ATTACHMENT A
FINAL FIELD ACTIVITIES PLAN

GROUNDWATER EVALUATION
ANCHOR LITH KEM KO SITE
Site Number: 1-30-021

Work Assignment No.
D004436-08

Prepared for:

SUPERFUND STANDBY PROGRAM
New York State
Department of Environmental Conservation
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Albany, New York 12233

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1.0 INTRODUCTION

1.1 PURPOSE OF THE WORK ASSIGNMENT

The purpose of this Field Activities Plan (FAP), Attachment A to the Work Plan, is to describe activities planned for the field sampling and related activities portions of the site investigation at the Anchor Lith Kem Ko site (hereafter referred to as the "site"). The site is an Inactive New York State Superfund site (Site No. 1-30-021). The work will be performed in accordance with NYSDEC Division of Environmental Remediation Draft DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC, 2002) and the scope of work specified in the Work Assignment Issuance letter (NYSDEC, July 2007).

The work described in this FAP is being performed under the Earth Tech Northeast, Inc. (Earth Tech) NYSDEC Superfund Standby Contract Work Assignment No. D004436-08. The FAP provides the detailed procedures for the installation of monitoring wells and the collection of environmental samples.

The quality assurance protocols applicable to this project are presented in the Quality Assurance Project Plan (QAPP), provided as Attachment B to the Work Plan. The health and safety plan (HASP) is provided as Attachment C to the Work Plan.

The objective of the work assignment is to conduct a groundwater evaluation in order to determine if contamination is emanating from the site.

1.2 SITE DESCRIPTION

The Anchor Kem Ko site is located at 500 West John Street in the Village of Hicksville, Town of Oyster Bay, Nassau County, New York (Section 11: Block 499, Lot 87). The site covers approximately 1.5 acres (100 feet by 400 feet) and includes a 28,850 square foot, two-story masonry structure. The remaining portions of the site are mainly covered by pavement except for a localized grassy area adjacent to West John Street. The site is currently occupied by the Cookie Factory Outlet.

The surrounding area is predominantly industrial with a recreational area to the northeast. The site is bordered to the west and east by commercial property, to the south by West John Street, and to the north by Cantiague Park, a 125-acre recreational facility which includes a golf course. The aerial photograph provided on Figure 1 depicts the general conditions of the site and the adjacent properties.

A groundwater recharge basin lies to the east of the Site. Public water is available to everyone in the area, but the contaminated groundwater is a potential threat to the water supply wells. These water districts are located less than 6,500 feet south of the site.

1.2.1 Operational/Disposal History

Anchor Chemicals operated at the John Street location from 1964 to 1986. In 1978, Anchor Chemical was purchased by Chessco Industries and the facility name was changed to Anchor Lith Kem Ko. This facility blended and packed chemicals for the graphic art industries. Contamination at the site is generally attributed to the building's past use as a chemical blending and packaging operation. The chemicals utilized at the site were stored in seven above ground storage tanks (ASTs) and seventeen underground storage tanks (USTs). The ASTs ranged from 550 to 1,500 gallons. The USTs were located beneath the concrete floor of the building with capacities ranging from 500 to 4,000 gallons. From 1981 to 1991, all the known USTs were emptied and abandoned in place, and the ASTs were removed.

1.2.2 Remedial History

Soil and groundwater samples results taken since 1977 indicate the primary contaminants are 1,1,1-trichloroethane (1,1,1-TCA), trichloroethene, methylene chloride, and tetrachloroethene (PCE).

In September 1995, a Record of Decision (ROD) was issued for this site, which required soils contaminated with 1,1,1-TCA, chromium, and lead be removed from four dry wells to prevent further groundwater contamination. The contaminated material within the dry wells was removed on September 29, 1995. Elevated groundwater 1,1,1-TCA concentrations ranges from 2 to 8 parts per billion (ppb). In groundwater chromium concentrations ranged from 132 to 1,440 ppb and lead concentrations ranged from 30.2 to 240 ppb. In the soil samples 1,1,1-TCA was detected at 3,300 ppb, chromium concentrations ranged from 101 parts per million (ppm) to 463 ppm and lead concentrations ranged from 607 to 1,620 ppm.

In April 1996 and July 1997, USEPA collected confirmatory groundwater samples from MW-4, MW-5S, MW-5D, MW-6S, and MW-6D to evaluate the groundwater quality on-site. Based on the sample results, EPA deleted the site from the NPL in September 1999.

In December 2005, NYSDEC sampled the five existing groundwater monitoring wells determined to be in "good" condition, identified as MW-4, MW-5S, MW-5D, MW-6S, and MW-6D; the results of this sampling event suggests that the on-site groundwater underlying the site is no longer contaminated.

However, low levels of 1,1,1-TCA were detected in public wells located in the region from 1977 to 2005. Due to the lack of an off-site groundwater evaluation performed during the remedial investigation, a preliminary investigation of the aquifer down-gradient of the site is necessary to determine if contaminated groundwater has migrated off-site.

A more detailed site description and site history is provided in Section 1 of the Work Plan.

1.3 SITE ACCESS

NYSDEC will obtain permission from the current owners of the site for the installation of temporary soil vapor and groundwater sampling. The remaining sampling locations are on the right-of-way. Permits will be obtained from Hicksville to install and/or sample from the sidewalk or roadway.

2.0 GENERAL FIELD ACTIVITIES

General field activities include mobilization, implementing the site health and safety plan (included in Attachment C to the Work Plan), decontamination procedures and handling of investigation derived waste, utility clearance procedures and a site survey. The QAPP is presented as Attachment B to the Work Plan

2.1 MOBILIZATION

Following authorization to proceed with the field investigation from NYSDEC, Earth Tech will mobilize necessary materials and equipment to the Site.

A project kick-off meeting will be held prior to initiating field work to orient field team members and subcontractors with the Site and to familiarize Earth Tech personnel and our subcontractor personnel with site background, scope of work, potential dangers, health and safety requirements, emergency contingencies and other field procedures.

2.2 HEALTH AND SAFETY

It is anticipated that the work to be completed at the Site will be performed in level D personal protection. See Attachment C for the HASP.

2.3 DECONTAMINATION PROCEDURES AND HANDLING OF INVESTIGATION DERIVED WASTE

All drilling equipment will be steam cleaned prior to installation of the next monitoring well. All dedicated equipment and tools used to develop monitoring wells or collect samples for chemical analysis will be decontaminated prior to and between each sample interval using a Alconox rinse and potable water rinse prior to reuse.

Investigation derived waste (IDW) consisting of soil cuttings and purge water will be staged in appropriate containers and analyzed to determine the appropriate disposal methods. Based on the analytical results Earth Tech will dispose of the IDW at a NYSDEC approved disposal facility.

2.4 UTILITY CLEARANCE

Prior to the initiation of subsurface borings or penetrations, a utility markout will be ordered by the contractor performing the penetrations or borings. In addition, a location-specific utility survey will be performed by Enviroprobe, Inc.

2.5 SITE SURVEY

Earth Tech will utilize available aerial photography to develop a site plan depicting general (existing) site features (i.e., buildings, roadways, etc.) within the vicinity of the site. The locations of all sample points and existing monitoring wells will be surveyed by a subcontractor, YEC. The horizontal and vertical positions will be tied in to the North American Datum 1983 and UTM Zone 18N coordinate system. The vertical positions will be tied to the North American Vertical Datum 1988 (NAVD88) or an established site datum identified on the site plan. The measuring point associated with the existing monitoring wells will be recorded to a vertical accuracy of 0.01 ft.

3.0 PHASE I WELL INSTALLATION AND GROUNDWATER SAMPLING (TASK 2)

This section outlines the procedures that will be used in the installation of seven Solinst CMT Multilevel Systems and sampling of monitoring wells 11 locations in the vicinity of the site. These activities will be conducted to determine if contamination is emanating from the site via groundwater.

3.1 SOLINST CMT MULTILEVEL SYSTEM INSTALLATION

Seven Solinst CMT Multilevel Systems will be installed by Solinst certified driller/installer. Earth Tech will observe the installation at each location.

Each CMT boring will be advanced using a combination of hollow stem augers (HSAs) and spin casing. HSAs will be advanced into the water table (approximately 70 ft bgs) in order to seal off the unsaturated soils. The boring will continue with spin casing to the targeted depth. The CMT device will then be installed in the casing in accordance with the Solinst CMT Multilevel System Assembly Manual included in Appendix 1. The driller, SGS Environmental Services, Inc., is a certified Solinst installation contractor. Once the CMT device has been placed in the cased borehole, the driller will install sand pack around each two foot screen interval. Bentonite will be placed on top of the screened interval to the next screened interval. This process will be repeated for each of the seven CMT sampling ports. The remaining annual space will be grouted to the ground surface. A flush-mounted well cover will be installed in a cement pad at ground surface. Each CMT will be developed to the extent practical. A well development form is provided in Appendix 2.

Soil cuttings generated from the boreholes will be logged and documented by a geologist or engineer. Notes will be kept in both bound field books and boring logs. The Unified Soil Classification System will be used to describe the soil. Cuttings will also be screened for VOCs using an organic vapor analyzer equipped with a photoionization detector (PID).

