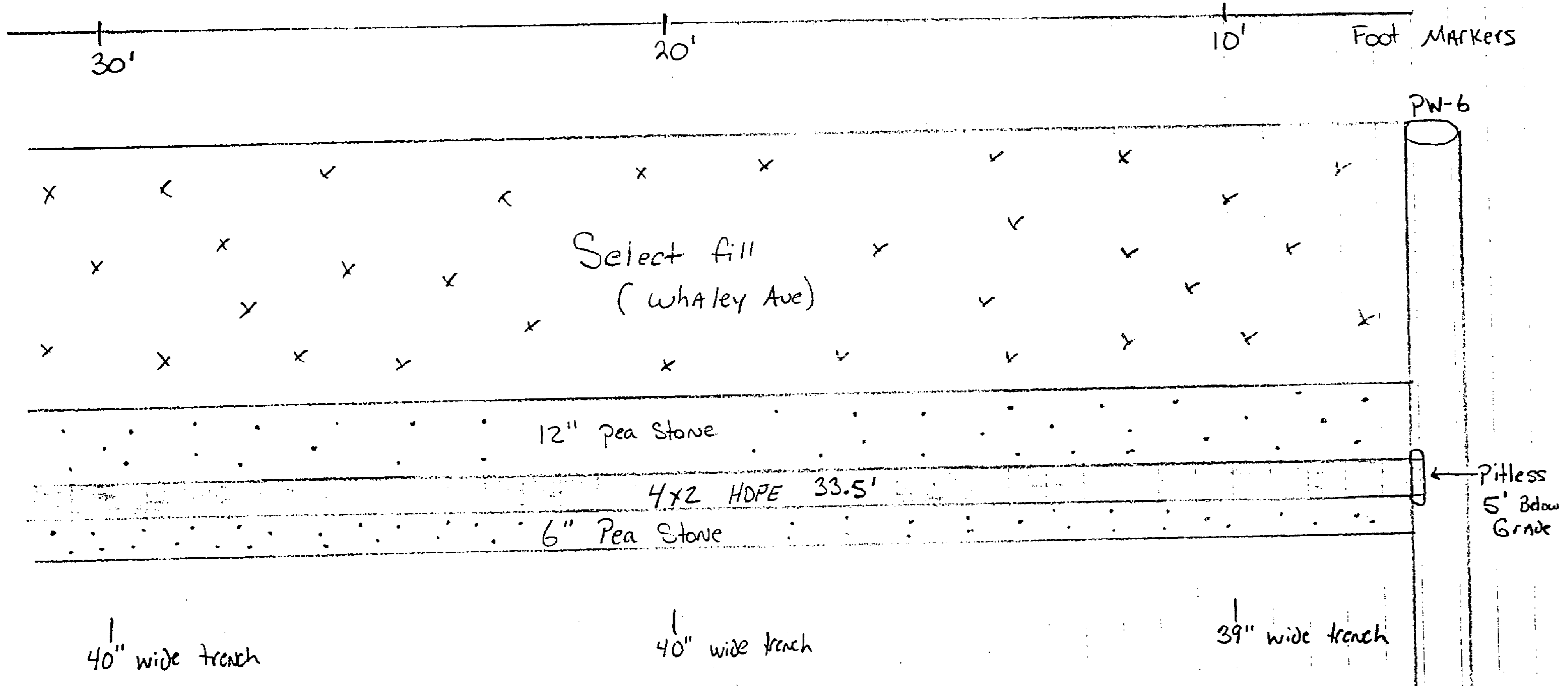


7-1-02

Ar. C's

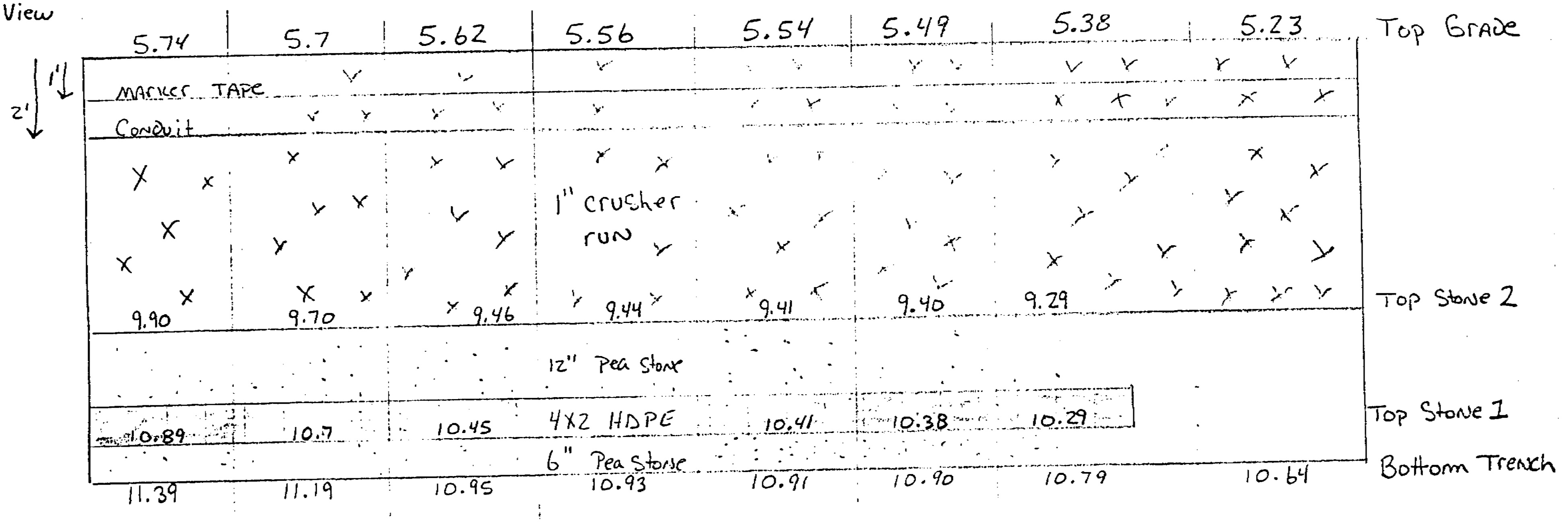
renching Piping chamber of PW-7 to PW-6 (Side view)

of Ground	3.62	3.51	3.49
12" pea Stone	8.4	8.14	7.97
p 6" pea stone	9.13	8.95	8.71
ench Bottom	9.52	9.04	8.76

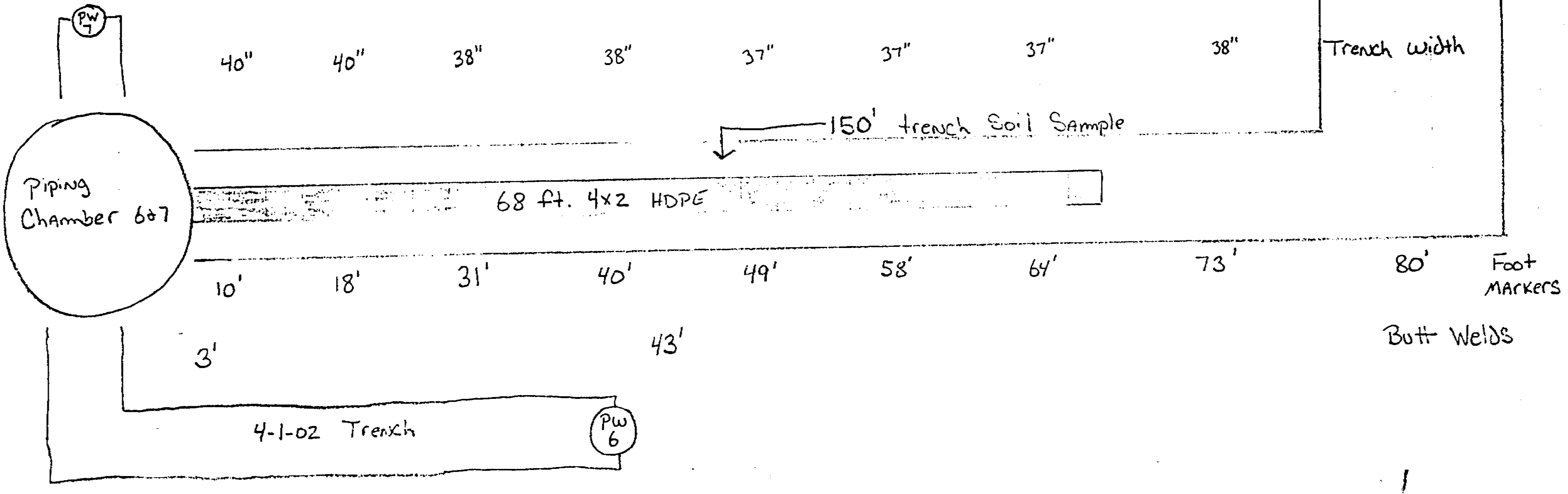


4-2-02
Mr. C's
Trench From Piping chamber 6 & 7 to 90 in Library Parking Lot

de View

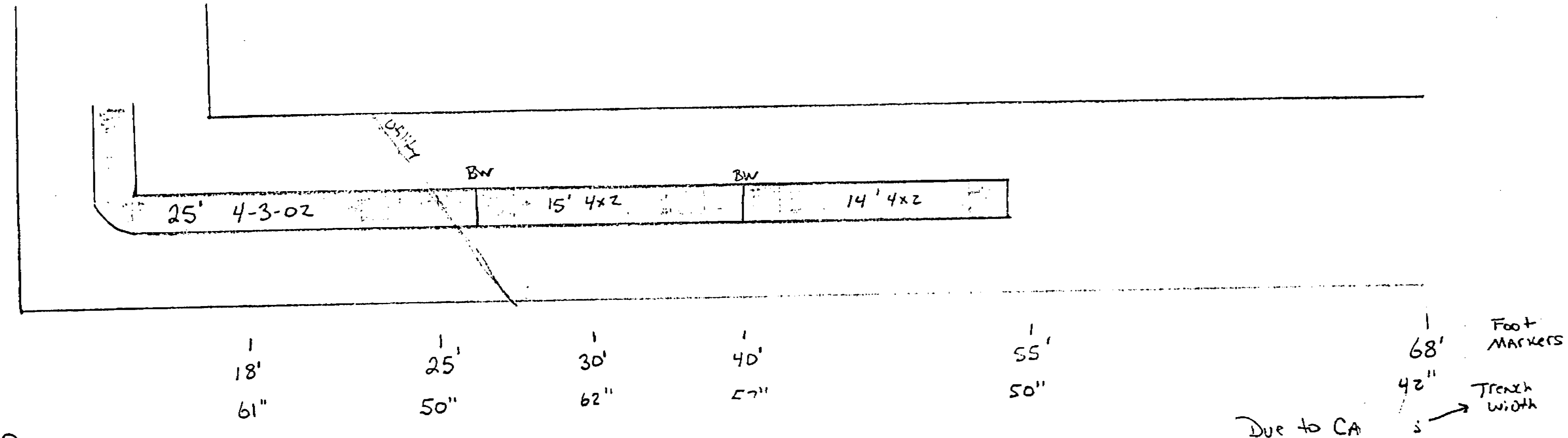


op View



+-4-02
Mr. C's
Trenching From 90 to Piping Chamber of 4 & 5

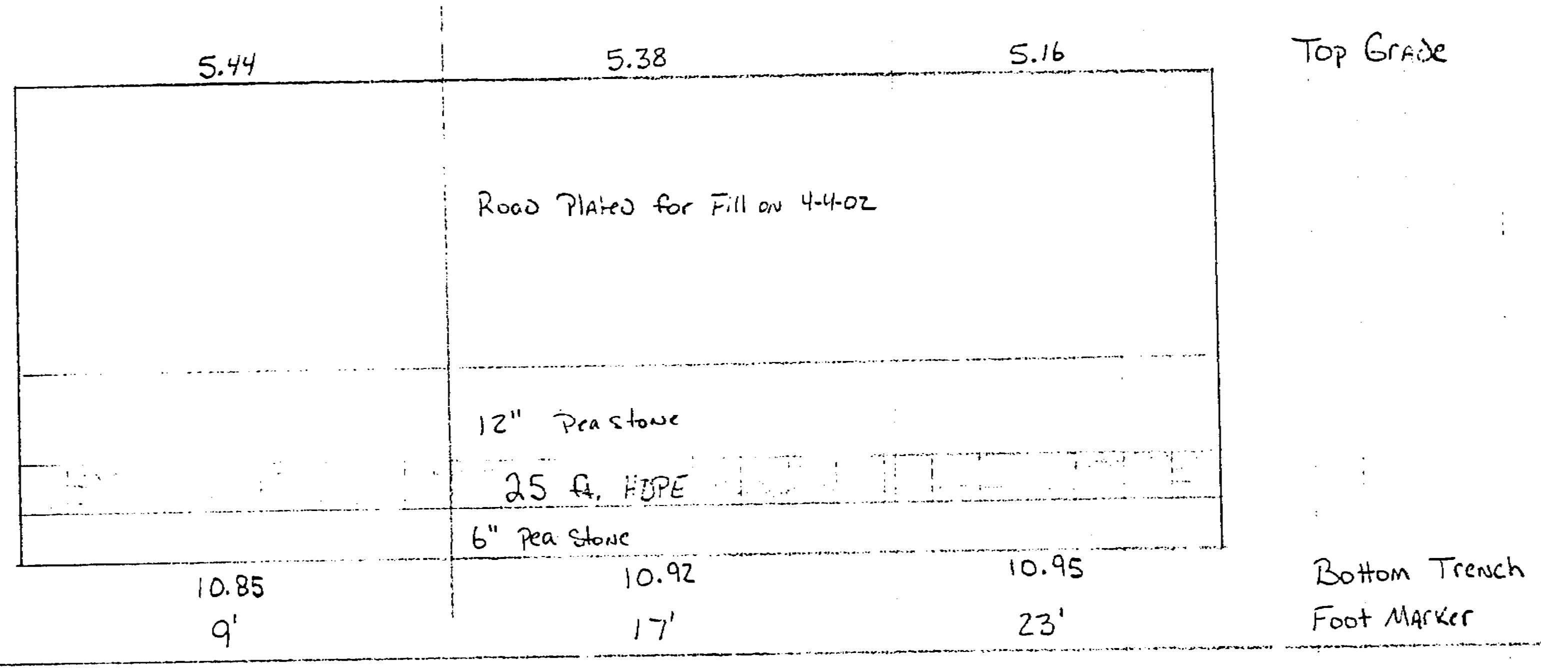
Measured with tape - 6" stone under pipe
12" stone on top of pipe
Conduit 2' down
Marker tape 1' down
trench 5'6" deep



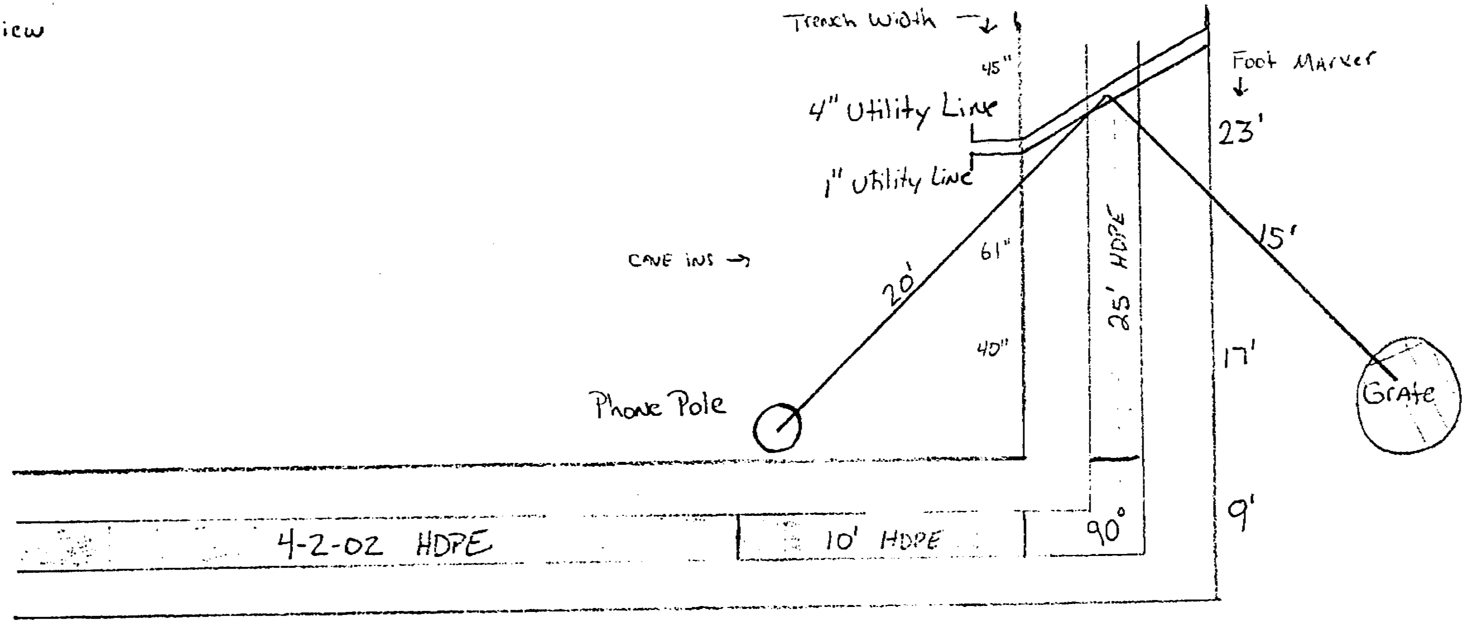
BW = Butt.

4-3-02
Mr. C's
Trenching from 90 to Piping Chamber 4 + 5

ide View



Top View

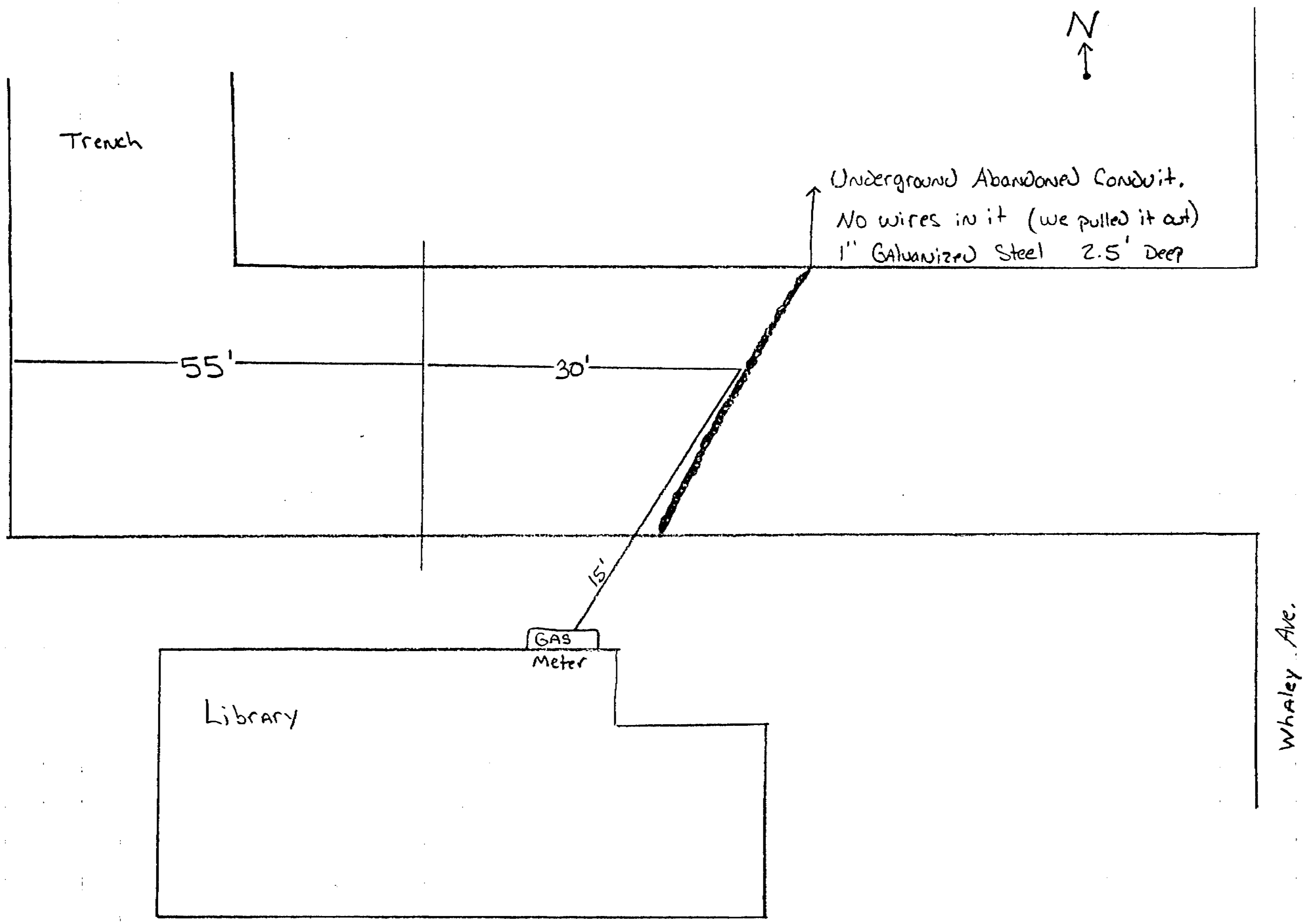


4-9-02

Mr. C's Dry Cleaners

Abandoned Conduit

David Pachan

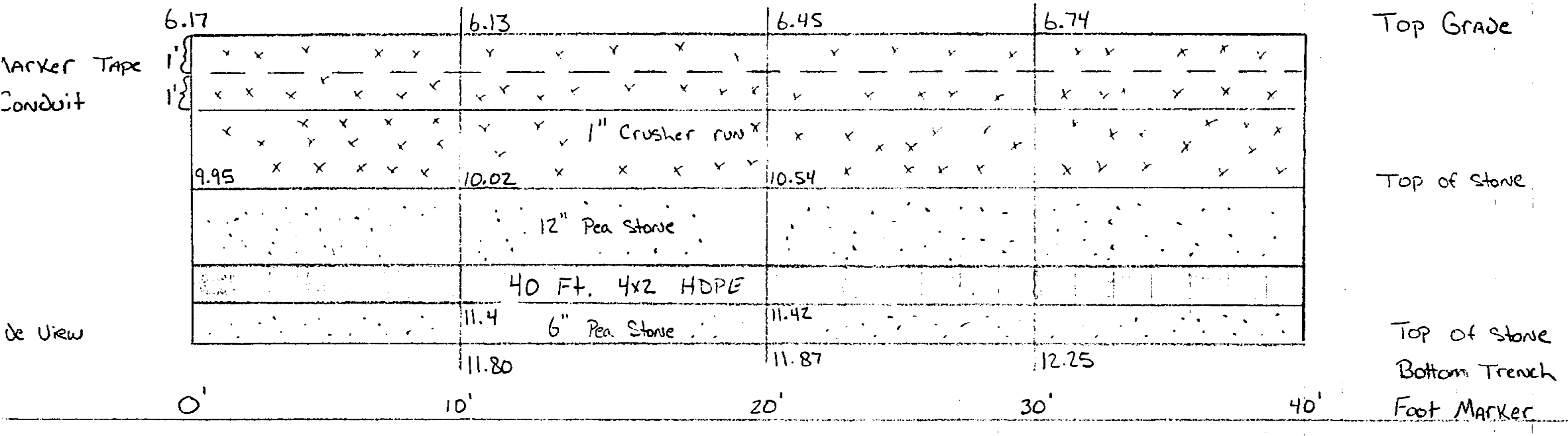


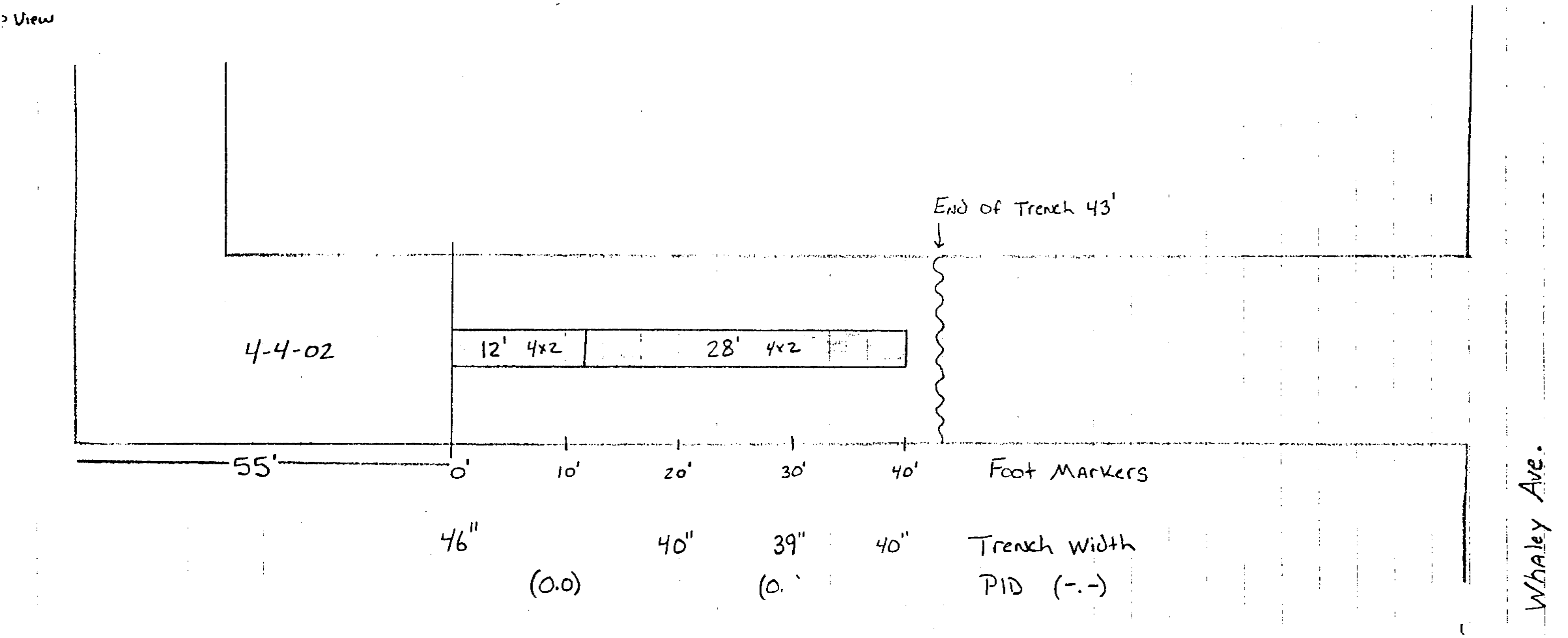
Underground Abandoned Conduit.
No wires in it (we pulled it out)
1" Galvanized Steel 2.5' Deep

4-9-02 DAVID PACHAN

Mr.C's Dry Cleaners

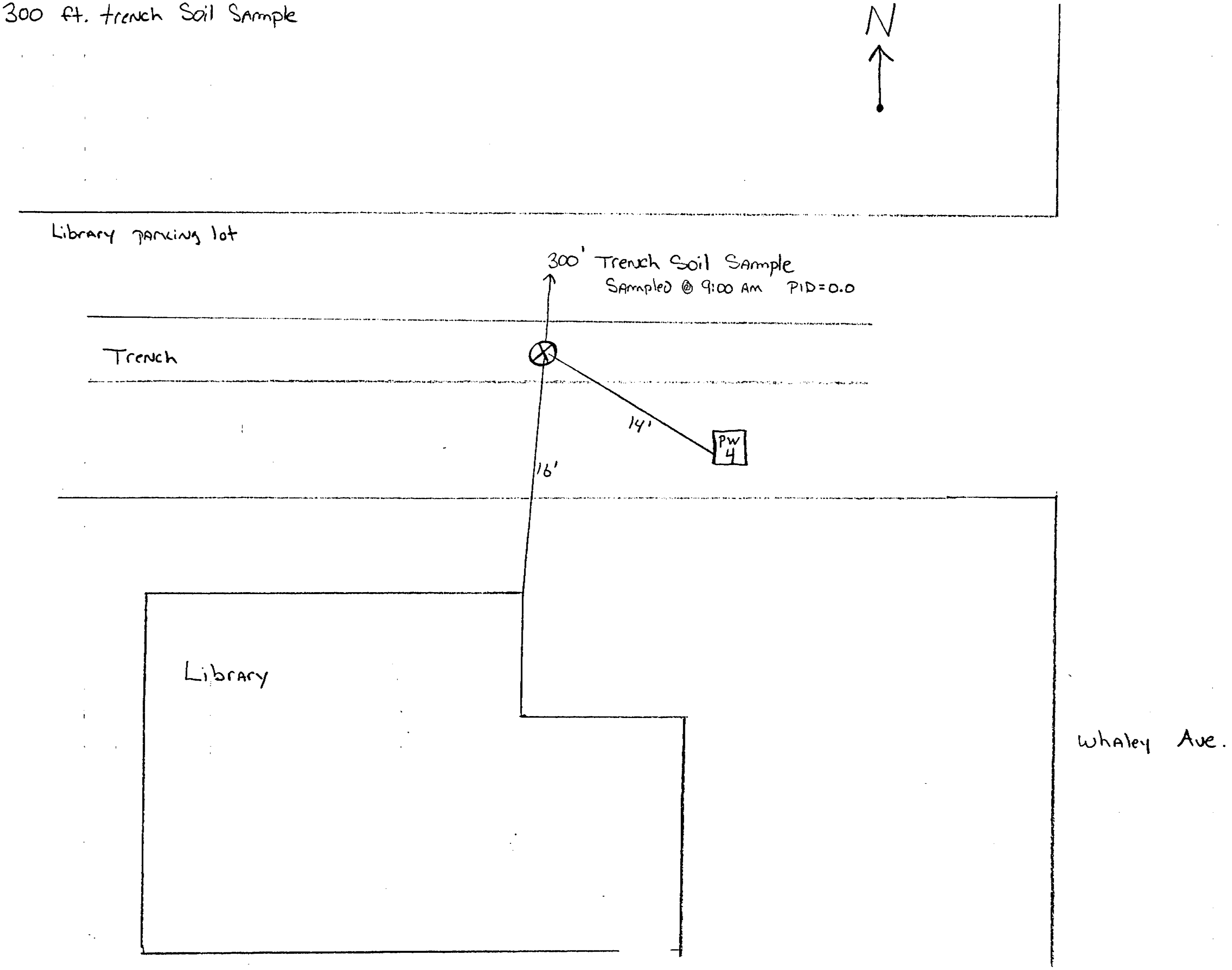
Trenching by Library towards Whaley Ave.





4-10-02
Mr. C's Dry cleaners
300 ft. trench Soil Sample

DAVID PACHAN

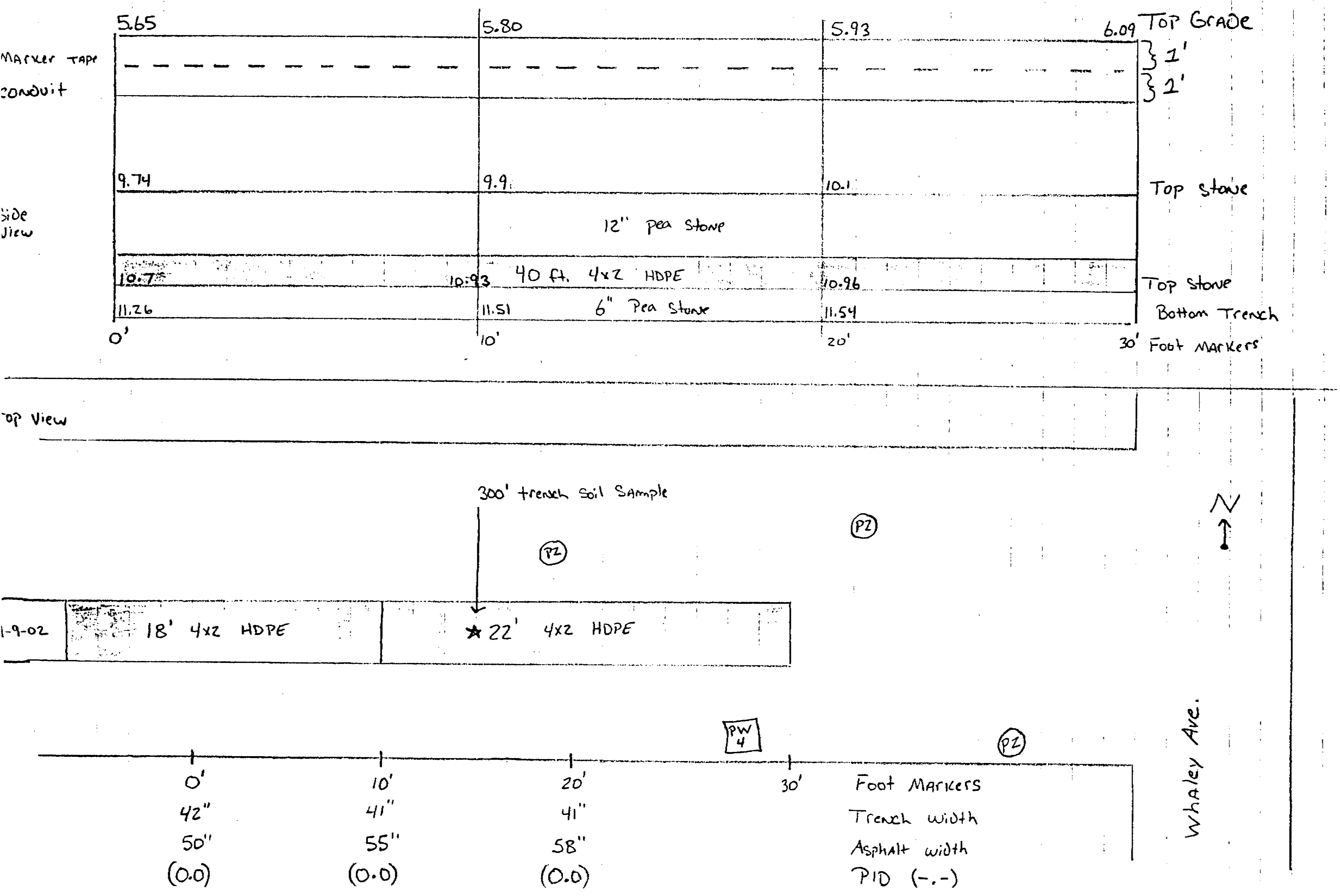


4-10-02

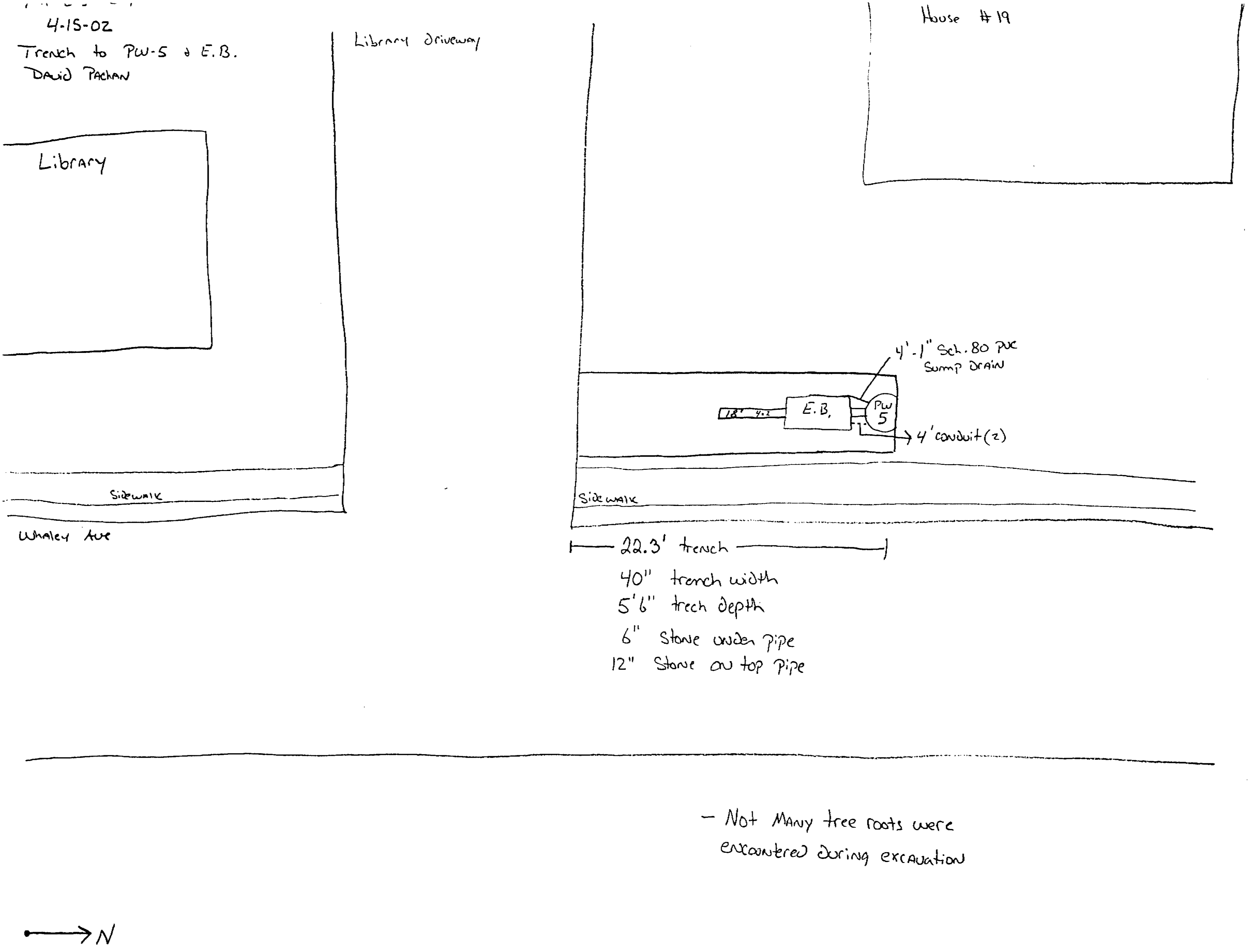
Mr. C's Dry Cleaners

Trenching Along Library to Whaley Ave.

David Pachan



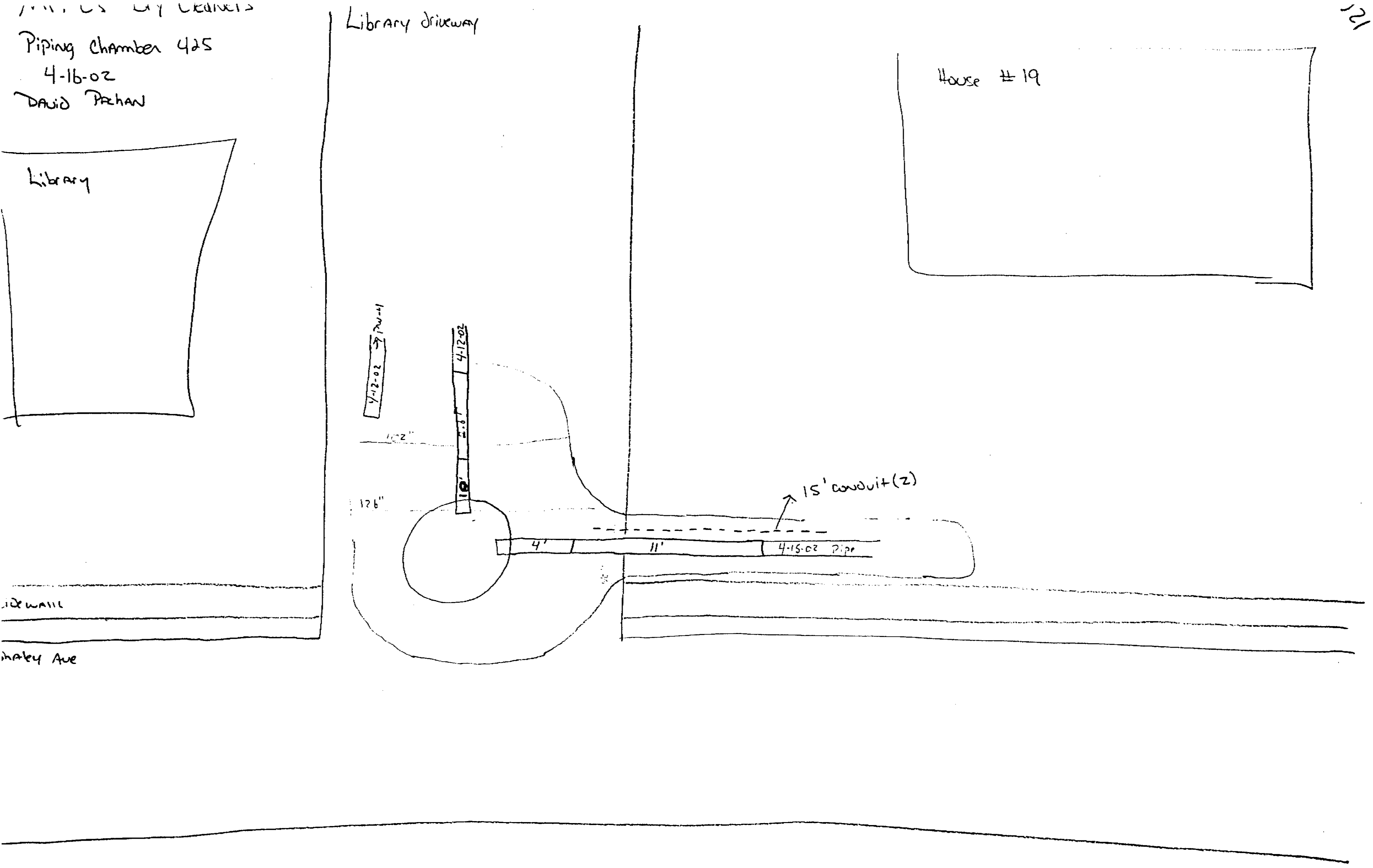
4-15-02
Trench to PW-5 & E.B.
David Pachan



22.3' trench
40" trench width
5'6" trech depth
6" Stone under pipe
12" Stone on top pipe

- Not many tree roots were encountered during excavation

Piping chamber 425
4-16-02
David Pachan

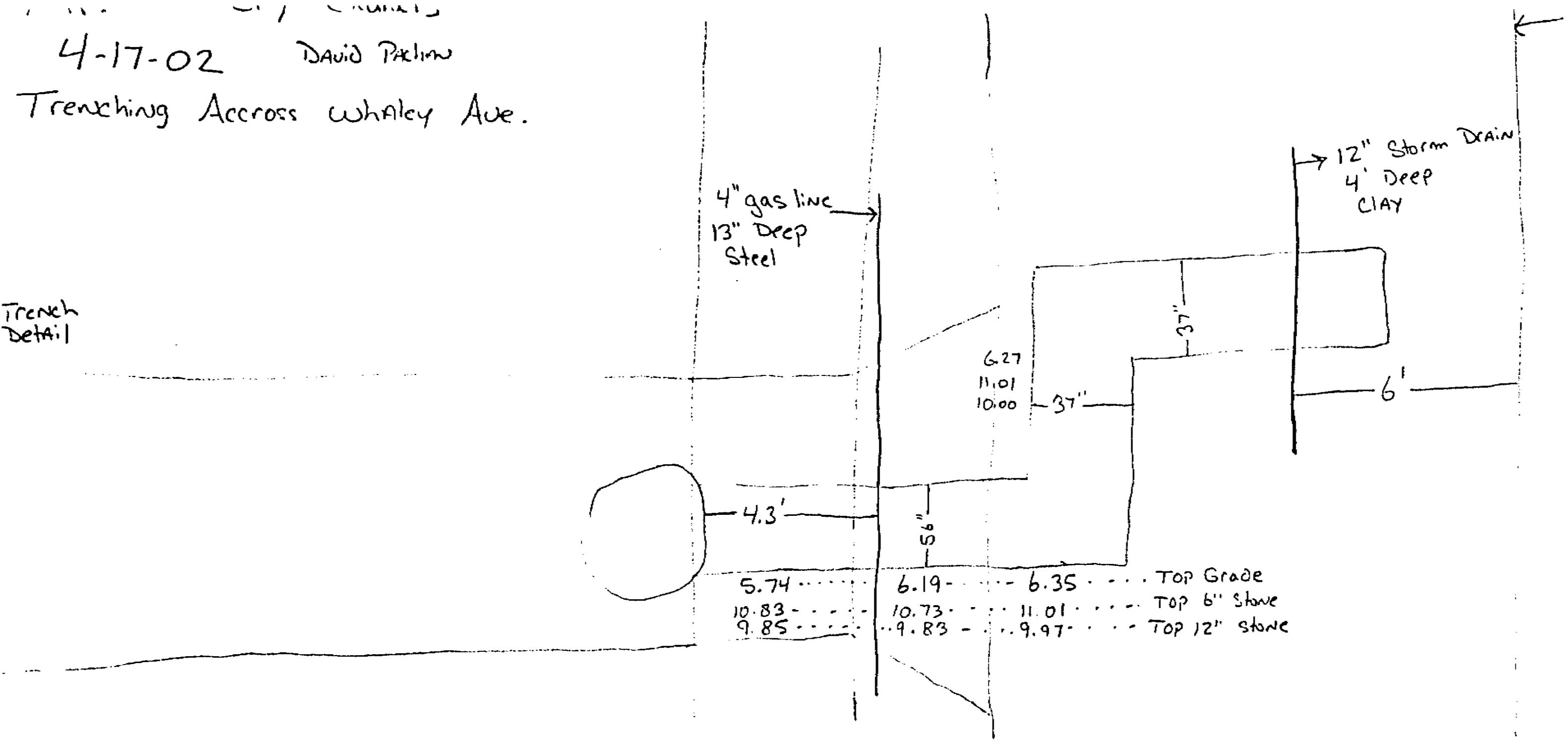


- 6" Stone under chamber
- Stone put in All the way below pipe.