3.2 SOLINST CMT WELL DEVELOPMENT

Once drilling operations are completed, the Solinst certified driller will develop each CMT sampling port. An appropriate Solinst pump will be used to purge each point. The goal of the development effort will be to achieve a turbid free or low turbid flow of groundwater from the sampling port. Development efforts will be limited to approximately one-half hour per sampling port.

3.3 WATER LEVEL SURVEY

Immediately prior to the groundwater sampling, the depth to water in each monitoring well and CMT will be gauged to provide information on groundwater flow in the vicinity of the site. Water level measurements will be recorded in the field notebook and on the form included in Appendix 2 (Field Forms) of this FAP. Based on field measurements and an established survey datum, Earth Tech will generate a groundwater elevation contour map.

3.4 GROUNDWATER SAMPLING

Approximately fourteen days after the installation and development of the proposed CMTs, an initial round of groundwater samples will be collected from each of the seven ports in the seven new CMT locations shown in Figure 3. Sampling will be conducted in addition to 11 existing monitoring wells shown in Figure 2.

CMTs will be sampled using low-flow techniques to the extent practical; depth to water cannot be measured during purging because the CMT channels are too narrow to accommodate the sampling tube and a water level probe but the field parameters will be recorded to determine when to collect each sample. If low flow techniques cannot be used, the CMTs will be sampled in accordance with the procedures outlined in the CMT Manual in Appendix 1. Monitoring wells will be purged via low flow sampling methods (in low yield wells, the sample may be collected after well recharges if purged dry) as outlined in Appendix 3 of this FAP. These forms include purge logs which will provide details on the groundwater conditions prior to sampling.

3.5 ANALYSES OF GROUNDWATER SAMPLES

Groundwater samples will be analyzed for volatile organic compounds (VOCs) by EPA Method 8260 and TAL metals by EPA method 6010/7141. The analytical samples required are summarized in Table 2 of the QAPP (Work Plan Attachment B); with further detail on the analytical requirement provided in the QAPP.

3.6 PHASE II WELL INSTALLATION AND GROUNDWATER SAMPLING

The Phase II investigation will be conducted similar to the Phase I if implemented.

4.0 FIELD EQUIPMENT CALIBRATION AND MAINTENANCE

Field testing of groundwater will be performed during purging of wells prior to sampling for laboratory samples. Field QC checks of control limits for pH, specific conductance (conductivity), temperature and turbidity are detailed below. The calibration frequencies discussed below are the minimum. Field personnel will check calibration more frequently in adverse conditions, if anomalous readings are obtained, or subjective observations of instrument performance suggest the possibility of erroneous readings.

4.1 PH METER

The pH meter will be calibrated each morning prior to initial use, using two standards bracketing the range of interest (generally 4.0 and 7.0). If the pH QC control sample (a pH buffer, which may be the same or different than those used to initially calibrate the instrument) exceeds ± 0.1 pH units from the true value, the source of the error will be determined and the instrument recalibrated. If a continuing calibration check with pH 7.0 buffer is off by ± 0.1 pH units, the instrument will be recalibrated. Expired buffer solutions will not be used.

Note that gel-type probes take longer to equilibrate (up to 15 minutes at near-freezing temperatures); this must be taken into account in calibrating the instrument and reading samples and standards.

4.2 SPECIFIC CONDUCTIVITY

A vendor-provided conductivity standard will be used to check the calibration of the conductivity meter each morning prior to initial use. Specific conductance QC samples will be on the order of 0.01 or 0.1 molar potassium chloride solutions in accordance with manufacturer's recommendations.

4.3 TURBIDITY

The turbidity meter will be calibrated using a standard as close as possible to 50 nephelometric turbidity units (NTU) (the critical value for determining effectiveness of well development and evacuation). The turbidity meter will be calibrated and checked prior to initial use. The turbidity QC sample will be a commercially prepared polymer standard (Advanced Polymer System, Inc., or similar).

4.4 TEMPERATURE

Temperature probes associated with instruments (such as the YSI SCT-33 conductivity and temperature meter) are not subject to field calibration, but the calibration should be checked to monitor instrument performance. It is recommended that the instrument's temperature reading be checked against a NBS-traceable thermometer concurrently with checking the conductivity calibration. The instrument manual will be referenced for corrective actions if accurate readings cannot be obtained.

5.0 SAMPLE IDENTIFICATION, NUMBERING, AND LABELING

Groundwater samples will be identified by the CMT monitoring well number from which they are collected (e.g., PW02). New monitoring wells will be numbered PW01 through PW07 (PW08 through PW18 for Phase II). Each port on the CMT will be designated by the top of screened interval in ft below ground surface. So for example, the third sampling port for PW04 (assuming the depth to the top of the fourth port/screen is 130 ft bgs) will be labeled PW04-130.

Field duplicates will have the same number as the original sample, with 50 added. For example, the field duplicate of PW12 will be labeled as PW62.

Trip blanks will be identified as "TB" followed by a six-digit date code indicating the date of shipment. For example, the trip blank shipped on November 15, 2007 will be labeled TB091507.

Field (rinsate) blanks will be identified as "FB" followed by a matrix code (as only groundwater field blanks are planned, the code will be "GW") and the six-digit date code.

Pre-printed sample labels will be provided by the laboratory along with the sample containers. Sample labels will be completed and will, as a minimum, include the site name or number, sample ID, date of sample, and the Site name.

6.0 EQUIPMENT DECONTAMINATION AND IDW DISPOSAL

All non-dedicated hand equipment and tools will be decontaminated using the following procedures:

- Scrub/wash with a laboratory grade detergent (e.g., Alconox);
- Tap water rinse or distilled/de-ionized water rinse;
- Distilled/de-ionized water rinse.

If equipment is to be stored for future use, it will be allowed to air dry, and then wrapped in aluminum foil or sealed in plastic bags.

General trash generated during the investigation (e.g., packaging materials, personal protective equipment which is not grossly contaminated) will be bagged and disposed as ordinary solid waste.

IDW consisting of soil cuttings and purge water will be staged in appropriate containers and analyzed to determine the appropriate disposal methods. Based on the analytical results Earth Tech will dispose of the IDW at a NYSDEC approved disposal facility.

Decontamination fluid will be discharged directly to the ground away from any surface water. As a contingency, the boring contractor will have drums available for containerization of site IDW if necessary.

7.0 FIELD DOCUMENTATION

Field notebooks will be initiated at the start of on-site work. The field notebook will include the following daily information for all site activities (except that information that is recorded on standard forms need not be repeated in the log book):

- Date;
- Meteorological conditions (temperature, wind, precipitation);
- Site conditions (e.g., dry, damp, dusty, etc.);
- Identification of crew members (Earth Tech and subcontractor present) and other personnel (e.g., agency or site owner) present;
- Description of field activities;
- Location(s) where work is performed;
- Problems encountered and corrective actions taken;
- Records of field measurements or descriptions recorded; and
- Notice of modifications to the scope of work.

During sampling of wells, field samplers will add the following:

- Sampling point locations and test results such as pH, conductance, etc.;
- Information about sample collection (e.g., duplicate sample location);
- Chain of custody information; and
- Field equipment calibration.

Field Forms will be used to standardize data collection and documentation, including the following:

- Well construction logs will be provided for temporary/permanent monitoring wells and soil vapor points;
- Purge logs will be provided for groundwater and soil vapor sample collection; and
- A photo log will be developed that documents site conditions, sampling procedures, etc.

Except for the photo log, copies of the field forms are provided in Appendix 2 to the FAP.

8.0 SITE INVESTIGATION REPORT (TASK 5)

Subsequent to the completion of the site investigation and receipt of the data, Earth Tech will submit a site investigation report, as described in greater detail in the Work Plan (Section 2.5).

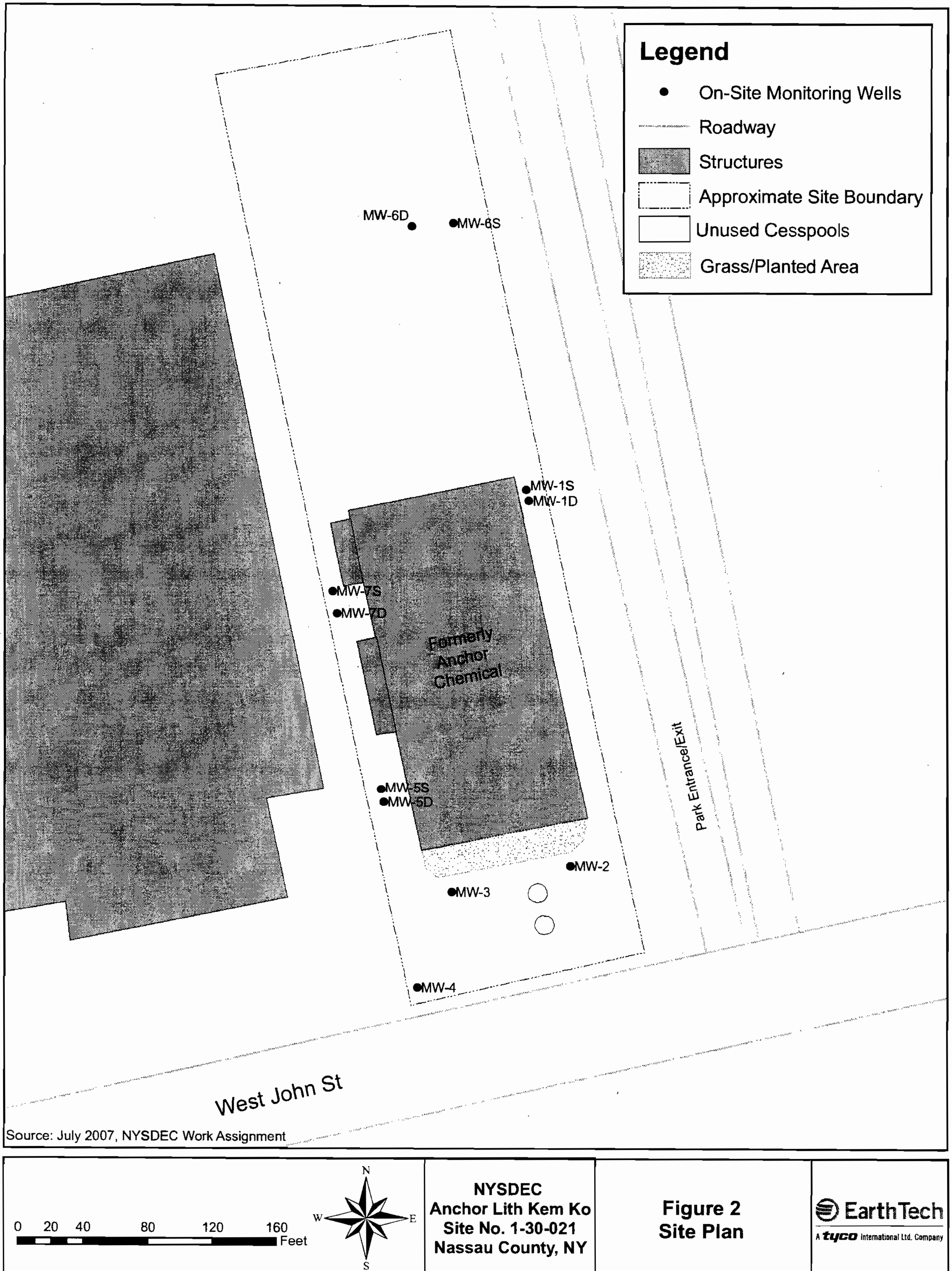
0 400,000 800,000 1,600,000 Feet

N W E S

NYSDEC Site No. 1-30-021
Anchor Lith Kem Ko Site
Hicksville, Nassau County, NY

Figure 1
Site Location

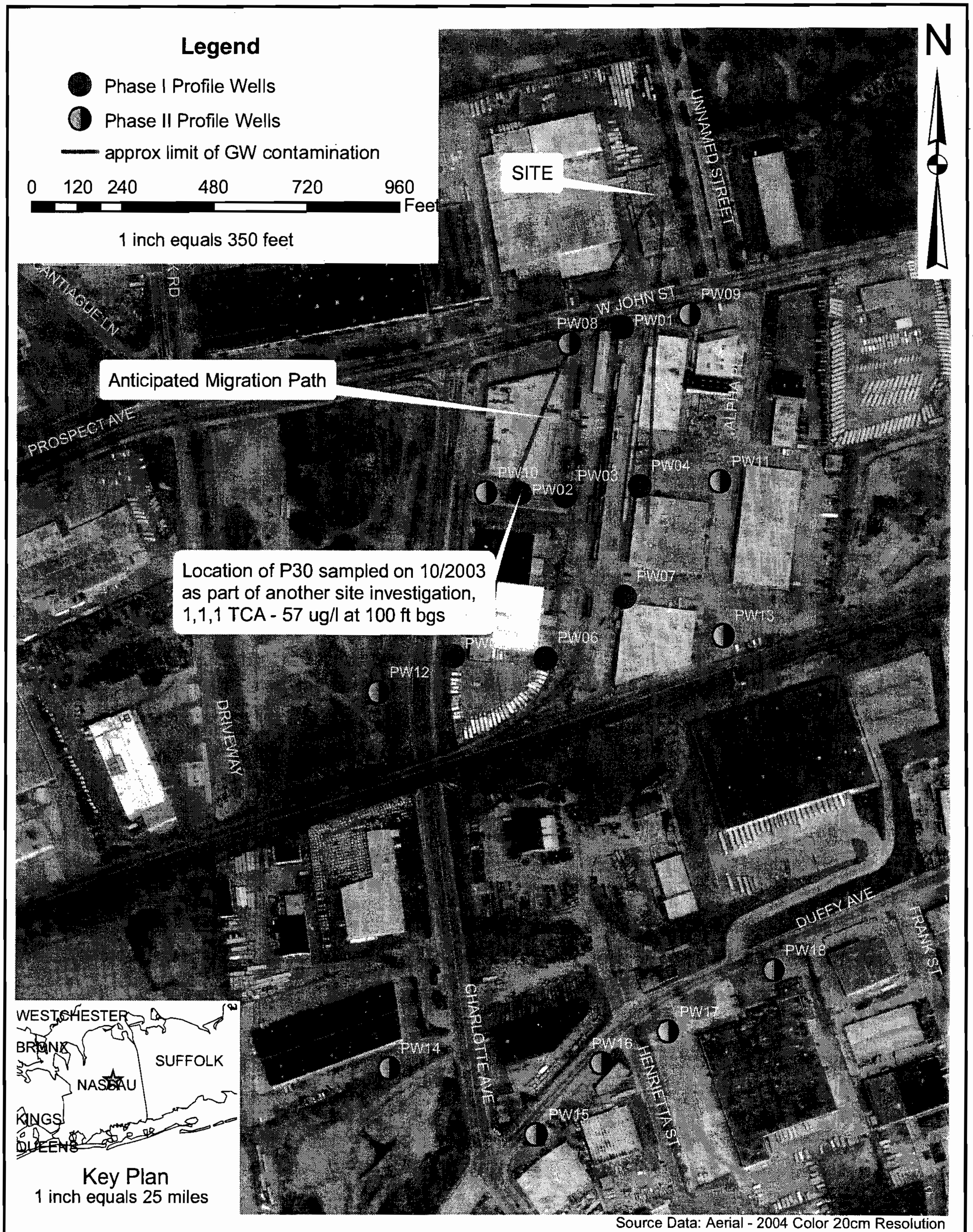
EarthTech
A tyco International Ltd. Company



NYSDEC
Anchor Lith Kem Ko
Site No. 1-30-021
Nassau County, NY

Figure 2
Site Plan

EarthTech
A tyco International Ltd. Company



New York State Department of Environmental Conservation
Proposed Sample Locations
Anchor Lith Kem Ko, Site No. 1-30-021
Hicksville, Nassau County, New York

Created by: BFJ	
Date: 6/26/06	
Figure 3	

APPENDIX 1

Solinst CMT Multilevel System Assembly Manual

Solinst®

CMT Multilevel System Assembly Manual

CMT® Multilevel
Continuous Multichannel Tubing

Printed in Canada
11/2004

CMT Manual Table of Contents

CMT Multilevel System Pre-installation Requirements

Please complete this form to verify that proper consideration has been given to design and borehole specifications for each CMT Multilevel System to be installed. (CMT tubing 1.7" OD, Guide Point Port 1.75" OD, Guide Point Port with Anchor 3.75" OD).

1/ **Minimum information required for effective design of the CMT Multilevel System:**

Accurate borehole depth ____________ Borehole Angle ________________

Depth to which CMT System is to be installed ________________

Borehole geology ______________

Drilling Method _________________

Casing size (minimum ID) _____________

Depth to base of well casing ________________

Number of Monitoring Zones __________________

Approximate Depth to Static Water Level ________________

Expected Maximum Pressure Heads at each Port location __________________

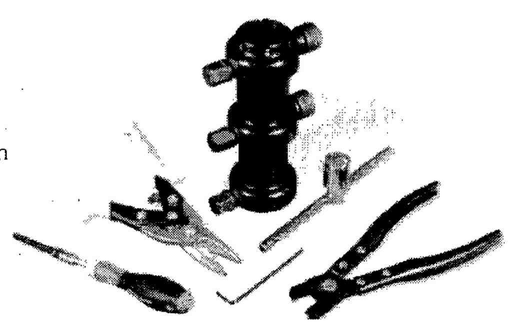
Site Conditions (eg. dry field, bush, swamp, paved, etc.) _____________________

Any special surface requirements for completion of installation (eg. flush mounted, angled, etc) ___________________________

Solinst can assist the client in the design and component selection for the CMT Multilevel System based on the above requested information, but final design and installation details remain the responsibility of the purchaser.

2/ **Ensure that these additional items are available on site during installation:**

- CMT Installation Toolkit (as shown at right)
- Measuring tape
- Hacksaw
- Marking pen or wax pencil
- Model 103 Tag line for checking backfill depths
- Model 101M or 102 Water Level Meters
- At least two client representatives to supervise and assist with installation. Solinst can provide a technician to assist with the installation upon request.
- Support stand (if purchased separately)
- Adjustable wrench



Tip: Practice making one or two ports in a short section of CMT before starting out on the real thing.

Introduction
The Solinst Model 403 CMT Multilevel monitoring well system represents a revolution in multilevel groundwater monitoring. The CMT System provides the simplicity of a bundle type installation with the benefits of backfilling or sealing around a single tube.