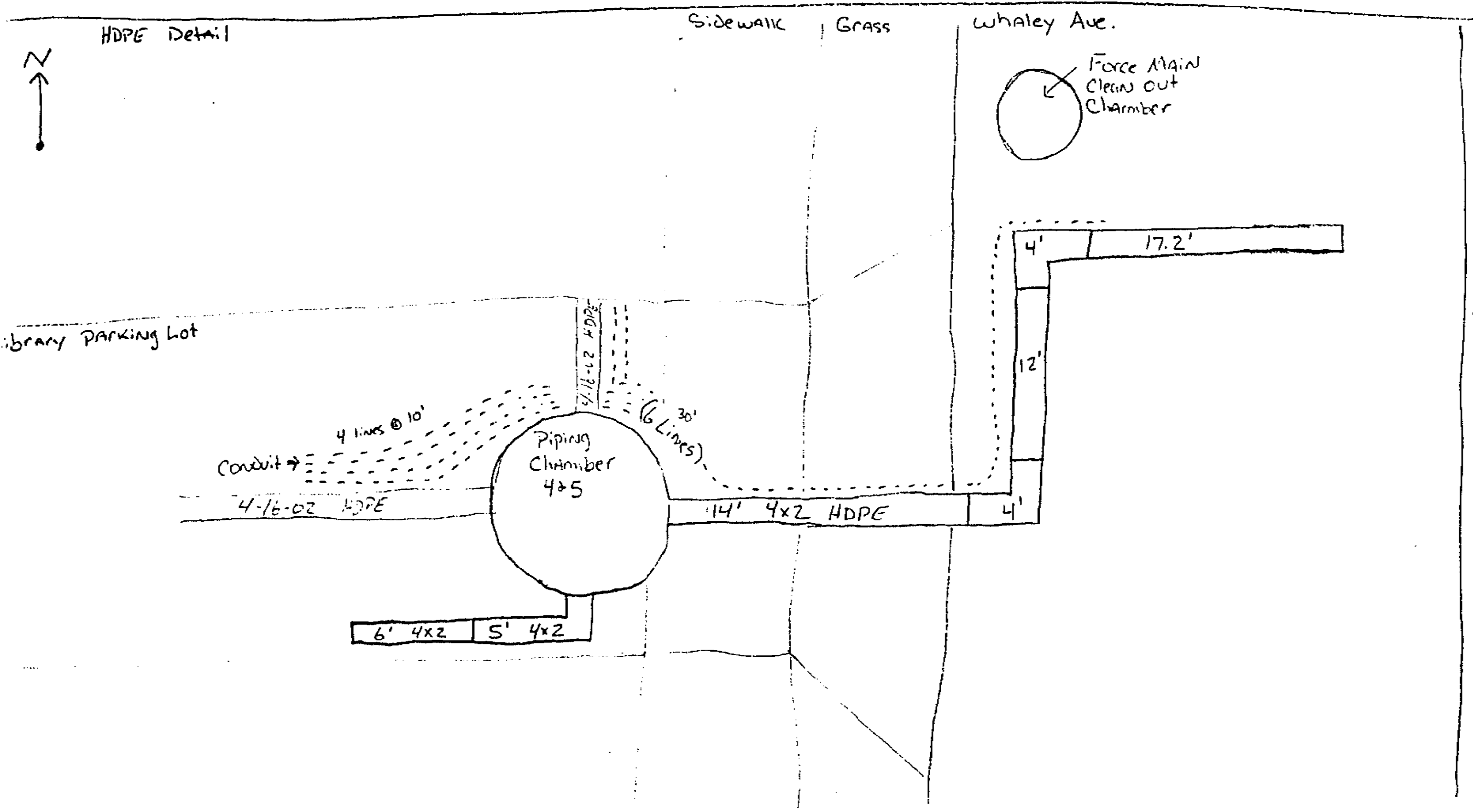
→ N

4-17-02 David Paklin

Trenching Accross Whaley Ave.



- Trench depth 4', pipe to go over Storm drain

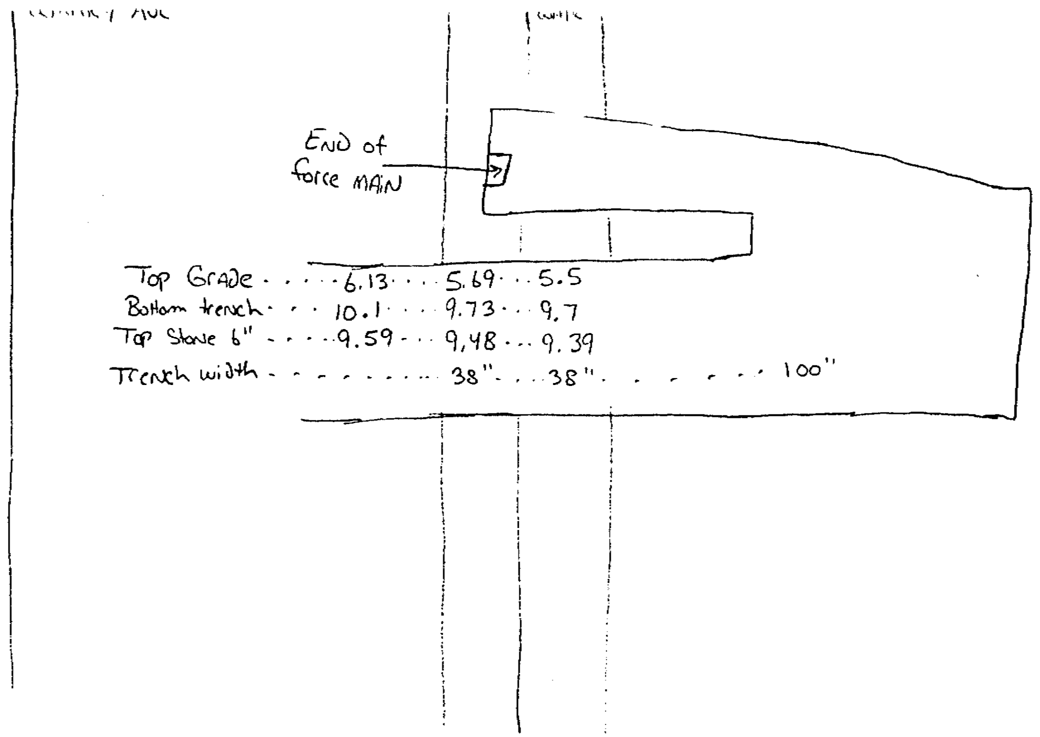


- Concrete Apron that was Removed 64" x 64"
- Concret Side walk that Needs to be replaced 200" x 47"
- Damaged the storm drain while trenching, it was fixed w/ fernco & plastic pipe, DPW was Notified

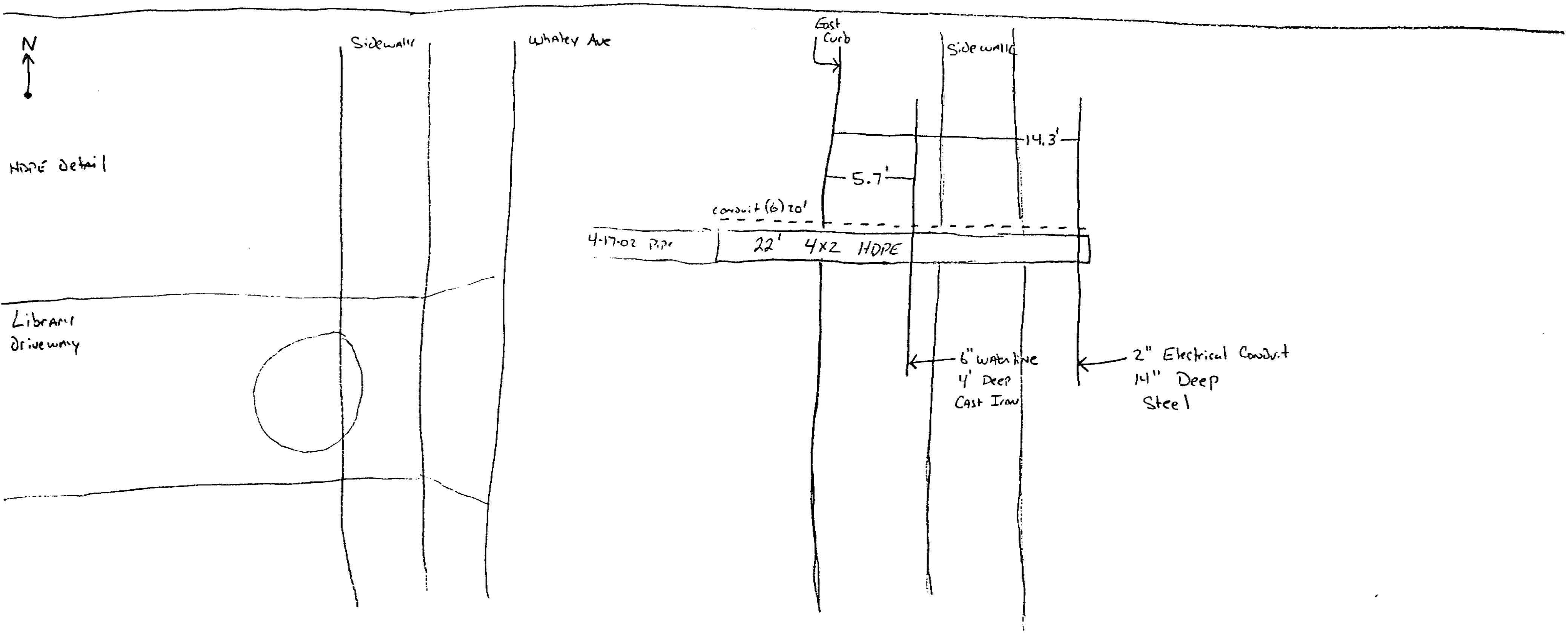
4-18-02

finish Whaley Ave. trench
David Pachan

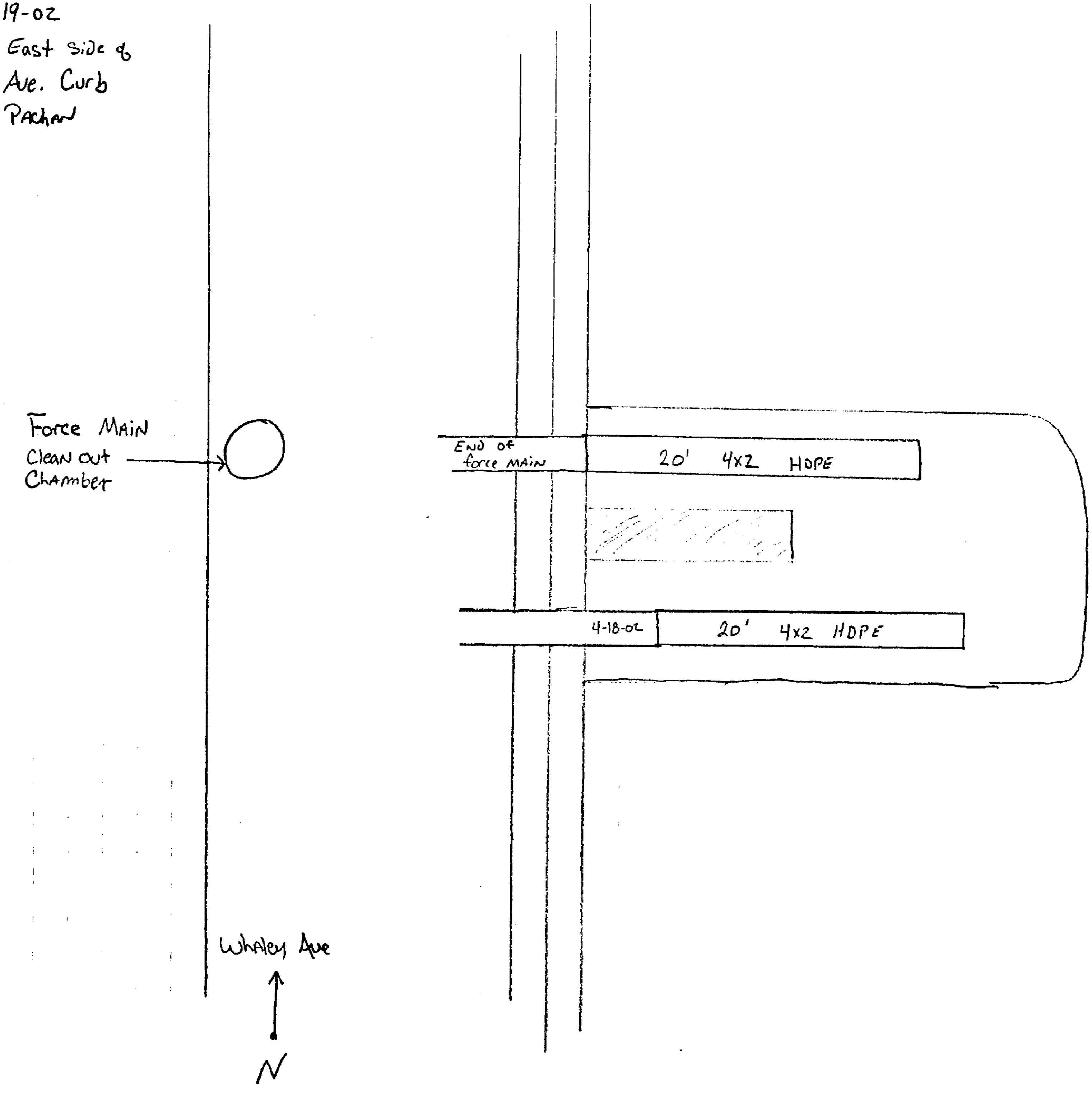
Trench detail



HDPE detail



Mr. C's Dry cleaners
4-19-02
Trench East side of
Whaley Ave. Curb
David Pachan



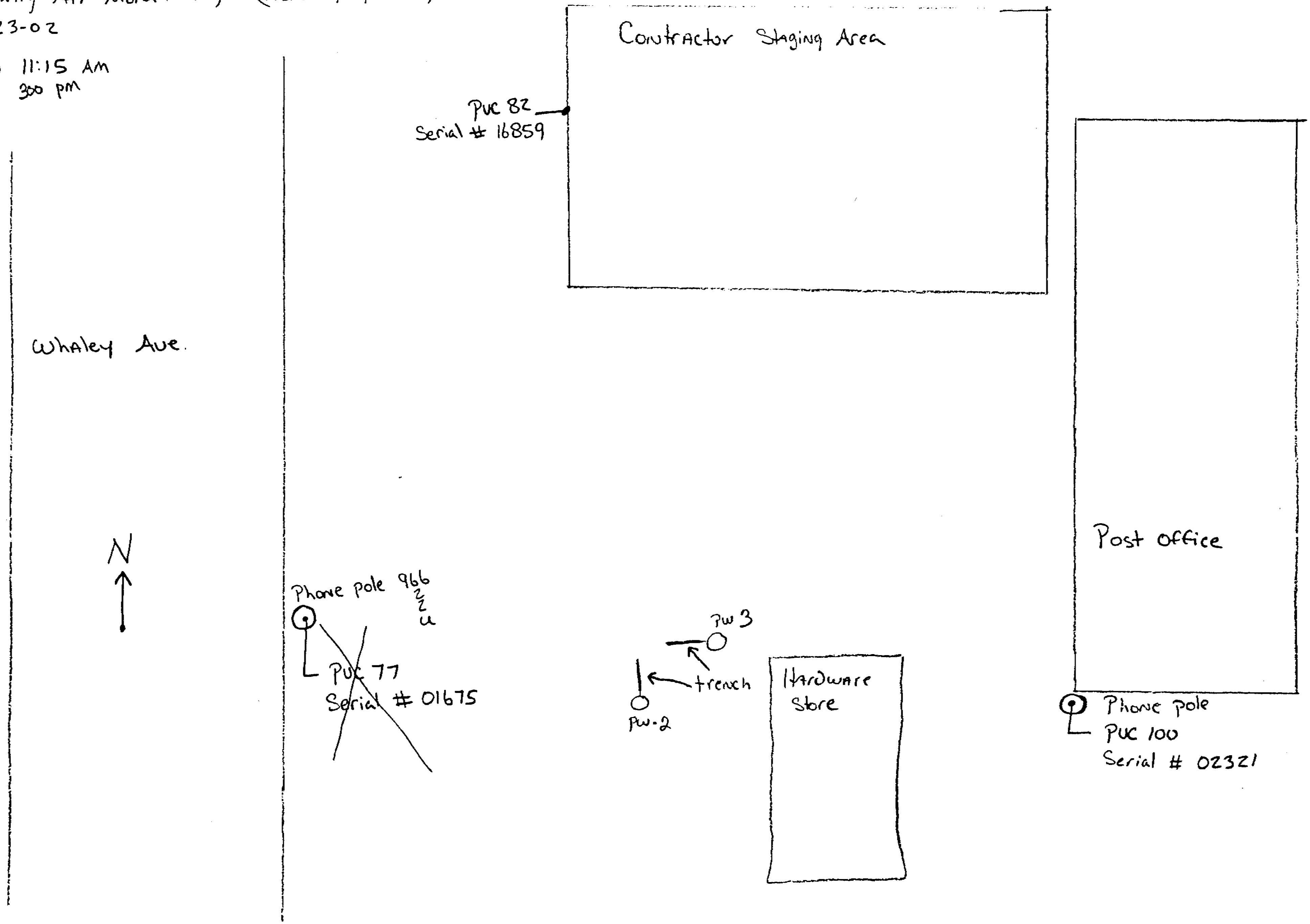
Mill's Dry Cleaners

Community Air Monitoring (trenching PW-2&3)

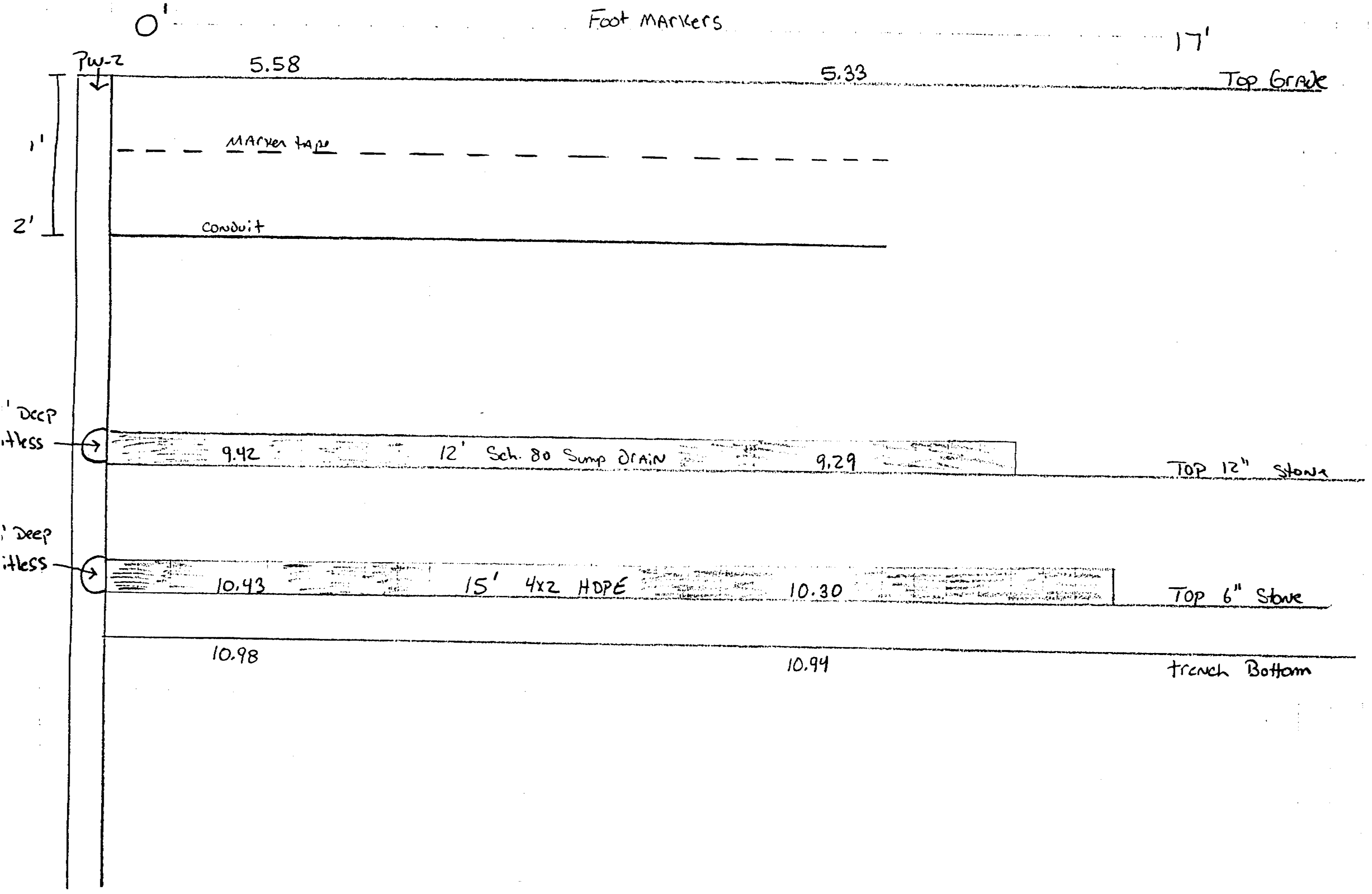
4-23-02

Start @ 11:15 AM

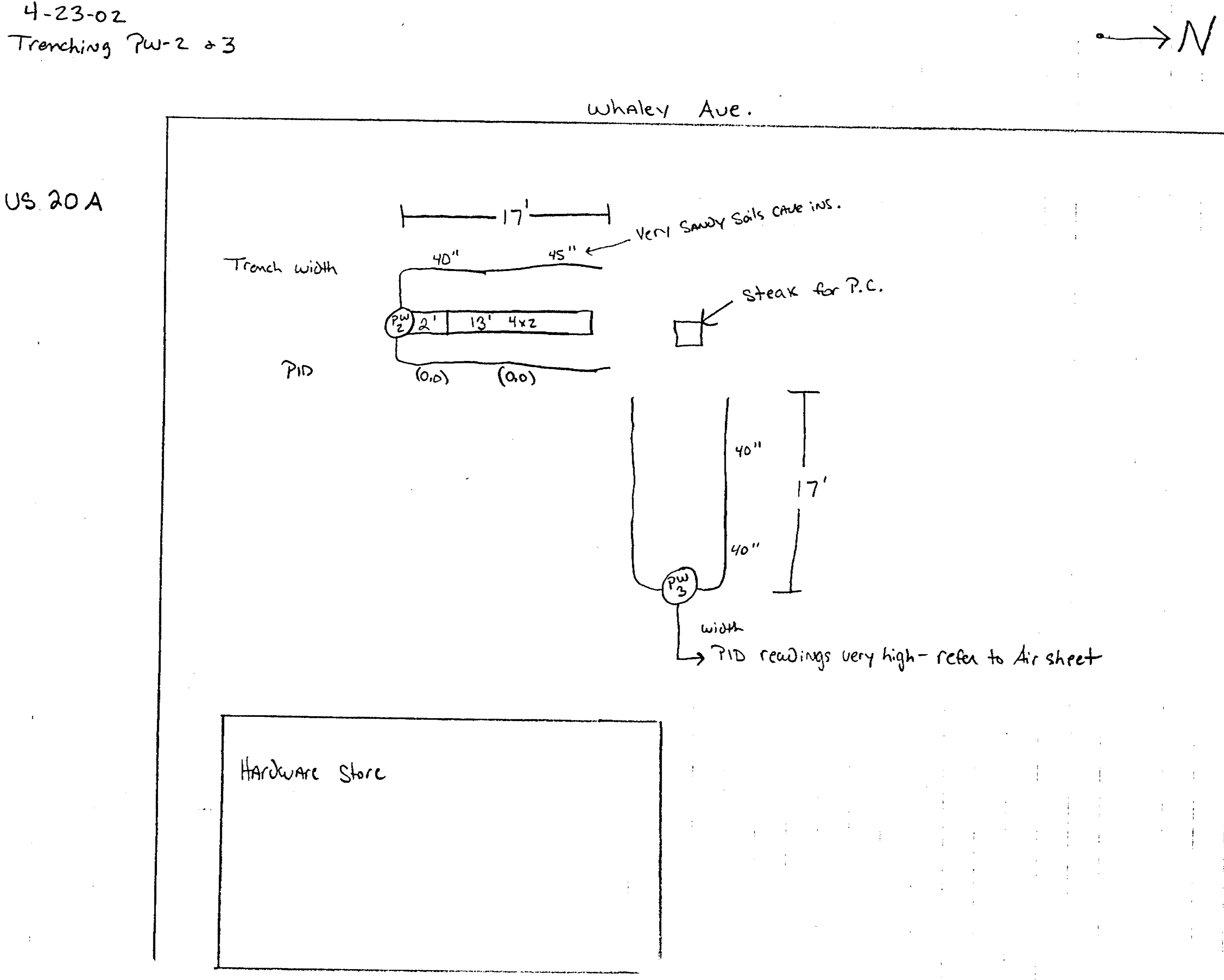
End @ 300 pm



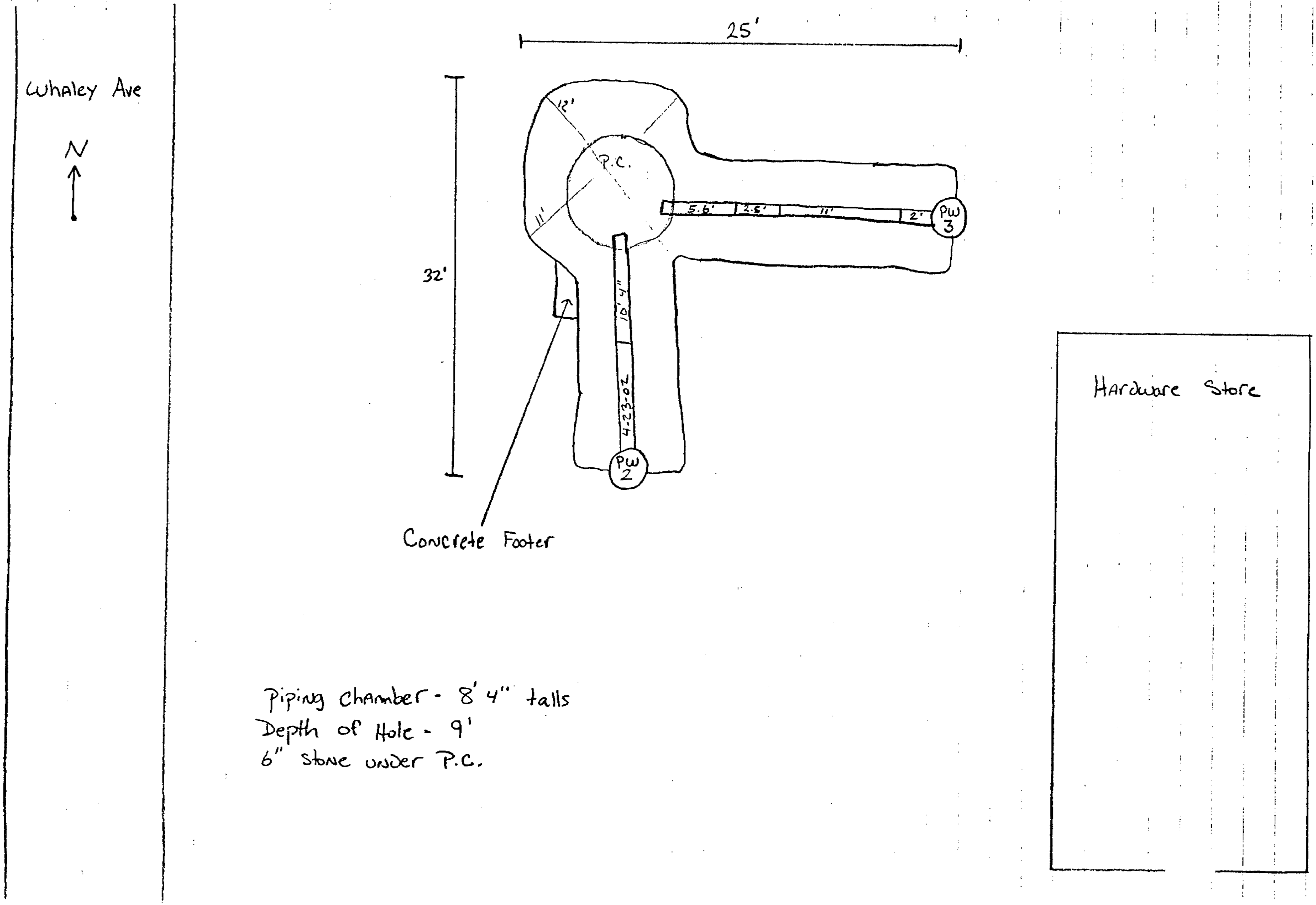
Mr. C's Dry cleaners
4-23-02
Trench Detail PW-2



Mr. C's Dry Cleaners
4-23-02
Trenching PW-2 & 3

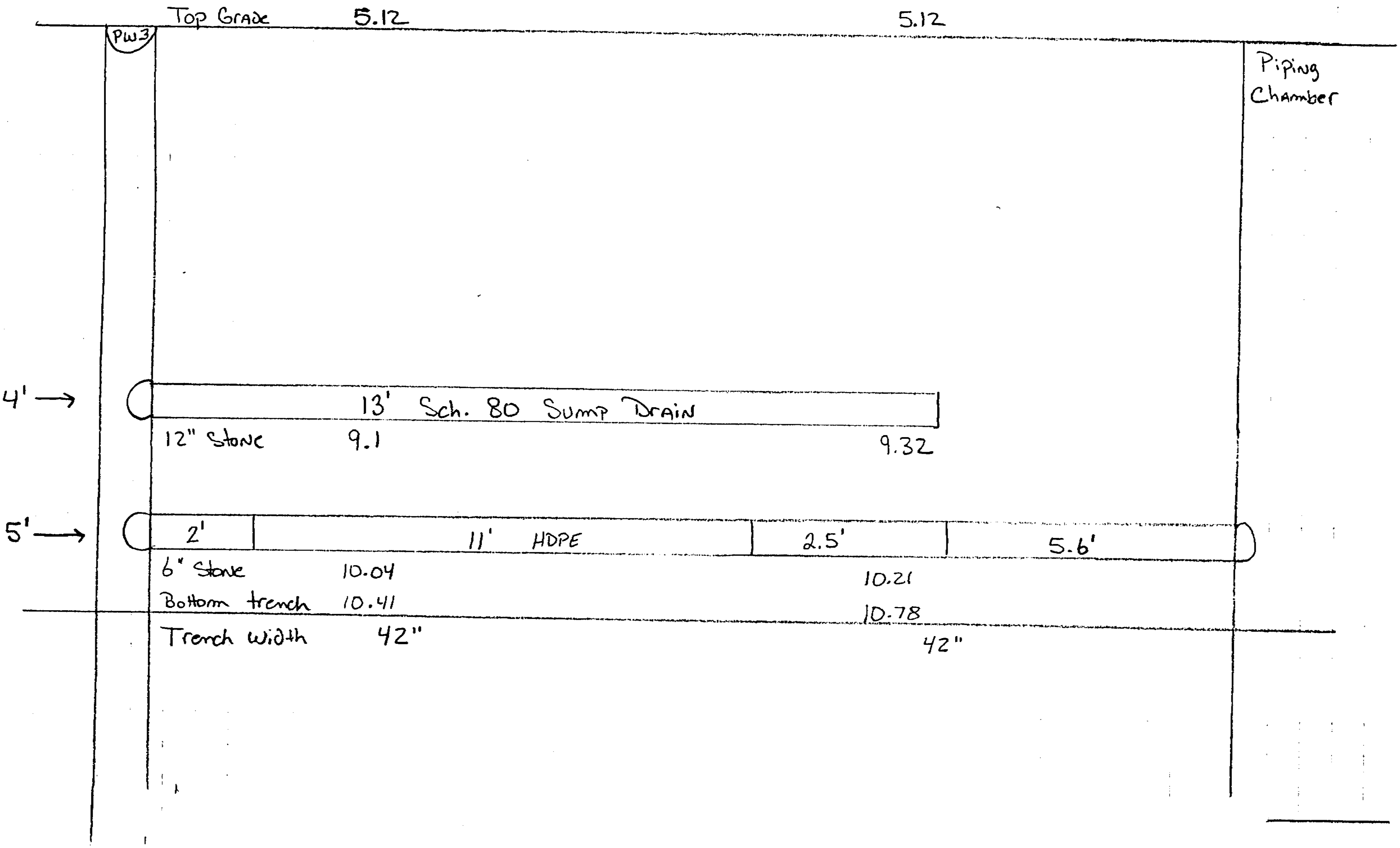


Mr. C's Dry Cleaners
PW 2 + 3 trench + Piping Chamber
4-24-02
David Pachan



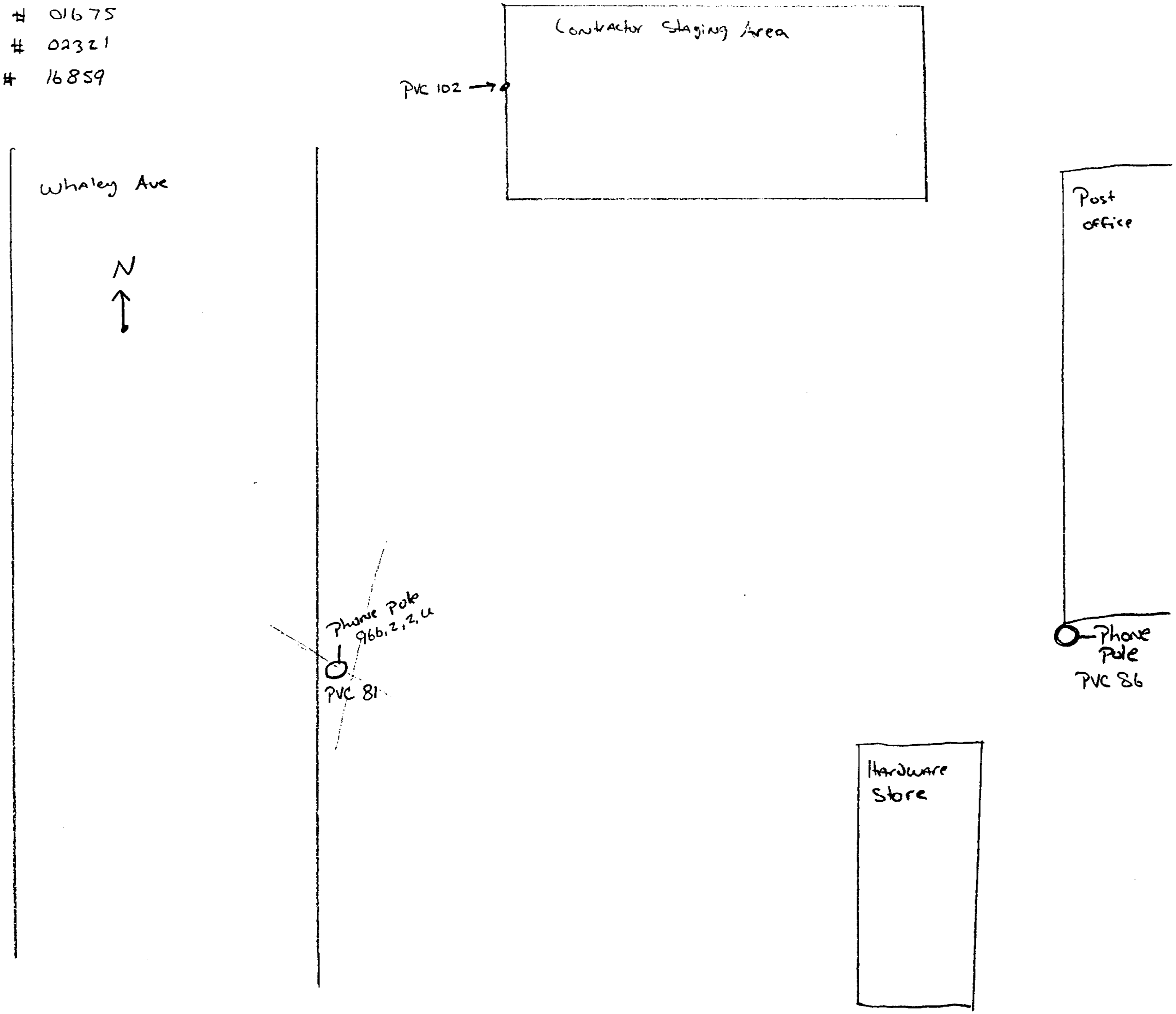
Piping chamber - 8' 4" talls
Depth of Hole - 9'
6" stone under P.C.

Mr. C's Dry Cleaners
PW 2&3 Trench & Piping Chamber
4-24-02
David Pachan



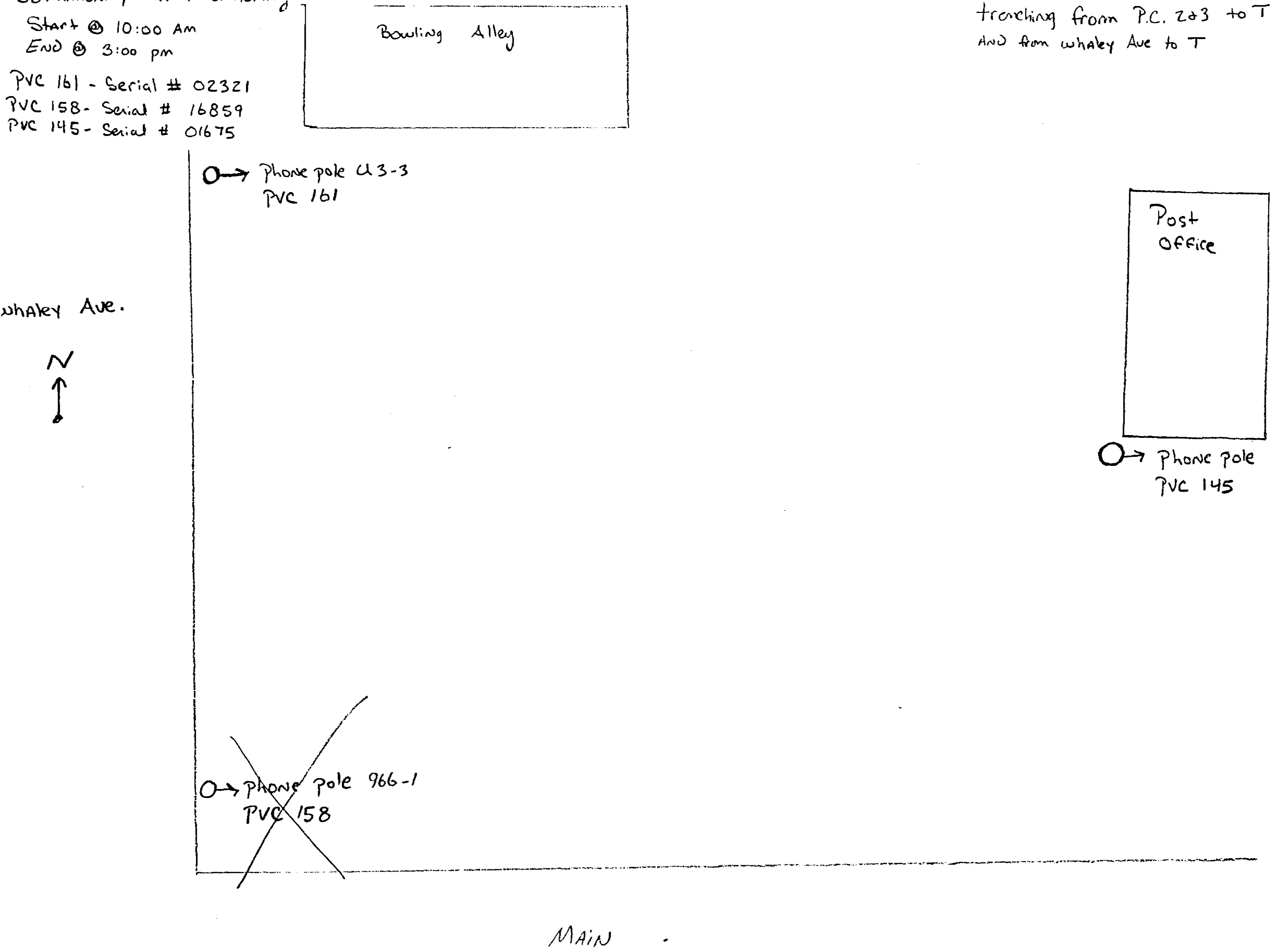
Community Air Monitoring @ 115 360

PVC 86 Serial # 01675
PVC 102 Serial # 02321
PVC 81 Serial # 16859



5-1-02
Community Air Monitoring
Start @ 10:00 Am
End @ 3:00 pm

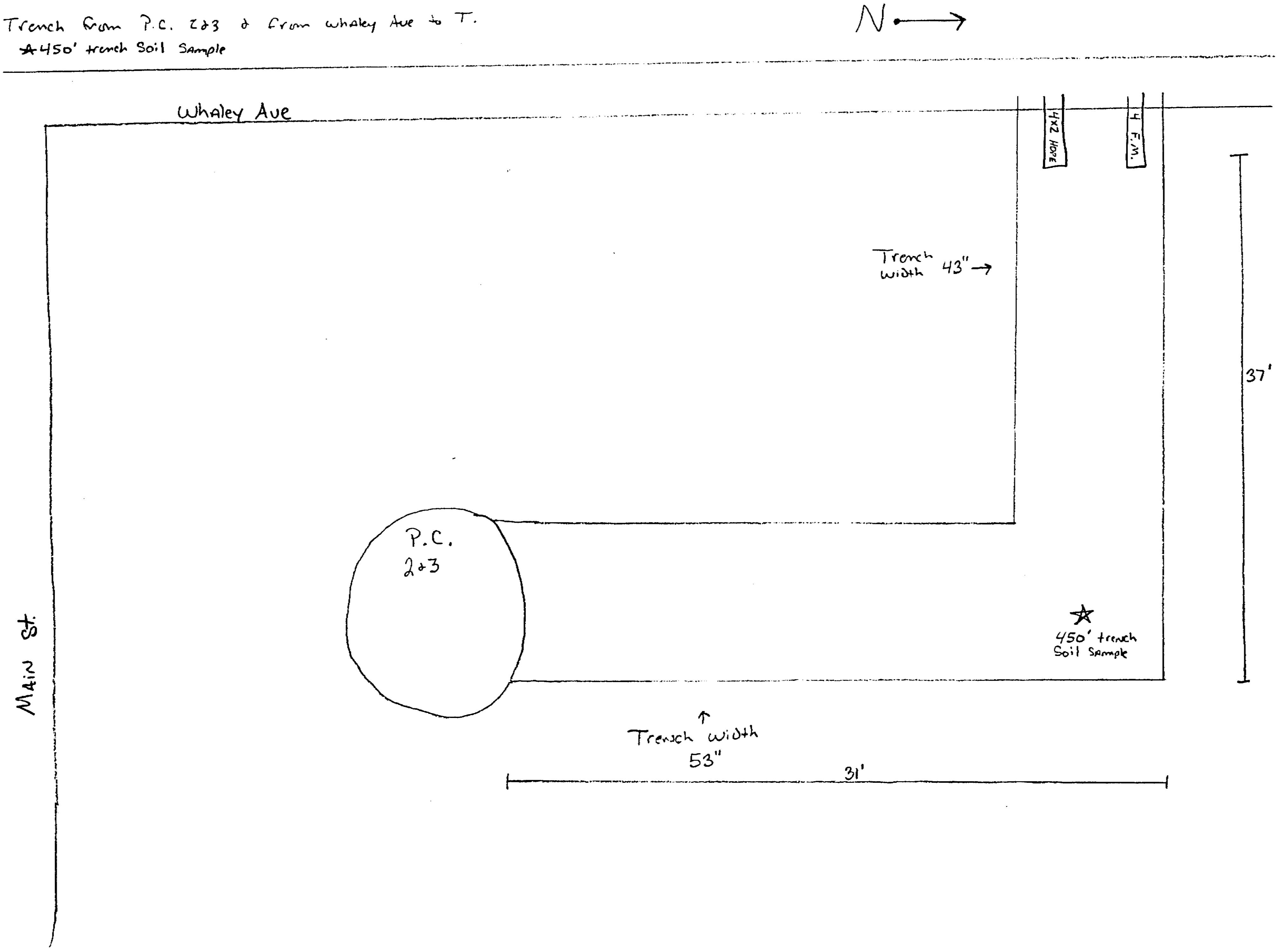
PVC 161 - Serial # 02321
PVC 158 - Serial # 16859
PVC 145 - Serial # 01675

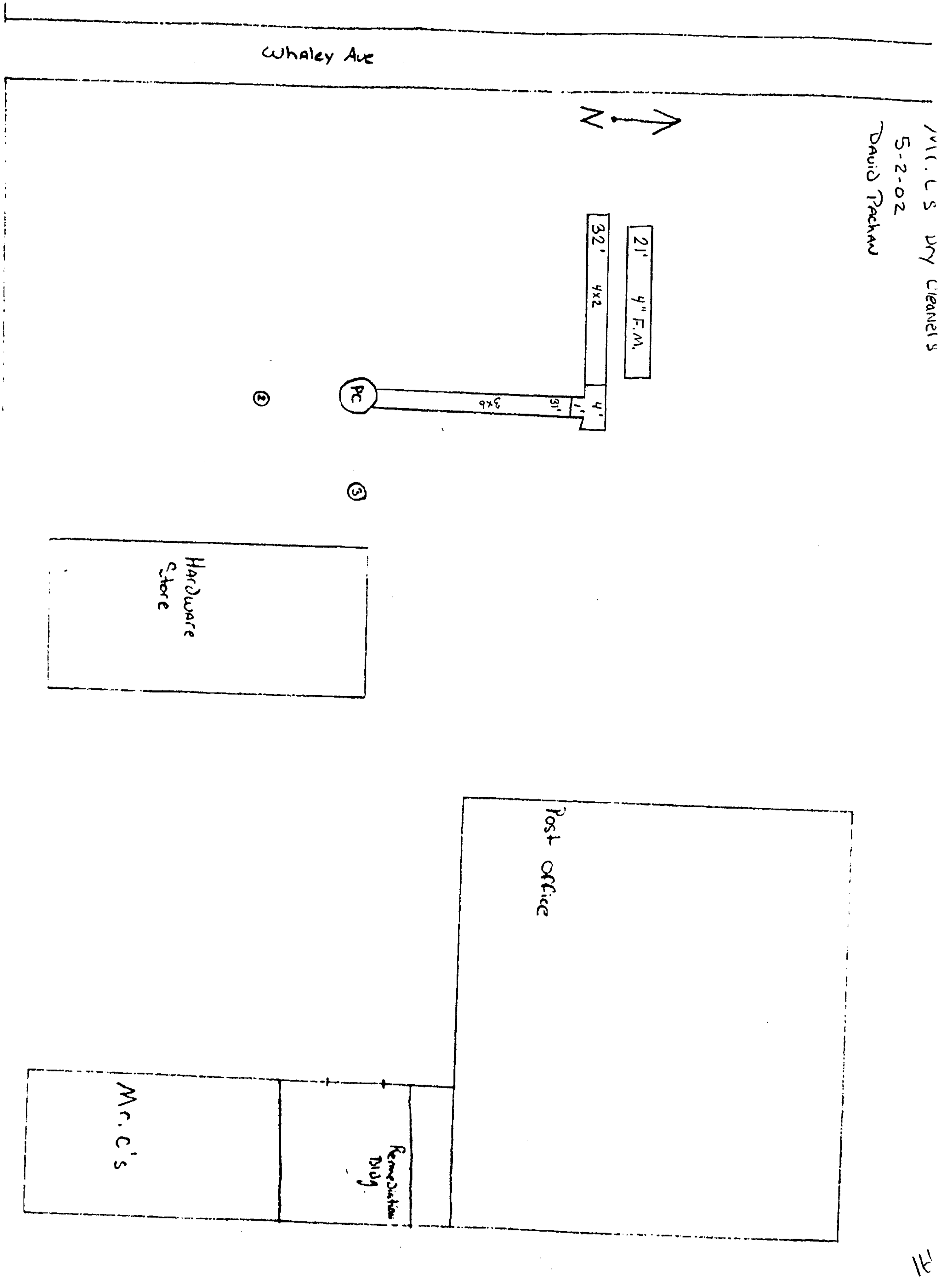


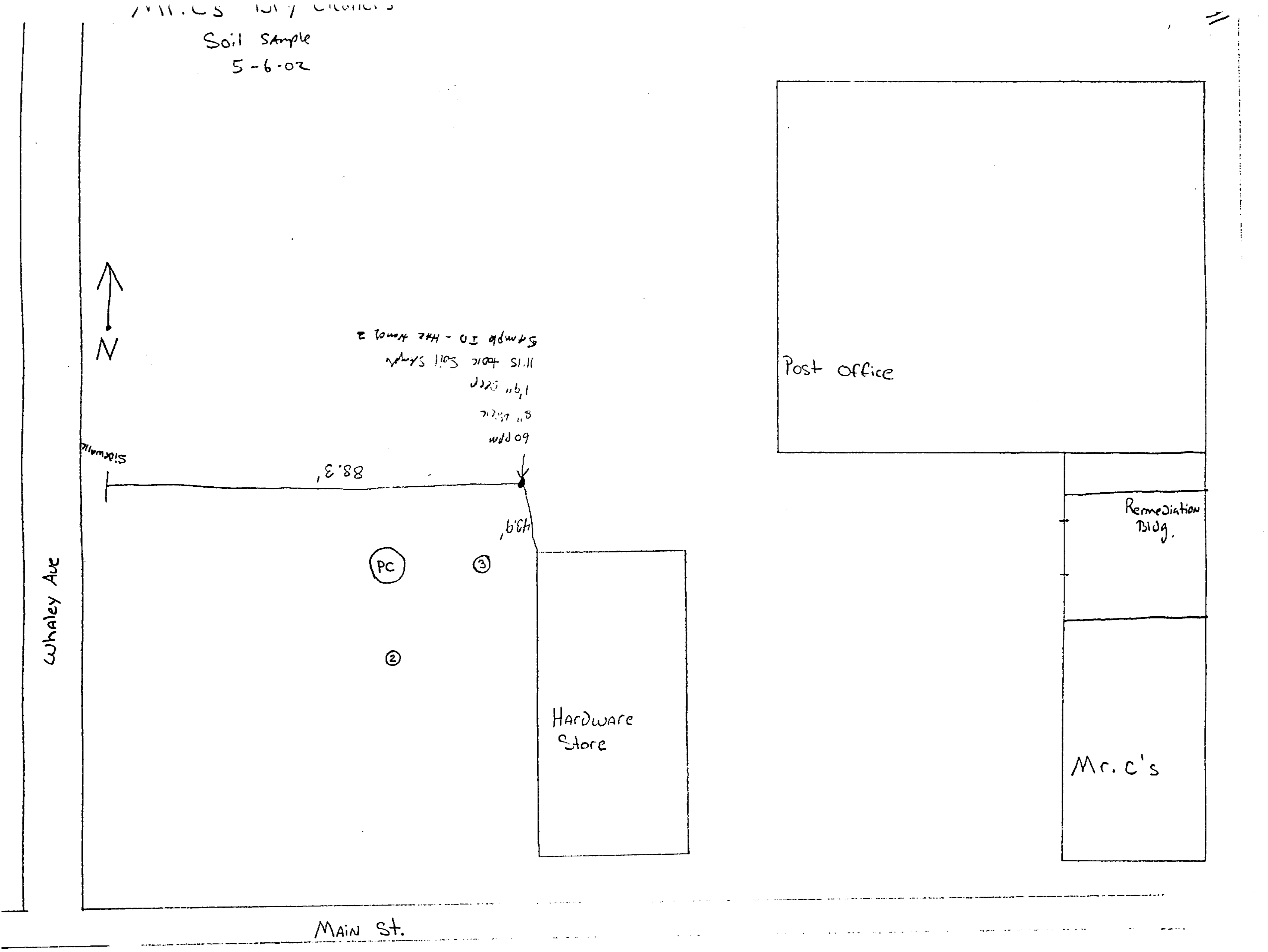
Mr. C's Dry Cleaners

Trench from P.C. 2&3 & from Whaley Ave to T.