This manual describes the above-ground assembly of CMT wells. This consists of creating intake ports in the various channels at the desired depths, installing water-tight plugs below each intake port, adding mesh screens, sealing the bottom of the tubing, and attaching low-profile borehole centralizers to the tubing. For installations in bedrock or cased 2" wells, inflatable packers can be attached to the CMT tubing to seal the borehole between the various intake ports.

Assembling CMT wells is straightforward and can be performed by either drilling contractors or environmental consultants. The wells can be assembled on site after the borehole is being drilled or off site and then transported to the job location. While the assembly of CMT wells is not difficult, it is important to follow all of the steps described in this manual. It is especially important when creating the monitoring ports to avoid cutting into one of the adjacent channels. Doing so creates a hydraulic connection between the two channels that cannot be repaired. Please read this manual carefully before assembling your first CMT well. In addition we suggest that you practice making one or two ports in a short section of CMT tubing before starting out on the real thing.

Preparation
Before making any ports in the CMT tubing, make a sketch of the desired well design. Show the depths of the desired monitoring zones and centralizers (if used) in feet/meters below ground surface. Also, show the depths of the desired lifts of sand and bentonite graphically on the figure. This will come in handy when you are measuring the depths of the backfill materials when you are building the well. If you are building a CMT well where alternating layers of sand and bentonite backfill are added from the surface, try to allow for two feet or more of sand above and below the monitoring ports to ensure that the bentonite does not cover the monitoring ports.

Remember to allow sufficient wellhead access when you install the protective cover over the well. Plan on using a large well cover (greater than 4" diameter is recommended) to allow plenty of room to access the wellhead. A diagram showing suggested dimensions of the wellhead and protective cover is shown in Figure 1 for flushmount and above ground completions.

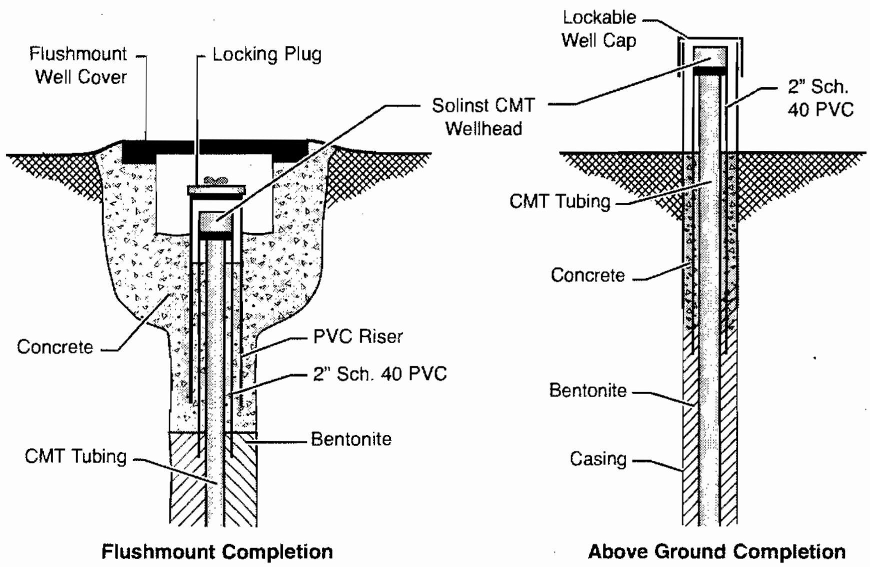


Figure 1

Example 1: Assembling Standard CMT Multilevel Systems

Table 1 shows the design of a hypothetical CMT Multilevel System designated well "ML-1." Each channel in this well can be used for both collecting a groundwater sample (with either a peristaltic pump, inertial pump or micro double valve pump) and measuring the depth to water. Each channel therefore functions both as a sampling port and an observation port.

Table 1
Hypothetical Design for a Standard CMT Well (Well ML-1)

Example

Monitored Zone	Channel Number	Depth to Center of Port (from ground surface)
1	1	23
2	2	34
3	3	48
4	4	55
5	5	69
6	6	77
7	7	92

Note: Newly uncoiled CMT tubing has a memory which can make it difficult to lay out straight. Sand bags help to hold down the ends of the tubing. The "memory" goes away relatively quickly, especially in warm weather. Placing the tubing on black plastic sheeting can warm the tubing, helping it straighten out more quickly.

Note: The channel identifier on the CMT tubing is intentionally subtle to avoid being a conduit for vertical leakage.

Note: The Channel 1 identifier is a low profile repetitive marking "<< CMT >>".

Marking the CMT Tubing with the Locations of the Monitoring Ports and Cutting the Tubing to the Proper Length

Uncoil the CMT tubing on the ground or other flat surface. Stretch out a measuring tape at least as long as the depth of the well, next to the CMT tubing.

Allowing for your desired wellhead stick up (2-3 feet above ground surface), place the end of the measuring tape below the length of tubing you want above ground. This is your measuring point which represents ground surface and all depths below this point use depths below ground surface.

3) The next step is to make marks on the CMT tubing at the depths corresponding to the midpoint of the desired monitoring ports. Before you do this, you will note that there is a faint channel identifier, a low profile repetitive marking "<< CMT >>" that runs along the entire length of the CMT tubing opposite one of the outer channels. This channel identifier facilitates identification of the various internal channels anywhere along the length of the tubing. The channel that has the identifier is always Channel 1. By convention, Channel 1 corresponds to the shallowest monitoring zone. The other five outer channels are numbered clockwise from 2 through 6 as you are looking down on the completed well from above. The center channel is Channel 7 and is always the deepest monitoring zone.

4) Make a mark across Channel 1 on the exterior of the CMT tubing at the depth corresponding to the center of the uppermost monitored port (23 feet below ground surface in our hypothetical example; Figure 2). A permanent marker or a "China marker" wax pencil works well for this. Write "Port 1" on the CMT tubing about 6 inches above the mark.

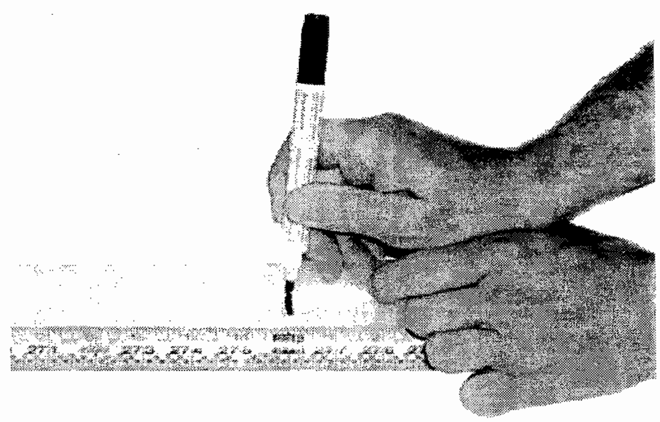


Figure 2

5) Next, draw a line along the Channel 1 identifier (i.e., parallel with the tubing) extending approximately 6" above and 6" below the depth mark (Figure 3). You will use this line (and other similar lines drawn at the other port depths) to index the Port Cutting Guide. This ensures that you cut holes only in the intended channels corresponding to the desired monitoring zones (as shown in Table 1).

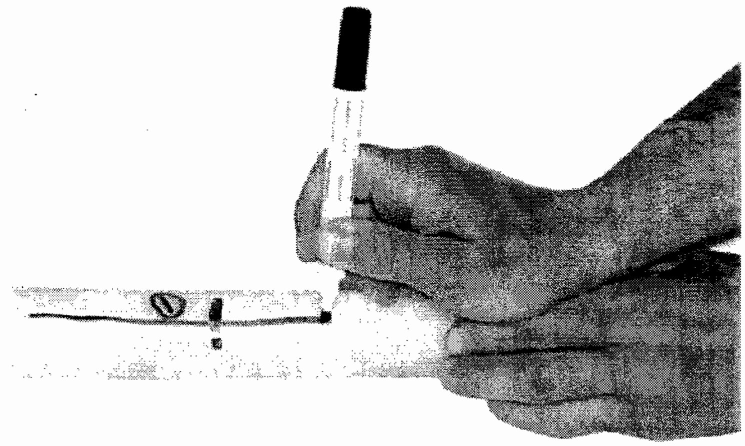


Figure 3

6) Make similar marks at the depths corresponding to the next five monitoring zones (i.e., 34, 48, 55, 69, and 77 feet below ground surface). Make the marks identical to the ones you drew at Port 1. That is, draw the depth mark across Channel 1 and draw the longitudinal line along the Channel 1 identifier. The Port Cutting Guide has been indexed so that it always references the Channel 1 identifier when it is used to cut holes in the five other outer channels. Label these depth marks as Port 2, Port 3, etc..... about 6 inches above each mark. Finally, make a mark at the depth of the deepest monitoring port (i.e., the internal channel, Port 7), which is also the bottom of the well, at 92 feet. Cut the CMT tubing at this mark using a hacksaw, sharp knife, or PVC cutter.