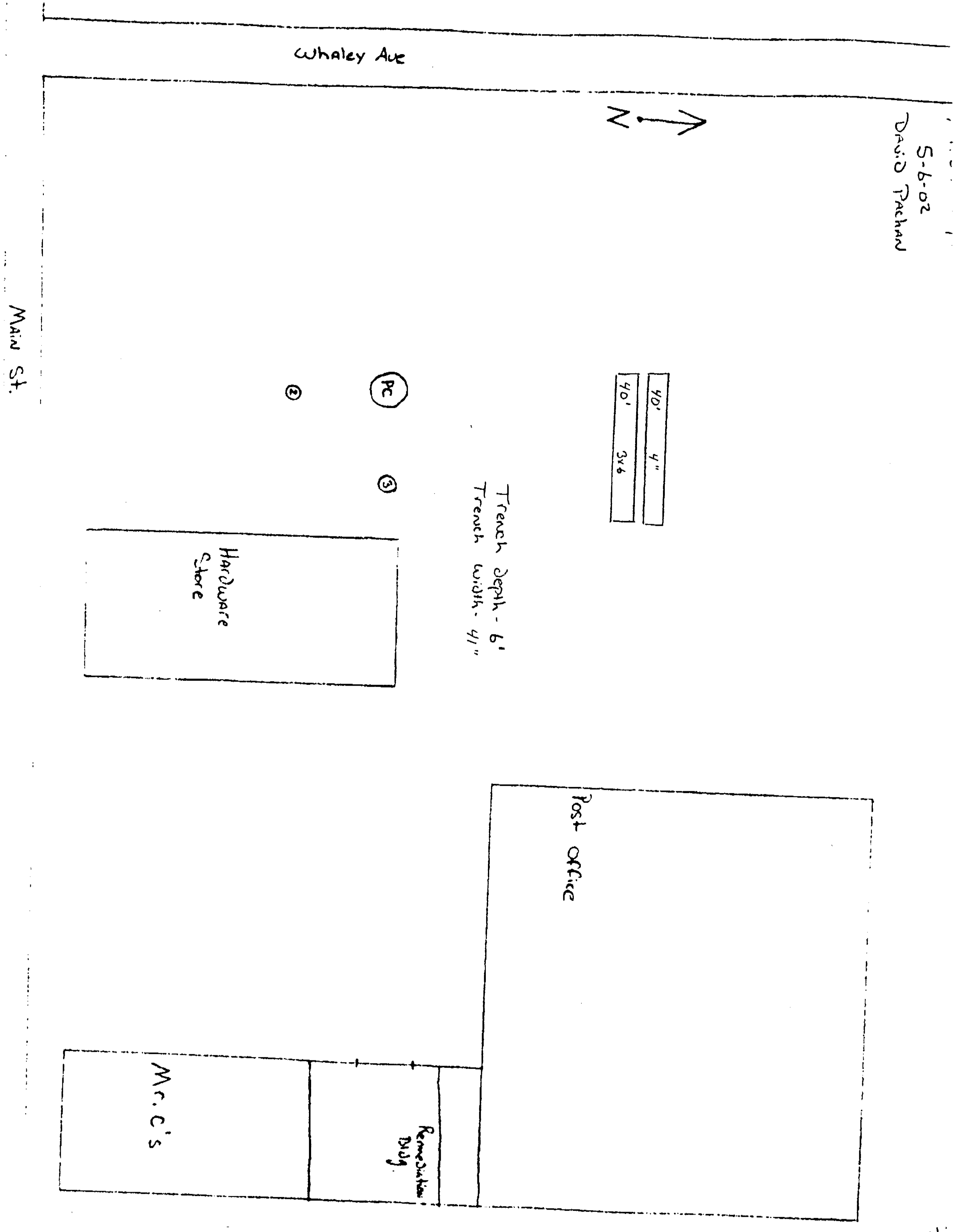
☆ 450' trench Soil Sample




Mills Dry Cleaners
5-2-02
David Pachan
Whaley Ave
N
Main St.
21'
4" F.M.
32'
4x2
4'
1'
31'
3x6
PC
②
③
Hardware Store
Post Office
Mr. C's
Remediation Bldg.
14



Soil Sample
5-6-02


Whaley Ave
N
5-6-02
David Pachan
Main St.
PC
②
③
40'
4"
40'
3x6
Trench depth - 6'
Trench width - 41"
Hardware Store
Post Office
Mr. C's
Remediation Bldg.

5-8-02
Community Air Samples
Charcoal tubes

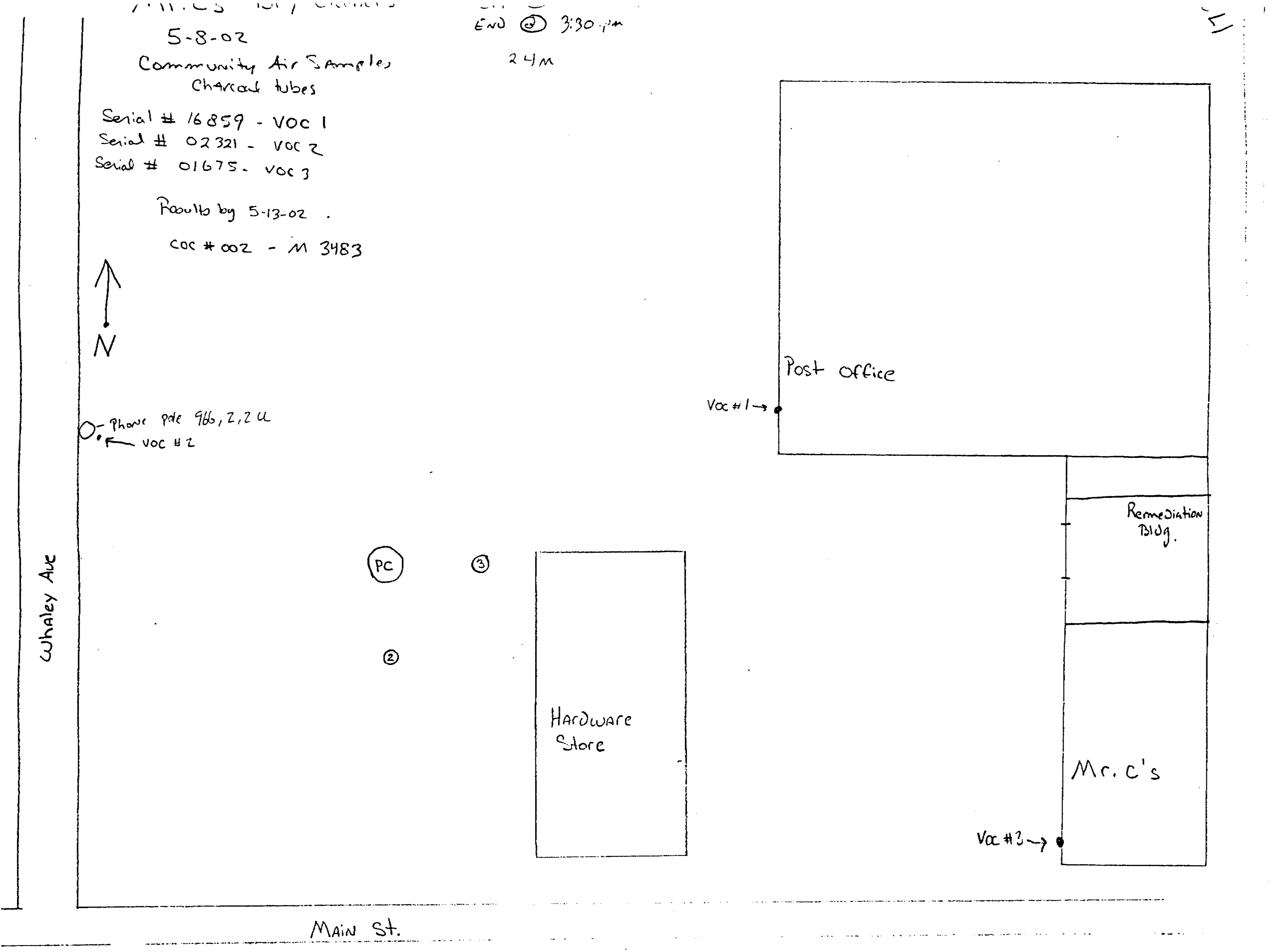
Serial # 16859 - VOC 1
Serial # 02321 - VOC 2
Serial # 01675 - VOC 3

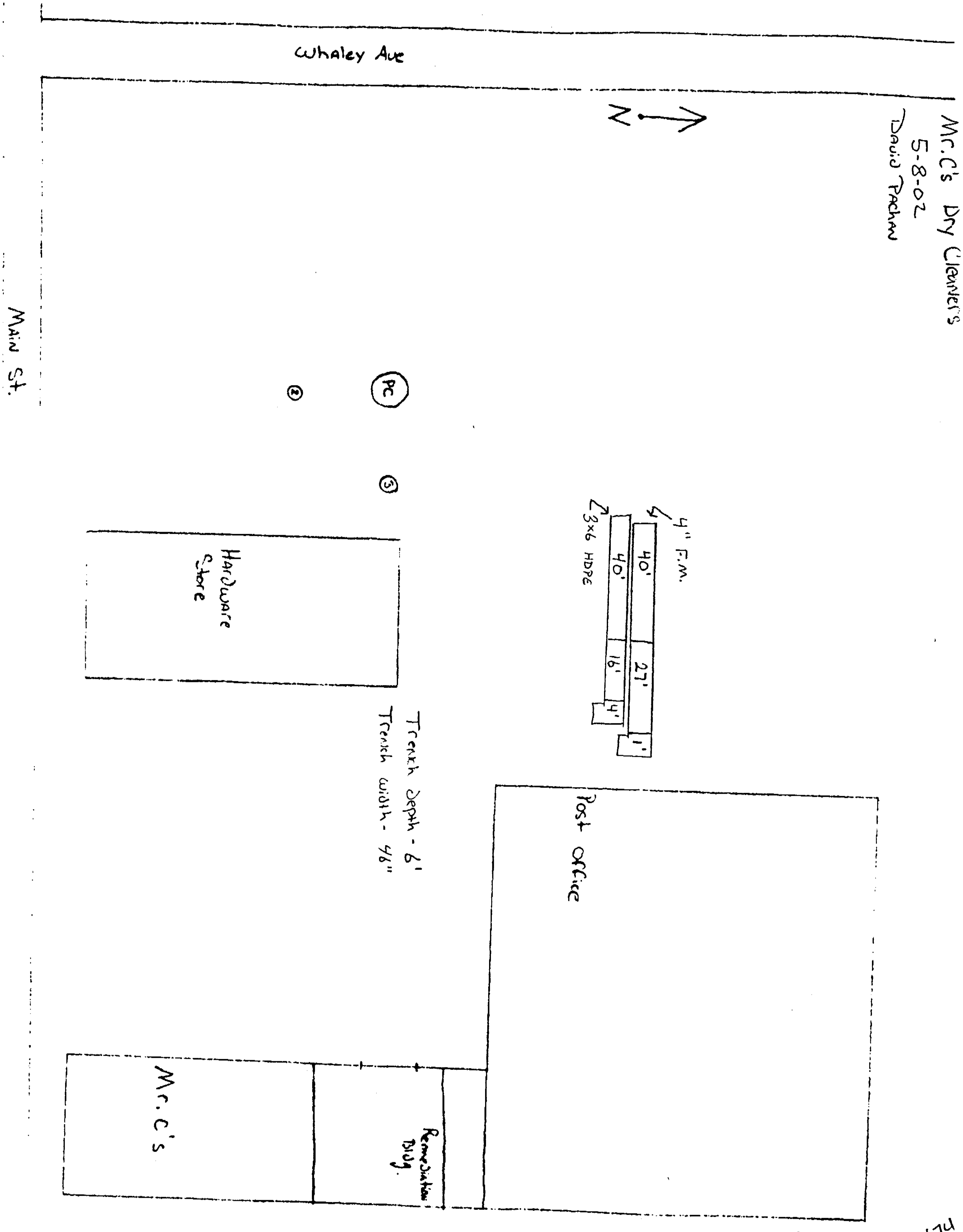
Results by 5-13-02.

COC # 002 - M 3483

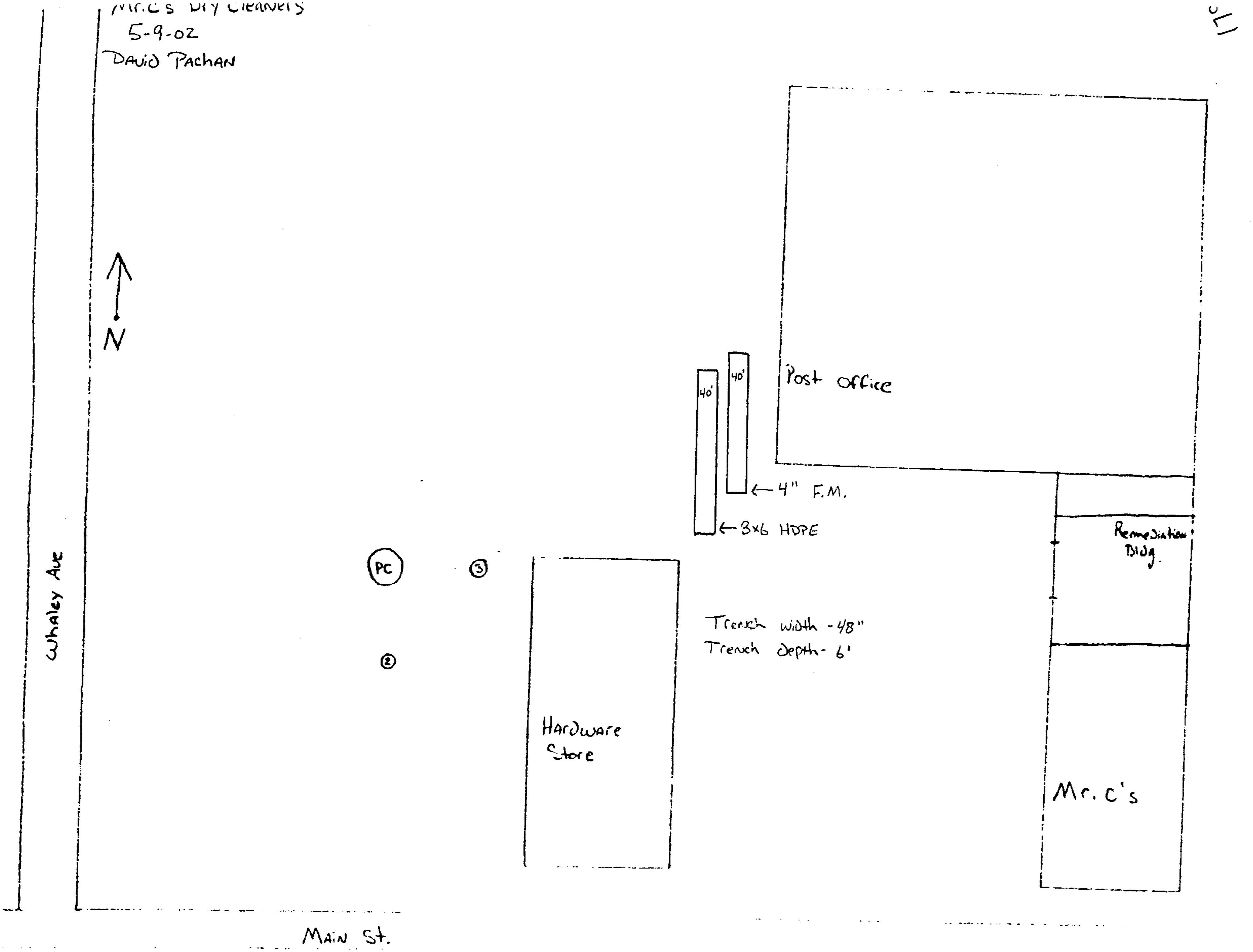
END @ 3:30 pm

24M

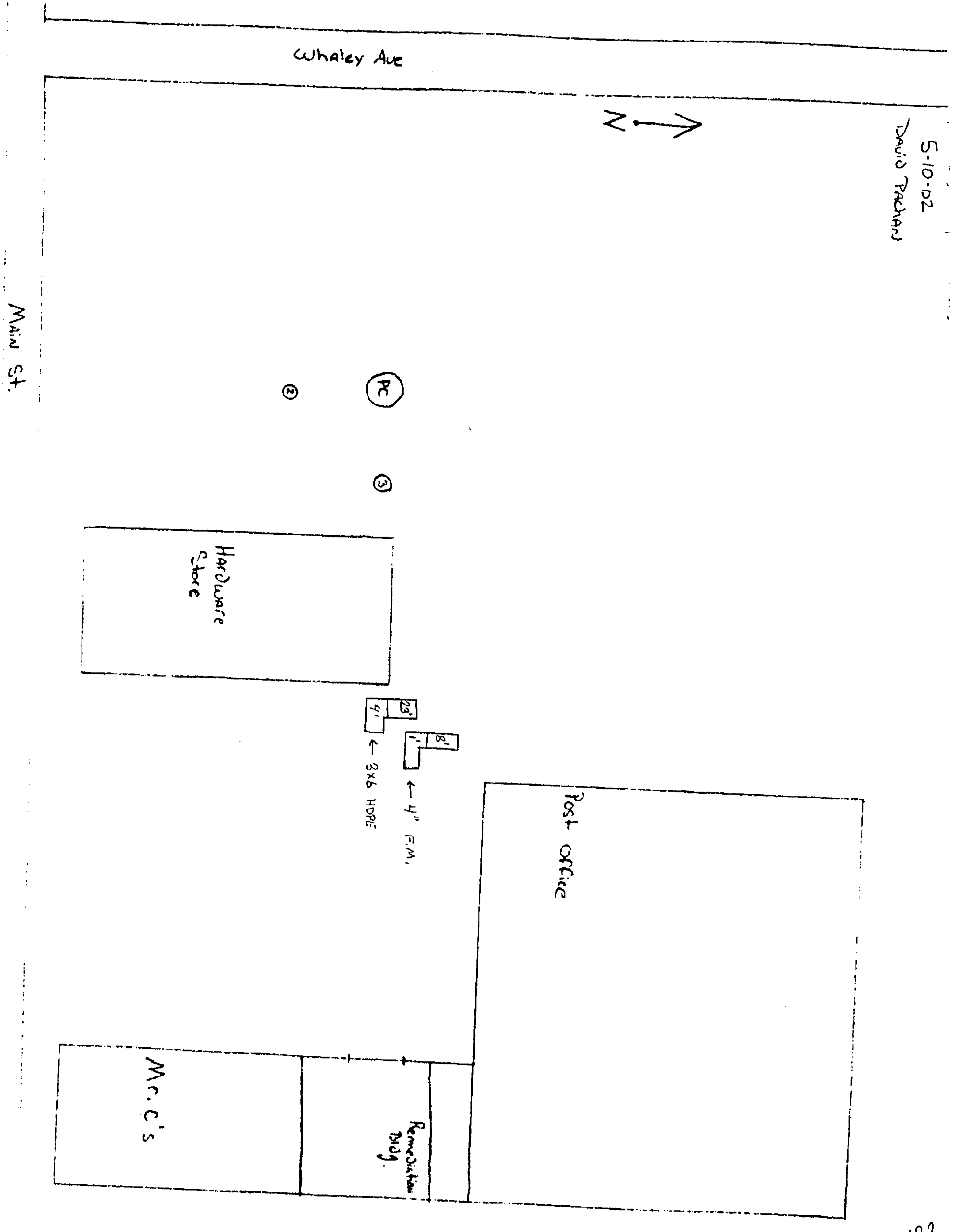



Mr. C's Dry Cleaners
5-8-02
David Pachan
Whaley Ave
N
Main St.
PC
2
3
4" F.M.
40'
27'
1'
2x6 HDPE
40'
16'
4'
Hardware Store
Trench Depth - 6'
Trench Width - 46"
Post Office
Mr. C's
Remediation Bldg.

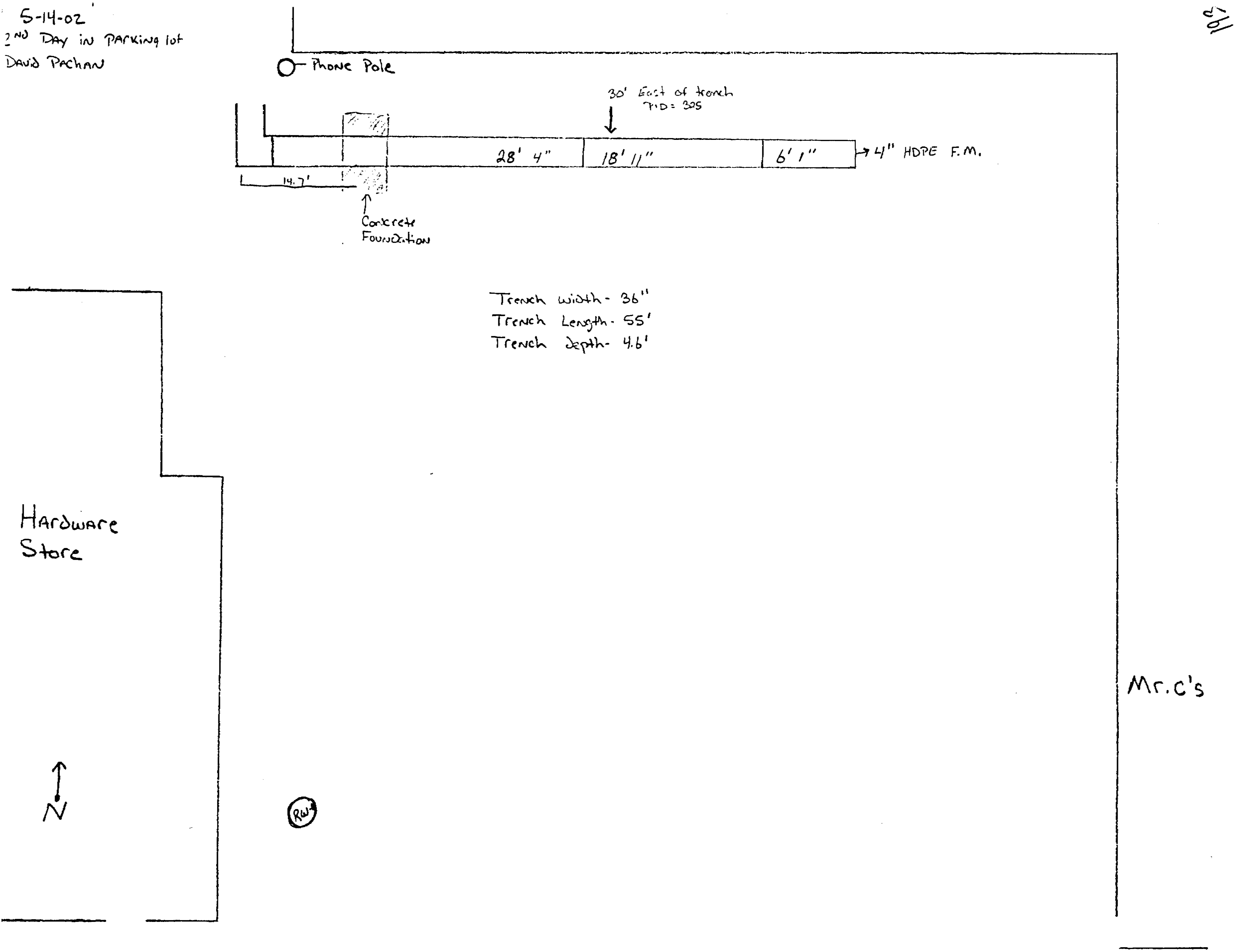
Mr.C's Dry Cleaners
5-9-02
David Pachan



17°


Whaley Ave
N
5-10-02
David Pachard
Main St.
2
PC
3
Hardware Store
23'
4'
18'
1'
← 3x6 HDPE
← 4" F.M.
Post Office
Mr. C's
Remediation Bldg.

5-14-02
2nd Day in Parking lot
David Pachan

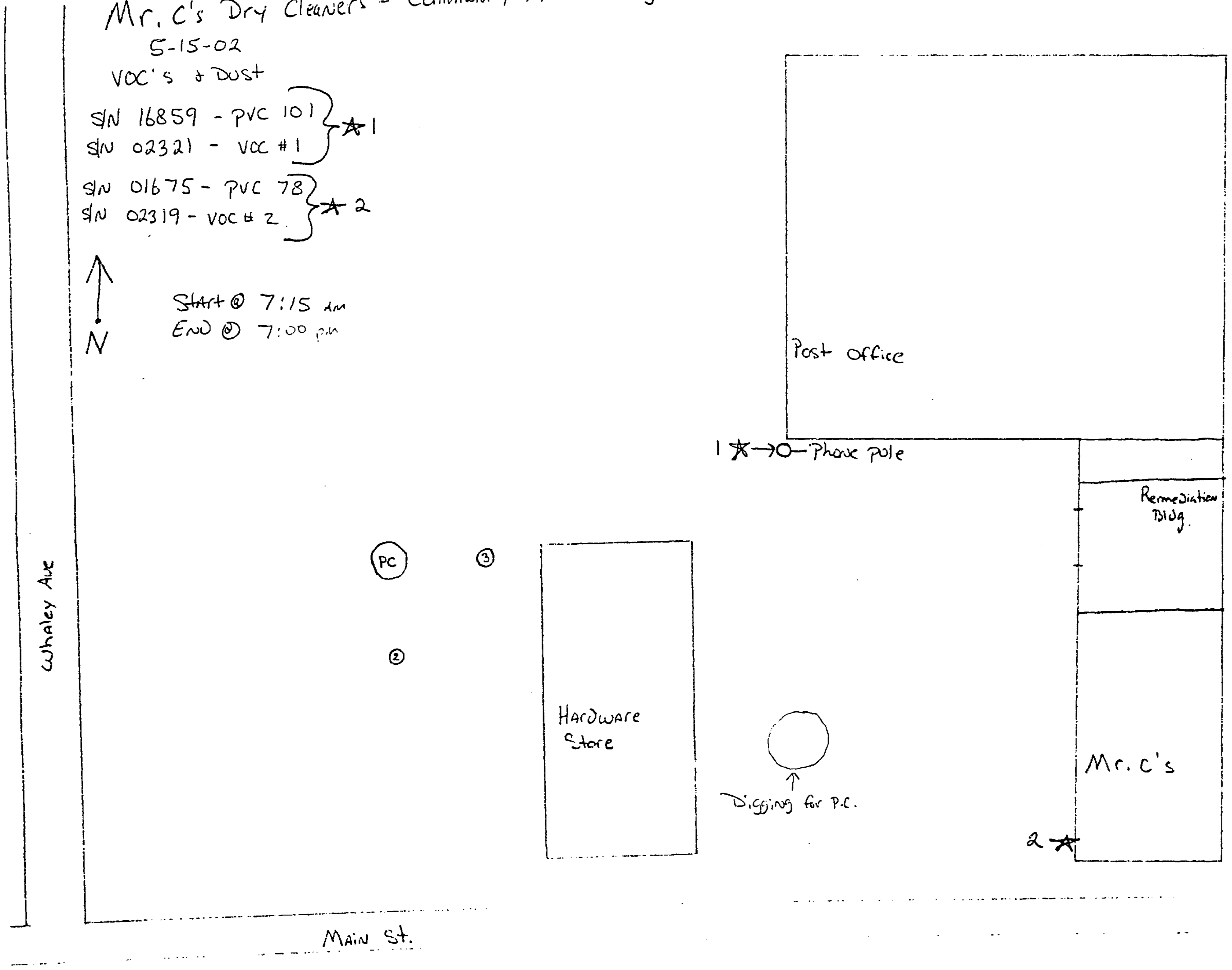


Mr. C's Dry Cleaners - Community Air Monitoring
5-15-02
VOC's & Dust

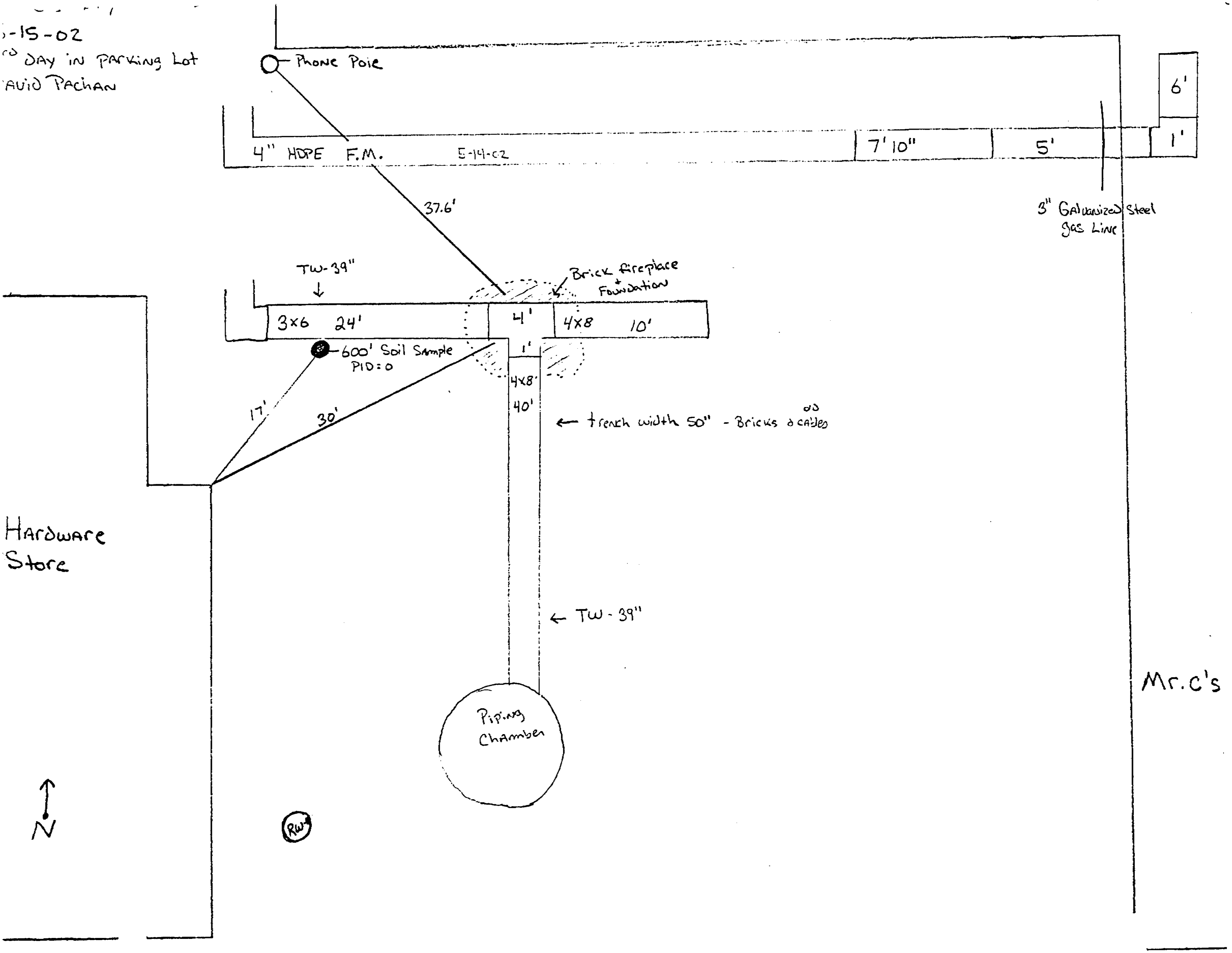
S/N 16859 - PVC 101
S/N 02321 - VOC #1
★1

S/N 01675 - PVC 78
S/N 02319 - VOC # 2
★2

Start @ 7:15 am
End @ 7:00 pm



-15-02
rd Day in Parking Lot
avid Pachan

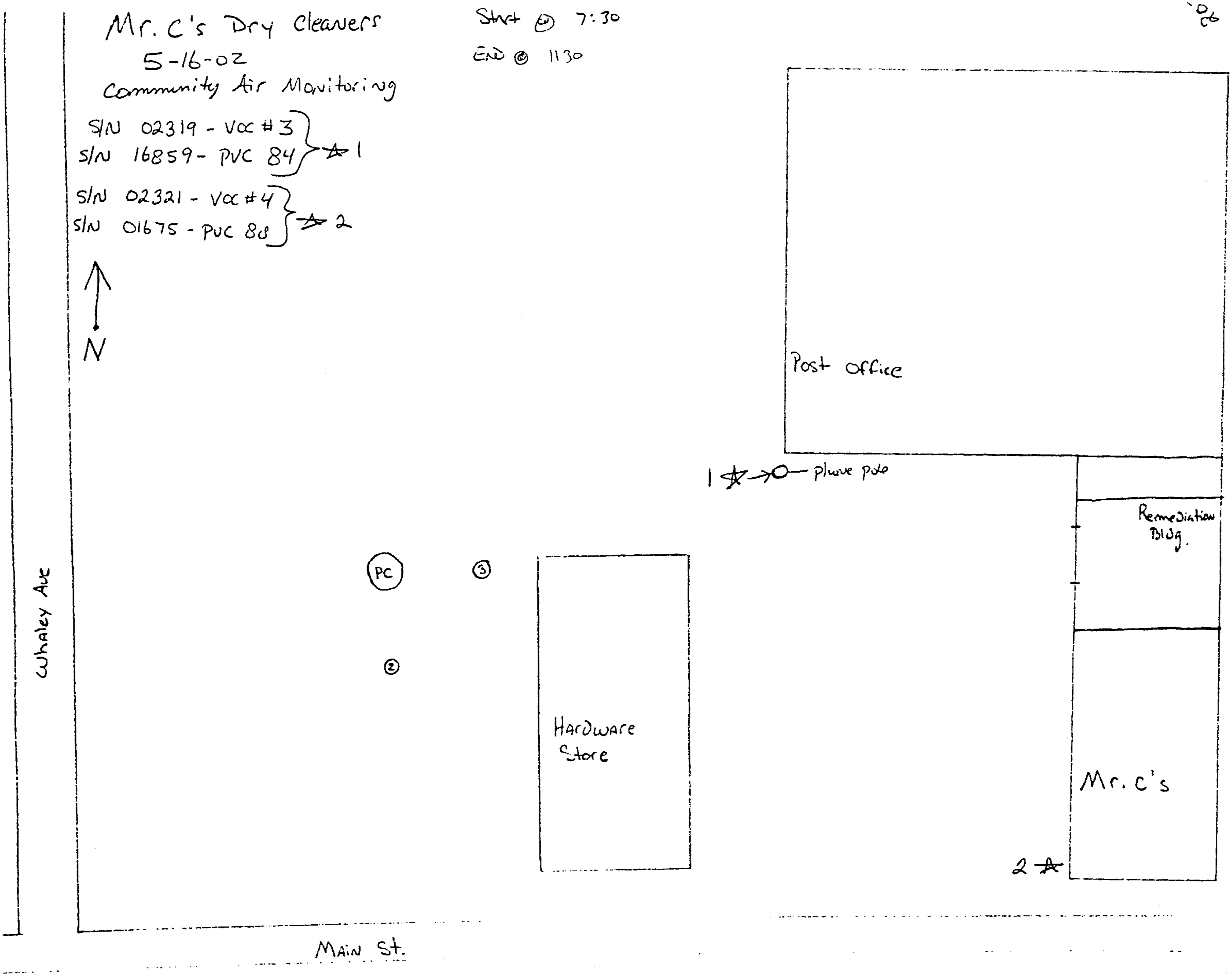


Mr. C's Dry Cleaners
5-16-02
Community Air Monitoring

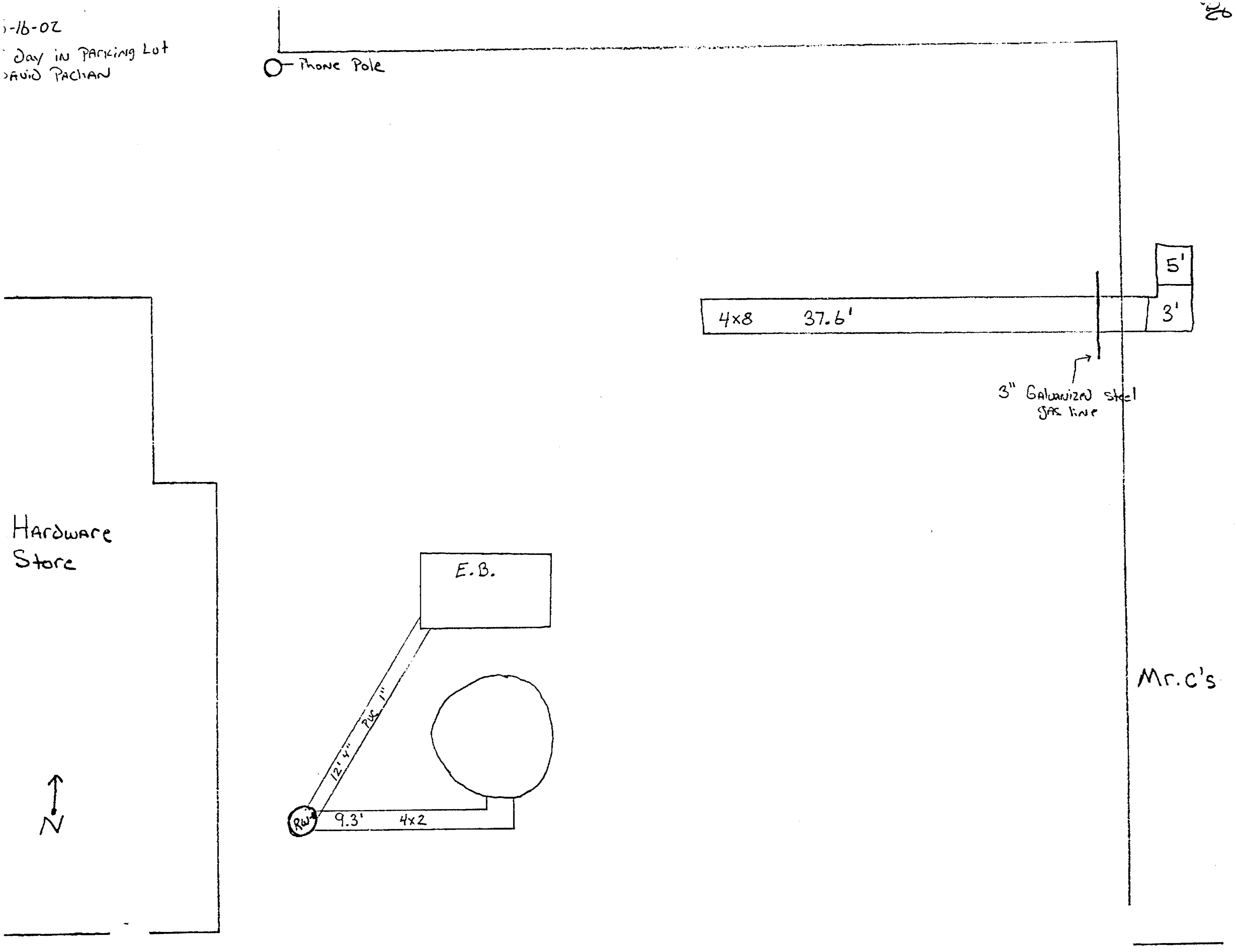
Start @ 7:30
End @ 1130

S/N 02319 - Voc #3 } ☆ 1
S/N 16859 - PVC 84 }

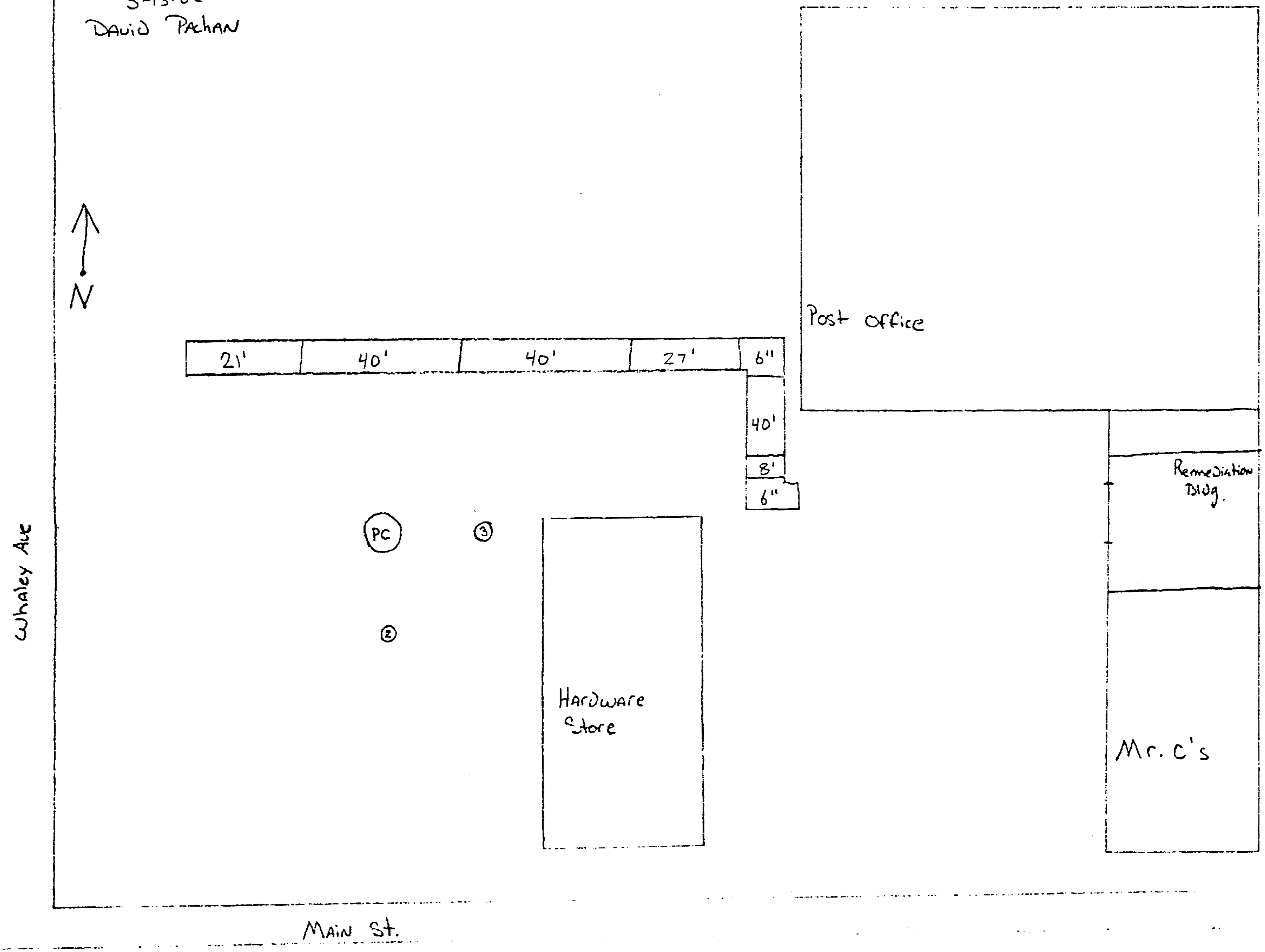
S/N 02321 - Voc #4 } ☆ 2
S/N 01675 - PUC 88 }