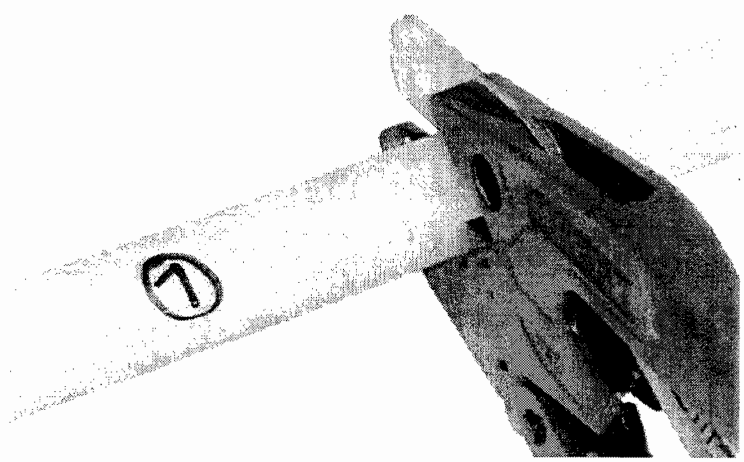


Figure 4

7) The design of the well has now been transferred to the CMT tubing.

Note: When using the Port Cutting Guide, ensure that the cutting bolts are located below the number 1 on the front of the Guide. The locking bolts go below the number 4 on the back of the Port Cutting Guide.

Cutting the Outer Ports and Vent Holes

8) Slide the Port Cutting Guide over the CMT tubing down to Port 1. Align the notch stamped "1" on the Port Cutting Guide with the line you drew along the Channel 1 identifier. Position the Port Cutting Guide so that the depth mark "+" (indicating the centre of the Port) is visible in the window in the center of the Port Cutting Guide (Figure 5). Secure the Port Cutting Guide to the CMT tubing by tightening the knurled Locking Bolts on the underside of the guide (Figure 6). Tighten the bolts, **by hand only**, to prevent the Port Cutting Guide from moving.

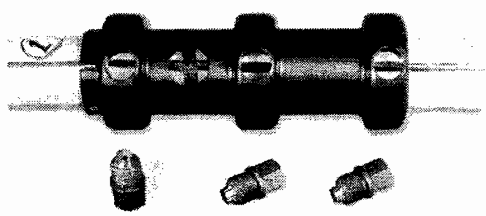


Figure 5

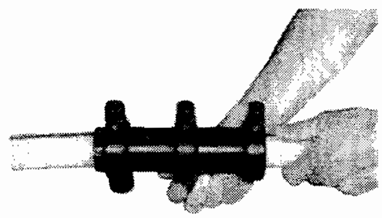


Figure 6

9) Next, cut three holes, as described below into Channel 1 using the cutting bolts screwed into the Port Cutting Guide.

Start by threading a cutting bolt into one of the holes located on the same side as the window. Use the hex wrench to tighten the Cutting Bolt. Tighten the bolt a few revolutions, then loosen it one revolution. Continue doing this until the Cutting Bolt "bottoms out" (Figure 7). Remove the Cutting Bolt. There should be a plastic disk inside of the cutting bolt. If there isn't, re-insert the cutting bolt and repeat the cutting process (make sure that the knurled Locking Bolts are tight). Push out the piece of plastic from the inside of the Cutting Bolt by inserting an Allen wrench through the small hole drilled in the head of the Cutting Bolt (Figure 8). Repeat this process to cut all three holes. The two upper holes will provide the port plug access and the lowest hole is the vent hole (Figure 9).

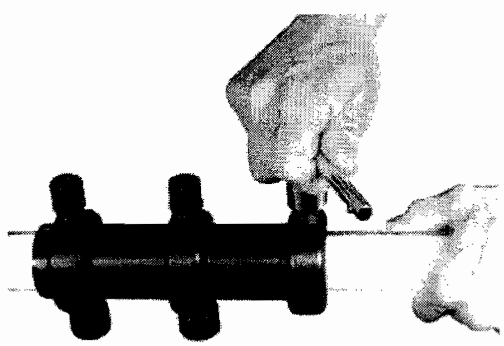


Figure 7

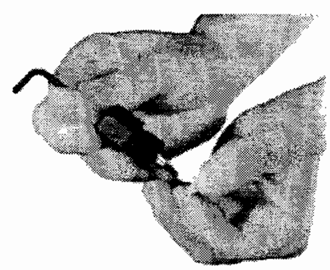


Figure 8

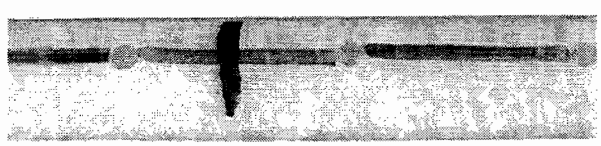


Figure 9

Note: The two upper holes allow you to use snips to cut away a panel of plastic between the two holes, creating a 3-inch-long port in Channel 1. The bottom hole is a vent hole. A vent hole is needed to allow air to escape from the channel beneath the monitoring port when the CMT tubing is inserted into the water-filled borehole during well installation.

Note: The vent hole does not allow cross connection with other monitoring zones because the bottom of the channel is sealed with a water-tight plug.

10) Loosen the cutting tool and move it "down" the CMT and out of the way. Next, use the snips as shown in Figure 10 to cut out the panel of plastic between the upper two port holes. **Do this carefully and keep the snips parallel to the channel side wall to avoid cutting into the walls separating Channel 1 from Channels 2 and 6**. Make the opening as large as possible to facilitate the insertion of the expansion plug as described in the next step.

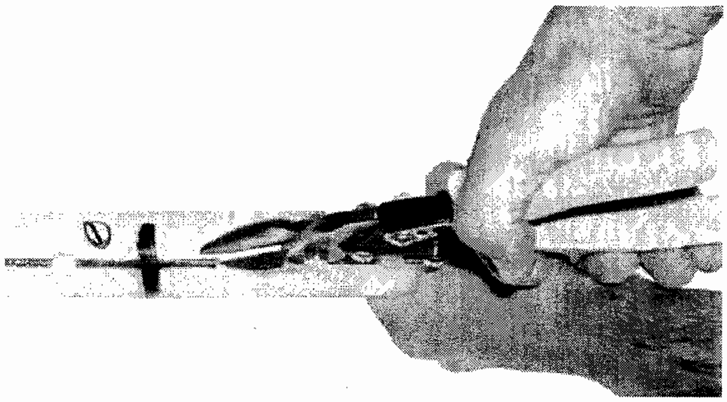


Figure 10

11) Insert an expansion plug through the opening (Figure 11) so that it seals Channel 1 below the monitoring port and above the vent hole. If necessary, use the torque driver to gently push the plug into place (Figure 12). Use the snips to trim the port opening if you have difficulty inserting the plug. Tighten the plug to a torque of 10 inch-pounds using the supplied torque driver.

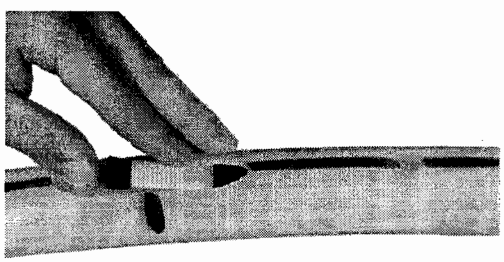


Figure 11

Figure 12

12) The last step in making the Channel 1 port consists of wrapping the stainless steel mesh around the port, forming a well screen over the opening. Center the mesh over the port opening and wrap it tightly around the CMT tubing (Figure 13). Use the low profile Oetiker clamps and pliers to firmly secure the mesh to the tubing. Use two clamps for each monitoring port (Figure 14). Construction of Port 1 is now finished. You are now ready to make Port number 2.

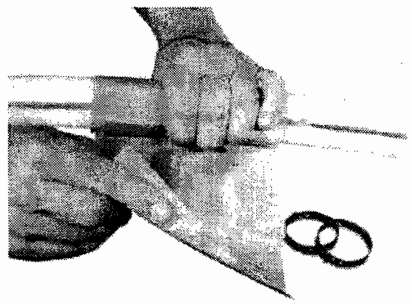


Figure 13

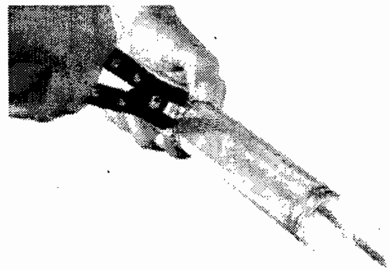


Figure 14

13) Slide the Port Cutting Guide down to Port 2. Position the Port Cutting Guide exactly as you did for Port 1. The depth mark should be visible in the window of the Port Cutting Guide and the longitudinal Channel 1 identifier should be indexed to the number "1" stamped on the guide (Figure 15). Now, rotate the Port Cutting Guide (without moving its position along the CMT tubing) so that the longitudinal line is now indexed to the number "2" stamped on the guide (Figure 16). This positions the Port Cutting Guide so that the cutting bolts will cut holes only into Channel 2. Secure the Port Cutting Guide using the knurled Locking Bolts as before. Cut the two port holes and one vent hole into Channel 2. Next, loosen the cutting tool and slide it down the tubing out of the way.