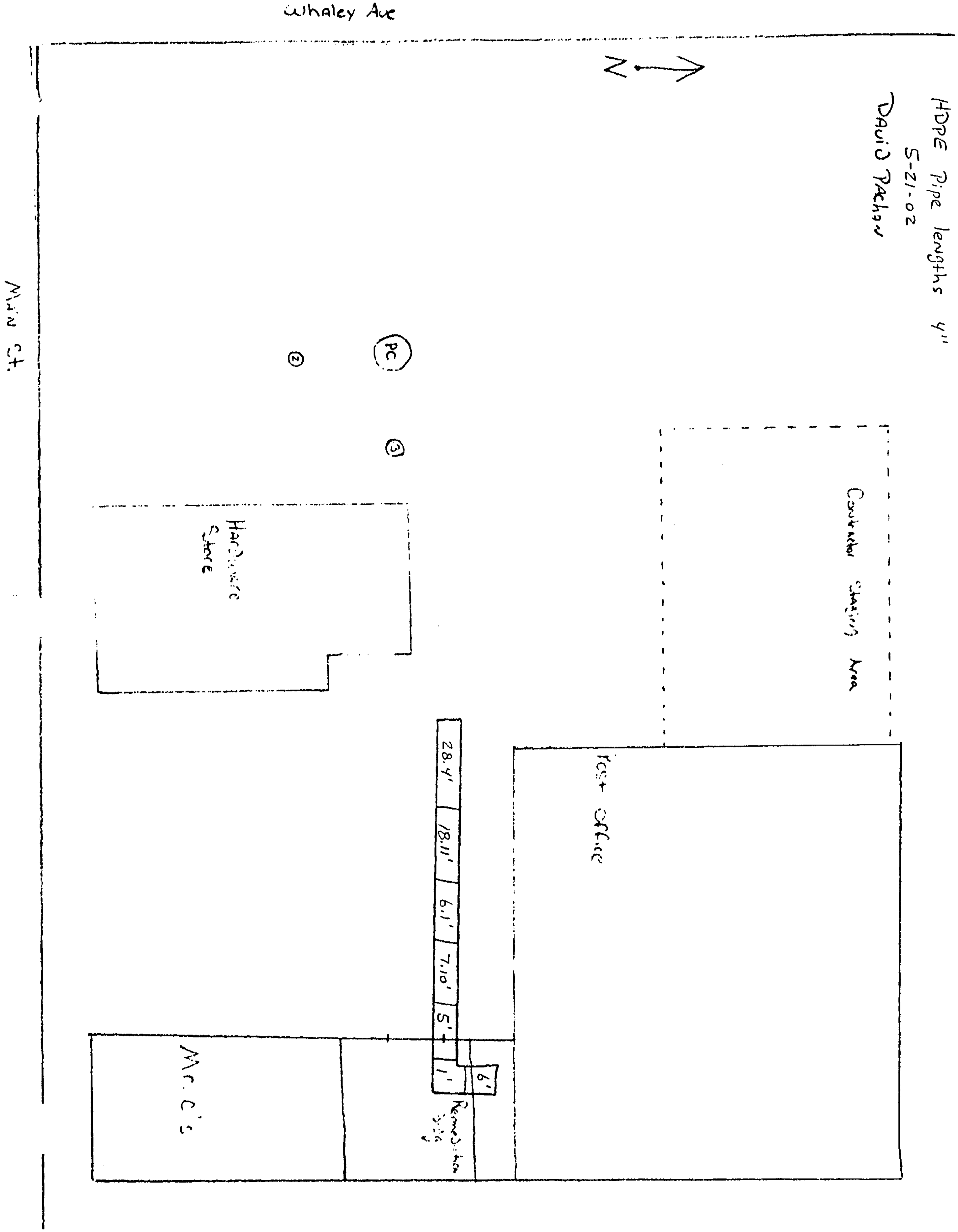
-16-02
Day in Parking Lot
avid Pachan

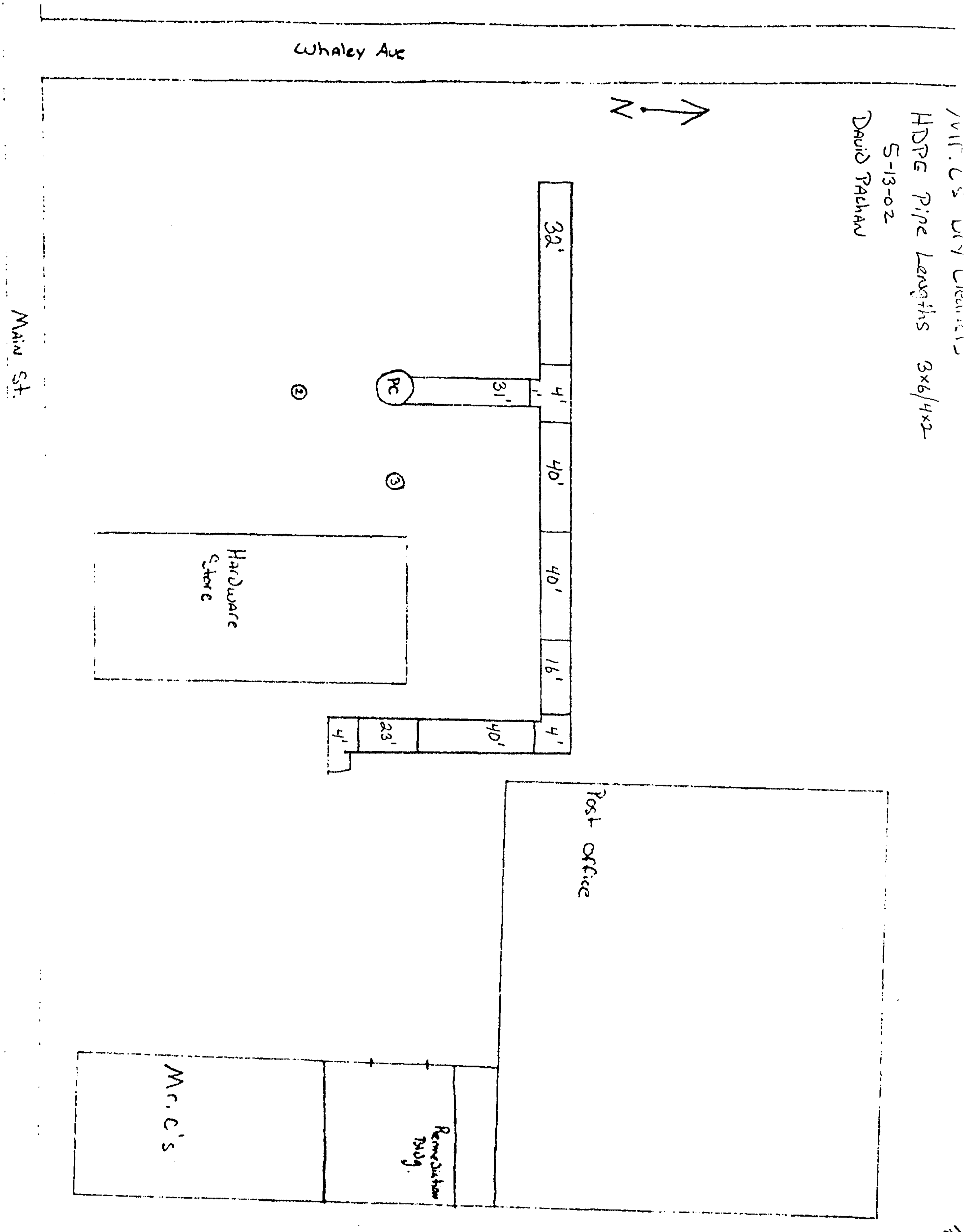


Mr.C's Dry Cleaners
HDPE Pipe Lengths 4"
5-13-02
David Pachan

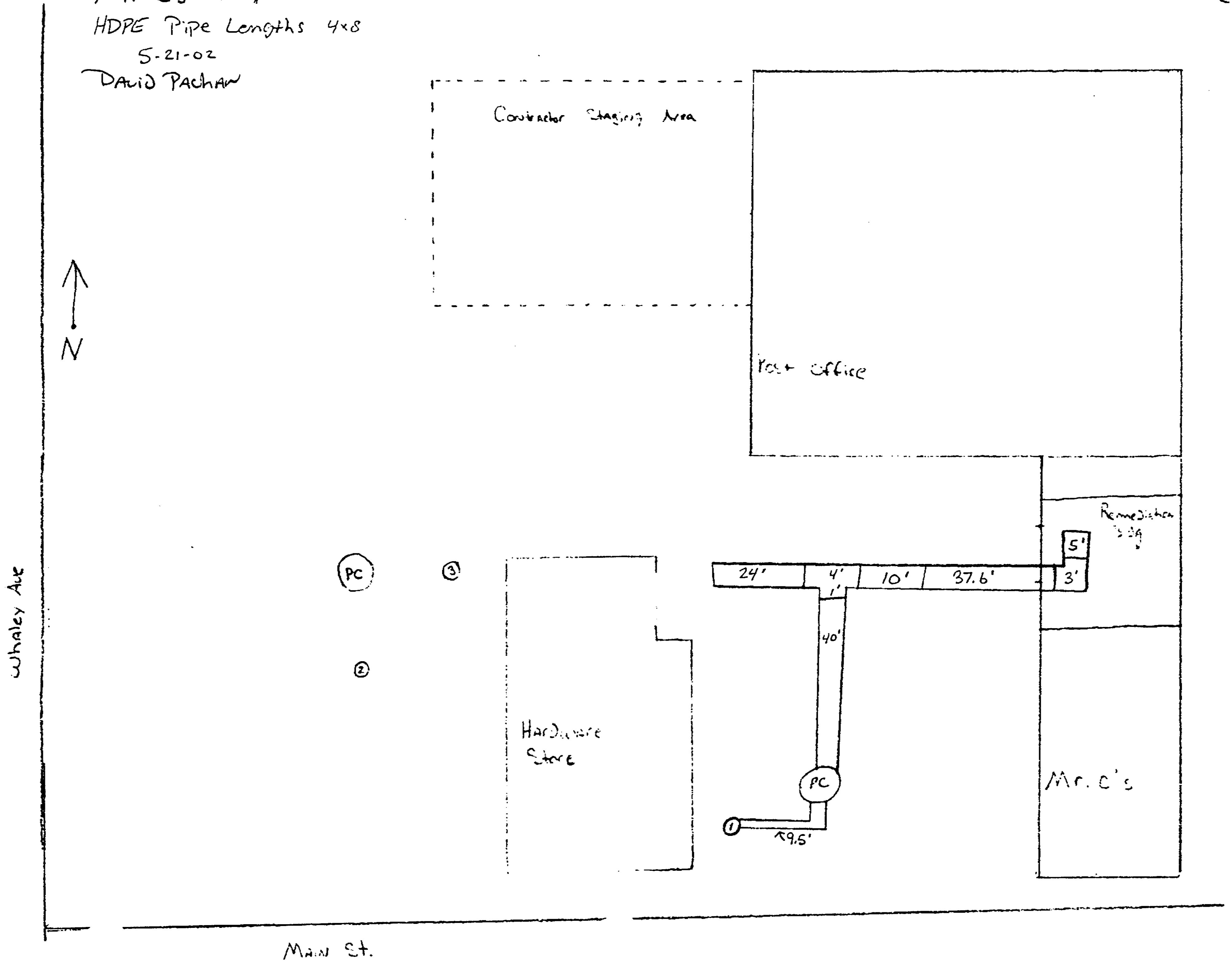


Mr Cs Dry Cleaners
HDPE Pipe lengths 4"
5-21-02
David Pachon



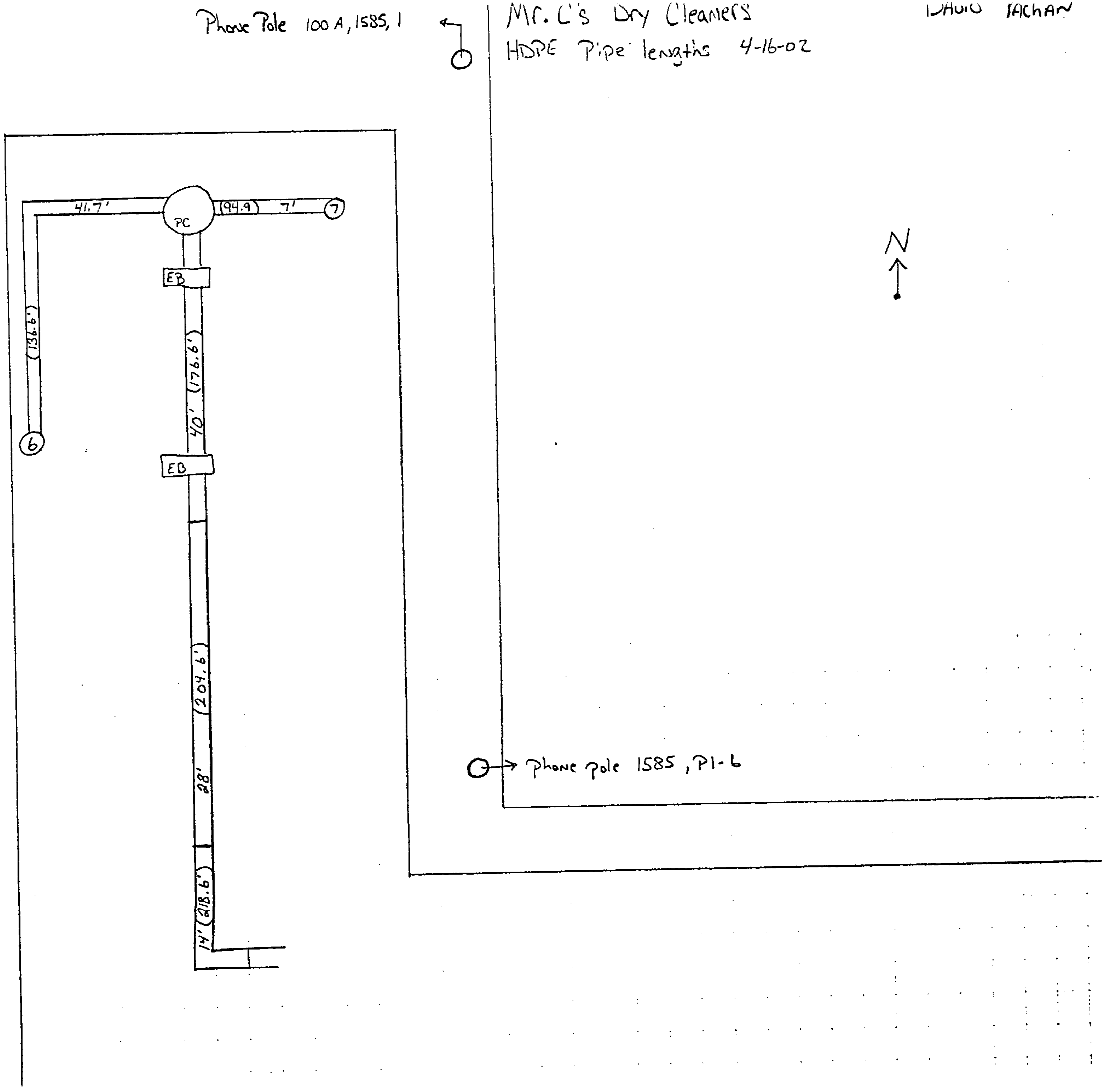

Mr. C's Dry Clean
HDPE Pipe Lengths 3x6/4x2
5-13-02
David Pachan
Whaley Ave
N
Main St.
32'
4'
31'
PC
②
③
40'
40'
16'
4'
40'
23'
4'
Hardware Store
Post Office
Mr. C's
Remediation Bldg.

Mr Cs Dry Cleaners
HDPE Pipe Lengths 4x8
5-21-02
David Pachan



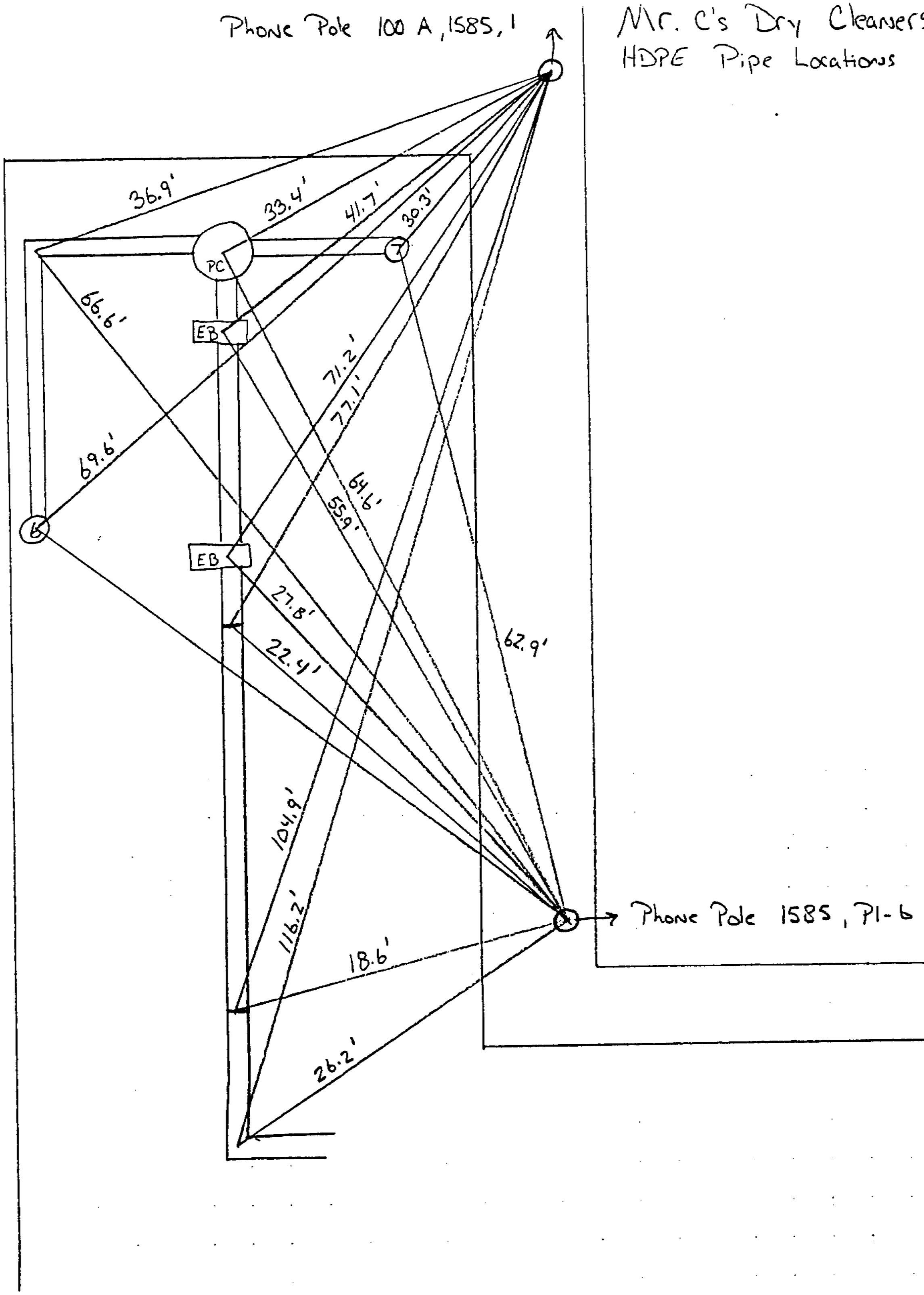
Mr. C's Dry Cleaners
HDPE Pipe lengths 4-16-02

DAVID JACHAN

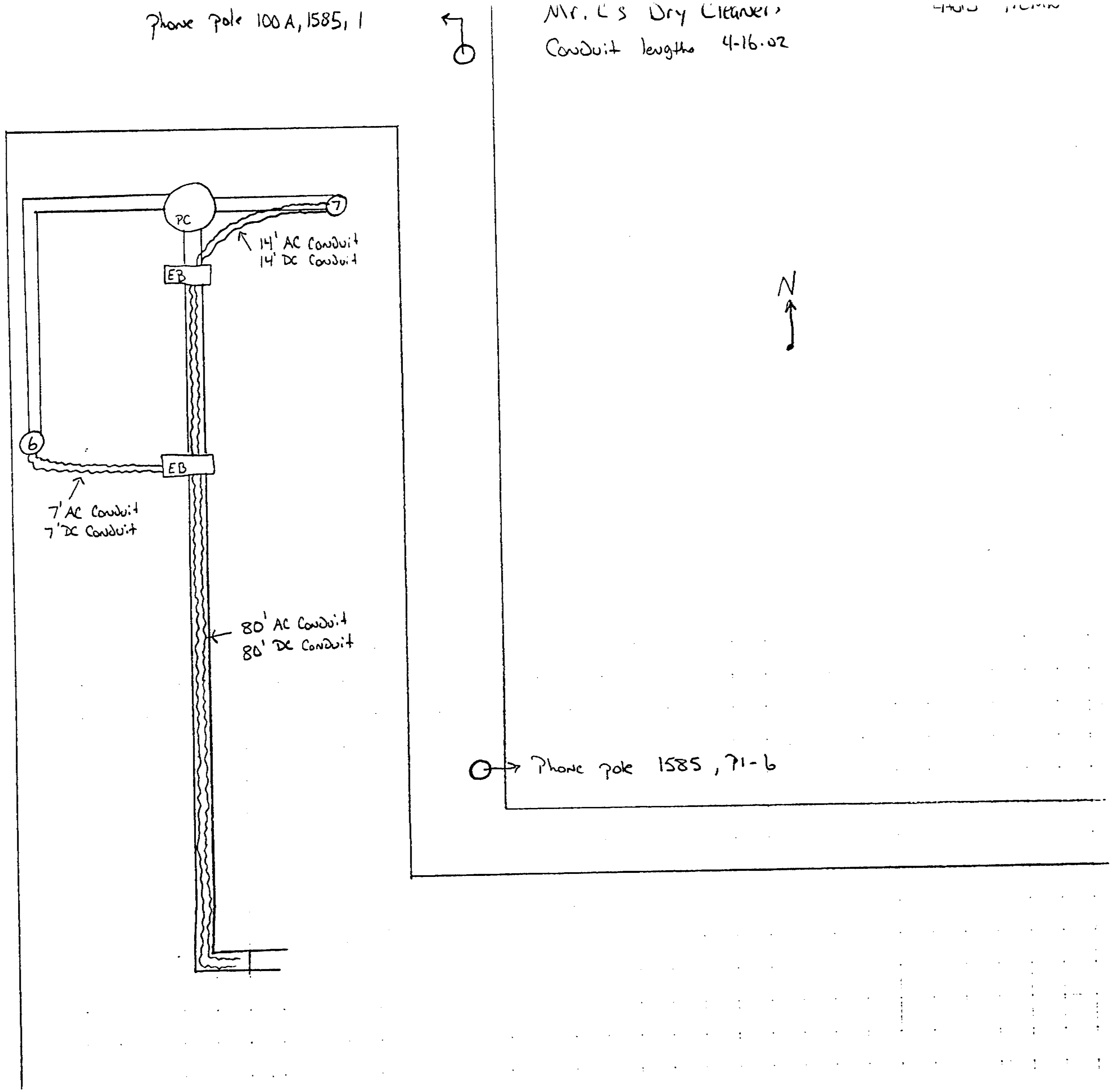


Mr. C's Dry Cleaners
HDPE Pipe Locations 4-16-02

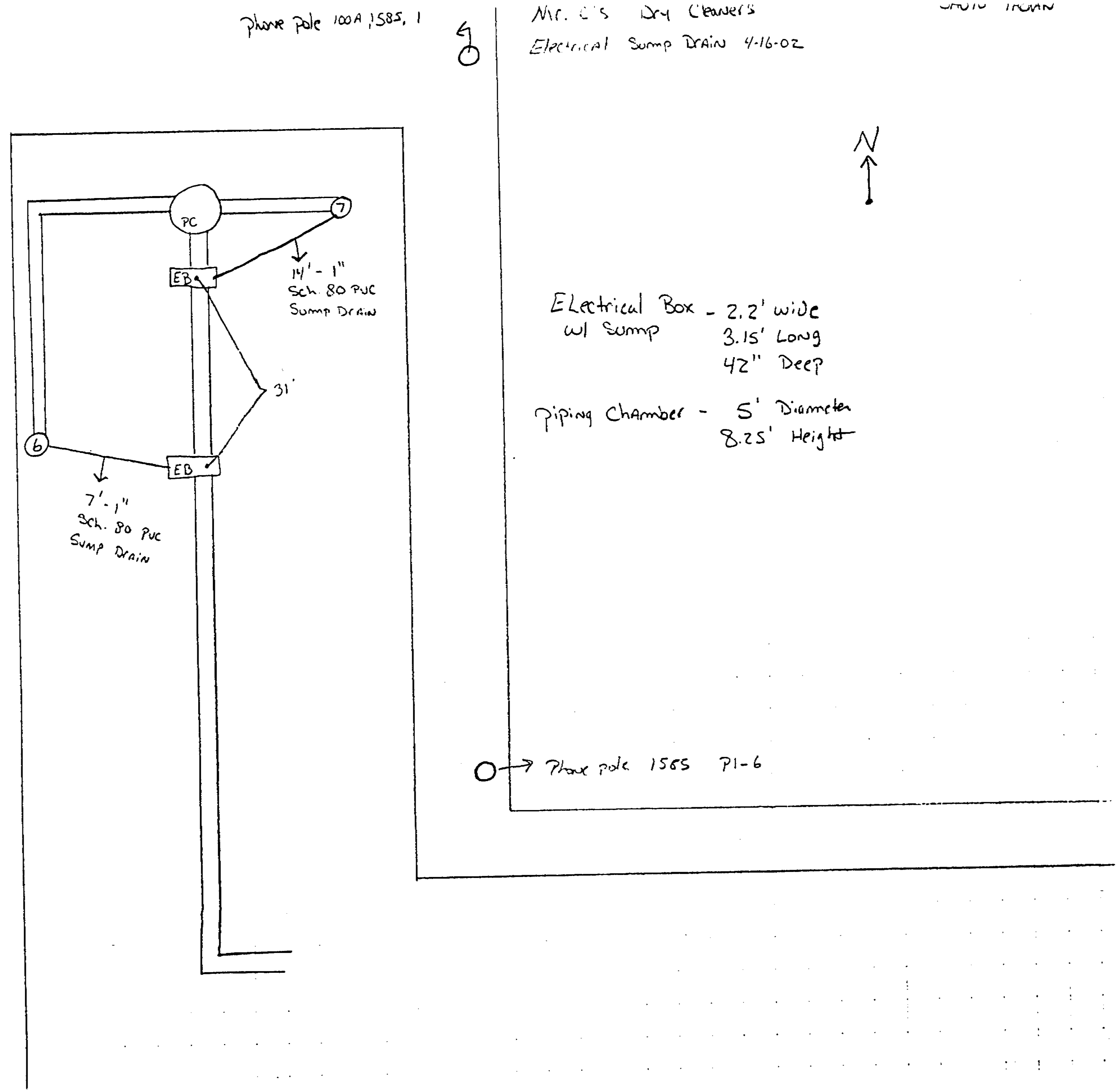
David Pachan



Mr. C's Dry Cleaners
Conduit lengths 4-16-02

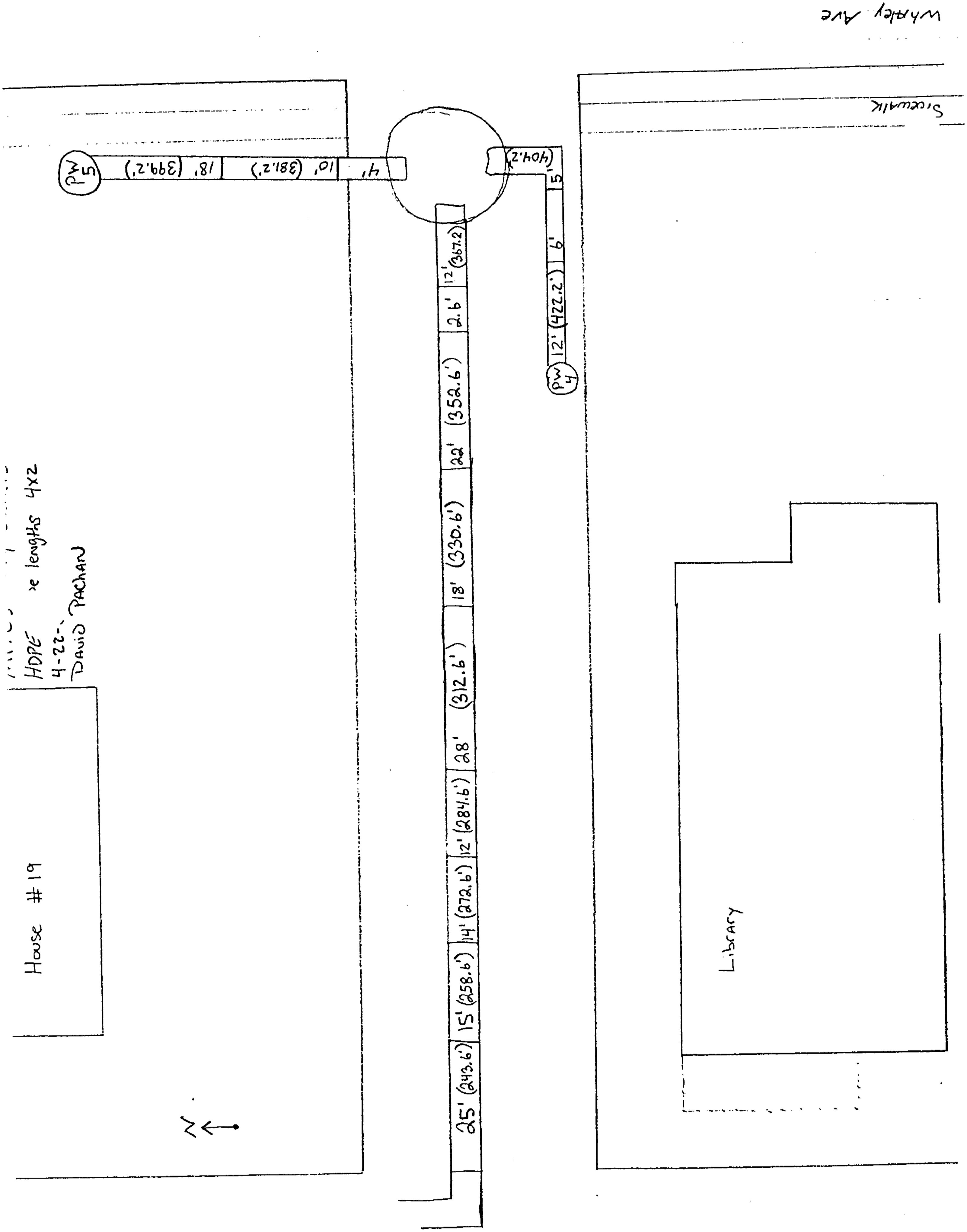


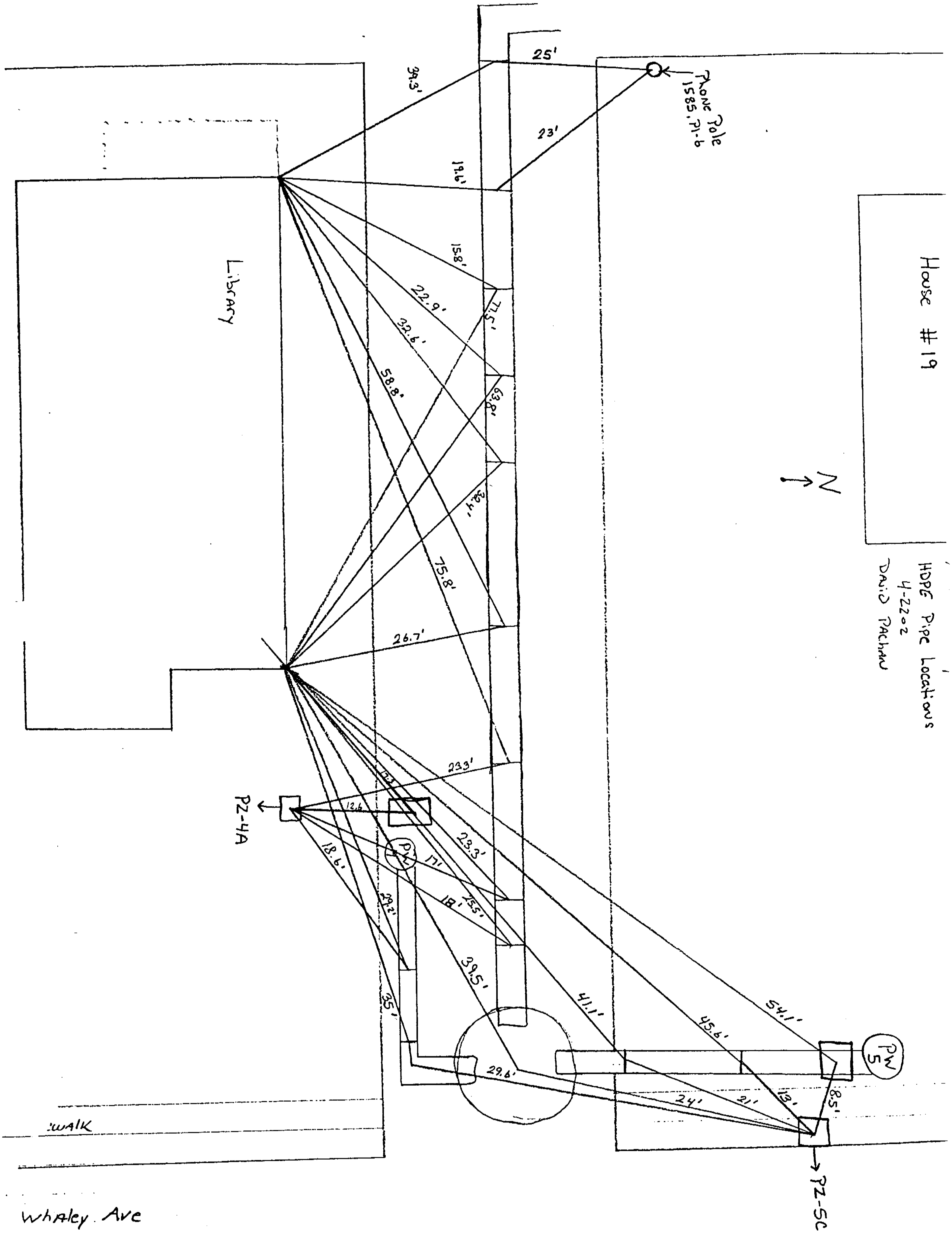
Mr. C's Dry Cleaners
Electrical Sump Drain 4-16-02



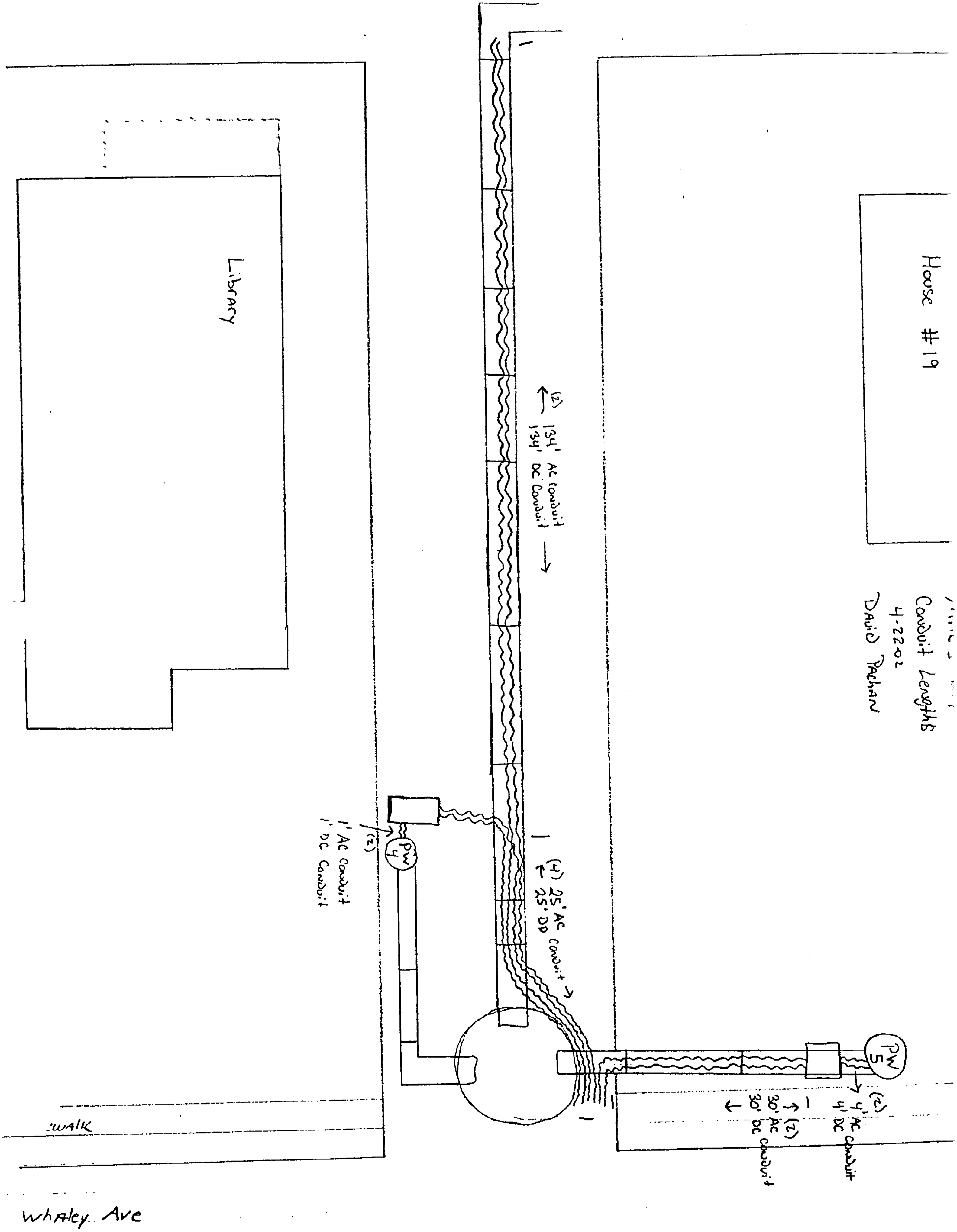
Electrical Box w/ Sump - 2.2' wide
3.15' Long
42" Deep

Piping Chamber - 5' Diameter
8.25' Height

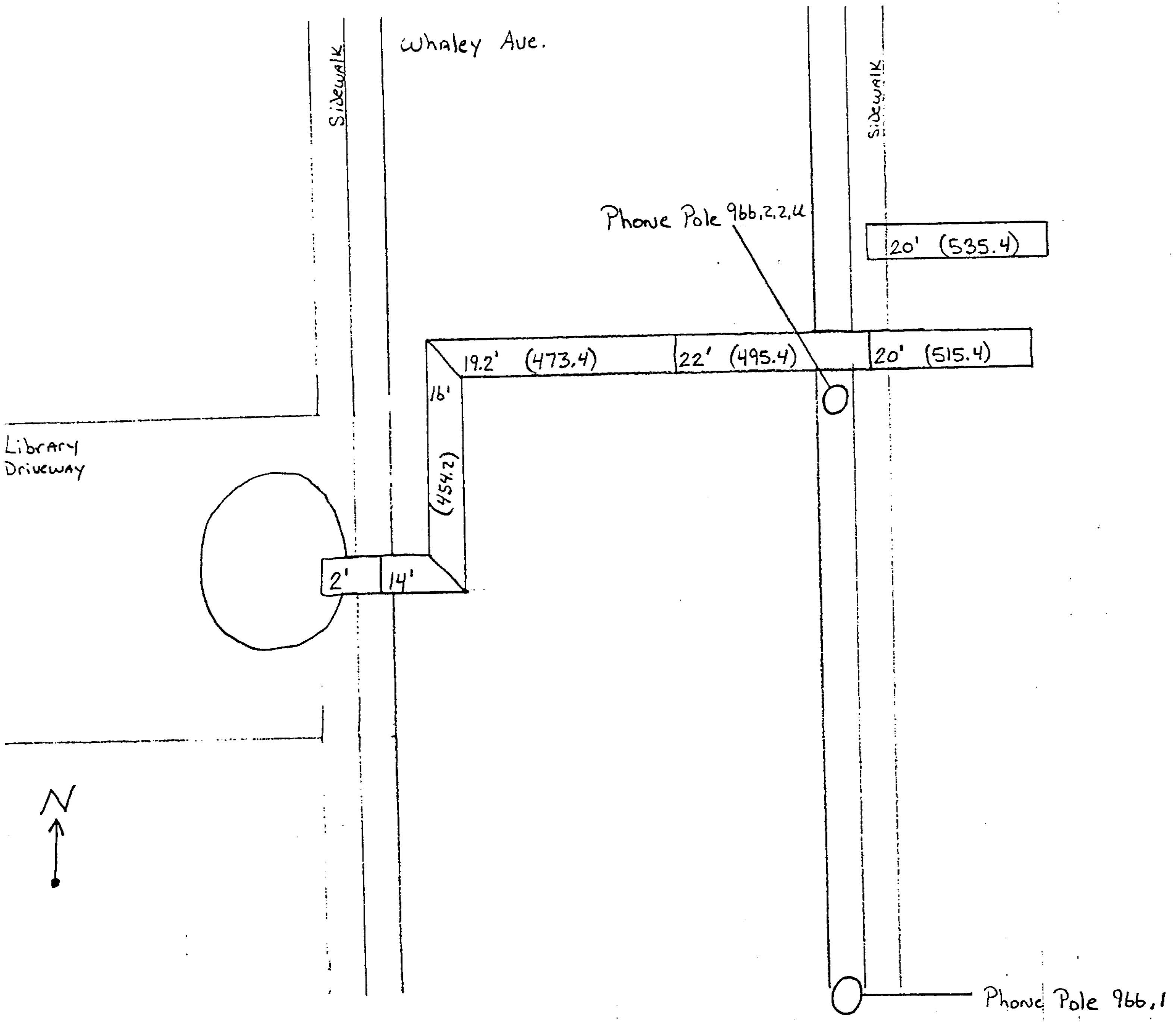

Whaley Ave
Sidewalk
PW 5
18' (399.2')
10' (381.2')
4'
(404.2')
5'
6'
12' (422.2')
PW 4
12' (367.2)
2.6'
22' (352.6')
18' (330.6')
28' (312.6')
12' (284.6')
14' (272.6')
15' (258.6')
25' (243.6')
HDPE re lengths 4x2
4-22-
David Pachan
House #19
Library
N



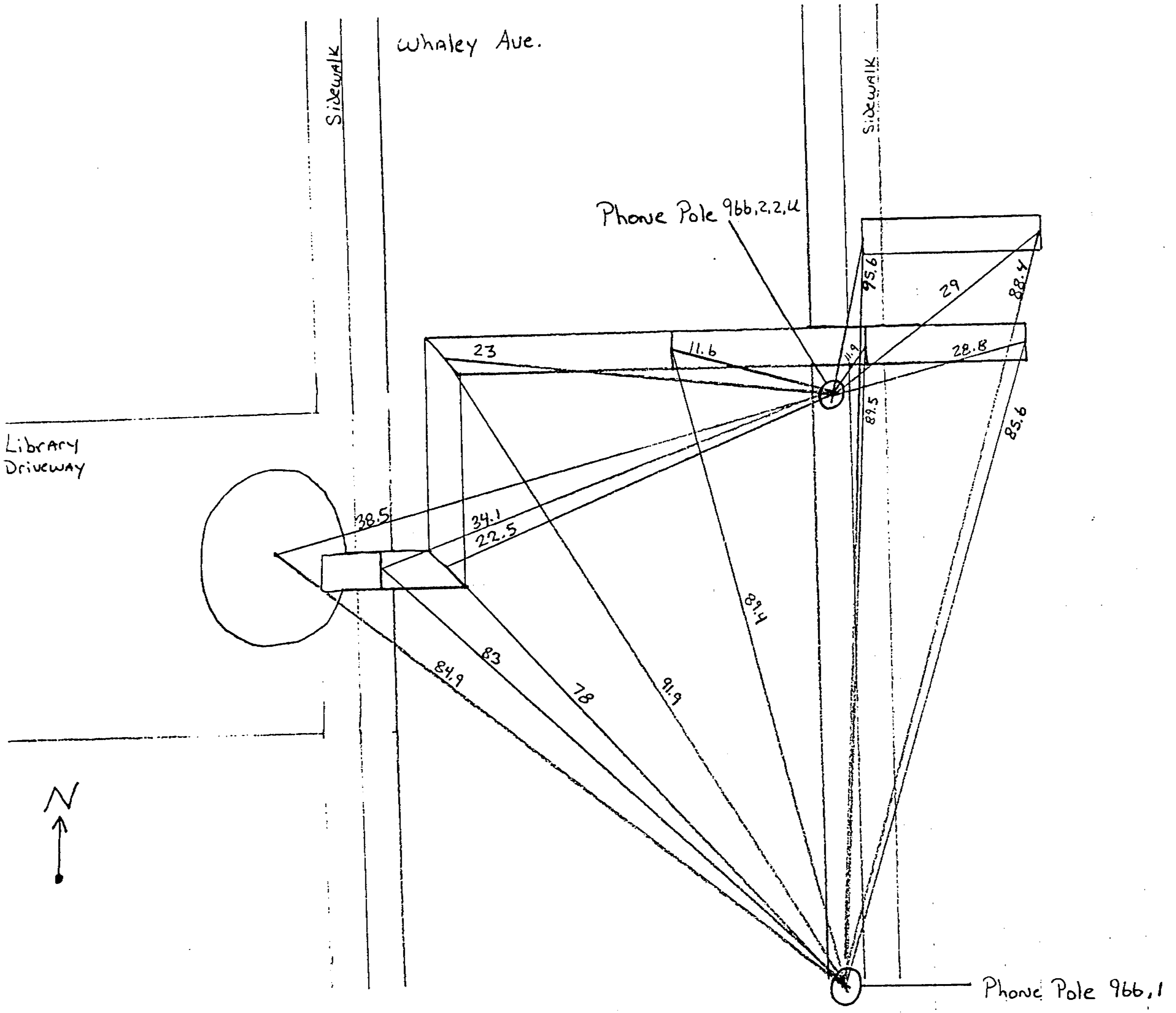
HDPE Pipe Locations
4-22-02
David Pachan


Library
House #19
Conduit Lengths
4-22-02
David Pachan
(2) 134' AC Conduit
134' DC Conduit
(4) 25' AC Conduit
25' DD
PW 4
(2) 1' AC Conduit
1' DC Conduit
PW 5
(2) 4' AC Conduit
4' DC Conduit
30' AC (2)
30' DC Conduit
walk
Whaley Ave

HDPE Pipe lengths 4x2
4-23-02
David Pachan



Mr. C's Dry Cleaners
HDPE Pipe locations
4-23-02
David Pachan

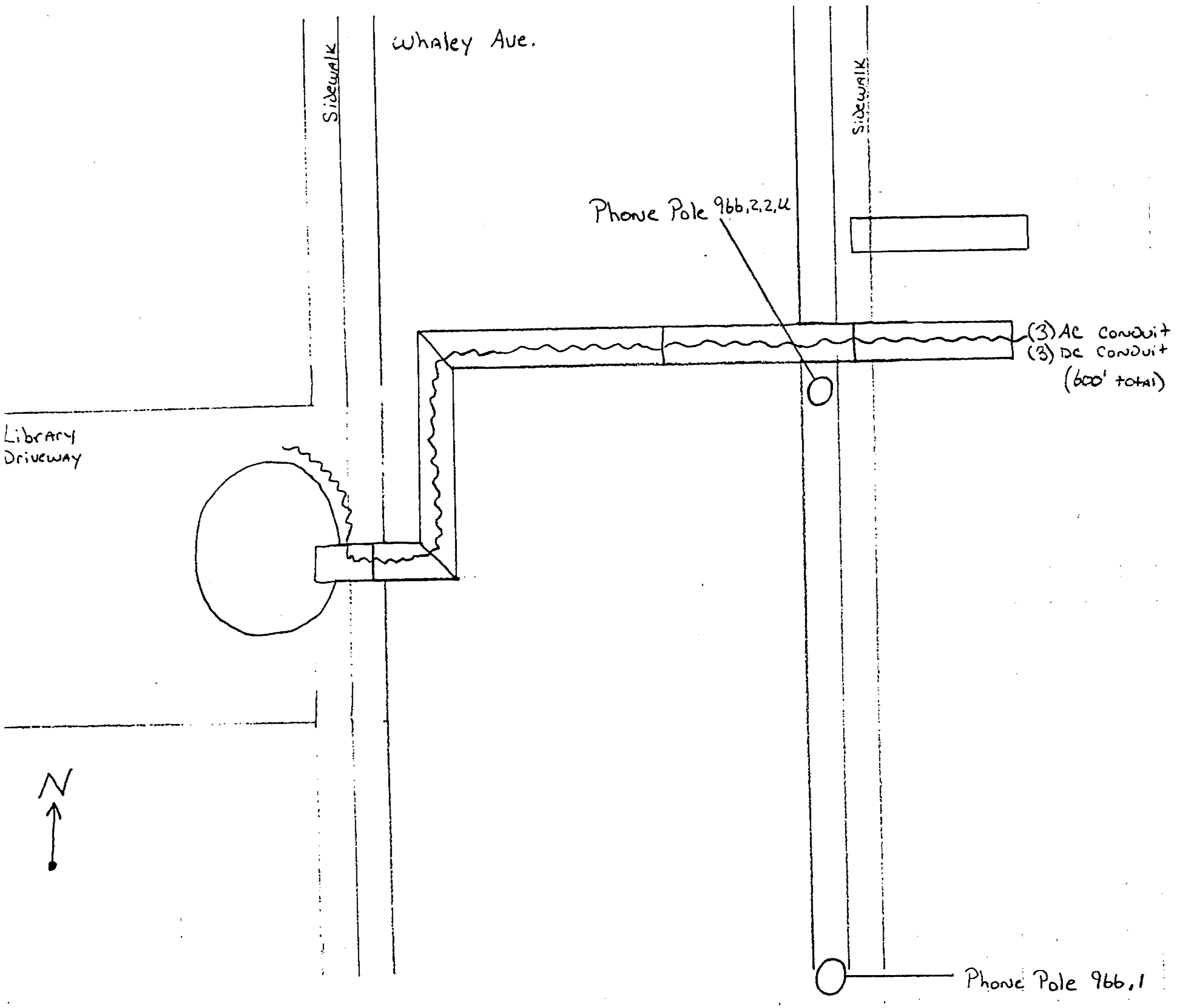


[illegible]

Conduit Lengths

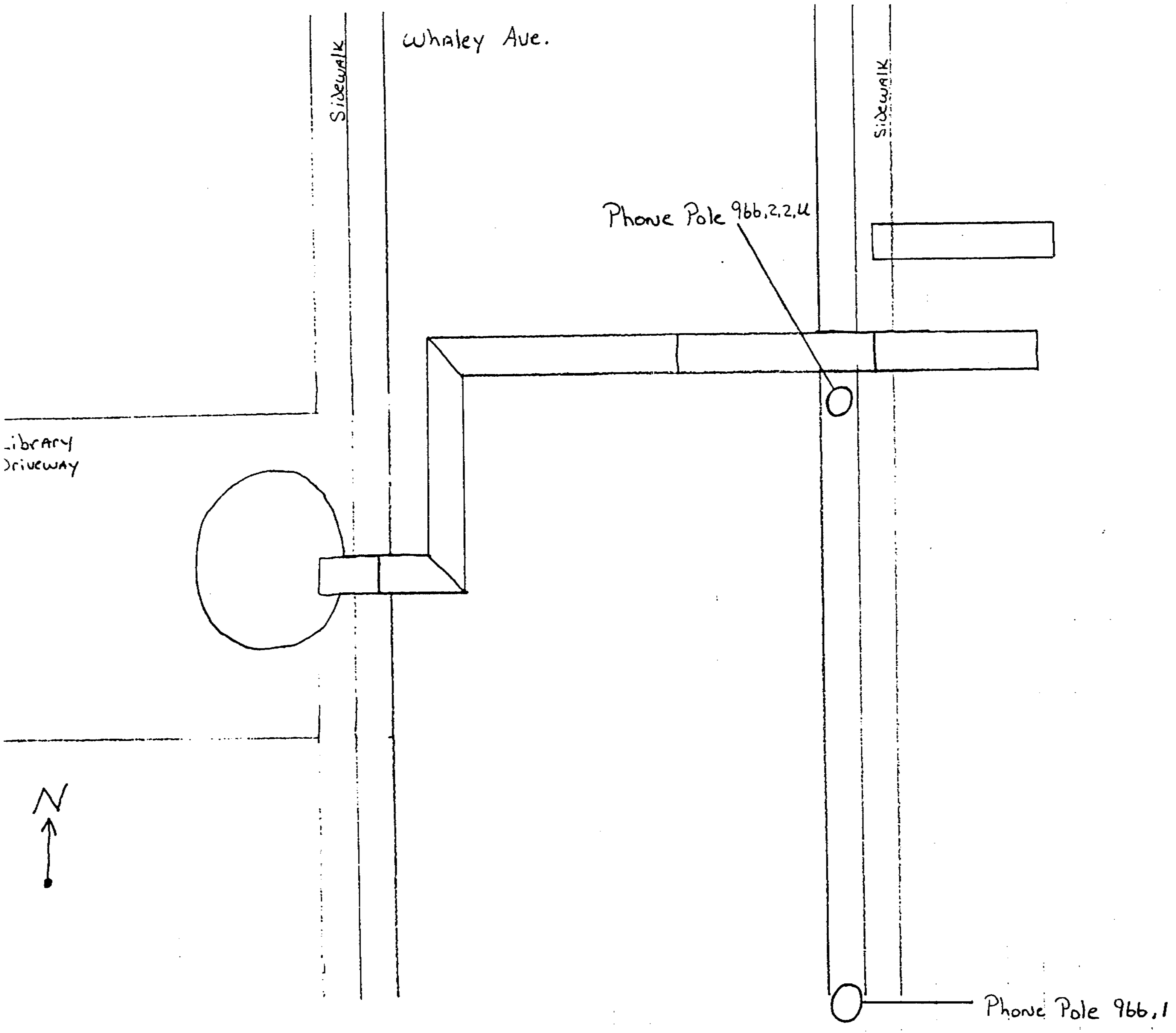
4-23-02

David Pachan



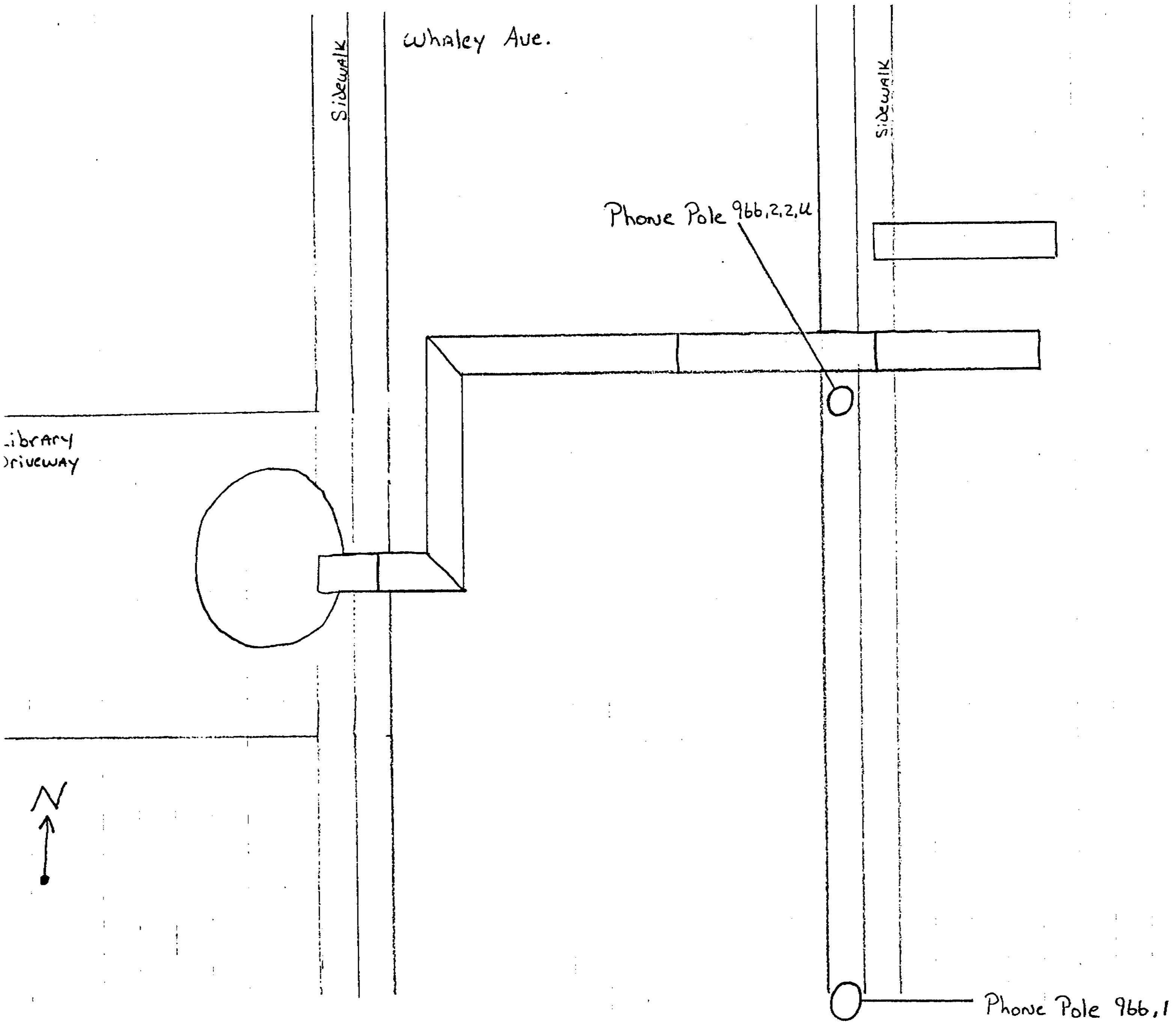
Mr. C's Dry Cleaners

David · Pachan

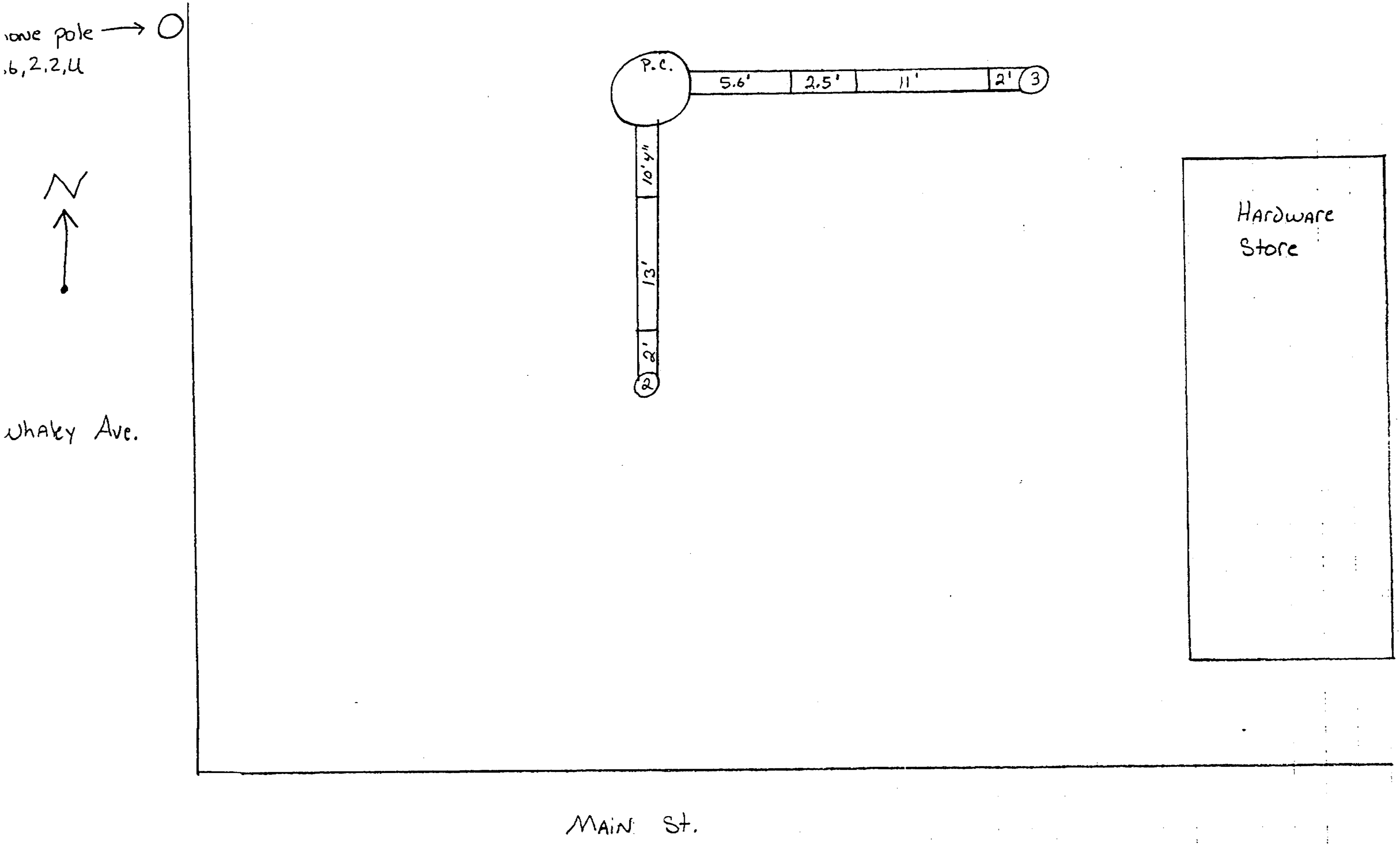


Mr. C's Dry Cleaners

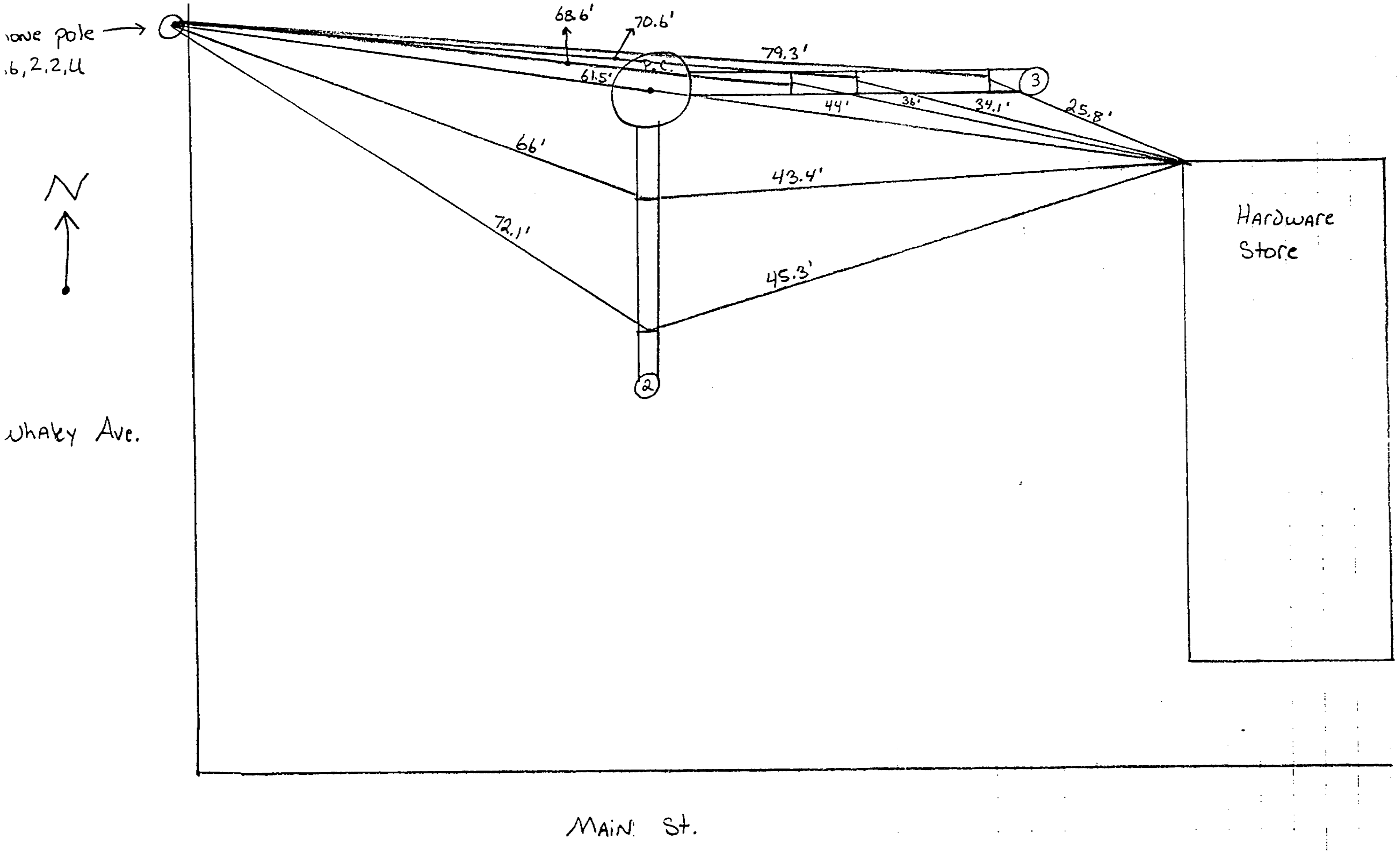
David Pachan



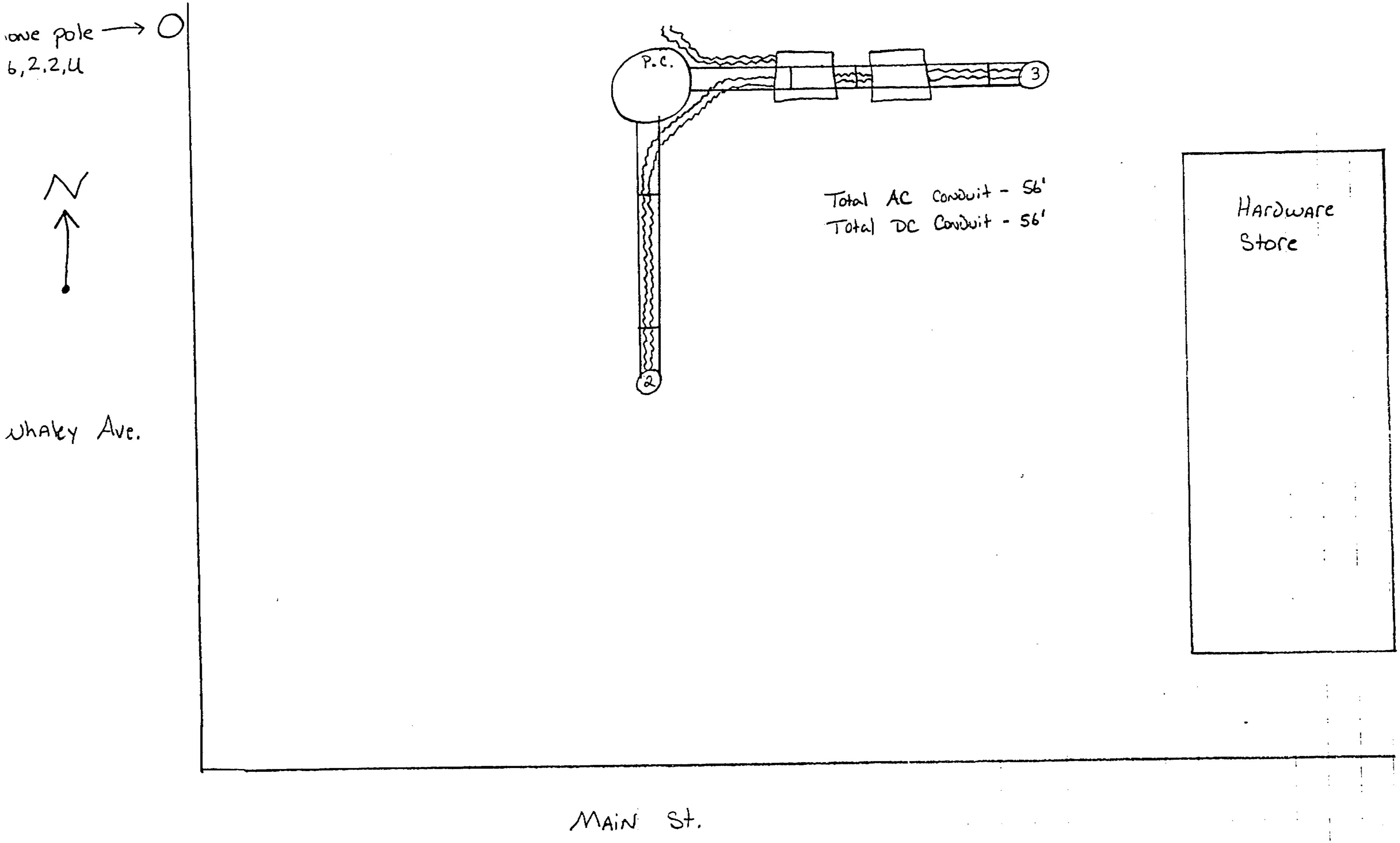
HDPE Pipe Lengths
4-30-02
David Pachan



M.L.s Dry Cleaners
HDPE Pipe locations
4-30-02
David Pachan

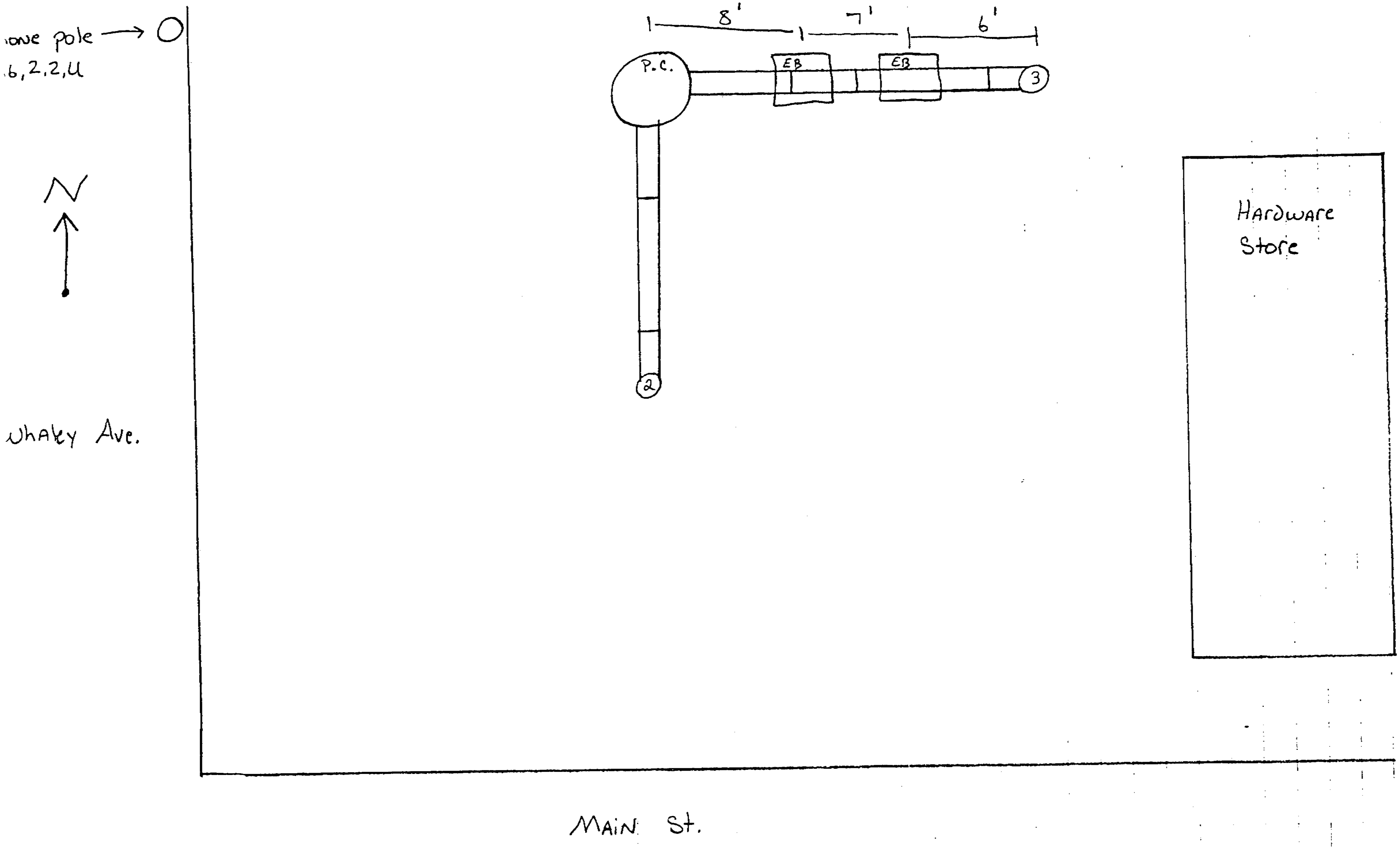


M.L's Dry Cleaners
Conduit Length
4-30-02
David Pachan

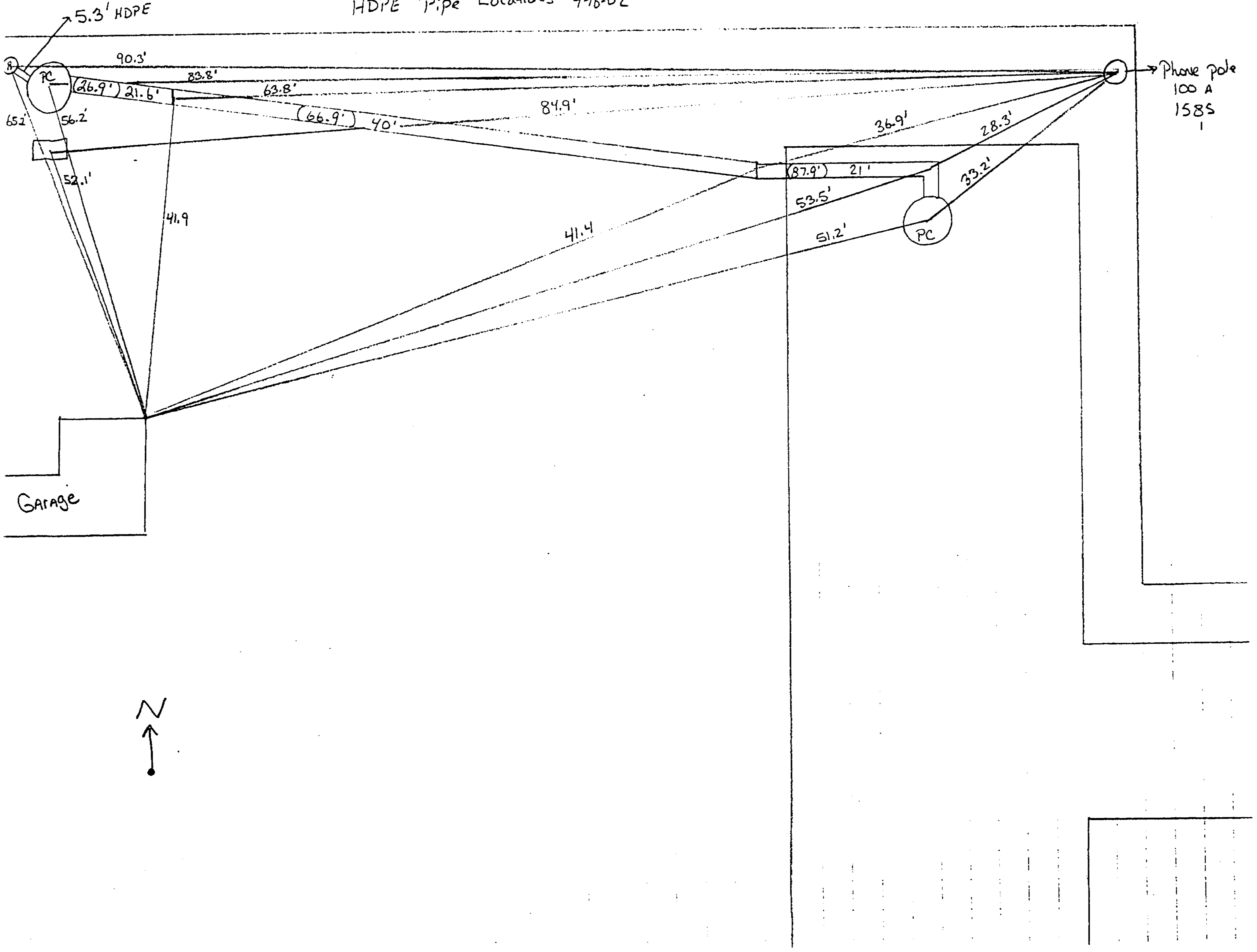


Total AC Conduit - 56'
Total DC Conduit - 56'

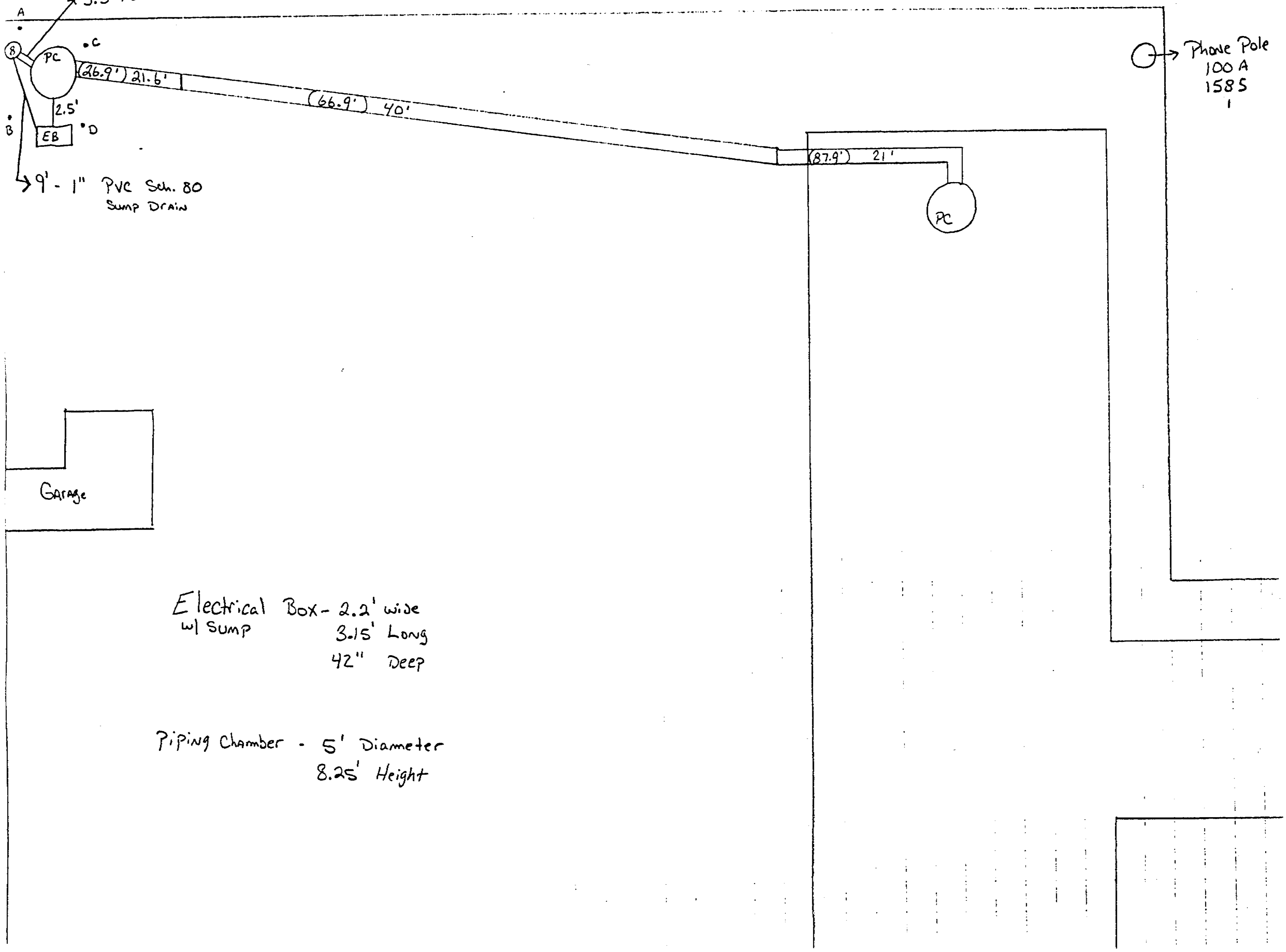
Electrical Box
4-30-02
David Pachan



HDPE Pipe Locations 4-16-02

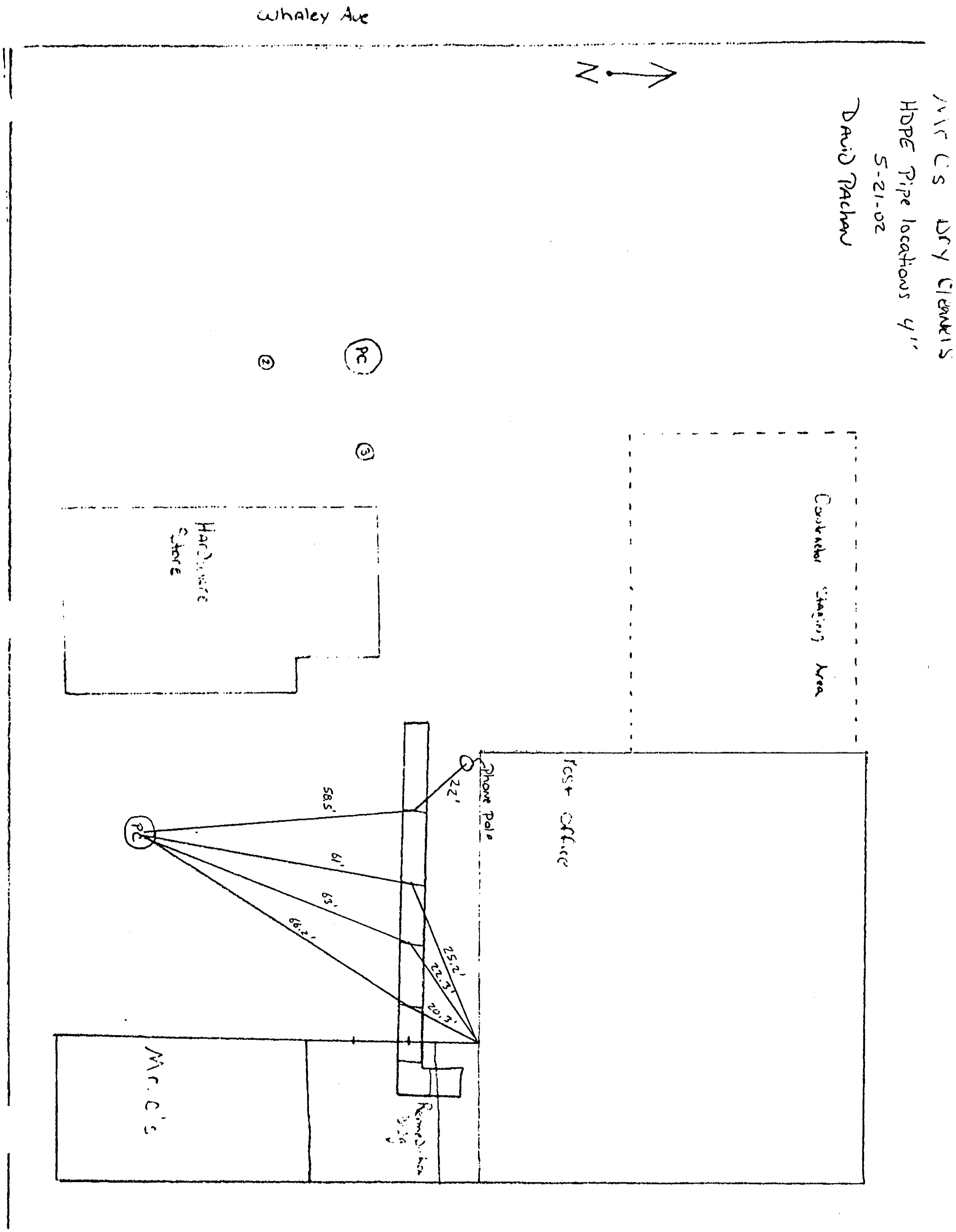


Electrical Sump Drain 4-16-02



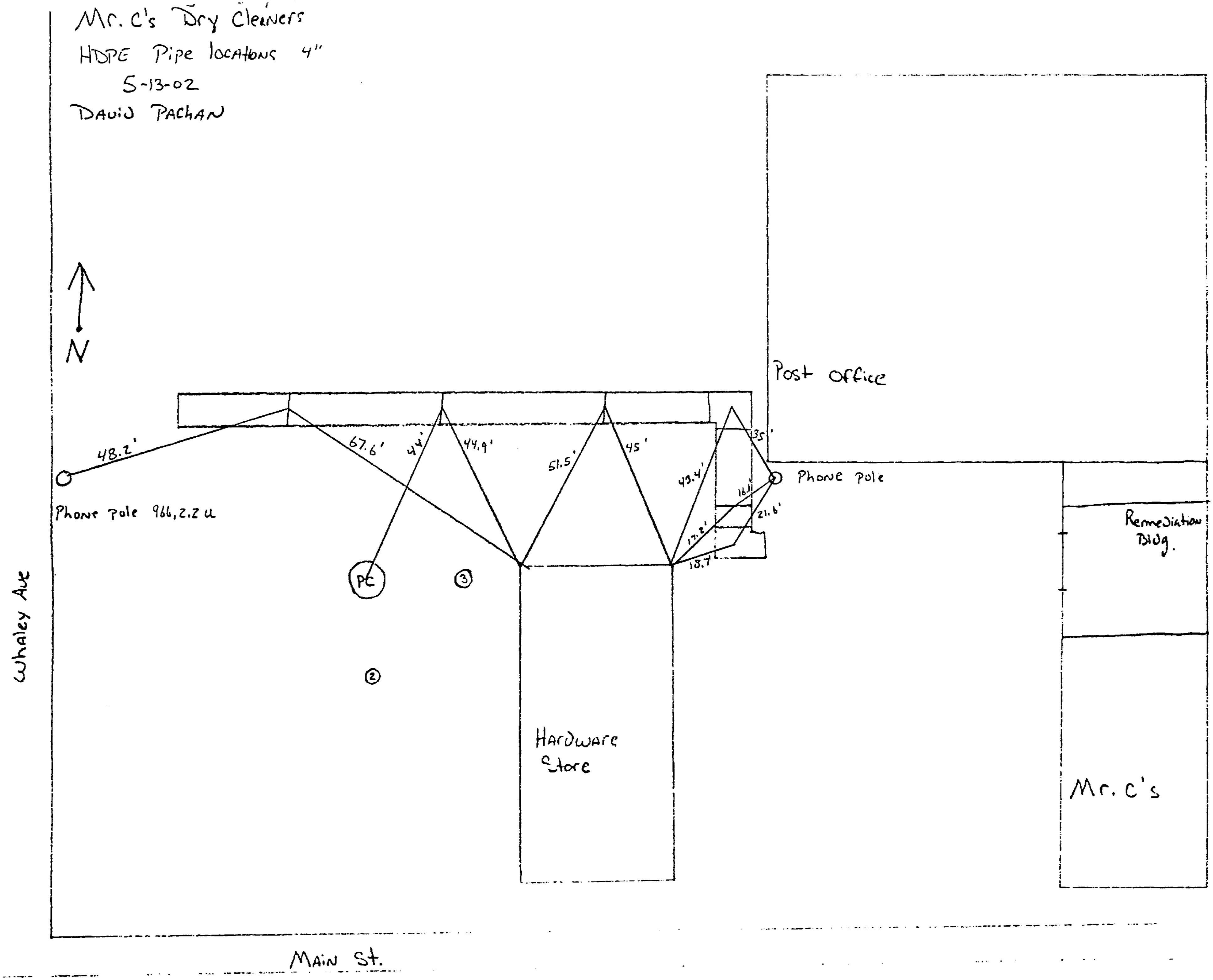
Electrical Box - 2.2' wide
w/ Sump 3.15' Long
42" Deep