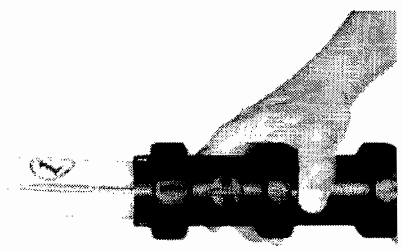


Figure 15

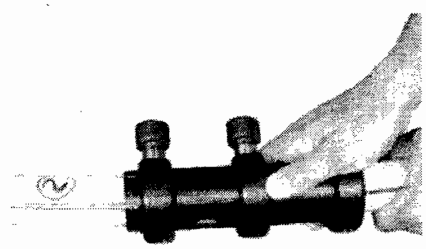


Figure 16

Note: To avoid installing ports in the wrong channels start by positioning the Port Cutting Guide so that the depth mark is visible in the window, then rotate the guide so that the appropriate number (corresponding to the port number) is indexed against the line you drew earlier along the longitudinal Channel 1 identifier. This step is very important

Note: At some sites, you may decide that it is not necessary to monitor every channel. In that case, only cut ports in the desired channels.

When constructing the bottom assembly, only insert the expandable plugs into the monitored channels, leaving the other channels open so that they can fill with water as the CMT tubing is inserted into the borehole (e.g. If only three channels are monitored, only those channels should have plugs inserted at the base.) This reduces buoyancy during well installation.

14) Snip away the panel of plastic between the upper two holes, creating an opening for Port 2.

15) Next, insert an expansion plug though the opening, positioning it below the monitoring port, and tighten it to 10 inch-pounds as before. Finally, wrap a piece of stainless steel mesh around the opening and secure it with two stainless steel clamps. You have now finished constructing Port 2.

16) Continue the steps described above for Ports 3 through 6.

Configuring the Bottom of the CMT Tubing (Zone 7)

17) Insert an expansion plug into each of the six channels. (Figure 17) Tighten each to a torque of 10 inch-pounds using the torque driver.

18) Slide the Guide Point Port Assembly (Figure 18) over the end of the CMT tubing and secure it to the tubing with two stainless steel clamps (Figure 19). The end of the Guide Point Port Assembly is tapered to prevent the bottom of the CMT tubing from getting snagged on a rock ledge or casing joints as it is being inserted into a borehole.

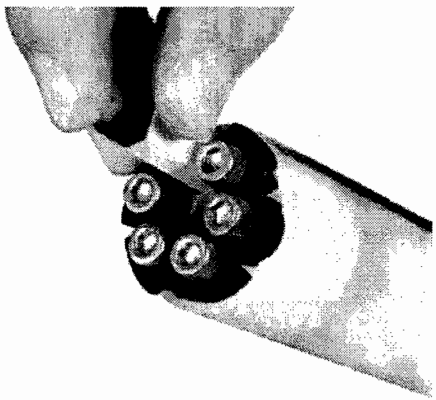


Figure 17

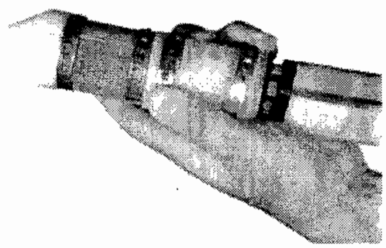


Figure 18

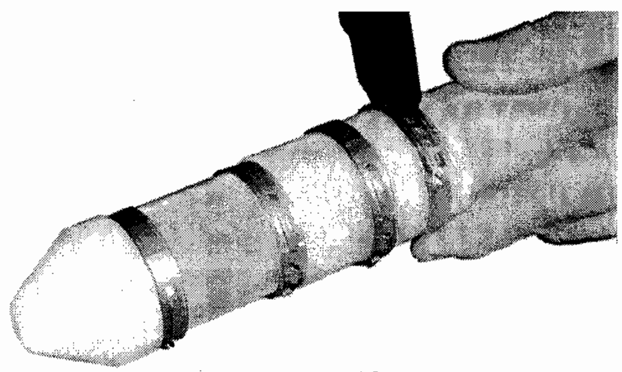


Figure 19

19) If desired, an anchor (3.75" diameter) can be attached to the Guide Point Port using a hex bolt (Figure 20). An anchor is used during installations where it is helpful to secure the bottom of the CMT to keep it from moving during well construction. Once the tubing has been inserted, use sand placed on top of the anchor to secure the well. This will prevent it from being pulled up as drive casing or augers are withdrawn from the borehole. Holes have been drilled in the anchor to allow water in the borehole to pass through the anchor when the CMT well is inserted.

Figure 20

Note: Solinst has developed special tubing centralizers that ensure that the tubing is centered in the borehole during well construction. The fins on the centralizers are low-profile to prevent them from obstructing the tremie tube, or sand and bentonite pellets poured from the surface.

Attaching Tubing Centralizers

20) Place the centralizers over the CMT tubing at the desired depths. Centralizers are generally placed along the CMT tubing at intervals ranging from every 5 to every 15 feet. Attach the centralizers securely to the CMT tubing using two stainless steel clamps (Figure 21).

The CMT well is now ready to be inserted into the borehole.

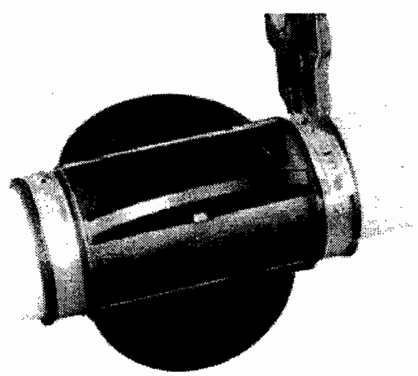


Figure 21

Note: The Solinst Tag Line, (Model 103), is recommended for accurate sand and bentonite placement.

Note: On the underside of the wellhead is a groove to fit 2" dia. PVC riser pipe.

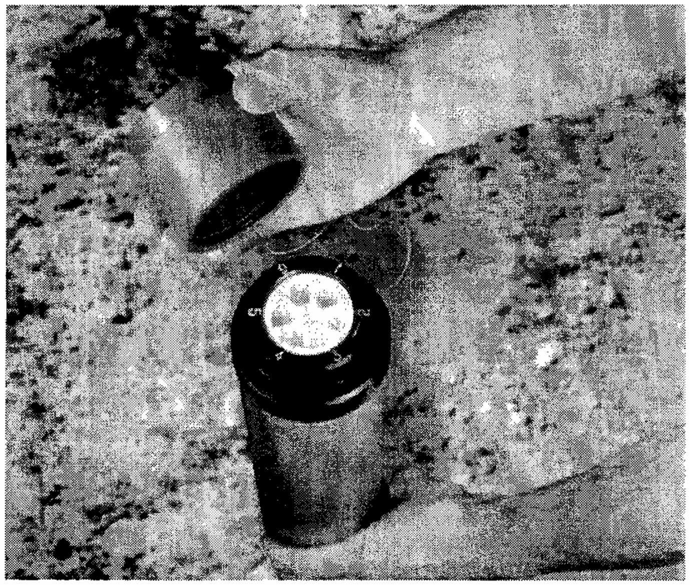


Figure 22

CMT Placement

21) Lower the assembled CMT System into the borehole slowly.

If buoyancy is a problem, wait, as the channels below water level will slowly fill and allow the system to be lowered further. To speed this process along, pour or pump clean water into the vent holes.

When the required depth is reached, suspend the system with the System Support Clamp to prevent it from moving during well construction (Figure 22).

22) Complete the installation by carefully pouring or using a tremie to place sand and bentonite at appropriate levels to seal the borehole annulus

Attaching the Standard Wellhead (after the well has been installed)
23) After the well has been built, cut the CMT tubing to the final elevation. You may choose to finish your CMT installation off above ground surface. If so, you can leave the CMT stick-up as is and install the standard wellhead or "house" the CMT inside a cut length of 2" dia. PVC riser pipe (not supplied). On the underside of the wellhead cap is a groove which is designed to allow a 2" dia PVC riser pipe to "key" into the wellhead. Locate Channel 1 and slide the Standard Wellhead over the tubing (Figure 22). Remember, Channel 1 has the identifier on the outside of the tubing. Secure the wellhead to the CMT tubing by tightening the hex screw on the side of the wellhead.

Optional Flow Control Monitoring Assembly
Under flowing artesian conditions or for vapor sampling, the CMT can be fitted with a special flow control monitoring assembly to allow the user to collect a sample, measure hydraulic or pneumatic pressure, and prevent uncontrolled flow from the well.

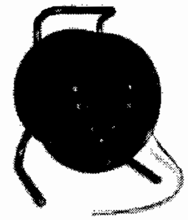
Monitoring Options

Water levels and samples can be accurately obtained using the following high quality Solinst instruments:

Water Level Measurement

Model 102 Water Level Meter

A narrow coaxial cable Model 102 Water Level Meter with a 1/4" dia probe can be used to monitor water levels in any CMT Channel.



Well Completion

Model 103 Tag Line

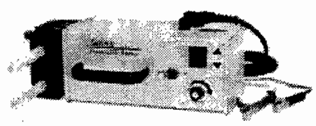
The Model 103 Tagline is ideal to aid accurate placement of sand and bentonite during borehole completion.

Sampling Methods

Depending on your site's depth to water and your sampling protocol, Solinst offers various sampling options.

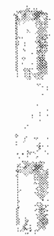
Model 410 Peristalitic Pump

Ideal for sample retrieval from shallow water levels less than 30ft (9m).