Piping Chamber - 5' Diameter
8.25' Height

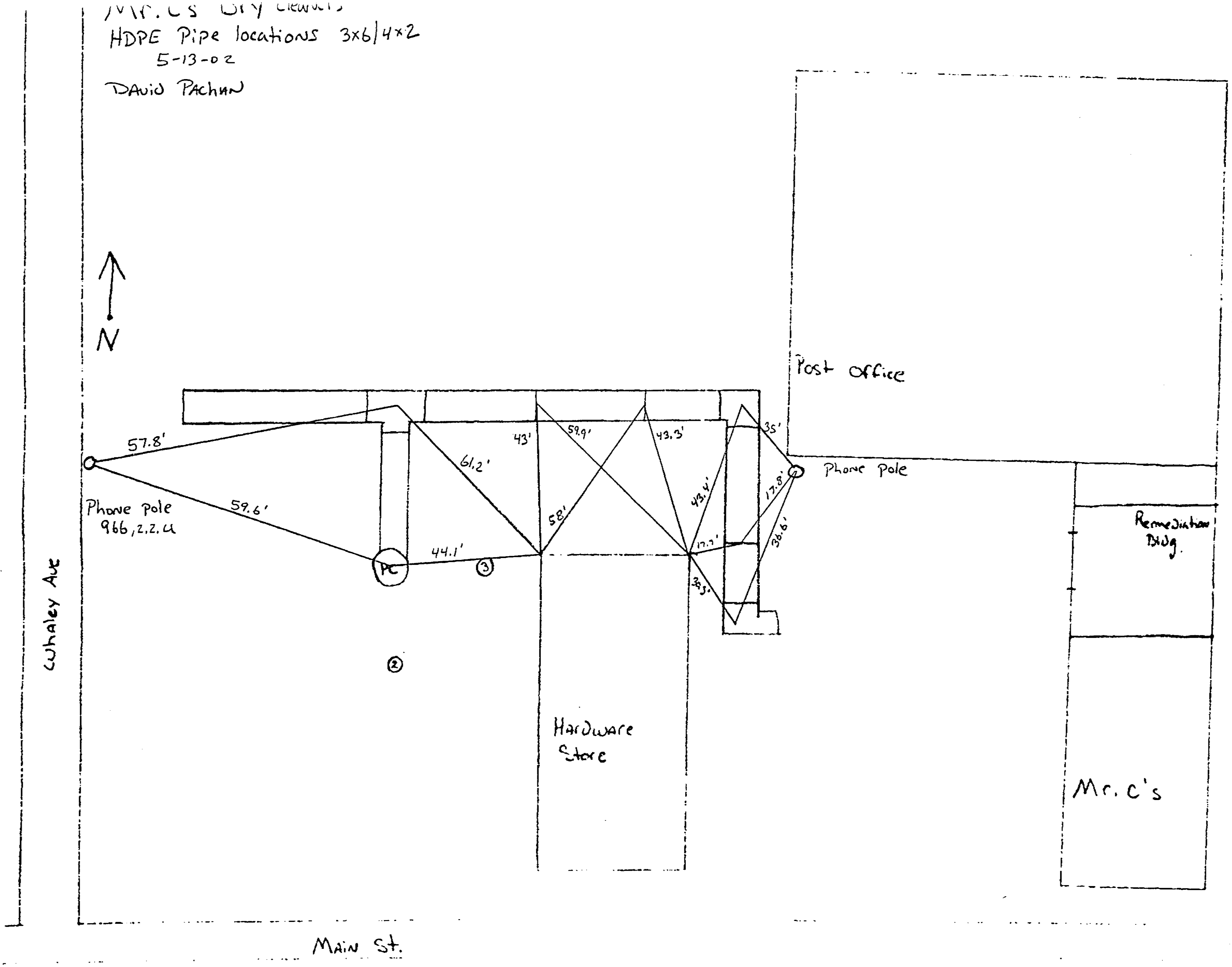


Mr C's Dry Cleaners
HDPE Pipe locations 4''
5-21-02
David Pachan

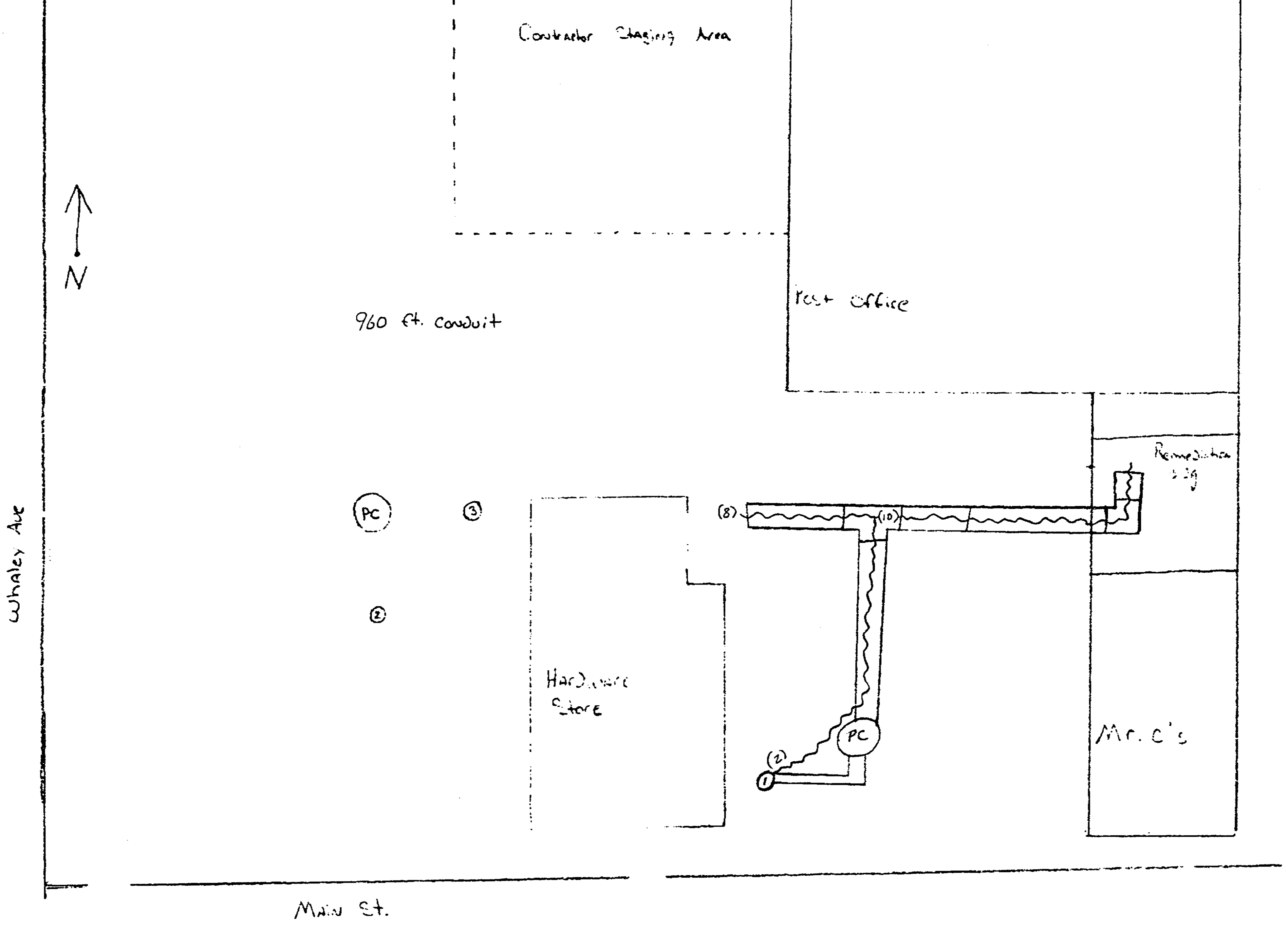
Mr. C's Dry Cleaners
HDPE Pipe locations 4"
5-13-02
David Pachan

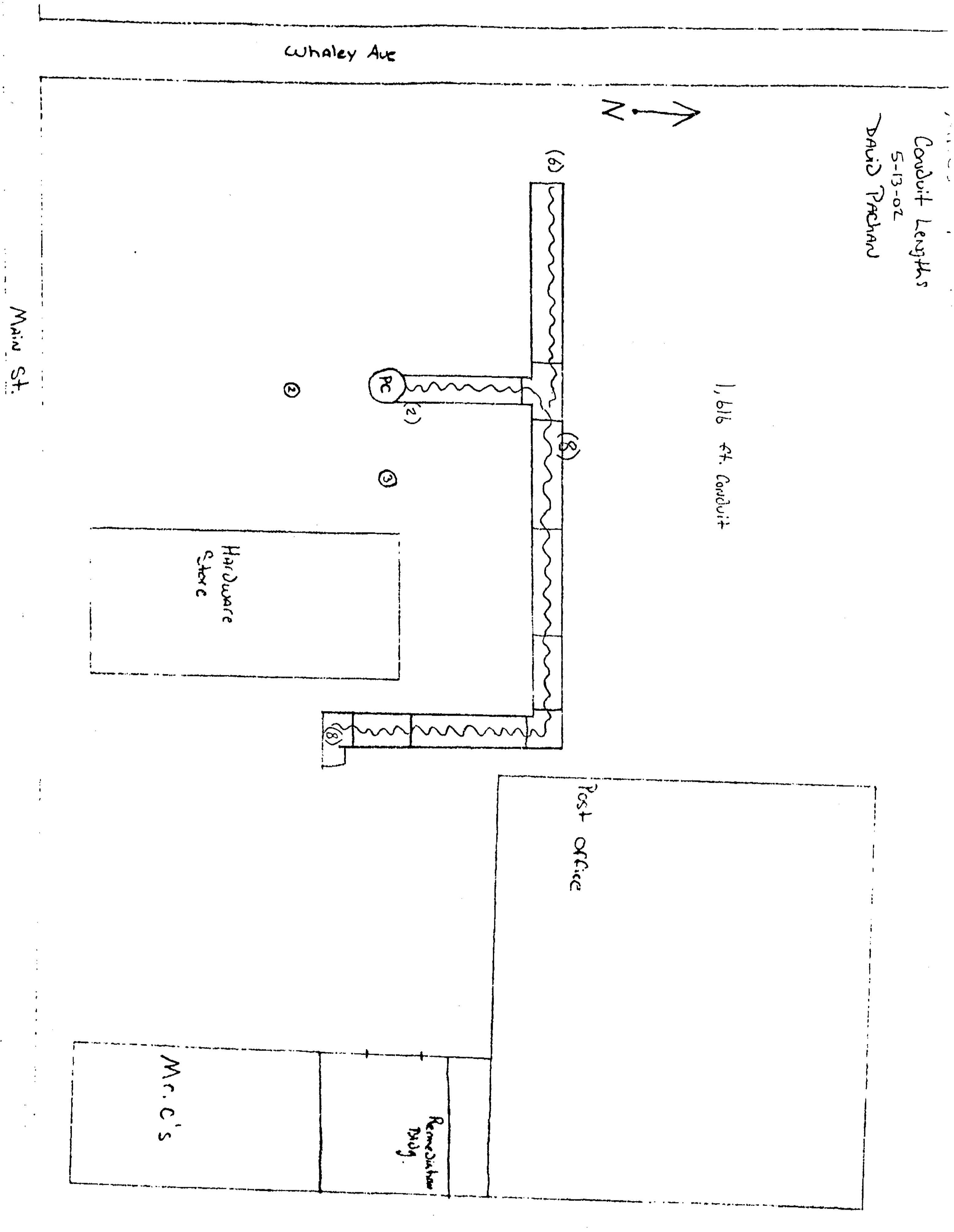


Mr. C's Dry Cleaners
HDPE Pipe locations 3x6/4x2
5-13-02
David Pachan



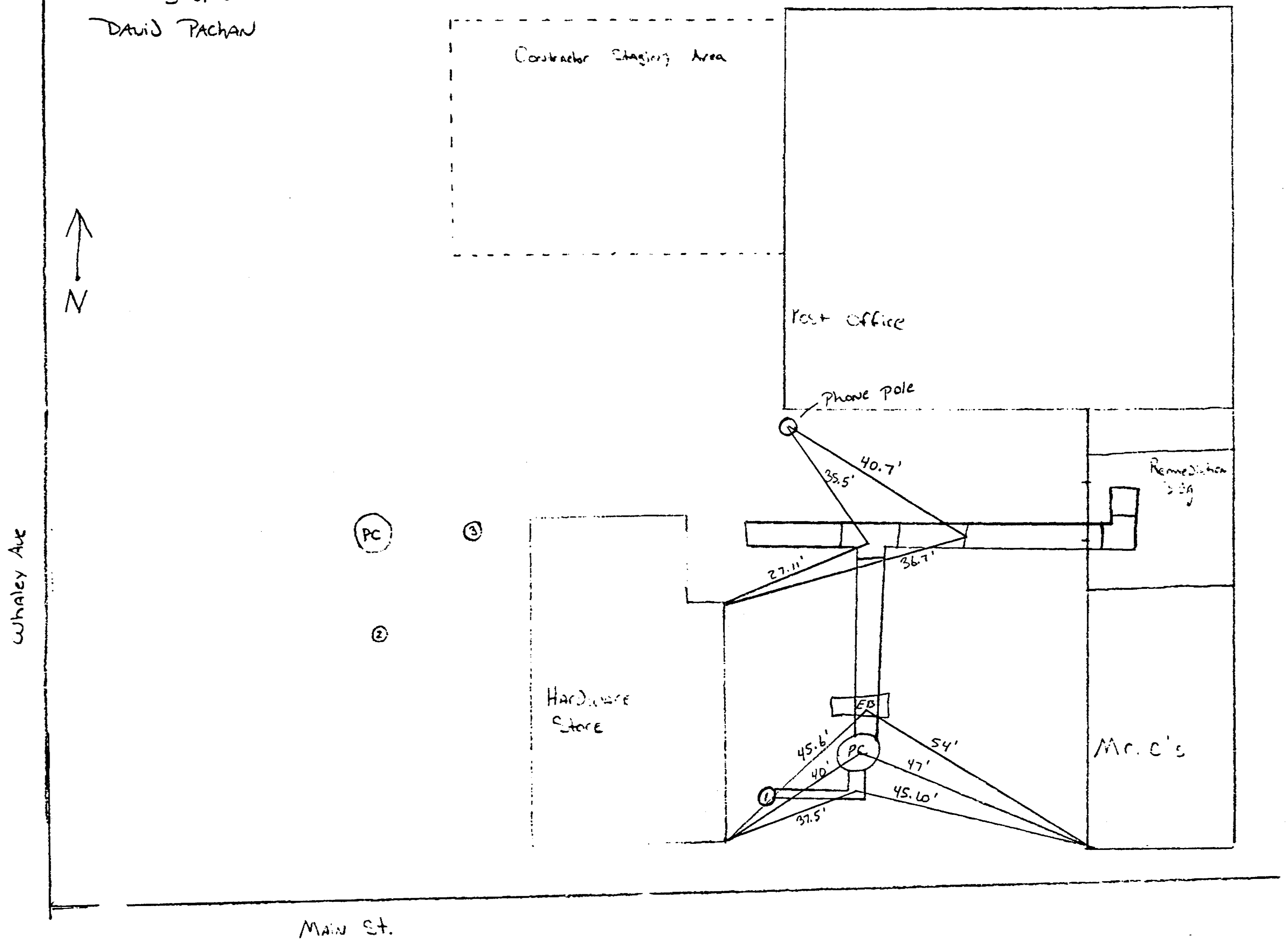
Mr C's Dry Cleaners
Conduit lengths
5-21-02
David Packer



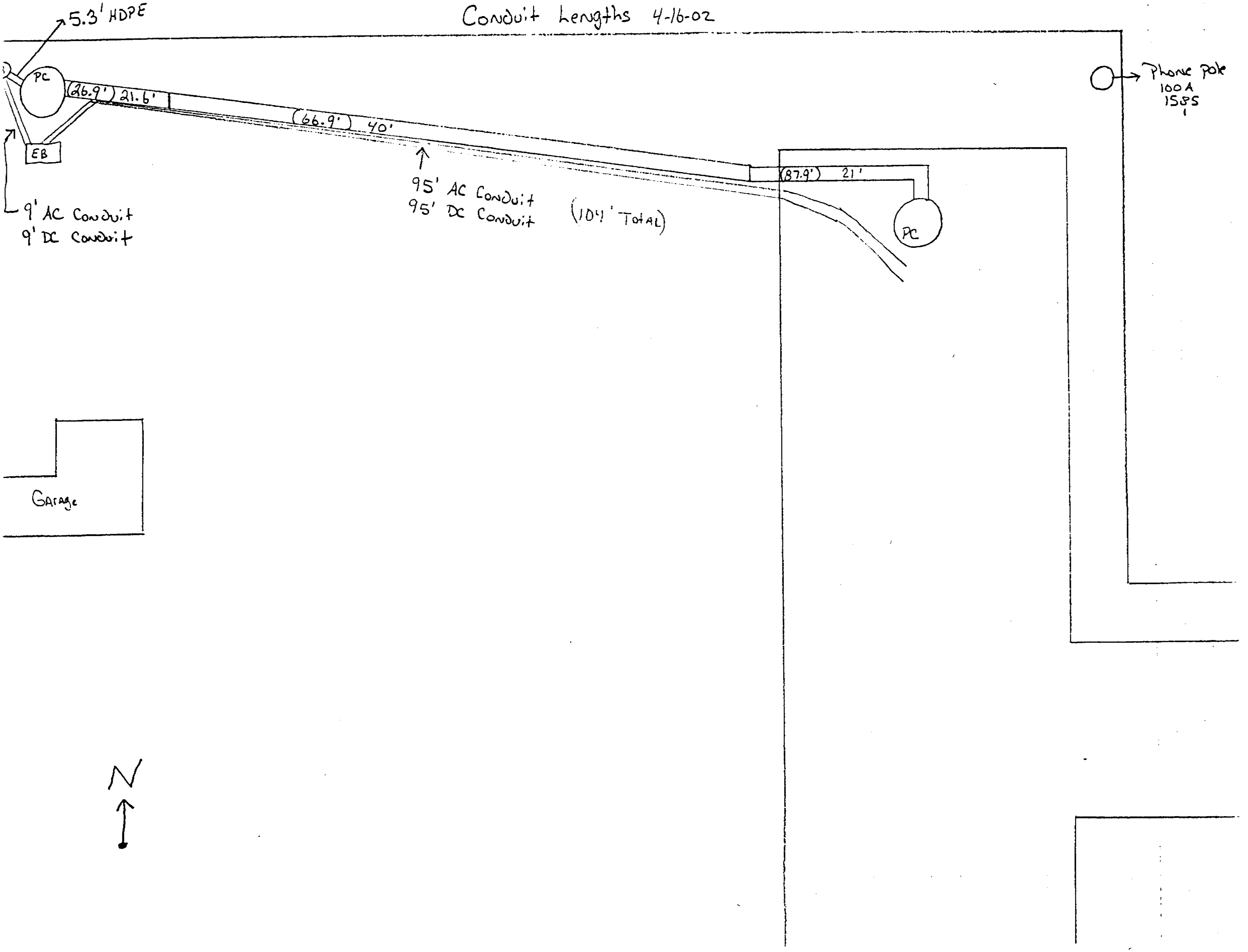


Conduit Lengths
5-13-02
David Pachan

Mr C's Dry Cleaners
HDPE Pipe Locations 4x8
5-21-02
David Pachan



Conduit Lengths 4-16-02



M

Mr. C's Dry Cleaners Site Operations and Maintenance (O&M) Plan Inspection Forms

M1 – Example Mr. C’s Dry Cleaners Site OM&M Site Inspection Form

MR. C's DRY CLEANERS SITE

NYSDEC Site #9-15-157

OM&M: SITE INSPECTION FORM

DATE: 2-Feb-12 *ACTIVITIES:* Site Inspection

INSPECTION PERSONNEL: R. Allen *OTHER PERSONNEL:* E&E, Inc.

WEATHER CONDITIONS: Sunny, cold *OUTSIDE TEMPERATURE (° F):* 30

ARE WELL PUMPS OPERATING IN AUTO: YES: ____ NO: √ If "NO", provide explanation below

PROVIDE WATER LEVEL READINGS ON CONTROL PANEL

RW-1	ON:	OFF: √	7 ft	PW-5	ON:	OFF: √	7 ft
PW-2	ON:	OFF: √	7 ft	PW-6	ON:	OFF: √	7 ft
PW-3	ON:	OFF: √	7 ft	PW-7	ON: √	OFF:	6 ft
PW-4	ON:	OFF: √	8 ft	PW-8	ON: √	OFF:	7 ft

EQUALIZATION TANK: 4 ft **Last Alarm D/T/Condition:** 1/17/12 Air Stripper High Level

NOTES:

INFLUENT FLOW RATE: 7 gpm INFLUENT TOTALIZER READING: 626,745.0 gallons

SEQUESTERING AGENT DRUM LEVEL: 20 inches *(x 1.7=)* *AMOUNT OF AGENT REMAINING:* 34 gallons

SEQUESTERING AGENT FEED RATE: 6.0 ml/min *METERING PUMP PRESSURE:* 4.0 psi

		Top	Bottom			Top	Bottom	
BAG FILTER PRESSURES:	LEFT:	24	0	psi	RIGHT:	40 - 6	0	psi

INFLUENT FEED PUMP IN USE: #1 √ #2 ____ *INFLUENT PUMP PRESSURE:* 8 psi

AIR STRIPPER BLOWER IN USE: #1 √ #2 ____ *AIR STRIPPER PRESSURE:* 12.0 in. H_2O

AIR STRIPPER DIFFERENTIAL PRESSURE: 0.018 in. H_2O *DISCHARGE PRESSURE:* 4.6 in. H_2O

EFFLUENT PUMP IN USE: #1 √ #2 ____ *EFFLUENT FEED PUMP PRESSURE:* 4.5 psi

EFFLUENT FLOW RATE: 92 gpm *EFFLUENT TOTALIZER READING:* 66,655,461 | 69290 gallons

ARE BUILDING HEATERS IN USE? YES: √ NO: ____ *INSIDE TEMPERATURE (° F):* 56

IS SUMP PUMP IN USE: YES: √ NO: ____ *ARE ANY LEAKS PRESENT?* YES: ____ NO: √

WATER LEVEL IN SUMP: 7.0 in. *TREATMENT BUILDING CLEAN & ORGANIZED?* YES: √ NO: ____

MR. C's DRY CLEANERS SITE

NYSDEC Site #90150157

SITE INSPECTION FORM

2-Feb-12

SAMPLES COLLECTED? **YES:** √ **NO:**

	Sample ID	Time of Sampling	pH	Turbidity	Temp.	Sp. Cond.
AIR STRIPPER INFLUENT:	INF	9:30 AM	7.46	7.21	10.0	2700
AIR STRIPPER EFFLUENT:	EFF	9:30 AM	7.08	8.50	11.2	2747

IS THERE EVIDENCE OF TAMPERING/VANDALISM OF WELLS: ?	**YES:**	**NO:** √
WERE MANHOLES INSPECTED?	**YES:** √	**NO:**
WERE ELECTRICAL BOXES INSPECTED?	**YES:** √	**NO:**
IS WATER PRESENT IN ANY MANHOLES OR ELECTRICAL BOXES?	**YES:**	**NO:** √

If yes, provide manhole/electric box ID and description of any corrective measures below:

PW-4 has collapsed inner ring. PZ-1B and PW-6 have missing top covers.

INCLUDE REMARKS & DESCRIBE ANY OTHER SYSTEM MAINTENANCE PERFORMED ON MR. C's SITE

Remarks:

Other Actions: Changed bag filters.

PW-6 - replaced missing top cover.

Replaced blower unit on west side of Church's subslab vapor extraction system

AGWAY

SYSTEM VACUUM: in. H_2O ***AIR PRESSURE:*** psi

SP-1: **scfm** **psi** **SP-5** **scfm** **psi**

SP-2: **scfm** **psi** **SP-6** **scfm** **psi**

SP-3: **scfm** **psi** **SP-7** **scfm** **psi**

SP-4: **scfm** **psi** **SP-8** **scfm** **psi**

INCLUDE REMARKS & DESCRIBE ANY OTHER SYSTEM MAINTENANCE PERFORMED ON AGWAY SITE

Remarks: System is OFF until further instructions.

Other Actions:

MR. C's DRY CLEANERS SITE
NYSDEC Site #9-15-157
OM&M: SITE INSPECTION FORM

DATE: 14-Feb-12 *ACTIVITIES:* Site Inspection

INSPECTION PERSONNEL: R. Allen *OTHER PERSONNEL:* ---------

WEATHER CONDITIONS: Cloudy, snow, cold *OUTSIDE TEMPERATURE (^{o}F):* 32

ARE WELL PUMPS OPERATING IN AUTO: YES: √ NO: ____ If "NO", provide explanation below

PROVIDE WATER LEVEL READINGS ON CONTROL PANEL

RW-1	ON: √	OFF:	6	ft	PW-5	ON:	OFF: √	7	ft
PW-2	ON:	OFF: √	5	ft	PW-6	ON:	OFF: √	7	ft
PW-3	ON:	OFF: √	3	ft	PW-7	ON: √	OFF:	7	ft
PW-4	ON:	OFF: √	8	ft	PW-8	ON: √	OFF:	5	ft

EQUALIZATION TANK: 4 ft Last Alarm D/T/Condition: 1/17/12 Air Stripper High Level

NOTES:

INFLUENT FLOW RATE: 49 gpm INFLUENT TOTALIZER READING: 832,521.0 gallons

SEQUESTERING AGENT DRUM LEVEL: 11 inches *(x 1.7=)* *AMOUNT OF AGENT REMAINING:* 18.5 gallons

SEQUESTERING AGENT FEED RATE: 6.0 ml/min *METERING PUMP PRESSURE:* 4.0 psi

		Top	Bottom			Top	Bottom	
BAG FILTER PRESSURES:	LEFT:	0	0	psi	RIGHT:	32 - 6	0	psi

INFLUENT FEED PUMP IN USE: #1 √ #2 ____ *INFLUENT PUMP PRESSURE:* 8 psi

AIR STRIPPER BLOWER IN USE: #1 √ #2 ____ *AIR STRIPPER PRESSURE:* 11.0 in. H_2O

AIR STRIPPER DIFFERENTIAL PRESSURE: 0.015 in. H_2O *DISCHARGE PRESSURE:* 4.5 in. H_2O

EFFLUENT PUMP IN USE: #1 √ #2 ____ *EFFLUENT FEED PUMP PRESSURE:* 4.5 psi

EFFLUENT FLOW RATE: 91 gpm *EFFLUENT TOTALIZER READING:* 66,782,573 | 199800 gallons

ARE BUILDING HEATERS IN USE? YES: √ NO: ____ *INSIDE TEMPERATURE (^{o}F):* 54

IS SUMP PUMP IN USE: YES: √ NO: ____ *ARE ANY LEAKS PRESENT?* YES: ____ NO: √

WATER LEVEL IN SUMP: 6.0 in. *TREATMENT BUILDING CLEAN & ORGANIZED?* YES: √ NO: ____

MR. C's DRY CLEANERS SITE

NYSDEC Site #90150157

SITE INSPECTION FORM

14-Feb-12

SAMPLES COLLECTED? **YES:** ____ **NO:** √

	Sample ID	Time of Sampling	pH	Turbidity	Temp.	Sp. Cond.
AIR STRIPPER INFLUENT:						
AIR STRIPPER EFFLUENT:						

IS THERE EVIDENCE OF TAMPERING/VANDALISM OF WELLS: ?	**YES:**	**NO:** √
WERE MANHOLES INSPECTED?	**YES:** √	**NO:**
WERE ELECTRICAL BOXES INSPECTED?	**YES:** √	**NO:**
IS WATER PRESENT IN ANY MANHOLES OR ELECTRICAL BOXES?	**YES:**	**NO:** √

If yes, provide manhole/electric box ID and description of any corrective measures below:

PW-4 has collapsed inner ring. PZ-1B has missing top cover and is temporarily sealed.

INCLUDE REMARKS & DESCRIBE ANY OTHER SYSTEM MAINTENANCE PERFORMED ON MR. C's SITE

Remarks:

Other Actions: Pour decanted well sampling water into sump box.

Changed bag filters.

AGWAY

SYSTEM VACUUM: ____ **in. H_2O**

AIR PRESSURE: ____ **psi**

SP-1:	**scfm**	**psi**	**SP-5**	**scfm**	**psi**
SP-2:	**scfm**	**psi**	**SP-6**	**scfm**	**psi**
SP-3:	**scfm**	**psi**	**SP-7**	**scfm**	**psi**
SP-4:	**scfm**	**psi**	**SP-8**	**scfm**	**psi**

INCLUDE REMARKS & DESCRIBE ANY OTHER SYSTEM MAINTENANCE PERFORMED ON AGWAY SITE

Remarks: System is OFF until further instructions.

Other Actions:

MR. C's DRY CLEANERS SITE

NYSDEC Site #9-15-157

OM&M: SITE INSPECTION FORM

DATE: 21-Feb-12 *ACTIVITIES:* Site Inspection

INSPECTION PERSONNEL: R. Allen *OTHER PERSONNEL:* ---------

WEATHER CONDITIONS: Cloudy, cold *OUTSIDE TEMPERATURE (°F):* 32

ARE WELL PUMPS OPERATING IN AUTO: YES: √ NO: ____ If "NO", provide explanation below

PROVIDE WATER LEVEL READINGS ON CONTROL PANEL

RW-1	ON: √	OFF:	8	ft	PW-5	ON:	OFF: √	6	ft
PW-2	ON:	OFF: √	5	ft	PW-6	ON: √	OFF:	6	ft
PW-3	ON:	OFF: √	6	ft	PW-7	ON: √	OFF:	8	ft
PW-4	ON:	OFF: √	6	ft	PW-8	ON:	OFF: √	7	ft

EQUALIZATION TANK: 4 ft **Last Alarm D/T/Condition:** 2/17/12 Air Stripper Low Level

NOTES:

INFLUENT FLOW RATE: 38 gpm INFLUENT TOTALIZER READING: 1,014,105.0 gallons

SEQUESTERING AGENT DRUM LEVEL: 2 inches *(x 1.7=)* *AMOUNT OF AGENT REMAINING:* 3.4 gallons

SEQUESTERING AGENT FEED RATE: 6.0 ml/min *METERING PUMP PRESSURE:* 3.5 psi

		Top	Bottom			Top	Bottom	
BAG FILTER PRESSURES:	LEFT:	0	0	psi	RIGHT:	8 - 6	0	psi

INFLUENT FEED PUMP IN USE: #1 √ #2 ____ *INFLUENT PUMP PRESSURE:* 8 psi

AIR STRIPPER BLOWER IN USE: #1 √ #2 ____ *AIR STRIPPER PRESSURE:* 12.0 in. H_2O

AIR STRIPPER DIFFERENTIAL PRESSURE: 0.013 in. H_2O *DISCHARGE PRESSURE:* 4.5 in. H_2O

EFFLUENT PUMP IN USE: #1 √ #2 ____ *EFFLUENT FEED PUMP PRESSURE:* 3.0 psi

EFFLUENT FLOW RATE: 93 gpm *EFFLUENT TOTALIZER READING:* 66,894,842 | 315190 gallons

ARE BUILDING HEATERS IN USE? YES: √ NO: ____ *INSIDE TEMPERATURE (°F):* 56

IS SUMP PUMP IN USE: YES: √ NO: ____ *ARE ANY LEAKS PRESENT?* YES: ____ NO: √

WATER LEVEL IN SUMP: 7.5 in. *TREATMENT BUILDING CLEAN & ORGANIZED?* YES: √ NO: ____

MR. C's DRY CLEANERS SITE

NYSDEC Site #90150157

SITE INSPECTION FORM

21-Feb-12

SAMPLES COLLECTED? **YES:** ____ **NO:** √

	Sample ID	Time of Sampling	pH	Turbidity	Temp.	Sp. Cond.
AIR STRIPPER INFLUENT:						
AIR STRIPPER EFFLUENT:						

IS THERE EVIDENCE OF TAMPERING/VANDALISM OF WELLS: ?	**YES:**	**NO:** √
WERE MANHOLES INSPECTED?	**YES:** √	**NO:**
WERE ELECTRICAL BOXES INSPECTED?	**YES:** √	**NO:**
IS WATER PRESENT IN ANY MANHOLES OR ELECTRICAL BOXES?	**YES:**	**NO:** √

If yes, provide manhole/electric box ID and description of any corrective measures below:

PW-4 has collapsed inner ring. PZ-1B has missing top cover and is temporarily sealed.

INCLUDE REMARKS & DESCRIBE ANY OTHER SYSTEM MAINTENANCE PERFORMED ON MR. C's SITE

Remarks:

Other Actions: Emptied old Redux drum into present drum.

AGWAY

SYSTEM VACUUM: ____ **in. H_2O**

AIR PRESSURE: ____ **psi**

SP-1:	**scfm**	**psi**	**SP-5**	**scfm**	**psi**
SP-2:	**scfm**	**psi**	**SP-6**	**scfm**	**psi**
SP-3:	**scfm**	**psi**	**SP-7**	**scfm**	**psi**
SP-4:	**scfm**	**psi**	**SP-8**	**scfm**	**psi**

INCLUDE REMARKS & DESCRIBE ANY OTHER SYSTEM MAINTENANCE PERFORMED ON AGWAY SITE

Remarks: System is OFF until further instructions.

Other Actions:

MR. C's DRY CLEANERS SITE

NYSDEC Site #9-15-157

OM&M: SITE INSPECTION FORM

DATE: 27-Feb-12 *ACTIVITIES:* Site Inspection

INSPECTION PERSONNEL: R. Allen *OTHER PERSONNEL:* SJB Services Inc

WEATHER CONDITIONS: Cloudy, cool *OUTSIDE TEMPERATURE (° F):* 40

ARE WELL PUMPS OPERATING IN AUTO: YES: √ NO: If "NO", provide explanation below

PROVIDE WATER LEVEL READINGS ON CONTROL PANEL

RW-1	ON:	OFF: √	8	ft	PW-5	ON:	OFF: √	5 ft
PW-2	ON:	OFF: √	6	ft	PW-6	ON: √	OFF:	6 ft
PW-3	ON:	OFF: √	6	ft	PW-7	ON: √	OFF:	11 ft
PW-4	ON:	OFF: √	7	ft	PW-8	ON: √	OFF:	4 ft

EQUALIZATION TANK: 4 ft Last Alarm D/T/Condition: 2/17/12 Air Stripper Low Level

NOTES:

INFLUENT FLOW RATE: 20 gpm INFLUENT TOTALIZER READING: 1,163,544.0 gallons

SEQUESTERING AGENT DRUM LEVEL: full inches *(x 1.7=)* *AMOUNT OF AGENT REMAINING:* 55 gallons

SEQUESTERING AGENT FEED RATE: 4.0 ml/min *METERING PUMP PRESSURE:* 3.5 psi

		Top	Bottom			Top	Bottom	
BAG FILTER PRESSURES:	LEFT:	10	0	psi	RIGHT:	47 - 8	0	psi

INFLUENT FEED PUMP IN USE: #1 √ #2 *INFLUENT PUMP PRESSURE:* 8 psi

AIR STRIPPER BLOWER IN USE: #1 √ #2 *AIR STRIPPER PRESSURE:* 12.0 in. H_2O

AIR STRIPPER DIFFERENTIAL PRESSURE: 0.014 in. H_2O *DISCHARGE PRESSURE:* 4.5 in. H_2O

EFFLUENT PUMP IN USE: #1 √ #2 *EFFLUENT FEED PUMP PRESSURE:* 3.5 psi

EFFLUENT FLOW RATE: 92 gpm *EFFLUENT TOTALIZER READING:* 66,987,004 | 409860 gallons

ARE BUILDING HEATERS IN USE? YES: √ NO: *INSIDE TEMPERATURE (° F):* 58

IS SUMP PUMP IN USE: YES: √ NO: *ARE ANY LEAKS PRESENT?* YES: NO: √

WATER LEVEL IN SUMP: 6.0 in. *TREATMENT BUILDING CLEAN & ORGANIZED?* YES: √ NO:

MR. C's DRY CLEANERS SITE

NYSDEC Site #90150157

SITE INSPECTION FORM

27-Feb-12

SAMPLES COLLECTED? **YES:** √ **NO:** ____

	Sample ID	Time of Sampling	pH	Turbidity	Temp.	Sp. Cond.
AIR STRIPPER INFLUENT:	INF	1:30 PM	7.45	14.50	10.5	3039
AIR STRIPPER EFFLUENT:	EFF	1:30 PM	8.53	20.30	10.6	3044

IS THERE EVIDENCE OF TAMPERING/VANDALISM OF WELLS: ? **YES:** ____ **NO:** √

WERE MANHOLES INSPECTED? **YES:** √ **NO:** ____

WERE ELECTRICAL BOXES INSPECTED? **YES:** √ **NO:** ____

IS WATER PRESENT IN ANY MANHOLES OR ELECTRICAL BOXES? **YES:** √ **NO:** ____

If yes, provide manhole/electric box ID and description of any corrective measures below:

PW-4 has collapsed inner ring. PZ-1B has missing top cover and is temporarily sealed.

INCLUDE REMARKS & DESCRIBE ANY OTHER SYSTEM MAINTENANCE PERFORMED ON MR. C's SITE

Remarks: Old HD basket has broken handle. Replaced with repaired HD basket.

Took (2) damaged filter baskets to Buffalo Well Products to be repaired.

Other Actions: Switched Redux pickup to new drum.

Changed bag filters.

Cleaned Air Stripper with low pressure hose. Adjusted influent rate up.

Took delivery of (3) Redux Drums. Have (5) full drums.

AGWAY

SYSTEM VACUUM: ____ **in. H_2O** ***AIR PRESSURE:*** ____ **psi**

SP-1: ____ **scfm** ____ **psi** **SP-5** ____ **scfm** ____ **psi**

SP-2: ____ **scfm** ____ **psi** **SP-6** ____ **scfm** ____ **psi**

SP-3: ____ **scfm** ____ **psi** **SP-7** ____ **scfm** ____ **psi**

SP-4: ____ **scfm** ____ **psi** **SP-8** ____ **scfm** ____ **psi**

INCLUDE REMARKS & DESCRIBE ANY OTHER SYSTEM MAINTENANCE PERFORMED ON AGWAY SITE

Remarks: System is OFF until further instructions.

Other Actions:

MR. C's DRY CLEANERS SITE
NYSDEC Site #9-15-157
OM&M: SITE INSPECTION FORM

DATE: 5-Mar-12 *ACTIVITIES:* Site Inspection

INSPECTION PERSONNEL: R. Allen *OTHER PERSONNEL:*

WEATHER CONDITIONS: Sunny, cold *OUTSIDE TEMPERATURE (° F):* 30

ARE WELL PUMPS OPERATING IN AUTO: YES: NO: √ If "NO", provide explanation below

PW-7 is OFF due to maintenance problem.

PROVIDE WATER LEVEL READINGS ON CONTROL PANEL

RW-1	ON:	OFF: √	5	ft	PW-5	ON:	OFF: √	6	ft
PW-2	ON:	OFF: √	7	ft	PW-6	ON: √	OFF:	5	ft
PW-3	ON:	OFF: √	3	ft	PW-7	ON: √	OFF:	16	ft
PW-4	ON:	OFF: √	6	ft	PW-8	ON:	OFF: √	5	ft

EQUALIZATION TANK: 5 ft Last Alarm D/T/Condition: 2/17/12 Air Stripper Low Level

NOTES:

INFLUENT FLOW RATE: 8 gpm INFLUENT TOTALIZER READING: 1,312,181.0 gallons

SEQUESTERING AGENT DRUM LEVEL: 27 inches *(x 1.7=)* *AMOUNT OF AGENT REMAINING:* 46 gallons

SEQUESTERING AGENT FEED RATE: 6.0 ml/min *METERING PUMP PRESSURE:* 4.0 psi

		Top	Bottom			Top	Bottom	
BAG FILTER PRESSURES:	LEFT:	0	0	psi	RIGHT:	8	0	psi

INFLUENT FEED PUMP IN USE: #1 √ #2 *INFLUENT PUMP PRESSURE:* 15 psi

AIR STRIPPER BLOWER IN USE: #1 √ #2 *AIR STRIPPER PRESSURE:* 11.0 in. H_2O

AIR STRIPPER DIFFERENTIAL PRESSURE: 0.013 in. H_2O *DISCHARGE PRESSURE:* 4.7 in. H_2O

EFFLUENT PUMP IN USE: #1 √ #2 *EFFLUENT FEED PUMP PRESSURE:* 4.0 psi

EFFLUENT FLOW RATE: 94 gpm *EFFLUENT TOTALIZER READING:* 67,078,416 | 503360 gallons

ARE BUILDING HEATERS IN USE? YES: √ NO: *INSIDE TEMPERATURE (° F):* 55

IS SUMP PUMP IN USE: YES: √ NO: *ARE ANY LEAKS PRESENT?* YES: NO: √

WATER LEVEL IN SUMP: 7.0 in. *TREATMENT BUILDING CLEAN & ORGANIZED?* YES: √ NO:

MR. C's DRY CLEANERS SITE

NYSDEC Site #90150157

SITE INSPECTION FORM

5-Mar-12

SAMPLES COLLECTED? **YES:** √ **NO:**

	Sample ID	Time of Sampling	pH	Turbidity	Temp.	Sp. Cond.
AIR STRIPPER INFLUENT:						
AIR STRIPPER EFFLUENT:						

IS THERE EVIDENCE OF TAMPERING/VANDALISM OF WELLS: ?	**YES:**	**NO:** √
WERE MANHOLES INSPECTED?	**YES:** √	**NO:**
WERE ELECTRICAL BOXES INSPECTED?	**YES:** √	**NO:**
IS WATER PRESENT IN ANY MANHOLES OR ELECTRICAL BOXES?	**YES:**	**NO:** √

If yes, provide manhole/electric box ID and description of any corrective measures below:

PW-4 has collapsed inner ring. PZ-1B has missing top cover and is temporarily sealed.

INCLUDE REMARKS & DESCRIBE ANY OTHER SYSTEM MAINTENANCE PERFORMED ON MR. C's SITE

Remarks:

Other Actions:

AGWAY

SYSTEM VACUUM: in. H_2O

AIR PRESSURE: psi

SP-1:	**scfm**	**psi**	**SP-5**	**scfm**	**psi**
SP-2:	**scfm**	**psi**	**SP-6**	**scfm**	**psi**
SP-3:	**scfm**	**psi**	**SP-7**	**scfm**	**psi**
SP-4:	**scfm**	**psi**	**SP-8**	**scfm**	**psi**

INCLUDE REMARKS & DESCRIBE ANY OTHER SYSTEM MAINTENANCE PERFORMED ON AGWAY SITE

Remarks: System is OFF until further instructions.

Other Actions:

M2 – Example Piezometer Water Level Log

System Inspection Field Form
Soil Vapor Mitigation Systems
Mr. C's Dry Cleaner Site
Village of East Aurora, Erie County, New York 14052
NYSDEC Site #9-15-157

CRAWLSPACE INSPECTION FORM

Post Commissioning, Routine or Non-Routine Inspections (circle one)

Address: ___________________________________ Tracking Number: ___________

Date of Inspection: ___________________________

Inaccessible Crawlspace	**As Found***		**As Left***	
	Crawlspace 1	**Crawlspace 2**	**Crawlspace 1**	**Crawlspace 2**
Suction Point #				
Crawlspace Volume	cf.	cf.	cf.	cf.
Suction Pipe Diameter	in.	in.	in.	in.
Manometer reading	in. WC	in. WC	in. WC	in. WC

Accessible Crawlspace	**As Found***		**As Left***	
	Crawlspace 1	**Crawlspace 2**	**Crawlspace 1**	**Crawlspace 2**
Suction Point #				
Smoke test each membrane				
Smoke entered seam				

Deviations/Comments

____

____

____

____

____

____

* As-found conditions = before corrective action.
* As-left conditions = after corrective action.

Performed by: ______________________________ Date: _____________________

System Inspection Field Form
Soil Vapor Mitigation Systems
Mr. C’s Dry Cleaner Site
Village of East Aurora, Erie County, New York 14052
NYSDEC Site #9-15-157

FAN AND ELECTRICAL INSPECTION FORM

Post Commissioning, Routine or Non-Routine Inspections (circle one)

Date of Inspection: ____

Address: ____________________________________ Tracking Number: ___________

Electric Meter Number: Last visit: ____________ Current visit: _______

Equipment Documentation

As Found		Manometer Reading (in. H$_2$0)	
Fan Model	Suction Point	Prior	Current

As Left		Manometer Reading (in. H$_2$0)	
Fan Model	Suction Point	Prior	Current

	As Found		As Left	
	Yes	No	Yes	No
System Re-commissioning				
Is there a differential pressure shown in U-Tube manometer?				
If yes, provide readings.				
Was each fan shroud removed?				
Is each fan mounted securely?				
Are coupling connections secure?				
Does each fan run when the switch is in the ON position?				
Does each fan shut down when the switch is in the OFF position?				
Is excessive noise heard when fan is running?				
Does each fan induce suction when running?				
Is switch is locked in the ON position?				
Electrical Check				
Are Romex connections secure?				
Is each junction box closed?				
Are conduit properly supported?				
Does each fan start when the switch is ON position?				
Are any appliances affected by fan operation?				
Does each fan stop when the switch is in OFF position?				
Are mitigation system labels applied?				
Are the correct labels applied in the proper locations?				

Deviations/Comments

____

____

Performed by: ________________________________ Date: ______________________

System Inspection Field Form
Soil Vapor Mitigation Systems
Mr. C’s Dry Cleaner Site
Village of East Aurora, Erie County, New York 14052
NYSDEC Site #9-15-157

PIPING, SLAB, AND WALL INSPECTION FORM

Post Commissioning, Routine or Non-Routine Inspections (circle one)

Address: ______________________________ Tracking Number: __________

Date of Inspection: ______________________________

	As Found		As Left	
Piping Check	**Yes**	**No**	**Yes**	**No**
Is glue evident at joints?				
Are system suction points sealed?				
Is piping system properly supported?				
Are valves and manometers installed at proper locations?				
Is excessive noise heard in piping joints?				
Were piping modifications and 10% of old joints smoke tested?				
Does smoke enter joints?				
If yes: Was joint re-sealed?				
Does smoke enter re-sealed joint?				
Slab Check				
Was each identified slab crack, repair, or modification smoke tested?				
Does smoke enter?				
If yes: Was area re-sealed with approved sealant*?				
Does smoke enter re-sealed area?				
Check/clean drain(s)/Dranjer(s)™?				
Were drain(s)/Dranjer(s)™ smoke-tested?				
Wall Check				
Was each visible wall crack smoke tested?				
Is movement observed at wall cracks?				
If yes: Was crack was re-sealed with approved sealant?				
Does smoke enter re-sealed crack?				
Was the open course of top wall smoke tested?				
Does smoke enter top course?				
If yes: Open block re-sealed with approved sealant?				
Does smoke enter open block tops?				

Deviations/Comments

____

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____

____

Performed by: ______________________________ Date: ____________________

* approved sealant shall be an odorless, non-toxic, non-flammable, environmentally safe product

System Inspection Field Form
Soil Vapor Mitigation Systems
Mr. C's Dry Cleaner Site
Village of East Aurora, Erie County, New York 14052
NYSDEC Site #9-15-157

STRUCTURE INSPECTION FORM

Post Commissioning, Routine or Non-Routine Inspections (circle one)

Address: ____________________ Tracking Number: ____________________

Date of Inspection: ____________________

Date of Last Inspection: ____________________

Have the following items changed since the last visit?

	No	**Yes**	**If yes, explain…**
Building Footprint			
Basement/Slab Occupancy			
Heating/Ventilating Systems			
Basement Finish			
Crawlspace			
Drains, Sumps, Floor Cracks			
Wall Penetrations, Cracks			
Appliances (in basement)			
Ownership			
Siding			

If any of these items have changed, a redesign may be required.
Contact the maintenance supervisor for field review.