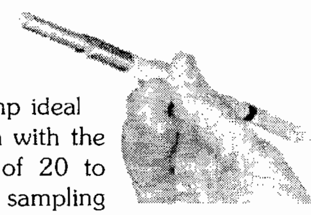
Mini Inertial Pump

Mechanical pump used inside 1/4" LDPE tubing. Typical flow rates of 50 to 250mL/min. If your site's water level is deeper than 50ft (15m), Teflon tubing is recommended



Model 408M 3/8" Dia. Flexible Micro Double Valve Pump

Small and flexible design makes this gas drive pump ideal for delivering high quality samples, in combination with the Model 466 Electronic Control Unit. Flow rates of 20 to 150mL/min make the 408M suitable for low flow sampling applications. Constructed of Stainless Steel and LDPE for lengths less than 50ft (15m) and Teflon tubing for any depths up to 200ft (60m) applications. This is the only viable option in wells with depth to water over 150 ft.



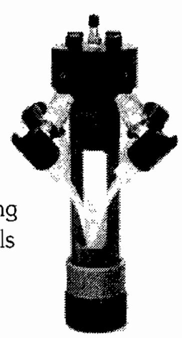
Model 403 Well Head Seal Assembly

For flowing conditions or vapor monitoring, Solinst offers a monitoring assembly, which applies a pressure seal to the individual CMT channel. This facilitates sampling through the well head at the surface.

408 Accessories

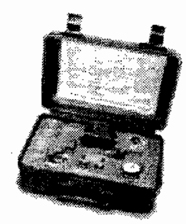
Multi-purge Manifold

A multi-purge manifold can be considered for purging multiple CMT channels simultaneously using 408M Micro Double Valve Pumps



Model 466 Electronic Control Unit

The 408M is durable and easy to operate using the presets and fine tuning capabilities built into the Solinst Model 466 Electronic Control Unit.



APPENDIX 2

Field Sampling Forms

EarthTech

A tyco International Ltd. Company

BORING LOG

Boring No.: (MW-)

PROJECT:	CONTRACTOR:	PAGE 1 OF 4
PROJECT No.:	LOCATION:	DATE:
SURFACE ELEVATION:	DATUM: DRILLER:	ET REP.:

WATER LEVELS			DRILLING AND SAMPLING				
DATE	TIME	DEPTH		CASING	SAMPLER	CORE	TUBE
			TYPE	Steel			
			I.D.	6-inch			
			WT./Fall	--			

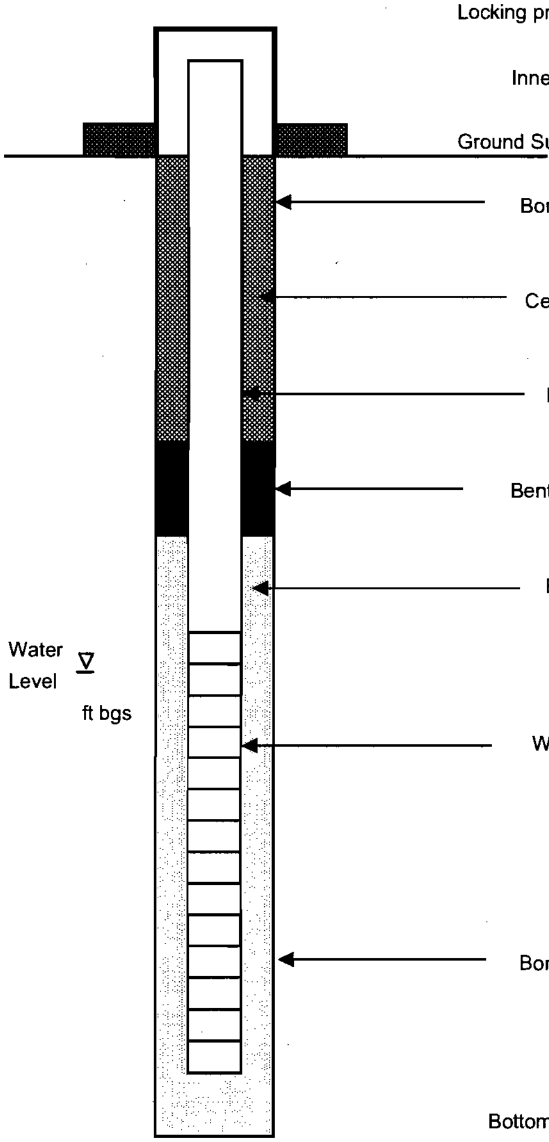
Depth (ft)	Sample Number & Time	Blows per/6"	Rec. (feet)	PID Readings (ppm)	SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

EarthTech

A tyco International Ltd. Company

Well No.

Project:	Location:	Page 1 of 1		
Earth Tech Project No.:	Subcontractor:	Water Levels		
Surface Elevation: Ft	Driller:	Date	Time	Depth
Top of PVC	Well Permit No.:			
Casing Elevation: Ft	Earth Tech Rep.:			
Datum: NGVD 1988	Date of Completion:			



Locking protective stickup with concrete pad, three bollards

Inner casing stickup ________ ft to ________ ft

Ground Surface

Borehole diameter ________ inches

Cement-bentonite grout from ________ ft to ________ ft

Riser Pipe from ________ ft to ________ ft

Bentonite seal from ________ ft to ________ ft

Filter pack from ________ ft to ________ ft

Sand Size ________

Well screen from ________ ft to ________ ft

Diameter ________ inches

Slot size ________ inches

Type ________

Borehole diameter ________ inches

Bottom Cap at ________ ft

Bottom of Borehole at ________ ft

Note: All measurements based on ground surface at 0.0 feet. (+) above grade. (-) below grade.

(NOT TO SCALE)

EarthTech

A tyco International Ltd. Company

WELL NO.

WELL DEVELOPMENT FORM	PROJECT	PROJECT No.	SHEET OF SHEETS
1. LOCATION	4. DATE WELL STARTED		5. DATE WELL COMPLETED
2. CLIENT	6. NAME OF INSPECTOR		
3. DRILLING COMPANY	7. SIGNATURE OF INSPECTOR		

ONE WELL VOLUME : WELL TD: PUMP INTAKE:

Time	Depth to Water (ft)	Purge Rate (gal/min)	FIELD MEASUREMENTS						REMARKS
			Temp. (C)	Conduct. (ms/cm)	DO (mg/L)	pH	ORP	Turbidity (ntu)	
									Static water level
									pump on

Pump Type: ____________________

Analytical Parameters: ____________________

EarthTech
A tyco International Ltd. Company

WELL NO.

WELL SAMPLING FORM	PROJECT	PROJECT No.	SHEET OF SHEETS
LOCATION		DATE WELL STARTED	DATE WELL COMPLETED
CLIENT		NAME OF INSPECTOR	
DRILLING COMPANY		SIGNATURE OF INSPECTOR	

ONE WELL VOLUME : WELL TD: PUMP INTAKE DEPTH:

Time	Depth to Water (ft)	Purge Rate (gal/min)	FIELD MEASUREMENTS						REMARKS
			Temp. (C)	Conduct. (ms/cm)	DO (mg/L)	pH	ORP	Turbidity (ntu)	
									Static water level
									pump on

Pump Type: ______________________

Analytical Parameters: ______________________

APPENDIX 3

Low-Flow Sampling Guidance

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION II

GROUND WATER SAMPLING PROCEDURE
LOW STRESS (Low Flow) PURGING AND SAMPLING

I. SCOPE & APPLICATION

This Low Stress (or Low-Flow) Purging and Sampling Procedure is the EPA Region II standard method for collecting low stress (low flow) ground water samples from monitoring wells. Low stress Purging and Sampling results in collection of ground water samples from monitoring wells that are representative of ground water conditions in the geological formation. This is accomplished by minimizing stress on the geological formation and minimizing disturbance of sediment that has collected in the well. The procedure applies to monitoring wells that have an inner casing with a diameter of 2.0 inches or greater, and maximum screened intervals of ten feet unless multiple intervals are sampled. The procedure is appropriate for collection of ground water samples that will be analyzed for volatile and semi-volatile organic compounds (VOCs and SVOCs), pesticides, polychlorinated biphenyls (PCBs), metals, and microbiological and other contaminants in association with all EPA programs.

This procedure does not address the collection of light or dense non-aqueous phase liquids (LNAPL or DNAPL) samples, and should be used for aqueous samples only. For sampling NAPLs, the reader is referred to the following EPA publications: DNAPL Site Evaluation (Cohen & Mercer, 1993) and the RCRA Ground-Water Monitoring: Draft Technical Guidance (EPA/530-R-93-001), and references therein.

II. METHOD SUMMARY

The purpose of the low stress purging and sampling procedure is to collect ground water samples from monitoring wells that are representative of ground water conditions in the geological formation. This is accomplished by setting the intake velocity of the sampling pump to a flow rate that limits drawdown inside the well casing.

Sampling at the prescribed (low) flow rate has three primary benefits. First, it minimizes disturbance of sediment in the bottom of the well, thereby producing a sample with low turbidity (i.e., low concentration of suspended particles). Typically, this saves time and analytical costs by eliminating the need for collecting and analyzing an additional filtered sample from the same well. Second, this procedure minimizes aeration of the ground water during sample collection, which improves the sample quality for VOC analysis. Third, in most cases the procedure significantly reduces the volume of ground water purged from a well and the costs associated with its proper treatment and disposal.

III. ADDRESSING POTENTIAL PROBLEMS

Problems that may be encountered using this technique include a) difficulty in sampling wells with insufficient yield; b) failure of one or more key indicator parameters to stabilize;
c) cascading of water and/or formation of air bubbles in the tubing; and d) cross-contamination between wells.