Deviations/Comments

____

____

____

____

____

Performed by: ____________________ Date: ____________________

System Inspection Field Form
Soil Vapor Mitigation Systems
Mr. C's Dry Cleaner Site
Village of East Aurora, Erie County, New York 14052
NYSDEC Site #9-15-157

TEST DATA AND BACKDRAFT

Post Commissioning, Routine or Non-Routine Inspections (circle one)

Address: ___________________________________ Tracking Number: ___________

Inspection Date: ______________________________

Manometer Reading at Fan Inlet

Prior Visit: __________ Date: _______
As found: __________
As left: __________

Manometer Reading at Suction Points (SSD#)

Suction Points

SSD#	1	2	3	4	5	6	7	8
Manometer Reading (Prior)								
Manometer Reading (As Found)								
Manometer Reading (As Left)								

Valves and manometers installed at proper location? ____Yes__

Communication Test (* See Comments)

Suction Points

Fan On	Point A	Point B	Point C	Point D	Point E	Point F	Point G	Point H
Test point identifier								
Micromanometer Reading								
Distance to Closest SSP (ft)								
Smoke Test								

Suction Points

Fan Off	Point A	Point B	Point C	Point D	Point E	Point F	Point G	Point H
Test point identifier								
Micromanometer Reading								
Distance to Closest SSP (ft)								
Smoke Test								

	As Found*		**As Left***	
	Yes	**No**	**Yes**	**No**
All fans in operation?	______	_____	______	_____
Winter conditions simulated?	______	_____	______	_____
Each test point tested?	______	_____	______	_____
Each test point sealed after testing?	______	_____	______	_____
Vacuum <-0.004 observed at each test point?	______	_____	______	_____
Smoke entered each test point?	______	_____	______	_____
All valves set prior to re-commissioning comm. test?	______	_____	______	_____

Backdraft Test	**As Found**		**As Left**	
	Yes	**No**	**Yes**	**No**
Windows closed?				
Venting appliances on?				
Doors closed?				
Combustion sources on?				
Backdraft Review				
Hot water heater?				
Furnace/Boiler?				
Fireplace?				
Dryer?				
Owner notified of existing backdraft condition?				
Was a previous backdraft condition present during any previous visit?				

Redline Drawing	**As Left**	
	Yes	**No**
Piping redlines complete?		
Each switch and electrical tie in are identified?		
Cracks/penetrations are identified?		
As-built notes are complete?		
New ventilation devices identified?		

Deviations/Comments

* As-found conditions = before corrective action.
* As-left conditions = after corrective action.

Performed by: ______________________________ Date: ____________________

M3 – Blank SSDS Inspection Forms

MR. C's DRY CLEANERS SITE

NYSDEC Site #9-15-157

OM&M: PIEZOMETER WATER LEVEL LOG

Date: 17-Sep-12

Measurements taken by: R. Allen

RW-1	15.20 ft	Comments:		PW-5	17.90 ft	Comments:	
PZ-1A	12.11 ft	Comments:		PZ-5A	11.70 ft	Comments:	
PZ-1B	----- ft	Comments:	damaged	PZ-5B	11.75 ft	Comments:	
PZ-1C	19.71 ft	Comments:		PZ-5C	11.32 ft	Comments:	
PZ-1D	13.39 ft	Comments:		PZ-5D	12.12 ft	Comments:	
PW-2	13.70 ft	Comments:		PW-6	12.30 ft	Comments:	
PZ-2A	11.94 ft	Comments:		PZ-6A	12.50 ft	Comments:	
PZ-2B	12.27 ft	Comments:		PZ-6B	12.35 ft	Comments:	
PZ-2C	11.63 ft	Comments:		PZ-6C	12.66 ft	Comments:	
MW-7	12.26 ft	Comments:	Substitute for 2D	PZ-6D	14.20 ft	Comments:	Shown as RW-2 on map
PW-3	19.40 ft	Comments:		PW-7	4.00 ft	Comments:	
PZ-3A	12.41 ft	Comments:		MPI-6S	12.18 ft	Comments:	
PZ-3B	12.82 ft	Comments:		PZ-7B	12.15 ft	Comments:	
PZ-3C	12.95 ft	Comments:		OW-B	12.09 ft	Comments:	
PZ-3D	12.48 ft	Comments:		PZ-7D	12.10 ft	Comments:	
PW-4	----- ft	Comments:	collapsed ring	PW-8	8.20 ft	Comments:	
PZ-4A	12.53 ft	Comments:		PZ-8A	9.06 ft	Comments:	
PZ-4B	11.76 ft	Comments:		PZ-8B	9.00 ft	Comments:	
PZ-4C	----- ft	Comments:	sealed over	PZ-8C	8.83 ft	Comments:	
PZ-4D	11.38 ft	Comments:		PZ-8D	8.59 ft	Comments:	

PUMPS IN OPERATION DURING MEASUREMENTS

RW-1 pump on?		Yes	√	No	PW-5 pump on?	√	Yes		No
PW-2 pump on?		Yes	√	No	PW-6 pump on?		Yes	√	No
PW-3 pump on?		Yes	√	No	PW-7 pump on?		Yes	√	No
PW-4 pump on?		Yes	√	No	PW-8 pump on?		Yes	√	No

M4 – Well Inspection Form

Mr. C's WELL INSPECTION FORM

Inspection No.:________

Well ID (sys_loc_code):____________________

Constructed well depth (ft):________________

Screened interval length (ft):_______________

WELL CASING

1. What is the casing type(s):

   ☐ Steel ☐ PVC ☐ Stainless Steel

2. Is the stainless steel well casing corroded, bent or broken?

   ☐ No ☐NA ☐ Yes (explain):_______________________________________

   ____

3. Is the PVC well casing cracked or broken?

   ☐ No ☐ NA ☐ Yes (explain):_______________________________________

   ____

4. Is the steel, stainless steel or PVC well casing loose?

   ☐ No ☐ Yes (explain):____

   ____

DOWNHOLE CONDITION

5. Is a measurement reference point marked on the top of the well casing?

   ☐ Yes ☐ No (explain):____

   ____

6. What is the total well depth (measured, ft)?____

7. Do any obstructions occur within the well?

   ☐ No ☐ Yes (explain):____

   ____

8. Is there any corrosion visible at the plumbing fittings?

   ☐ No ☐ Yes (explain):____

   ____

CONCRETE PAD

9. Is the well pad installed and in good condition?

   ☐ Yes ☐ No (explain):____

   ____

10. Is the well pad level sloped to prevent water ponding around the casing?

    ☐ Yes ☐ No (explain):____

    ____

11. Are there any voids in the soil around the top of the wellhead which could allow runoff to travel down the borehole to the aquifer?

    ☐ No ☐ Yes (explain):____

    ____

Continued on next page…

Mr. C's WELL INSPECTION FORM

Inspection No.:________

WELL IDENTIFICATION AND SECURITY

12. Is the a stainless-steel plate with engraved well number attached to the outermost casing?

☐ Yes ☐ No (explain):____

____

13. Is the well identification legible and correct?

☐ Yes ☐ No (explain):____

____

14. Does the well have a well cap or lid?

☐ Yes, both ☐ No (explain):____

____

15. Is the well cover in place and bolted shut with bolts in good condition?

☐ Yes ☐ No (explain):____

____

16. Is the well cap vermin-proof, watertight and securely attached to the well casing?

☐ Yes ☐ No (explain):____

____

17. Does the well have a waterproof steel/brass lock?

☐ Yes ☐ No (explain):____

____

WELL ACCESS

18. Do any obstructions (asphalt, parked cars) block access to the well?

☐ No ☐ Yes (explain):____

____

WELL MAINTENANCE REQUEST

19. Is maintenance needed for this well? (if yes, provide specific recommendations):

☐ No ☐ Yes (explain):____

____

____

____

____

Inspected by:_____________________________

Inspection Date:___________________________

N

Mr. C's Site-specific Health and Safety Plan (sHASP)

N-1 – Operations, Maintenance, and Monitoring Services

HEALTH & SAFETY PLAN

for

OPERATIONS, MAINTENANCE AND MONITORING
at
Mr. C's Dry Cleaner Site
586 Main Street
East Aurora, NY (Erie County)
SITE #9-15-157

JUNE 2007

PREPARED FOR

NEW YORK STATE DEC
DIVISION OF ENVIRONMENTAL REMEDIATION
625 Broadway, Albany, NY 12233

and

Ecology & Environment Engineering, P.C.
368 Pleasant View Dr., Lancaster, NY 14086

PREPARED BY

IYER ENVIRONMENTAL GROUP, PLLC
44 Rolling Hills Dr., Orchard Park, NY 14127

TABLE 1
EMERGENCY NOTIFICATION TABLE
OM&M for Mr. C's Dry Cleaner Site

Agency	Contact	Phone Number
Police Sheriff	Emergency	911
Fire & First Aid	Emergency	911
Ambulance	Emergency	911
Hospital/ Emergency Care Facility	Mercy Hospital 565 Abbott Road, Buffalo, NY	(716)826-7000
Poison Control Center	219 Bryant St., Buffalo, NY	(716)878-7654 (800) 336-6997
Chemical Emergency Advise	CHEMTREC	(800) 424-9300
NYS Department of Health	NYS Dept. of Health 582 Delaware Avenue Buffalo, NY 14203-2399	(716) 851-7220
NYS Department of Environmental Conservation, Region 9	Mr. William Welling NYDEC Divn. of Environmental Remediation 625 Broadway, Albany, NY 12233	(518) 402-9813 - Work Hrs. (800) 342-9296 - After Hrs.
	Spill Hotline	(800) 457-7362
SITE CONTACT	None	
O&M CONTRACTOR	Dharma Iyer, PhD, PE, Project Manager Richard Allen, Field Technician Iyer Environmental Group, PLLC	(716) 662-4157 (716) 445-9684 (D. Iyer) (716)445-9685 (R. Allen)
STANDBY CONSULTANT	Jeff Kohler / Mike Steffan Ecology & Environment Engineering PC. 368 Pleasant Drive Lancaster, NY 14086	(716) 684-8060 (716) 481-0703 Cell (Jkohler)
DIRECTIONS TO HOSPITAL (EMERGENCY ROUTE) *See Figure 2*	Mercy Hospital is located approximately approx. 16 miles from the site at 565 Abbott Rd., Buffalo, NY 14220 (Phone: 826-7000) FROM THE SITE: From site, turn LEFT onto Main Street (Route 20A), travel 1 mile; Take State Route 400, and head north for 12 miles; Exit onto State Route 16 and travel west for approx. 1.5 miles; Turn LEFT (south) onto Casenovia St. for 0.4 mile; Turn LEFT (south-east) onto Abbott Road for 32 yards; Hospital is on the right	

HEALTH & SAFETY PLAN
OM&M at Mr. C's Dry Cleaner Site
586 Main Street, East Aurora, NY
TABLE OF CONTENTS

HEALTH & SAFETY PLAN
OM&M at Mr. C's Dry Cleaner Site
586 Main Street, East Aurora, NY
TABLE OF CONTENTS *(Continued)*

TABLES End of Section

FIGURES Following Page

SECTION 1.0
Project Description

1.0 INTRODUCTION

The health and safety protocols established in this plan are based on site conditions and chemical hazards known, anticipated or suspected to be present from available site data. The following site Health and Safety Plan (HASP) is intended solely for use by Iyer Environmental Group PLLC (IEG) staff during the operations, maintenance and monitoring of the groundwater extraction treatment system at Mr. C's Dry Cleaners at 586 Main Street, East Aurora, NY 14052 (see Figure 1). This O&M subcontract also includes the adjacent Agway air sparging system located at 566 Main Street. Ecology and Environment Engineering, P.C. (EEPC) is the prime standby consultant to the NYSDEC on this four year work assignment.

All activities and equipment used in association with the referenced supplemental investigation and interim measure will, at a minimum, comply with:

- 29 CFR 1910, General Industry, Occupational Safety and Health (OSHA) Safety and Health Standards;
- 29 CFR 1926, Construction Industry, OSHA Safety and Health Standards;
- 40 CFR 262, Standards Applicable to Generators of Hazardous Waste, Current Edition;
- 40 CFR 178, Shipping Container Specification, Current Edition;
- NIOSH 85-115, NIOSH/OSHA/USCG/USEPA, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, October 1985;
- EPA Publication 9285.1-03, Standard Operating Safety Guides (PB92-963414), June 1992
- "Threshold Limit Values for Chemical and Physical Agents and Biological Exposure Indices," American Conference of Government Industrial Hygienists, Cincinnati, Ohio, Current Edition;
- "Guide to Occupational Exposure Values," American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio, Current Edition;
- "Community Air Monitoring Plan," 93118PR00149, NYSDEC;
- NYSDOL 28.876, Article 28, Section 876 of NYS Labor Law (Right-to-Know Law), 1980; and
- Other applicable Federal, State, and Local regulations

2.0 SITE DESCRIPTION AND BACKGROUND

1.2.1 General Location

The property is located at 586 Main Street (or Route 20A), a major state route through the Town of East Aurora, southeast of Buffalo (see site location map on Figure 1). It is in a commercial/retail section, and is bordered to the west, east and north by retail businesses, and to the south by Main Street.

1.1.2 Site History

Mr. C's Dry Cleaners has been in operation since 1970. Prior to that, the property was used for several other commercial purposes including laundry services, auto repair/painting as well as a hotel. In 1991, the NYSDEC investigated complaints of odors in a neighboring property southwest of the site, across Main Street. The NYSDEC designated the site as a Class 2 hazardous Waste Site (Site Number 9-15-157) based on the results of indoor air, soil vapor, groundwater and sanitary sewer sampling which confirmed the presence of Tetrachloroethylene (PCE). In a 1994 Remedial Investigation (RI), the highest levels of PCE contamination was found beneath the dry cleaner building, along with petroleum hydrocarbons and PCE degradation byproducts. Following a 1996 Feasibility Study, a Record of Decision was issued in 1997 with in-situ air stripping as the selected remedy. Based on pre-design investigations in 1998-99, the NYSDEC modified the remedy to a conventional groundwater pump and treat system which was designed in 2000 and installed in 2002.

1.3 GENERAL SUMMARY OF WORK

The following are scheduled activities by IEG as part of the subcontract agreement with EEEPC:

a) General operating inspection of the system:
  - Record pressure, vacuum gauge and flow meter readings inside building
  - Record water levels in pumping wells and piezometers around site
  - Inspect pumping wells and electrical boxes

b) System Operation, Maintenance and Repairs
  - Replace bag filters
  - Balance system to maximize remedial cleanup
  - Repair/replace pumps, level transducers, electrical lead
  - Clean treatment equipment
  - Respond to system alarms

c) Chemical handling
  - Set up sequestering agent supply drum
  - Return empty drums

d) Groundwater Sampling
  - Collect treatment performance samples in laboratory-provided containers
  - Package and ship samples to off-site laboratory

SECTION 2.0
Hazard Assessment & Risk Analysis

An assessment and analysis of chemical, physical, and biological hazards associated with this project is presented in the subsections that follow. A task-by-task risk analysis of the potential exposure to the identified hazards is provided below and in Table 3 at the end of this section.

TASK	POTENTIAL EXPOSURE RISK
General operating inspection of the system	Slight
System Operation, Maintenance and Repairs	Moderate
Chemical handling	Moderately high
Groundwater sampling	Moderately high

Anticipated Exposure Risk Definitions:

LOW =	Non-Intrusive Work – No Chance of Exposure.
SLIGHT =	Non-Intrusive Work, Possible Safety Hazards with Tools - Little to No Chance of Exposure.
MODERATE =	Non-Intrusive Work, Possible Safety Hazards with Powered Tools, Heavy Equipment, and/or work near or in water. Possible Exposure to Contaminants.
MODERATELY HIGH =	Intrusive Work, Possible Safety Hazards with Equipment – Exposure to Contaminants Possible.
HIGH =	Intrusive Work, Possible Safety Hazards with Equipment – Exposure to Contaminants Probable.

2.1 CHEMICAL HAZARDS

The primary chemical hazard substances known or suspected to exist on-site are volatile organic compounds (VOCs) associated with use of this property as a dry cleaner, and to a lesser extent as an auto repair shop. The hazards associated with these chemical substances are discussed in Table 2 at the end of this section.

The levels of personal protective equipment (PPE) identified in Section 6.0 of this HASP have been assigned by task, known/anticipated chemical toxicity, and potential exposure risks. Action levels for PPE upgrade (see Section 7.0) have been set conservatively to minimize the risk of exposure to field personnel.

2.2 PHYSICAL/GENERAL HAZARDS

The following general, physical, and ergonomic hazards may be associated with this project:

1. **Potential Hazard:** Dermal and inhalation hazards resulting from potential exposure to the chemical compounds identified in Table 2.

Procedure(s) to Mitigate Hazard: Don PPE identified in Section 6.0 of this HASP. The levels of PPE identified in Section 6.0 of this HASP have been assigned by task, known/anticipated chemical toxicity, and potential exposure risks. Other means of minimizing or eliminating risk of exposure include: practicing contamination prevention including a thorough washing of hands and face when exiting the exclusion zone and prohibiting use of contact lenses during field activities.

2. **Potential Hazard:** Slips, Trips, and Falls.

   Procedure(s) to Mitigate Hazard: (1) Exercise extreme caution in all work areas. (2) Be sure of footing during equipment access/egress and when moving through the work area. (3) Avoid stepping or standing on uneven or unsteady surfaces. (4) Clearly delineate open pits, wells, and other fall hazards with orange safety fencing. Securely cover as appropriate.

3. **Potential Hazard:** Exposure to inclement weather.

   Procedure(s) to Mitigate Hazard: (1) Follow the procedures for the prevention and/or treatment of heat or cold stress (if ambient air temperatures exceed 70°F or drop below 40°F) described in Section 5.5 of this HASP. (2) Adhere to the emergency response procedures provided in Section 10.3 of this HASP.

4. **Potential Hazard:** Housekeeping

   Procedure(s) to Mitigate Hazard: (1) Store equipment property. (2) Remove rubbish/scrap material from work area. (3) Keep access to equipment, meters and gauges clear

5. **Potential Hazard:** Vehicle Traffic

   Procedure(s) to Mitigate Hazard: Utilize warning signs and flagman (men) as appropriate to direct traffic away from work area.

6. **Potential Hazard:** Hazardous Material Storage

   Procedure(s) to Mitigate Hazard: (1) Segregate flammable/combustible liquid from ignition sources. (2) Store in approved containers. (3) Keep solvent waste, oily rags, and liquids in fire resistant containers.

7. **Potential Hazard:** Electrical

   Procedure(s) to Mitigate Hazard: (1) Utilize approved grounding and bonding procedures. (2) Guard and maintain electrical lines/cords. (3) Tag/remove damaged equipment from service.

8. **Potential Hazard:** Tools

   Procedure(s) to Mitigate Hazard: (1) Tag and remove defective tools from service. (2) Maintain and inspect per manufacturer's recommendations. (3) Utilize proper eye protection.

9. **Potential Hazard:** Above and/or Underground Utilities within Work Area(s)

   Procedure(s) to Mitigate Hazard: (1) Obtain a site utility plan or markout and ensure that electrical lines (if any) are not energized.

2.3 BIOLOGICAL HAZARDS

Biological hazards which on-site personnel may encounter are considered minimal, but include animal bites or stings, contact with plants, and exposure to microbes.

Animal bites or stings are usually nuisances (localized swelling, itching, and minor pain) that can be handled by first aid treatment. The bites of certain snakes, lizards, and spiders contain sufficient poison to warrant medical attention. There also are diseases that can be transmitted by animal bites which will require professional medical attention. Examples are rabies (mainly from dogs, skunks, raccoons, and foxes), Lyme disease (from ticks [see discussion below]), and encephalitis (from mosquitoes).

The biggest hazard and most common cause of fatalities from animal bites and stings (particularly bees, wasps, and spiders) is a sensitivity reaction. Anaphylactic shock due to stings can lead to severe reactions to the circulatory, respiratory and central nervous system, and it can also result in death. Therefore, workers with known insect allergies must notify the site health and safety officer of his/her condition prior to engaging in remedial operations.

Workers who are bitten by an animal or stung by an insect must immediately notify the site safety and health officer.

Lyme Disease is caused by an infectious agent, Borrelia burgdorferi. This agent is a spirochete transmitted to animals or humans via ticks. The early symptoms and signs, with one exception, are non-specific and easily attributed to other illnesses, such as the flu. They include fever, nausea, vomiting, fatigue, headache, photophobia (sensitivity to light), and, in approximately 75 percent of the cases, a rash. Over several days it enlarges, sometimes reaching a diameter of 20 centimeters. The border of the enlarging rash is red, slightly warm, but flat. Often, the center of the rash clears somewhat, so that it looks like an irregular ring. In about half of the persons with a rash, more than one circular eruption is present. The rash termed, erythema migrans, is essentially diagnostic of Lyme disease, and therefore is a very important finding.

Undiagnosed/untreated Lyme disease can lead to severe, sometimes life-threatening medical problems. The principal targets include the skin, the nervous system, the heart, and the joints. Early treatment is highly desirable since, in most cases, it prevents progression of the disease and is a less prolonged, less intense affair.

Preventative measures include protective clothing (see Section 6.0); head/hair protection; and the use of insect repellant containing DEET on all exposed areas and coveralls. Workers should check their bodies thoroughly for ticks and should bathe soon after returning home. Remove any ticks carefully, using a gentle, firm, tugging motion with fine tweezers. Do not kill the tick before it has been removed. Workers should save the ticks and monitor their bites, checking for a rash and other symptoms (up to about eight weeks after the bite).

Toxic effects from plants are generally due to ingestion. Of more concern to on-site personnel are certain plants, including poison ivy, poison oak, and poison sumac, which produce adverse effects from direct contact. The usual effect is dermatitis inflammation of the skin. The protective clothing and decontamination procedures used for chemicals also reduce the exposure risk from the plant toxins. Cleaning the skin thoroughly with soap and water after contact will reduce the risk.

TABLE 2 : CHEMICAL HAZARD/EXPOSURE DATA SUMMARY
OM&M for Mr. C's Dry Cleaner Site

Chemical of Concern	Maximum Concentration (If Known)	Potentially Contaminated Media	OSHA PEL/ ACGIH TLV/ NIOSH IDLH	Routes of Exposure	Exposure Symptoms/ Primary Hazards
Chlorinated solvents Perchloroethene (PCE) Trichloroethene (TCE) and degradation products	Refer to RI Report, OM&M Reports	Soil Groundwater	PEL: 10 ppm TLV: 10 ppm IDLH: NE	Inhalation Adsorption	Overexposure can cause unconsciousness and death. It can also cause the heart to beat irregularly or to stop. High or repeated lower exposures can damage the liver and kidneys. Long term skin contact can cause thickening and cracking of the skin. Never use near combustion sources like furnaces or welding; highly toxic gases are formed (including Hydrogen Chloride and Phosgene).
Petroleum Hydrocarbons Benzene, Xylenes, Toluene, Ethyl benzene	Refer to RI Report, OM&M Reports	Soil Groundwater	PEL: 1 - 10 ppm TLV: 100 ppm IDLH: 100 ppm	Inhalation Absorption	FLAMMABLE LIQUIDS/FIRE HAZARD May damage the developing fetus. They can irritate the eyes, nose and throat. High levels can cause dizziness, passing out and death. Repeated exposure may damage bone marrow causing low blood cell count. May also damage the eyes, and cause stomach problems. May cause problems with memory and concentration.

NOTES:

OSHA PEL = Occupational Safety & Health Administration's Final Rule Limits Permissible Exposure Limit for an 8-hour, time-weighted average (TWA) from CFR 1910.1000, Tables Z-1A, Z-2, and Z-3.

ACGIH TLV = American Conference of Governmental Industrial Hygienists' Threshold Limit Value for an 8-hour, TWA.

NIOSH IDLH = National Institute of Occupational Safety and Health Level Immediately Dangerous to Life and Health.

TABLE 3 : TASK & RISK ANALYSIS TABLE
OM&M for Mr. C's Dry Cleaner Site

Task	Sub-Tasks	Activity	Hazard	Protective Measures
General operating inspection	Inspection system, field measurements, inspect wells and electrical boxes	Use of hand tools, direct read instruments	Potential exposure to chemicals, falls, cuts, release of kinetic or stored energy, electrical hazards	Use of proper techniques and work practices, and PPE
Operation, Maintenance and Repairs	Replace components, clean equipment, balance system	Use of heavy equipment, power tools, and hand tools	Potential exposure to chemicals, falls, cuts, injury from falling objects, release of kinetic or stored energy, electrical hazards	Proper work practices including proper heavy equipment operation and use of PPE
Chemical Handling	Set up sequestering agent drums, return empty drums	Use of heavy equipment, power tools, and hand tools	Potential chemical exposure	Proper work practices including proper heavy equipment operation and use of PPE
Sampling	Field measurements, water sampling	Use of hand tools, direct read instruments or other equipment to gather samples for analysis	Potential chemical exposure	Use of proper techniques and PPE

SECTION 3.0
Project Organization & Personnel Responsibilities

The following IEG managerial personnel are assigned to this project and will assume the job functions listed below:

- **Project Manager and Site H&S Officer (IEG)** - Dharmarajan R. Iyer, Ph.D., PE;
- **Field technician (IEG)** – Richard Allen

The Project Manager will be responsible for the execution of this subcontract work, submittals, field inspection, monitoring and sampling, and reporting. Oversight of this subcontract work is provided by EEPC.

The Site Health and Safety Officer will be responsible for field implementation of this HASP and for insuring the project team's compliance to the site-specific health and safety protocol established herein. The HSO will be responsible for the following:

- Implementing, enforcing, and monitoring the HASP
- Preconstruction indoctrination and periodic training of all on-site personnel with regard to this safety plan and other safety requirements to be observed during construction including:
  - ✓ Potential hazards,
  - ✓ Personal hygiene principles,
  - ✓ Personal protective equipment (PPE),
  - ✓ Respiratory protection equipment usage and fit testing,
  - ✓ Emergency procedures dealing with fire and medical situations, and
  - ✓ Conduct daily update meetings in regard to health and safety

- Evaluating monitoring data to make field decisions regarding safety and health
- Informing project personnel of NYS Labor Law Section 876 (Right-to-Know Law)
- Maintaining separation of Exclusion Zone (dirty) from the Support Zone (clean)

SECTION 4.0
Site Personnel Training Requirements

All personnel assigned to the site will be in compliance with the training requirements of 29 CFR 1910 and 1926 as listed below. Site personnel will have met one of the following requirements prior to the start of activities at the site:

- A 40 hour minimum hazardous materials safety and health course, as stipulated in 29 CFR 1926.65 e(3); and
- An 8 hour minimum refresher course per year after the 40 hour minimum training has occurred (29 CFR 1926.65.e[8]).

On-site managers and supervisors must be in compliance with the additional supervisory training requirements of 29 CFR 1926.65.e(4). Emergency responders must be in compliance with the additional training requirements of 29 CFR 1926.65.e(7). Personnel involved in confined space entry will have completed training in accordance with OSHA requirements.

As stipulated in 29 CFR 1910.120, all IEG and subcontractor personnel assigned to this project also will receive site-specific training in:

- Provisions of OSHA regulations and legislation under OSHA Standards 1910 and 1926;
- Provisions of NYSDOL 28.876;
- Medical monitoring per Section 5.0 of this HASP;
- Hazards of the work place (chemical/physical/biological/ergonomic);
- Standard safety operation procedures (see Attachment B);
- Decontamination procedures;
- Work zones;
- Emergency procedures and contingency plans;
- Respirator equipment training, qualitative fit testing and respirator maintenance;
- Emergency first aid procedures, blood borne pathogen program, and CPR;
- On-site communication procedures;
- Air monitoring techniques and sample taking;
- Hazardous material recognition;
- Importance of "Buddy System";
- Toxicology and basic chemistry;
- Site entry; and
- Use of emergency escape packs.

Copies of applicable training certificates (i.e., 40 hour training records, 8 hour training records, 8 hour supervisor training records, medical monitoring documentation, respirator fit test results, first aid/CPR certificates, asbestos handlers cards, confined space entry training certificates, etc.) for site personnel will be retained by the HSO.

4.1 VISITORS

Only those persons who have (1) completed the same level of training as the workers for the portion of the site they wish to enter, in addition to having received the site orientation currently outlined in this HASP, and (2) signed the Visitor's Entry Log will be permitted to enter established work areas. The HSO will establish, on a case-by-case basis, a safe location from which visitors can observe the site activity of interest.

4.2 SAFETY MEETINGS

Personnel who work on the site are required to attend Pre-Entry Site Briefing as and when it is held. It will include a review of the requirements of this HASP. On-site safety meetings will occur regularly and ***on-site personnel will be required to attend***. Attending personnel must sign an attendance sheet. Any personnel who miss the on-site safety meetings will be required to attend a review by the HSO before he/she will be allowed to work at the discretion of the HSO. Items to be considered at the safety meetings may include, but are not limited to:

- Review of relevant site data that may relate to the potential for worker exposure;
- Delegation of responsibility (i.e., field technicians, equipment operators, emergency backup personnel, competent persons, logistical and support requirements);
- Type and frequency of environmental and personal monitoring to be performed;
- Mobilization of support and decontamination equipment;
- Initial levels of protection required and the anticipated potential for upgrading;
- Decontamination requirements;
- Emergency procedures;
- Functional and interpretive problems that may have been encountered while using monitoring instrumentation, personal protective or other support equipment;
- Personal hygiene;
- Fire prevention;
- Heavy equipment operation; and
- Discussion of on-going and planned work activities.

4.3 EMERGENCY RESPONSE TRAINING

Training in site-specific emergency procedures will be provided by the site health and safety officer before work begins on-site. This training will include, but is not limited to, the following;

- Emergency chain-of-command;
- Communication methods and signals;
- Location of phones and emergency numbers;
- Use of emergency equipment;
- Evacuation and emergency procedures;
- Off-site support;
- Site-specific hazards;
- Decontamination procedures;
- Standard operating procedures; and
- Location and use of first aid equipment.

SECTION 5.0
Medical Surveillance

Medical monitoring is required by OSHA as a means of monitoring worker exposure to certain toxic substances. IEG will implement a Medical Surveillance Program (MSP) for employees engaged in on-site activities which is consistent with the requirements of 29CFR.1926.65(b). All medical records and personnel exposure monitoring data generated from the MSP will be retained per 29 CFR 1910.1020.

A baseline medical surveillance examination will be given not more than one year prior to a 40-Hour OSHA-Trained worker reporting to the job site to work in contaminated areas. Copies of the physician's statement certifying each employee's ability to work at task-specific operations, as well as their suitability for wearing respirators will be maintained by the HSO for review by involved regulatory personnel upon request. The baseline Medical Surveillance Exam will meet the requirements of 29CFR.1926.65 (b).

5.1 EPISODIC EXAMINATIONS

Non-scheduled medical examinations may be required upon acute exposure, at the discretion of the HSO, or upon receipt of a request for a medical examination from any employee with symptoms of exposure to hazardous substances, or following injuries, etc. Episodic examinations will be provided, if required, by that person's direct employer through their Medical Surveillance Program.

5.2 ANNUAL AND/OR TERMINATION EXAMINATIONS

All personnel participating in the medical monitoring program (i.e., those personnel who are 40-Hour, OSHA-Trained) will have annual re-examinations and follow-up examinations upon completion of the work. Biological monitoring for blood lead levels will be conducted as part of these examinations in accordance with 29 CFR 1926.62. Employees will be notified of their blood lead levels within five working days of receipt of biological monitoring results.

The annual and termination exams will be complementary in scope with the baseline exams to the degree sufficient to allow comparison of individual biologic parameters. Additional testing for the purpose to further diagnose occupationally induced or significant abnormalities will be at the discretion of the examining physician.

5.3 AUDIOMETRIC TESTING

In addition to the baseline physical exam, all personnel will receive an annual audiogram. This annual audiogram will be reviewed against the baseline or most current audiogram by a certified audiologist to determine if noise-induced hearing loss has occurred. If a noise-induced hearing loss is noted during the evaluation, the employee will be notified, in writing, within 21 days of the determination. This testing is performed in compliance with 29 CFR 1210.95.

5.4 ABNORMAL MEDICAL SURVEILLANCE RESULTS

In general, whenever any medical test which is of significance yields abnormal results, the test will be repeated. Whenever abnormal results are substantiated, the worker may be restricted or excluded from areas which are potentially contaminated or thought to compromise his/her safety. Employees exhibiting elevated blood lead levels will be removed from exposures. The decision of worker disposition will rest with the examining physician.

5.5 HEAT/COLD STRESS MONITORING

The following program will be implemented when the ambient air temperatures exceed 70°F (heat stress monitoring) or drop below 40°F (cold stress monitoring).

5.5.1 Heat Stress Monitoring

Site personnel who wear protective clothing allow body heat to be accumulated with an elevation of the body temperature. Heat cramps, heat exhaustion, and heat stroke can be experienced, which, if not remedied, can threaten life or health. Therefore, an American Red Cross Standard -First Aid book (current edition) or equivalent will be maintained on site at all times so that the HSO and site personnel will be able to recognize symptoms of heat emergencies and be capable of controlling the problem.

When protective clothing is worn (especially Levels A, B, and C) the suggested guidelines for ambient temperature and maximum wearing time per excursion are:

Ambient Temperature (°F)	**Maximum Wearing Time Per Excursion (Minutes)**
Above 90	15
85 to 90	30
80 to 85	60
70 to 80	90
60 to 70	120
50 to 60	180

Monitoring the heart rate is one method of measuring the effectiveness of employees' rest-recovery regime:

- During a 3-minute period, count the pulse rate for the last 30 seconds of the first minute, the last 30 seconds of the second minute, and the last 30 seconds of the third minute.
- Double the count.

If the recovery pulse rate during the last 30 seconds of the first minute is at 110 beats/minute or less and the deceleration between the first, second, and third minutes is at least 10 beats/minute, the work-recovery regime is acceptable. If the employee's rate is above that specified, a longer rest period is required, accompanied by an increased intake of fluids.

In the case of heat cramps or heat exhaustion, "Gatorade" or its equivalent is suggested as part of the treatment regime. The reason for this type of liquid refreshment is that such beverages will return much-needed electrolytes to the system. Without these electrolytes, body systems cannot function properly, thereby increasing the represented health hazard. NOTE: The HSO or HSTs may weigh workers before and after entry to determine if there is excessive loss of fluid.

This liquid refreshment will be stored in a cooler at the edge of the decontamination zone in plastic squeeze bottles. The plastic bottles will be marked with individual's names. Disposable cups with lids and straws may be used in place of the squeeze bottles. Prior to drinking within the decontamination zone, the project personnel will follow the following decontamination procedures:

A. Personnel will wash and rinse their outer gloves and remove them.
B. Personnel will remove their hard hats and respirators and place on table.
C. Personnel will remove their inner gloves and place them on table.
D. Personnel will wash and rinse their face and hands.
E. Personnel will carefully remove their personal bottle or cup from the cooler to ensure that their outer clothes do not touch any bottles, cups, etc. Personnel also must ensure that their hands to not touch their outer clothes.
F. The used bottle or cups will not be returned to the cooler, but will be placed in a receptacle or container to be cleaned or disposed of.
G. Personnel will replace their respirators, hard hats, gloves and tape gloves prior to re-entering the hazardous zone.

When personnel are working in situations where the ambient temperatures and humidity are high-and especially in situations where protection Levels A, B, and C are required the HSO must:

- Assure that all employees drink plenty of fluids ("Gatorade" or its equivalent);
- Assure that frequent breaks are scheduled so overheating does not occur; and
- Revise work schedules, when necessary, to take advantage of the cooler parts of the day (i.e., 5:00 a.m. to 1:00 p.m., and 6:00 p.m. to nightfall).

5.5.2 Cold Stress Monitoring

Whole-body protection will be provided to site personnel that have prolonged exposure to cold air. The right kind of protective clothing will be provided to site personnel to prevent cold stress. The following dry clothing will be provided by IEG as deemed necessary by the HSO:

- Appropriate underclothing (wool or other);
- Outer coats that repel wind and moisture;
- Face, head, and ear coverings;
- Extra pair of socks;
- Insulated safety boots; and
- Glove liners (wool) or wind- and water-repellant gloves.

The HSO will use the equivalent chill temperature when determining the combined cooling effect of wind and low temperatures on exposed skin or when determining clothing insulation requirements.

Site personnel working continuously in the cold are required to warm themselves on a regular basis in the on-site hygiene facility. Warm, sweet drinks will also be provided to site personnel to prevent dehydration. The HSO will follow the work practices and recommendations for cold stress threshold limit values as stated by the latest edition of the Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices by the American Conference of Governmental Industrial Hygienists or equivalent cold stress prevention methods.

SECTION 6.0
Personal Protective Equipment

Based on an evaluation of potential hazards (see Section 2.0), the following levels of personal protective equipment are assigned for this project.

PLANNED WORK ACTIVITY	PLANNED LEVEL OF PROTECTION	ACTION LEVEL FOR PPE UPGRADE/DOWNGRADE
Inspection and routine operation	Level D	Upgrade to Level C if Sustained Readings[A] of 2.5 x Background and 150 μg/m^3 are recorded or if an IDLH Condition is Probable.
Repairs and Maintenance	Modified Level D	Upgrade to Level C if Sustained Readings[A] of 2.5 x Background and 150 μg/m^3 are recorded or if an IDLH Condition is Probable.
Chemical Handling	Modified Level D	Upgrade to Level C if Sustained Readings[A] of 2.5 x Background and 150 μg/m^3 are recorded or if an IDLH Condition is Probable.
Groundwater sampling	Level D	Upgrade to Level C if Sustained Readings[A] of 2.5 x Background and 150 μg/m^3 are recorded or if an IDLH Condition is Probable.

NOTES:

A. For the purposes of this discussion, a *sustained reading* is defined as a consistent reading on a real-time monitoring instrument which does not vary substantially from a peak or a result which is averaged over a period of time (i.e., 5 minutes). Sustained is called out in order to avoid downgrading PPE based on a single "hit" or "miss" instead of the average concentration present. Unless a chemical has a ceiling value, the TWA and STEL values are averages for exposure over 8-hours or 15 minutes and not single peaks. The values for the above action levels are based on TWA and STEL values.

B The action levels given are based on the potential for exposure to the chemicals listed in the contract documents. These action levels may be changed based on further chemical-specific sampling.

C. The levels of PPE identified have been assigned by task (Table 3), known/anticipated chemical toxicity (Table 2), and potential exposure risks (Table 3). Action levels for PPE upgrade have been set conservatively to minimize the risk of physical injury and/or exposure to field personnel.

D. Respiratory protection will conform to OSHA 1910.134. Personnel assigned to work in the Exclusion Zone or Contamination Reduction Zone must have passed a Respirator Fit Test in accordance with OSHA 3079. Fit tests will be administered by the HSO. Respirators will be maintained and operated per the SOP set forth in Attachment D of this HASP.

E. The HSO will be responsible for determining the need for PPE upgrade or downgrade based on actual conditions encountered in the field.

PPE levels are defined in Table 4 at the end of this section. Project-specific PPE requirements are summarized below.

- The **Level D PPE ensemble** will include work clothing as dictated by weather (sleeved shirts and long pants required); a hard hat; safety glasses; and steel-toe work boots. Hearing and fall protection will be utilized as directed by the HSO or HSTs.
- The **Modified Level D PPE ensemble** will include work clothing as dictated by weather; disposable Tyvek coveralls or equivalent; disposable nitrile (NRC) or neoprene outer gloves (worn over optional inner latex or surgical gloves); a hard hat; safety glasses; steel-toe work boots; and neoprene or butyl rubber overboots. Hearing and fall protection will be utilized as

directed by the HSO or HSTs.

- The **Level C PPE ensemble** will include full face air purifying respirator (MSHA/NIOSH approved) with combination organic vapor, acid gas and high efficiency particulate cartridge/filter; Saranax-laminated Tyvek or equivalent coverall; chemical-resistant outer and inner gloves; a hard hat; safety glasses; steel-toe work boots; neoprene or butyl rubber overboots; long cotton underwear (optional); and an escape air mask (readily available). Hearing and fall protection will be utilized as directed by the HSO or HSTs.

- **Level B PPE** will be worn when confined space entry is required (i.e., during tank cleaning). The Level B PPE ensemble will include a positive-pressure SCBA (MSHA/NIOSH approved) or positive-pressure air line respirator with escape bottle for IDLH or potential IDLH atmosphere (MSHA/NIOSH approved); chemical-resistant clothing (Saranax-laminated Tyvek or equivalent coverall); long cotton underwear (optional); outer and inner chemical-resistant gloves; steel-toe work boots; disposable chemical-resistant overboots; and hard hat (face shield optional). Hearing or fall protection will be utilized as directed by the HSO or HSTs.

Taping will be used between suit and gloves, and suit and boots for Levels B, C, and Modified D PPE.

The base levels of protection identified are to be considered preliminary and may change based on air monitoring information collected by the HSO or HSTs during project work. No Changes to the specified levels of protection will be made without the approval of the HSO.

TABLE 4
DESCRIPTION OF PPE LEVELS

LEVEL OF PROTECTION	EQUIPMENT	PROTECTION PROVIDED	SHOULD BE USED WHEN:	LIMITING CRITERIA
A	**Recommended** ▸ Pressure-demand, full-facepiece SCBA or pressure-demand supplied-air respirator with escape SCBA. ▸ Full-encapsulating, chemical-resistant suit. ▸ Inner chemical-resistant gloves. ▸ Chemical-resistant safety boots/shoes. ▸ Two-way radio communications. **Optional** ▸ Cooling Unit. ▸ Coveralls. ▸ Long cotton underwear. ▸ Hard hat. ▸ Disposable gloves and boot covers.	The highest available level of respiratory, skin, and eye protection.	▸ The chemical substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on either: → measured (or potential for) high concentration of atmospheric vapors, gases, or particulates or → site operations and work functions involving a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin or capable of being absorbed through the intact skin. ▸ Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible. ▸ Operations must be conducted in confined, poorly ventilated areas until the absence of conditions requiring Level A protection is determined.	▸ Fully-encapsulating suit material must be compatible with the substances involved.

TABLE 4
DESCRIPTION OF PPE LEVELS

LEVEL OF PROTECTION	EQUIPMENT	PROTECTION PROVIDED	SHOULD BE USED WHEN:	LIMITING CRITERIA
B	**Recommended** ▸ Pressure-demand, full-facepiece SCBA or pressure-demand supplied-air respirator with escape SCBA. ▸ Chemical-resistant clothing (overalls and long-sleeved jacket; hooded, one- or two-piece chemical splash suit; disposable chemical resistant one-piece suit). ▸ Inner and outer chemical-resistant gloves. ▸ Chemical-resistant safety boots/shoes. ▸ Hard hat. ▸ Two-way radio communications. **Optional** ▸ Coveralls. ▸ Disposable boot covers. ▸ Face shield. ▸ Long cotton underwear.	The same level of respiratory protection but less skin protection than Level A. It is the minimum level recommended for initial site entries until the hazards have been further identified.	▸ The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection. This involves atmospheres: → with IDLH concentrations of specific substances that do not represent a sever skin hazard; or → that do not meet the criteria for use of air-purifying respirators. ▸ Atmosphere contains less than 19.5 percent oxygen. ▸ Presence of incompletely identified vapors or gases is indicated by direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin.	▸ Use only when the vapor of gases present are not suspected of containing high concentrations of chemicals that are harmful to skin or capable of being absorbed through the intact skin. ▸ Use only when it is highly unlikely that the work being done will generate either high concentrations of vapors, gases, or particulates or splashes of material that will affect exposed skin.

TABLE 4
DESCRIPTION OF PPE LEVELS

LEVEL OF PROTECTION	EQUIPMENT	PROTECTION PROVIDED	SHOULD BE USED WHEN:	LIMITING CRITERIA
C	**Recommended** ▸ Full-facepiece, air-purifying, canister-equipped respirator. ▸ Chemical-resistant clothing (overalls and long-sleeved jacket; hooded, one- or two-piece chemical splash suit; disposable chemical-resistant one-piece suit). ▸ Inner and outer chemical-resistant gloves. ▸ Chemical-resistant safety boots/shoes. ▸ Hard hat. ▸ Two-way radio communications. **Optional** ▸ Coveralls. ▸ Disposable boot covers. ▸ Face shield. ▸ Escape mask. ▸ Long cotton underwear.	The same level of skin protection as Level B, but a lower level of respiratory protection.	▸ The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect any exposed skin. ▸ The types of air contaminants have been identified, concentrations measured, and a canister is available that can remove the contaminant. ▸ All criteria for the use of air-purifying respirators are met.	▸ Atmospheric concentration of chemicals must not exceed IDLH levels. ▸ The atmosphere must contain at least 19.5 percent oxygen.
D	**Recommended** ▸ Coveralls. ▸ Safety boots/shoes. ▸ Safety glasses or chemical splash goggles. ▸ Hard hat. **Optional** ▸ Gloves. ▸ Escape mask. ▸ Face shield.	No respiratory protection. Minimal skin protection.	▸ The atmosphere contains no known hazard. ▸ Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemical.	▸ This level should not be worn in the Exclusion Zone. ▸ The atmosphere must contain at least 19.5 percent oxygen.

SECTION 7.0
Air Monitoring Program

Air monitoring is not required at this time given the nature of this subcontract work assignment. A site specific air monitoring program will be implemented if deemed necessary during the course of the OM&M work.

SECTION 8.0
Decontamination Procedures

Personnel and equipment decontamination procedures to be employed when exiting contaminated work areas at this project site are detailed in the following subsections.

8.1 PERSONNEL DECONTAMINATION

All personnel will be made aware of any personal habit that may allow contaminants into or onto the body. All personnel will check that regularly worn PPE (e.g., hard hats and liners, eye protection, etc.) is clean and in good condition. Any products for personal consumption or application are prohibited in any work area. Break area(s) will be limited to specific areas where eating, drinking, smoking, etc. and the storage of these materials will be allowed.

No PPE will be removed from a designated work area without proper decontamination or disposal. All personnel leaving the work area will pass through a contamination reduction zone where they will remove their PPE and thoroughly wash/rinse exposed skin with water and biodegradable soap before leaving the project site per the following seven step decontamination SOP.

Step 1: Place equipment and/or samples in area(s) designated in the Equipment Drop-Off Station.

Step 2: Scrape gross contamination from boots and outer gloves, wash using soap in water solution, and rinse with water.

Step 3: Remove tape from around boots and gloves and place in plastic bag or drum provided. Remove overboots and outer gloves and place in plastic bags.

Step 4: Remove respiratory cartridges (if used) and place in plastic bag or drum provided.

Step 5: Remove disposable coveralls and place in plastic bag or drum. Remove boots and store in appropriate location. Remove disposable inner gloves (if worn) and place in plastic bag. Remove hard hat and safety glasses: decontaminate as necessary (wash with sanitizing solution [MSA sanitizing solution or equivalent], rinse with potable water, and allow to dry at the end of each day).

Step 6: Remove respirator (if used) and deposit in plastic bag or drum provided. Avoid touching face with fingers. Respirators will be washed in a sanitizing solution (MSA sanitizer or equivalent), rinsed with potable water, and allowed to air dry at the end of each day.

Step 7: Thoroughly wash/rinse exposed skin with water and biodegradable soap (i.e., trisodium phosphate). Shower and launder personal clothing as soon as possible upon completing daily activities.

Portable decontamination stations (a.k.a., "boot wash" facilities) will be set up in the CRZ adjacent to each hazardous work zone requiring decontamination for personnel. The Boot Wash facilities will be constructed to contain spent wash water, contain a reservoir of clean wash water, a power supply to operate a pump for the wash water, a separate entrance and exit to the decontamination platform with equipment being mobile, allowing easy transport for one hazardous work zone to the next. Personnel will be required to dress down and drum their used PPE in the decontamination area in accordance with the above seven step procedure.

A fixed decontamination trailer equipped with shower facilities will be located in the CRZ near the to the support zone. All personnel will be required to shower before leaving the site.

All materials generated during decontamination will be drummed for disposal in accordance with applicable local, state, and federal regulations.

8.2 EQUIPMENT DECONTAMINATION

Equipment which may have been contaminated during the course of remedial operations will be decontaminated prior to removal from the site. Generally, equipment decontamination will be performed as follows:

1. Conduct gross removal of solids at point of use (i.e., manually scrape off dirt/soil from tires, bucket, etc.).
2. Move to the temporary equipment decontamination pad in the CRZ for decontamination via pressure washing. The self-contained high pressure unit will be capable of heating wash waters to 180°F and providing a nozzle pressure of 150 psi.
3. Perform complete detergent rinse (if necessary) using an environmentally-safe solvent (MSDSs will be provided for any materials brought on-site and will be maintained in the Contractor's field trailer).
4. Perform a final steam rinse.

The HSO will be responsible for inspecting decontaminated equipment before releasing it from the project site. The HSO will certify in writing that each piece of equipment utilized in the "dirty" area has been properly decontaminated prior to removal from the site.

SECTION 9.0
Site Standard Operating Procedures

Site personnel will observe the following Standard Operating Safety Procedures when working at the site.

1. Ensure that all safety equipment and protective clothing is kept clean and well maintained.
2. Ensure that all prescription eyeglasses in use on this project are safety glasses and are compatible with respirators. No contact lenses will be allowed on site.
3. Ensure that all disposable or reusable gloves worn on the site are approved by the HSO.
4. Change respirator filters during periods of prolonged respirator usage in contaminated areas, upon breakthrough. Respirator filters will always be changed daily.
5. Cover footwear used on site by rubber overboots or booties when entering or working in the Exclusion Zone area or CRZ. Boots or booties will be washed with water and detergents to remove dirt and contaminated sediment before leaving the Exclusion Zone or CRZ.
6. Decontaminate or dispose of all PPE used on site at the end of the work day. The HSO will be responsible for ensuring decontamination of PPE before reuse.
7. Individually assign all respirators and do not interchange them between workers without cleaning and sanitizing. Contractor, Subcontractor, and service personnel unable to pass a fit test as a result of facial hair or facial configuration will not enter or work in an area that requires respiratory protection.
8. Ensure that all project personnel have vision or corrected vision to at least 20/40 in one eye.
9. On-site personnel found to disregard any provision of this HASP may be barred from the project.
10. Do not reuse disposable outerwear such as coveralls, gloves, and boots. Used disposable outerwear will be removed upon leaving the hazardous work zone and will be placed inside disposable containers provided for that purpose. These containers will be stored at the site at the designated staging area and the Contractor will be responsible for proper disposal of these materials at the completion of the project.
11. Immediately replace protective coveralls that become torn or badly soiled.
12. Prohibit eating, drinking, chewing gum or tobacco, and smoking in the Exclusion Zone and CRZ.
13. All personnel will thoroughly cleanse their hands, face, and forearms and other exposed areas prior to eating, smoking, or drinking.
14. Workers who have worked in an Exclusion Zone will shower in the on-site decontamination trailer at the completion of the work day.
15. All personnel will wash their hands, face, and forearms before using toilet facilities.
16. Do not allow alcohol, firearms, or drugs (without prescriptions) on site at any time.
17. All personnel who are on medication should report it to the HSO who will make a determination whether or not the individual will be allowed to work and in what capacity. The HSO may require a letter from the individual's personal physician stating what limitations (if any) the medication may impose on the individual.

SECTION 10.0
Emergency Response & Contingency Plan

The following Emergency Response Plan (ERP) considers and recommends:

- Preventative Measures;
- Personnel training and regular safety meetings conducted to reduce the likelihood of accidents;
- Mitigative measures to limit the scope of any accident; and
- Contingency actions to respond to and remedy the effects of accidents.

10.1 PRE-PLANNING

All work will be coordinated with EEPC, IEG, and other involved regulatory personnel. In addition, local police and fire departments, local hospital(s), and local ambulance services will be contacted by the HSO prior to initiation of site operations to inform them of scheduled remedial activities at the site. Arrangements for emergency communication will be made with these organizations prior to initiating on-site operations.

As discussed in Section 5.0 of this HASP, emergency response procedures will be covered as part of each site personnel's training. Training in site-specific emergency procedures will be provided by the site health and safety officer before work begins on-site. This training will include, but is not limited to, the following;

- Emergency chain-of-command;
- Communication methods and signals;
- Location of phones and emergency numbers;
- Use of emergency equipment;
- Evacuation and emergency procedures;
- Off-site support;
- Site-specific hazards;
- Decontamination procedures;
- Standard operating procedures; and
- Location and use of first aid equipment.

10.2 EMERGENCY CHAIN-OF-COMMAND

Personnel will immediately notify the HSO in the event of an emergency using available communications. The HSO will make a rapid assessment of the situation and take appropriate action which (depending upon emergency circumstances) can include notifying the Engineer of the situation; initiating engineering controls (i.e., dust suppression, ventilation, etc.); ordering the suspension of work; ordering evacuation of the work zone; implementing emergency altering and response procedures; requesting emergency medical treatment; and/or administering first aid.

10.3 COMMUNICATION METHODS AND SIGNALS

For emergency situations when two-way radio communication is not available or practical, oral, hand, and semaphore safety signals have been established to protect project personnel. These signals will be made available to personnel for all phases of operation before going on-site. This will ensure quick communication during adverse or emergency situations.

Examples of established signals and their meanings are provided below.

Signal	Indicates
Hand gripping throat	Out of air, can't breath
Wave hands over head from side-to-side	Attention: stand-by for next signal
Swing hand from direction of person receiving signal to directly overhead and through in a circle	Come here
Pointed finger on extended arm	Look in that direction
Grip partner's wrist or both hands around wrist	Leave the area immediately
Hands on top of head	Need assistance
Thumbs up	OK, I'm alright, I understand
Thumbs down	No, negative

Examples of audio signals include:

Signal	Indicates
Short blast of airhorn	Caution or look here
Four (4) blasts of airhorn	Leave the area

Each field team member will be assigned a buddy. Field personnel will watch for hazards or problems his/her buddy might encounter. Buddies will pre-arrange hand signals or other means of emergency signals for communication when respiratory protection or distance makes communication difficult. Communication between buddies must be maintained at all times. Visual contact must be maintained between buddies. Further, buddies must remain in close proximity to each other in order to assist in case of emergencies.

10.4 EVACUATION

Emergency escape routes will be designated by the HSO for use in situations where rapid egress from the Exclusion Zone is required. The locations of these routes will be posted in prominent location(s) on-site (i.e., personnel change trailer, office trailer, break trailer, etc.) and will be reviewed with site personnel during daily tool-box and weekly safety meetings.

An emergency evacuation alarm (i.e., air horn) will be kept on-site at all times. A series of regularly spaced, repeated blasts (four blasts) will be used to signify that all personnel should evacuate the work area. After exiting the work area, personnel will meet at an upwind location designated by the HSO. The emergency alarm will be sounded in the event of any serious problem or emergency on-site which requires the assistance of site personnel or the evacuation of work zone personnel. In all situations when an on-site emergency results in evacuation of the Exclusion Zone, personnel will not be permitted to reenter until:

- The conditions resulting in the emergency have been corrected;
- The hazards have been reassessed;
- This HASP has been reviewed; and
- Site personnel have been briefed on any changes in the HASP.

10.5 EMERGENCY SERVICES/EMERGENCY VEHICLE ACCESS

Emergency telephone numbers (see Table 1) will be posted at each project site telephone. Directions to the local hospital (see Figure 1) also will be posted at the site. In the event that emergency services vehicles (police, fire, ambulance) need access to a location which is blocked by the working crew operations, those operations (equipment, materials, etc.) will be immediately moved to allow those vehicles access. Emergency crews will be briefed as to site conditions and hazards by the HSO. All vehicles and personnel will be decontaminated prior to leaving the site.

10.6 WEATHER-RELATED HAZARD RESPONSE

Threats to site personnel can arise from natural causes (i.e., lightening, high winds, etc.). In the event that severe weather is imminent, the HSO will notify field team members. As the storm approaches, all work will cease, loose objects will be secured, and site personnel will take shelter at pre-arranged locations. After the severe weather event has passed, the HSO will inspect the work area for safety hazards prior to resuming work.

10.7 SPILL CONTROL & CONTINGENCY PLAN

A site-specific Emergency Spill Response Plan is provided in Section 10.0. Specific procedures for responding to spills associated with planned contract operations can be found in said plan.

10.8 PERSONAL INJURIES

In the event of personal injuries the following procedures will be enacted. **An Incident Report Form will be completed by the HSO within 24 hours of the injury.**

1. ***Initial alarm and first aid.*** Upon observation of an injury, site employees will quickly get the attention of other nearby workers; immediately act to protect the injured person from a life-threatening situation; render appropriate first aid; and warn unsuspecting persons of the potential hazard.
2. ***Notify the HSO and the Project Engineer.*** Utilizing available personal radio communications or other rapid communication methods, the HSO and the Project Engineer will be notified of the situation, the identity of the injured person, the type of injury, and the project site location.
3. ***Ambulance and hospital services.*** The HSO will immediately assess the situation and, if necessary, notify the designated off-site hospital of the emergency situation.
4. ***Follow-up.*** The HSO will determine why the injury occurred, and will take appropriate steps to prevent a similar recurrence. Events associated with the injury will be recorded in the safety officer's logbook.

10.8.1 Personnel Injury in the Exclusion Zone

Upon notification of any injury in the Exclusion Zone, the designated emergency signal will be sounded. All site personnel will assemble at a pre-arranged location. A rescue team made up of the HSO and other personnel as needed who have received property training (see Section 4.0) will enter the Exclusion Zone (if required) to remove the injured person to the boundary of the Exclusion Zone. The HSO then will evaluate the nature of the injury. The affected person will be decontaminated as necessary to the extent possible prior to movement to the Support Zone. Appropriate first aid will be initiated (see Section 10.12), and the ambulance and designated medical facility (Table 1) will be contacted if required. No persons will reenter the Exclusion Zone until the cause of the injury or symptoms of the illness have been determined.

10.8.2 Personnel Injury in the Support Zone

Upon notification of an injury in the Support Zone, the HSO will assess the nature of the injury. If the cause of the injury or loss of the injured person does not affect the performance of site personnel, operations may continue. The appropriate first aid will be initiated (see Section 10.12) and necessary follow-up as stated in above. If the injury increases the risk to others, the designated emergency signal will be sounded and all site personnel will move a prearranged location for further instructions. Activities on site will stop until the added risk is removed or minimized.

10.9 FIRE/EXPLOSION

The following contingency plan will be implemented in the event of a fire at the project site.

1. ***Initial Alarm.*** Upon observation of any on-site fire, personnel must immediately notify the HSO (or his designated on-site representative) and the Project Engineer. No attempt will be made to extinguish the fire prior to sounding the alarm.

2. ***Control and/or extinguish small fires which can be suppressed promptly with available on-site equipment.*** Without risking personal injury, an attempt will be made to control or extinguish small fire(s) utilizing ABC-type fire extinguishers. Water will not be used except on wood or paper fires.

3. ***Notify local fire company.*** The HSO and the Project Engineer (or their designated on-site representatives) will immediately assess the situation and, if deemed necessary, notify the local Fire Department of the location and type of fire or explosion. If required, the HSO and/or the Project Engineer (or their designated on-site representatives) will immediately order the site evacuated if a fire occurs which cannot be controlled with a portable fire extinguisher.

4. ***Follow-up.*** The HSO will determine why the fire or explosion occurred, and will take appropriate steps to prevent a similar recurrence. Events associated with the fire or explosion will be recorded in the safety officer's logbook.

An Incident Report must be completed by the HSO and submitted to Corporate Management and the Project Engineer within 24 hours of the fire/explosion.

10.10 PERSONAL PROTECTIVE EQUIPMENT FAILURE

If any site worker experiences a failure or alteration of protective equipment that affects the protection factor, that person and his/her buddy immediately will leave the Exclusion Zone and notify the HSO. Reentry will not be permitted until the equipment has been replaced or repaired, and the affected areas of the person's body have been decontaminated if applicable.

10.11 OTHER EQUIPMENT FAILURE

If any on-site equipment other than PPE (see Section 10.10 above) fails to operate properly, the HSO will be notified. The HSO then will determine the effect of this failure on continuing operations on site. If the failure affects the safety of personnel or prevents the completion of the Work Plan tasks, all personnel will leave the Exclusion Zone until the situation is evaluated and all appropriate actions taken.

10.12 EMERGENCY EQUIPMENT & ON-SITE FIRST AID

Emergency and first aid equipment to be maintained on-site includes:

- The active work area will be provided with approved, portable emergency eye wash and shower units in accordance with ANSI Standard Z358.1 and minimum rating 2A-10 B:C type dry chemical fire extinguishers.

- At least one "industrial" first aid kit and stretcher will be provided and maintained fully stocked at an easily accessible, uncontaminated location to be determined on-site by the HSO. Additional first aid kits will be provided in the event active work areas are so isolated or separated as to make use of the one first aid station impractical.

- First aid/CPR kit locations will be specifically marked by the HSO and provided with adequate water and other supplies necessary to cleanse and decontaminate burns, wounds, or lesions. First aid stations will be supplied with a buffer solution for testing acid and caustic burns. NOTE: CPR should only be started if the worker is trained in CPR and the victim's heart has stopped beating.

- At least two (2) First Aid Technicians certified by the American Red Cross or other approved agency will be on-site at all times.

- 2A-10 B:C type dry chemical fire extinguishers will be provided at all site locations where flammable materials present a fire risk.

- A minimum of two self-contained breathing apparatus (SCBAs) or lower level of protection as site conditions allow will be maintained in contaminated work areas.

Agencies and medical facilities to be contacted in the event of an on-site emergency are identified in Table 1 of this HASP. The Emergency Response Notification Table also includes the route to the nearest hospital. The table (and corresponding map) will be posted in a prominent location(s) on-site.

If a site worker becomes injured or ill, Red Cross first aid procedures and the blood borne pathogens program provided in this HASP will be followed. First aid or other appropriate initial actions will be provided by the trained first aid responders closest to the incident. NOTE: When protective clothing has been grossly contaminated during an accident/injury, contaminants may be transferred to treatment personnel or the wearer and cause injuries. Unless severe medical problems have occurred simultaneously with splashes, protective clothing should be washed off as rapidly as possible and removed. If the worker is ambulatory or can be moved, he/she will be taken to the personnel decontamination station where decontamination procedures, additional first aid, or preparation for transport to the hospital will be accomplished. In the event that the victim could not be decontaminated, the rescue service provider must be notified of that situation.

If the injury to the worker is chemical in nature, the following first aid procedures are to be instituted:

- ***Eye Exposure.*** If contaminated solids or liquids get into the eyes, wash eyes immediately at the emergency eyewash station using large amounts of water and lifting the lower and upper lids occasionally. Wash for at least 15 minutes. Obtain medical attention.

- ***Skin Exposure.*** If contaminated solids or liquids get on the skin, promptly wash the contaminated skin using soap and water. Obtain medical attention immediately when exposed to concentrated solids or liquids.

- ***Respiratory Exposure.*** Move victim to fresh air at once and begin CPR. Phone 911 to obtain immediate medical attention.

- ***Ingestion Exposure.*** For swallowed contaminants, identify the item swallowed. Follow appropriate procedures and obtain medical attention as soon as possible.

NOTE: Any person transported to the hospital for treatment related to an exposure injury will take with them the appropriate information (see Table 2) about the chemical(s) to which he/she has been exposed. MSDSs for chemicals known or suspected to exist on-site will be maintained in the Contractor's field office by the HSO.

SECTION 11.0
Logs, Reports, & Record Keeping

The following health and safety reports will be prepared and submitted as needed and as indicated below.

Daily Safety Report
Employee Meeting Record
Site Log
Accident/Incident Report
Health & Safety Inspection Report
Spill Report
Equipment Decontamination Verification Form

N-2 – Groundwater and Air Sampling

Ecology and Environment Engineering, P. C.

SITE-SPECIFIC HEALTH AND SAFETY PLAN

Project: Mr. C's Dry Cleaners Site – SSDS Ambient Air Sampling and Monitoring Well Installation and Decommissioning Oversight

Project No.: 002700.DC13 – Subtask # .02.01.03 – Air Sampling
002700.DC13 – Subtask # .03 – Oversight of Monitoring Well Network Improvements

TDD/PAN No.: 002700.DC13.02.01.02

Project Location: Village of East Aurora, Erie County, New York

Proposed Dates of Field Activities: December 2011- May 2012

Contract Manager: Tom Heins, P.E.

Project Manager: Michael Steffan

Date Reviewed: M. G. Steffan 12/12/11

Prepared by: R. Moxley

Date Prepared: December 5, 2011

Approved by: Thomas Siener, CIH

Date Approved:

1.3 SITE DESCRIPTION

Site Map: Site maps are provided in the Work Plan.

Site History/Description (see project work plan for detailed description): In 1979 IBM reported a spill of 4,100 gallons of 1,1,1-trichoroethane (TCA) at their Endicott, NY facility. During the subsequent investigations, it was determined that the groundwater contaminant plume also contained trichloroethene (TCE), tetrachloroethene (PCE), dichloroethane (DCA), dichloroethene (DCE), methylene chloride, vinyl chloride and Freon. The investigation of the contaminant plume was broadened with the start of groundwater remediation in 1980, which is ongoing. Groundwater contamination from the former IBM facility has resulted in detectable levels of contaminants in indoor air in structures, including off-site locations in the Village of Endicott and elsewhere in the Town of Union. TCE and PCE are the primary contaminants of concern with respect to indoor air. IBM and NYSDEC have or will install mitigation systems in approximately 500 structures identified as having indoor air problems.

EEEPC's site-specific work will be the indoor ambient air sampling of two sites where subslab depressurization systems are operating and outdoor work performing construction oversight of monitoring well installation and decommissioning in the right-of-way and on public and private properties, off-site of the Mr. C's site.

Is the site currently in operation? Yes, the First Presbyterian Church and 27 Whaley Avenue residence are active and functional properties. The monitoring well network is actively used to monitor the contaminants in of concern the groundwater plume.

Locations of Contaminants/Wastes: PCE and TCE in soil vapor below the OSHA requirement is located below the basement floor slab throughout. See floor plan in **Figure 2.**

Types and Characteristics of Contaminants/Wastes:

☐ Liquid
☐ Flammable/Ignitable
☐ Explosive
☐ Medical/Pathogenic
☐ Solid
☒ Volatile
☐ Reactive
☐ Other: ____________________
☐ Sludge
☐ Corrosive
☒ Carcinogenic
☒ Gas/Vapor
☐ Acutely Toxic
☐ Radioactive

2. ORGANIZATION AND RESPONSIBILITIES

E & E team personnel shall have on-site responsibilities as described in E & E's standard operating procedure (SOP) for Site Entry Procedures (ENV 3.2). The project team, including qualified alternates, is identified below.

Name	Site Role/Responsibility
Michael Steffan	Project Manager
Larry Roedl	Field Team Leader, Ambient Air sampling, & SSO.
Rachael Moxley	Field Team Member

3. TRAINING

Prior to work, E & E team personnel shall have received training as indicated below. As applicable, personnel shall have read the project work plan, sampling and analysis plan, and/or quality assurance project plan prior to project work.

Training	Required
40-Hour OSHA HAZWOPER Initial Training and Annual Refresher (29 CFR 1910.120)	X
Annual First Aid/CPR	X
Hazard Communication (29 CFR 1910.1200)	X
40-Hour Radiation Protection Procedures and Investigative Methods	
8-Hour General Radiation Health and Safety	
Radiation Refresher	
Hazardous Material/Dangerous Goods Shipping and Biannual Refresher	
Other: NYSDOL Asbestos Training	

4. MEDICAL SURVEILLANCE

4.1 MEDICAL SURVEILLANCE PROGRAM

E & E field personnel shall actively participate in E & E's medical surveillance program as described in the Corporate Health and Safety Program and shall have received, within the past year, an appropriate physical examination and health rating.

E & E's health and safety record (HSR) form will be maintained on site by each E & E employee for the duration of his or her work. E & E employees should inform the site safety officer (SSO) of any allergies, medical conditions, or similar situations that are relevant to the safe conduct of the work to which this HASP applies.

Is there a concern for radiation at the site? Yes ☑ **No**

If no, go to 5.1.

4.2 RADIATION EXPOSURE

Not applicable.

5. SITE CONTROL

5.1 SITE LAYOUT AND WORK ZONES

Site Work Zones: Work zones include the interior and exterior of the church and the 27 Whaley Avenue residence, and locations in the ROW and on public and private property in the vicinity, but off-site of Mr. C's. A figure of the monitoring well network improvements is located in the work plan. Due to contaminant levels below the OSHA regulated level, no exclusion zones will be established.

Site Access Requirements and Special Considerations: Permission to access the property has been signed by the property owner(s) or designee.

Illumination Requirements: All outdoor work must be performed during daylight hours only or unless prior approval is obtained and the illumination requirements in 29 CFR 1910.120(m) are satisfied.

Sanitary Facilities (e.g., toilet, shower, potable water): Facilities are identified on the floor plan in Attachment #1

On-Site Communications: Cell phones will be brought on site and maintained by the E&E field team leader.

Other Site-Control Requirements: None known at this time. To be determined.

5.2 SAFE WORK PRACTICES

Daily Safety Meeting: A daily safety meeting will be conducted for all E & E personnel and documented by the Field Team Leader. The information and data obtained from applicable site characterization and analysis will be addressed in the safety meetings and also used to update this HASP, if necessary.

Work Limitations: Work shall be limited to a maximum of 8 hours per day. If 12 consecutive days are worked, at least one day off shall be provided before work is resumed.

Weather Limitations: Work outdoor shall not be conducted during electrical storms. Work conducted in other inclement weather (e.g. severe rain or snow) will be approved by project management and the regional safety coordinator or designee.

6. HAZARD EVALUATION AND CONTROL

6.1 PHYSICAL HAZARD EVALUATION AND CONTROL

Potential physical hazards and their applicable control measures are described in the following table for each task.

Hazard	Task Number	Hazard Control Measures
Biological (flora, fauna, etc.)	A & B	Potential hazard: Bee stings, poison ivy, or dog bites. Establish site-specific procedures for working around identified hazards. Other:
Cold Stress	All, when performed in winter	Provide warm break area and adequate breaks. Provide warm non-caffeinated beverages. Promote cold stress awareness. See *Cold Stress Prevention and Treatment* (attached at the end of this plan if cold stress is a potential hazard).
Compressed Gas Cylinders	None	Use caution when moving or storing cylinders. A cylinder is a projectile hazard if it is damaged or its neck is broken. Store cylinders upright and secure them by chains or other means. Other:
Confined Space	None	Ensure compliance with 29 CFR 1910.146. See SOP for Confined Space Entry. Additional documentation is required. Other:
Drilling/Direct Push	None	See SOP for Health and Safety on Drilling Rig Operations. Additional documentation may be required. Other:

Hazard	Task Number	Hazard Control Measures
Drums and Containers	None	Ensure compliance with 29 CFR 1910.120(j). Consider unlabeled drums or containers to contain hazardous substances and handle accordingly until the contents are identified. Inspect drums or containers and assure integrity prior to handling. Move drums or containers only as necessary; use caution and warn nearby personnel of potential hazards. Open, sample, and/or move drums or containers in accordance with established procedures; use approved drum/container-handling equipment. Other:
Electrical	A	Ensure compliance with 29 CFR 1910 Subparts J and S. Locate and mark energized lines. De-energize lines as necessary. Ground all electrical circuits. Guard or isolate temporary wiring to prevent accidental contact. Evaluate potential areas of high moisture or standing water and define special electrical needs. Other: ____________________
Excavation and Trenching	None	Ensure that excavations comply with and personnel are informed of the requirements of 29 CFR 1926 Subpart P. Ensure that any required sloping or shoring systems are approved as per 29 CFR 1926 Subpart P. Identify special personal protective equipment (PPE) (see Section 7) and monitoring (see Section 8) needs if personnel are required to enter approved excavated areas or trenches. Maintain line of sight between equipment operators and personnel in excavations/trenches. Such personnel are prohibited from working in close proximity to operating machinery. Suspend or shut down operations at signs of cave in, excessive water, defective shoring, changing weather, or unacceptable monitoring results. Other: ____________________

Hazard	Task Number	Hazard Control Measures
Fire and Explosion	A	Inform personnel of the location(s) of potential fire/explosion hazards. Establish site-specific procedures for working around flammables. Ensure that appropriate fire suppression equipment and systems are available and in good working order. Define requirements for intrinsically safe equipment. Identify special monitoring needs (see Section 8). Remove ignition sources from flammable atmospheres. Coordinate with local fire-fighting groups regarding potential fire/explosion situations. Establish contingency plans and review daily with team members. Other: ______________________________
Heat Stress	All when performed in summer	Provide cool break area and adequate breaks. Provide cool non-caffeinated beverages. Promote heat stress awareness. Use active cooling devices (e.g., cooling vests) where specified. See *Heat Stress Prevention and Treatment* (attached at the end of this plan if heat stress is a potential hazard).
Heavy Equipment Operation	None	Define equipment routes, traffic patterns, and site-specific safety measures. Ensure that operators are properly trained and equipment has been properly inspected and maintained. Verify back-up alarms. Ensure that ground spotters are assigned and informed of proper hand signals and communication protocols. Identify special PPE (Section 7) and monitoring (Section 8) needs. Ensure that field personnel do not work in close proximity to operating equipment. Ensure that lifting capacities, load limits, etc., are not exceeded. Other: ______________________________
Heights (Scaffolding, Ladders, etc.)	A	Ensure compliance with applicable subparts of 29 CFR 1910. Identify special PPE needs (e.g., lanyards, safety nets, etc.) Other: ______________________________

Hazard	Task Number	Hazard Control Measures
Noise	A & B	Establish noise level standards for on-site equipment/operations. Inform personnel of hearing protection requirements (Section 7). Define site-specific requirements for noise monitoring (Section 8). Other: ______
Overhead Obstructions	A & B	Wear hard hat. Other: ______
Power Tools	A	Ensure compliance with 29 CFR 1910 Subpart P. Use care when lifting tools. Be prepared for excessive torque when using drills & rotary hammers. Other: ______
Sunburn	None	Apply sunscreen. Wear hats/caps and long sleeves. Other: ______
Utility Lines (outdoor & underground)	None	Identify/locate existing utilities prior to work. Ensure that overhead utility lines are at least 25 feet away from project activities. Contact utilities to confirm locations, as necessary. Other: ______
Weather Extremes	None	Establish site-specific contingencies for severe weather situations. Provide for frequent weather broadcasts. Weatherize safety gear, as necessary (e.g., ensure eye wash units cannot freeze, etc.). Identify special PPE (Section 7) needs. Discontinue work during severe weather. Other: ______
Other:	None	__ ______ ______

6.2 CHEMICAL HAZARD EVALUATION AND CONTROL

6.2.1 Chemical Hazard Evaluation

Potential chemical hazards are described by task number in Table 6-1. Hazard Evaluation Sheets for major known contaminants are attached to the end of this plan.

Table 6-1

CHEMICAL HAZARD EVALUATION

Task Number	Compound	Exposure Limits (TWA)			Dermal Hazard (Y/N)	Routes of Exposure	Acute Symptoms	Odor Threshold/ Description	FID/PID	
		PEL	REL	TLV					Relative Response (%)	Ionization Potential (eV)
A	Tetrachloroethene (PCE)	25 ppm	0.4 Ppm	100 ppm	Y	Inh, Ing, Eye, Skin	Irritation of the eyes, skin, throat, dizziness, headache, nausea, and difficulty breathing	Odor like ether or chloroform	70	9.32
A	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	1000 ppm	1000 ppm	1000 ppm	N	Inh, Ing Eye, Skin	Skin irritation, dermatitis, central nervous central depression	Sweet aromatic	85	11.99
A	1,1,1-Trichloroethane	350 ppm	350 ppm	350 ppm	Y	Inh, Ing, Eye, Skin	Irritation of eyes/skin, headache, weakness, exhaustion, CNS depression, poor equilibrium, cardiac arrhythmia	Sweet odor	105	11.3
A	Trichloroethene	100 ppm	25 ppm	50 ppm	Y	Inh, Ing, Eye, Skin	Irritation of eyes/nose/throat, vomiting, difficulty breathing	50 ppm	70	9.45
A	Methylene Chloride	25 ppm	***	50 ppm	Y	Inh, Ing, Eye, Skin	Irritation of the eyes, skin, throat, dizziness, headache, nausea, and difficulty breathing	Colorless liquid with a mild sweet odor	100	11.32

KEY:

* Chemical is a known or suspected carcinogen.
--- Information not available
C = Ceiling
CNS = Central Nervous System
eV = electron volts
Ing = Ingestion

Inh = Inhalation
PEL = Permissible exposure limit (OSHA)
ppm = parts per million
REL = Recommended exposure limit (NIOSH)
TLV = Threshold Limit Value (ACGIH)
TWA = Time weighted average

* - Potential occupational carcinogen – NIOSH 2004
** - Lowest Feasible concentration – NIOSH 1992
*** - Lowest Feasible concentration - NIOSH 1999

6.2.2 Chemical Hazard Control

An appropriate combination of engineering/administrative controls, work practices, and PPE shall be used to reduce and maintain employee exposures to a level at or below published exposure levels (see Section 6.2.1).

Applicable Engineering/Administrative Control Measures: None.

PPE: See Section 7.

6.3 RADIOLOGICAL HAZARD EVALUATION AND CONTROL

Not applicable.

7. LEVEL OF PROTECTION AND PERSONAL PROTECTIVE EQUIPMENT

7.1 LEVEL OF PROTECTION

The following levels of protection (LOPs) have been selected for each work task based on an evaluation of the potential or known hazards, the routes of potential hazard, and the performance specifications of the PPE. On-site monitoring results and other information obtained from on-site activities will be used to modify these LOPs and the PPE, as necessary, to ensure sufficient personnel protection. The authorized LOP and PPE shall only be changed with the approval of the regional safety coordinator or designee. Level A is not included below because Level A activities, which are performed infrequently, will require special planning and addenda to this HASP.

Number	B	C	D	Modifications Allowed?
A			X	Yes
B			X	Yes

Note: Use "X" for initial levels of protection. Use "(X)" to indicate levels of protection that may be used as site conditions warrant.

7.2 PERSONAL PROTECTIVE EQUIPMENT

The PPE selected for each task is indicated below. E & E's PPE program complies with 29 CFR 1910.120 and 29 CFR 1910 Subpart I and is described in detail in the Corporate Health and Safety Program. Refer to 29 CFR 1910 for the minimum PPE required for each LOP.

PPE	Task Number/LOP							
	A	B						
Full-face APR								
Powered APR								
Cartridges:								
H								
GMC-P-100								
GMA-H								
Other:								
Positive-pressure, full-face SCBA								
Spare air tanks (Grade D air)								
Positive-pressure, full-face, supplied-air system								
Cascade system (Grade D air)								
Manifold system								
5-Minute escape mask								
Safety glasses	X	X						
Monogoggles								
Protective clothing:								
Tyvek		(X)						
Saranex								
Other:								
Splash apron								
Inner gloves:								
Cotton								
Nitrile		X						
Latex								
Other:								
Outer gloves:								
Viton								
Rubber								
Neoprene								
Nitrile								
Other:								
Work gloves	(X)	(X)						
Safety boots (as per ANSI Z41)	X	X						
Neoprene safety boots (as per ANSI Z41)								
Boot covers (type: latex)	(X)	(X)						
Hearing protection (type: foam plugs, or better)	(X)	(X)						
Hard hat	(X)	(X)						
Face shield								
Other:								
Other:								

8 HEALTH AND SAFETY MONITORING

Health and safety monitoring will be conducted to ensure proper selection of engineering/administrative controls, work practices, and/or PPE so that employees are not exposed to hazardous substances at levels that exceed permissible exposure/dose limits or published exposure levels. Health and safety monitoring will be conducted using the instruments, frequency, and action levels described in Table 8-1. Health and safety monitoring instruments shall have been appropriately calibrated and/or performance-checked prior to use.

Table 8-1

HEALTH AND SAFETY MONITORING

Instrument	Task Number	Contaminant	Monitoring Location	Monitoring Frequency	Action Levels[a]	
☐ PID (e.g., HNu IS-101) ☐ FID (e.g., OVA 128-GC)	A & B	Organic vapors	Breathing zone	continuous	**Unknown Vapors** Background to 1 ppm: Level D 1 to 5 ppm above background: Level C 5 to 500 ppm above backgrnd: Level B >500 ppm above background: Level A	**Contaminant-Specific**
Oxygen Meter/Explosimeter	None	Explosive gases	At drilling location	continuous	**Oxygen** <19.5% or >22.0%: Evacuate area; eliminate ignition sources; reassess conditions. 19.5 to 22.0%: Continue work in accordance with action levels for other instruments.	**Explosivity** ≤10% LEL: Continue work in accordance with action levels for other instruments; monitor continuously for combustible atmospheres. >10% LEL: Evacuate area; eliminate ignition sources; reassess conditions.
Other:						

[a] Unless stated otherwise, airborne contaminant concentrations are measured as a time-weighted average in the worker's breathing zone. Acceptable concentrations for known airborne contaminants will be determined based on OSHA/NIOSH/ACGIH and/or NRC exposure limits. As a guideline, the PEL/REL/TLV, whichever is lower should be used.

9. DECONTAMINATION PROCEDURES

All equipment, materials, and personnel will be evaluated for contamination upon leaving the exclusion area. Equipment and materials will be decontaminated and/or disposed and personnel will be decontaminated, as necessary. Decontamination will be performed in the contamination reduction area or any designated area such that the exposure of uncontaminated employees, equipment, and materials will be minimized. Specific procedures are described below.

Equipment/Material Decontamination Procedures (specified by work plan): No decontamination of items by construction oversight personnel is expected at the project site. PPE may be required during air sampling activities, but is not expected.

Ventilation: __

Personnel Decontamination Procedures: Protective clothing to be removed in a manner that will minimize the potential of contaminant to skin contact.

PPE Requirements for Personnel Performing Decontamination: Appropriate splash protection to be worn during steam cleaning and/or a wet decon.

Personnel Decontamination in General: Following appropriate decontamination procedures, all field personnel will wash their hands and face with soap and potable water.

Disposition of Disposable PPE: Disposable PPE must be rendered unusable and disposed with the subcontractor for abatement work.

Disposition of Decontamination Wastes (e.g., dry wastes, decontamination fluids, etc.): Used PPE is to be double bagged if deemed non-hazardous.

10. EMERGENCY RESPONSE

This section contains additional information pertaining to on-site emergency response and does not duplicate pertinent emergency response information contained in earlier sections of this plan (e.g., site layout, monitoring equipment, etc.). Emergency response procedures will be rehearsed regularly, as applicable, during project activities.

10.1 EMERGENCY RESPONSIBILITIES

All Personnel: Personnel for Tasks A & B shall be alert to the possibility of an on-site emergency; report potential or actual emergency situations to the oversight team leader and SSO; and notify appropriate emergency resources, as necessary.

Team Leader: The team leader will determine the emergency actions to be performed by E & E personnel and will direct these actions. The team leader also will ensure that applicable incidents are reported to appropriate E & E and client project personnel and government agencies.

Site Safety Officer: The SSO will recommend health/safety and protective measures appropriate to the emergency. Recommendations will be made with the concurrence of the regional safety coordinator as necessary.

Other:

10.2 LOCAL AND SITE RESOURCES (including phone numbers)

Ambulance: **911**

Hospital: **MERCY AMBULATORY CARE CENTER, 3669 Southwestern Boulevard, Orchard Park, NY 14127**
General Phone Number – (716) 662-0500.

Directions to Hospital: See location map for **Mercy Ambulatory Care Center** attached at the end of this plan.

Poison Control: 1-800-222-1222

Police Department: 911

Fire Department: 911

Client Contact: William Welling (New York Department of Environmental Conservation)

Site Contact: None

On-Site Telephone Number: Oversight personnel to be equipped with cellular telephone.

Cellular Telephone Number: Mike Steffan 716-481-5535; additional numbers to be determined.

Radios Available: None

Other:

10.3 E & E EMERGENCY CONTACTS

E & E Emergency Response Center (24 Hours):	716/684-8060
Corporate Health and Safety Director, Dr. Paul Jonmaire:	716/684-8060 (office) 716/655-1260 (home)
Regional Office Contact, Tom Siener, CIH:	716/684-8060 (office) 716/662-4740 (home)
Other:	

10.4 OTHER EMERGENCY RESPONSE PROCEDURES

On-Site Evacuation Signal/Alarm (must be audible and perceptible above ambient noise and light levels): Sound car horn in continuous mode for 10 seconds.

On-Site Assembly Area: At E & E support vehicle.

Emergency Egress Route to Get Off Site: TBD per site location.

Off-Site Assembly Area: TBD

Preferred Means of Reporting Emergencies: Telephone, see emergency contact information above.

Site Security and Control: In an emergency situation, personnel will attempt to secure the affected area and control site access.

Emergency Decontamination Procedures: Wash hands and remove contaminated outer wear.

PPE: Personnel will don appropriate PPE when responding to an emergency situation within the exclusion zone. The SSO and Section 7 of this plan will provide guidance regarding appropriate PPE.

Emergency Equipment: Appropriate emergency equipment is listed in Attachment 3. Adequate supplies of this equipment shall be maintained in the support area or other approved work location.

Incident Reporting Procedures: Report using telephone to appropriate authorities.

ATTACHMENT 1
EQUIPMENT/SUPPLIES CHECKLIST

INSTRUMENTATION	No.
OVA	
Thermal desorber	
O_2/explosimeter w/cal. kit	
Photovac tip	
PID (probe: ___eV)	
Magnetometer	
Pipe locator	
Weather station	
Draeger tube kit (tubes: ______________)	
Brunton compass	
Real-time cyanide monitor	
Real-time H_2S monitor	
Heat stress monitor	
Noise equipment	
Personal sampling pumps and supplies	
MiniRam dust monitor	
Mercury monitor	
Spare batteries (type________________)	
RADIATION EQUIPMENT/SUPPLIES	
Documentation forms	
Portable ratemeter	
Scaler/ratemeter	
1" NaI gamma probe	
2" NaI gamma probe	
ZnS alpha probe	
GM pancake probe	
Tungsten-shielded GM probe	
Micro R meter	
Ion chamber	
Alert monitor	
Pocket dosimeter	
Dosimeter charger	
Radiation warning tape	
Radiation decon supplies	
Spare batteries (type:______________)	
SAMPLING EQUIPMENT	
4-oz. bottles	
1-liter amber bottles	
VOA bottles	
Gauze pads	
Hand bailers	
Spoons	
Bottle labels	X

EMERGENCY EQUIPMENT	No.
First aid kit	X
Stretcher	
Portable eye wash	
Blood pressure monitor	
Fire blanket	
Fire extinguisher	
Thermometer (medical)	
Spill kit	
DECONTAMINATION EQUIPMENT	
Wash tubs	
Buckets	
Scrub brushes	
Pressurized sprayer	
Spray bottle	
Detergent (type: Alconox/Liquinox)	
Solvent (type: ________________)	
Plastic sheeting	X
Tarps and poles	
Trash bags	X
Trash cans	
Masking tape	
Duct tape	X
Paper towels	X
Face mask	
Face mask sanitizer	
Step ladders	
Distilled water	
Deionized water	
Drums (USDOT)	
MISCELLANEOUS (Cont.)	
Gatorade or equivalent	
Tables	
Chairs	
Weather radio	
Two-way radios.	
Binoculars	
Megaphone	
Cooling vest	

ATTACHMENT 1
EQUIPMENT/SUPPLIES CHECKLIST

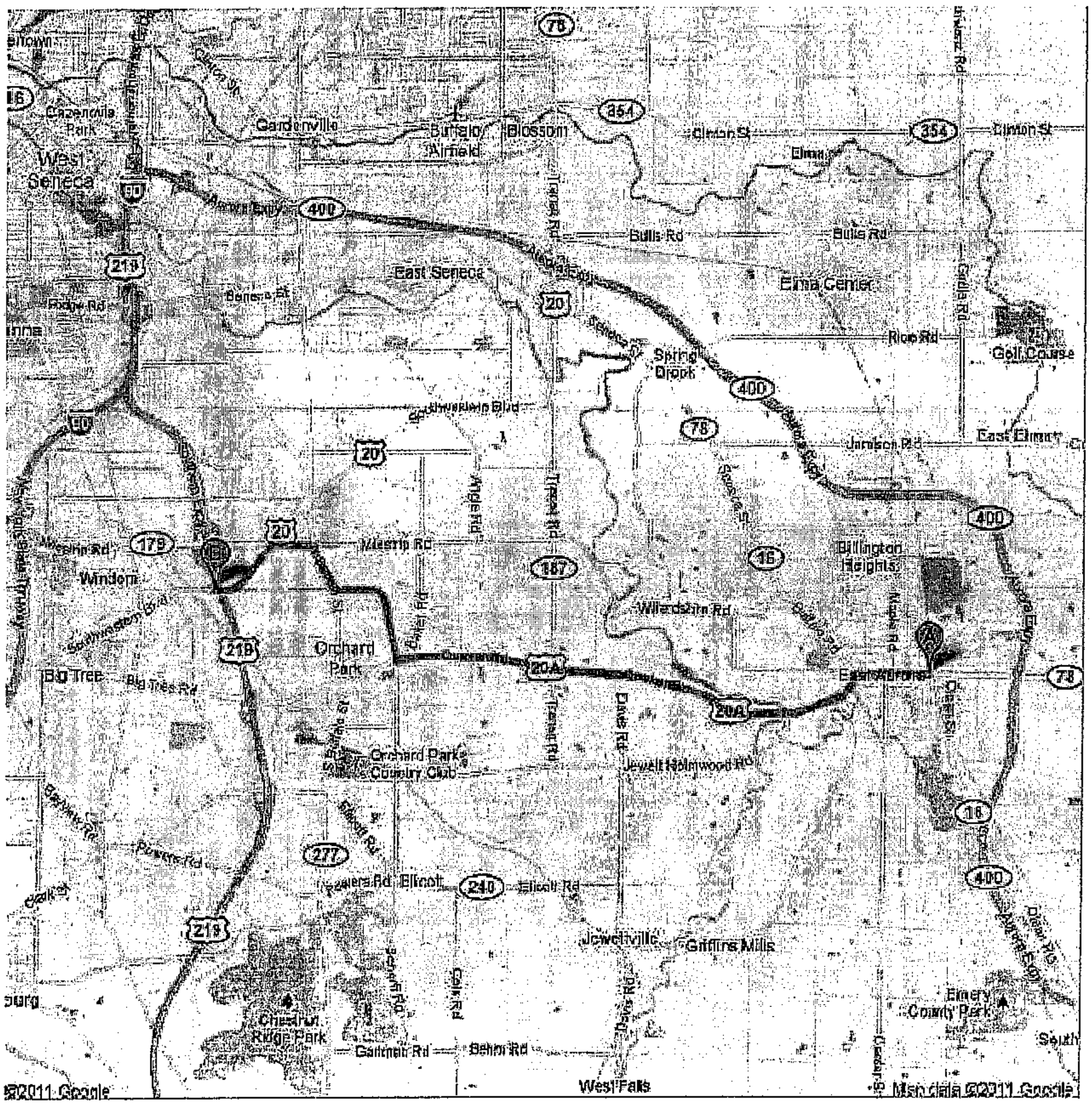
MISCELLANEOUS	No.	SHIPPING EQUIPMENT	No.
Pump		Coolers	
Surveyor's tape		Paint cans with lids and clips	
100' Fiberglass tape		Bubble Wrap	
300' Nylon rope		Shipping labels	
Nylon/polyethylene string		DOT labels:	
Surveying flags		"Up"	
Camera – Digital	X	"Danger"	
Extra Batteries	X	"Inside Container Complies ..."	
		Hazard Group	
Soil auger		Strapping tape	
Pick		Baggies	
Shovel		Custody seals	
Catalytic heater		Chain-of-custody forms	X
Propane gas		Federal Express forms	
Banner tape		Clear packing tape	X
Surveying meter stick		Permanent markers	X
Chaining pins and ring			
Logbooks (X large, small)	X		
Required MSDSs			
Intrinsically safe flashlight			
Potable water			

LOCATION OF MERCY AMBULATORY CARE CENTER

3669 Southwestern Boulevard, Orchard Park, NY 14127

Phone Number:

716-662-0500



Route to Hospital:

1. Start at **Mr. C's Cleaners, 586 Main Street, East Aurora, NY** going **WEST** toward Whaley Avenue - go **0.8** mi
2. At the traffic circle, take the **2nd** exit onto **Ernst Pl** - go **354** ft
3. Continue onto **U.S. 20A W/Hamburg St** - go **5.5** mi
4. Turn R onto **Freeman Rd** - go **0.8** mi
5. Continue onto **Webster Rd** - go **0.5** mi
6. Turn R on **NY-240 N/NY-277 N/N Buffalo St** - go **0.6** mi
7. Take the **3rd** L onto **Milestrip Rd** - go **0.5** mi
8. Take the **1st** L onto **US-20 W/Southwestern Blvd** - go **0.9** mi
9. Arrive at Mercy Ambulatory Care Center, 3669 Southwestern Boulevard, Orchard Park, NY 14127, Destination will be on the left.