Insufficient Yield

Wells with insufficient yield (i.e., low recharge rate of the well) may dewater during purging. Care should be taken to avoid loss of pressure in the tubing line due to dewatering of the well below the level of the pump's intake. Purging should be interrupted before the water level in the well drops below the top of the pump, as this may induce cascading of the sand pack. Pumping the well dry should therefore be avoided to the extent possible in all cases. Sampling should commence as soon as the volume in the well has recovered sufficiently to allow collection of samples. Alternatively, ground water samples may be obtained with techniques designed for the unsaturated zone, such as lysimeters.

Failure to Stabilize Key Indicator Parameters

If one or more key indicator parameters fails to stabilize after 4 hours, one of four options should be considered: a) continue purging in an attempt to achieve stabilization; b) discontinue purging, do not collect samples, and document attempts to reach stabilization in the log book; c) discontinue purging, collect samples, and document attempts to reach stabilization in the log book; or d) Secure the well, purge and collect samples the next day (preferred). The key indicator parameter for samples to be analyzed for VOCs is dissolved oxygen. The key indicator parameter for all other samples is turbidity.

Cascading

To prevent cascading and/or air bubble formation in the tubing, care should be taken to ensure that the flow rate is sufficient to maintain pump suction. Minimize the length and diameter of tubing (i.e., 1/4 or 3/8 inch ID) to ensure that the tubing remains filled with ground water during sampling.

Cross-Contamination

To prevent cross-contamination between wells, it is strongly recommended that dedicated, in-place pumps be used. As an alternative, the potential for cross-contamination can be reduced by performing the more thorough "daily" decontamination procedures between sampling of each well in addition to the start of each sampling day (see Section VII, below).

Equipment Failure

Adequate equipment should be on-hand so that equipment failures do not adversely impact sampling activities.

IV. PLANNING DOCUMENTATION AND EQUIPMENT

- Approved site-specific Field Sampling Plan/Quality Assurance Project Plan (QAPP). This plan must specify the type of pump and other equipment to be used. The QAPP must also specify the depth to which the pump intake should be lowered in each well. Generally, the target depth will correspond to the mid-point of the most permeable zone in the screened interval. Borehole geologic and geophysical logs can be used to help select the most permeable zone. However, in some cases, other criteria may be used to select the target depth for the pump intake. In all cases, the target depth must be approved by the EPA hydrogeologist or EPA project scientist.

- Well construction data, location map, field data from last sampling event.

- Polyethylene sheeting.
- Flame Ionization Detector (FID) and Photo Ionization Detector (PID).

- Adjustable rate, positive displacement ground water sampling pump (e.g., centrifugal or bladder pumps constructed of stainless steel or Teflon). A peristaltic pump may only be used for inorganic sample collection.

- Interface probe or equivalent device for determining the presence or absence of NAPL.

- Teflon or Teflon-lined polyethylene tubing to collect samples for organic analysis. Teflon or Teflon-lined polyethylene, PVC, Tygon or polyethylene tubing to collect samples for inorganic analysis. Sufficient tubing of the appropriate material must be available so that each well has dedicated tubing.

- Water level measuring device, minimum 0.01 foot accuracy, (electronic preferred for tracking water level drawdown during all pumping operations).

- Flow measurement supplies (e.g., graduated cylinder and stop watch or in-line flow meter).

- Power source (generator, nitrogen tank, etc.).

- Monitoring instruments for indicator parameters. Eh and dissolved oxygen must be monitored in-line using an instrument with a continuous readout display. Specific conductance, pH, and temperature may be monitored either in-line or using separate probes. A nephalometer is used to measure turbidity.

- Decontamination supplies (see Section VII, below).

- Logbook (see Section VIII, below).

- Sample bottles.

- Sample preservation supplies (as required by the analytical methods).

- Sample tags or labels, chain of custody.

V. SAMPLING PROCEDURES

<u>Pre-Sampling Activities</u>

1. Start at the well known or believed to have the least contaminated ground water and proceed systematically to the well with the most contaminated ground water. Check the well, the lock, and the locking cap for damage or evidence of tampering. Record observations.

2. Lay out sheet of polyethylene for placement of monitoring and sampling equipment.

3. Measure VOCs at the rim of the unopened well with a PID and FID instrument and record the reading in the field log book.

4. Remove well cap.

5. Measure VOCs at the rim of the opened well with a PID and an FID instrument and record the reading in the field log book.

6. If the well casing does not have a reference point (usually a V-cut or indelible mark in the well casing), make one. Note that the reference point should be surveyed for correction of ground water elevations to the mean geodesic datum (MSL).

7. Measure and record the depth to water (to 0.01 ft) in all wells to be sampled prior to purging. Care should be taken to minimize disturbance in the water column and dislodging of any particulate matter attached to the sides or settled at the bottom of the well.

8. If desired, measure and record the depth of any NAPLs using an interface probe. Care should be taken to minimize disturbance of any sediment that has accumulated at the bottom of the well. Record the observations in the log book. If LNAPLs and/or DNAPLs are detected, install the pump at this time, as described in step 9, below. Allow the well to sit for several days between the measurement or sampling of any DNAPLs and the low-stress purging and sampling of the ground water.

<u>Sampling Procedures</u>

9. Install Pump: Slowly lower the pump, safety cable, tubing and electrical lines into the well to the depth specified for that well in the EPA-approved QAPP or a depth otherwise approved by the EPA hydrogeologist or EPA project scientist. The pump intake must be kept at least two (2) feet above the bottom of the well to prevent disturbance and resuspension of any sediment or NAPL present in the bottom of the well. Record the depth to which the pump is lowered.

10. Measure Water Level: Before starting the pump, measure the water level again with the pump in the well. Leave the water level measuring device in the well.

11. Purge Well: Start pumping the well at 200 to 500 milliliters per minute (ml/min). The water level should be monitored approximately every five minutes. Ideally, a steady flow rate should be maintained that results in a stabilized water level (drawdown of 0.3 ft or less). Pumping rates should, if needed, be reduced to the minimum capabilities of the pump to ensure stabilization of the water level. As noted above, 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.

12. Monitor Indicator Parameters: During purging of the well, monitor and record the field indicator parameters (turbidity, temperature, specific conductance, pH, Eh, and DO) approximately every five minutes. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings as follows (Puls and Barcelona, 1996):

    ±0.1 for pH
    ±3% for specific conductance (conductivity)
    ±10 mv for redox potential
    ±10% for DO and turbidity

    Dissolved oxygen and turbidity usually require the longest time to achieve stabilization. The pump must not be removed from the well between purging and sampling.

13. Collect Samples: Collect samples at a flow rate between 100 and 250 ml/min and such that drawdown of the water level within the well does not exceed the maximum allowable drawdown of 0.3 ft. VOC samples must be collected first and directly into sample containers. All sample containers should be filled with minimal turbulence by allowing the ground water to flow from the tubing gently down the inside of the container.

    Ground water samples to be analyzed for volatile organic compounds (VOCs) require pH adjustment. The appropriate EPA Program Guidance should be consulted to determine whether pH adjustment is necessary. If pH adjustment is necessary for VOC sample preservation, the amount of acid to be added to each sample vial prior to sampling should be determined, drop by drop, on a separate and equal volume of water (e.g., 40 ml). Ground water purged from the well prior to sampling can be used for this purpose.

14. Remove Pump and Tubing: After collection of the samples, the tubing, unless permanently installed, must be properly discarded or dedicated to the well for resampling by hanging the tubing inside the well.

15. Measure and record well depth.

16. Close and lock the well.

VI. FIELD QUALITY CONTROL SAMPLES

Quality control samples must be collected to determine if sample collection and handling procedures have adversely affected the quality of the ground water samples. The appropriate EPA Program Guidance should be consulted in preparing the field QC sample requirements of the site-specific QAPP.

All field quality control samples must be prepared exactly as regular investigation samples with regard to sample volume, containers, and preservation. The following quality control samples should be collected during the sampling event:

- Field duplicates
- Trip blanks for VOCs only
- Equipment blank (not necessary if equipment is dedicated to the well)

As noted above, ground water samples should be collected systematically from wells with the lowest level of contamination through to wells with highest level of contamination. The equipment blank should be collected after sampling from the most contaminated well.

VII. DECONTAMINATION

Non-disposable sampling equipment, including the pump and support cable and electrical wires which contact the sample, must be decontaminated thoroughly each day before use ("daily decon") and after each well is sampled ("between-well decon"). Dedicated, in-place pumps and tubing must be thoroughly decontaminated using "daily decon" procedures (see #17, below) prior to their initial use. For centrifugal pumps, it is strongly recommended that non-disposable sampling equipment, including the pump and support cable and electrical wires in contact with the sample, be decontaminated thoroughly each day before use ("daily decon").

EPA's field experience indicates that the life of centrifugal pumps may be extended by removing entrained grit. This also permits inspection and replacement of the cooling water in centrifugal pumps. All non-dedicated sampling equipment (pumps, tubing, etc.) must be decontaminated after each well is sampled ("between-well decon," see #18 below).

17. <u>Daily Decon</u>

A) Pre-rinse: Operate pump in a deep basin containing 8 to 10 gallons of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.

B) Wash: Operate pump in a deep basin containing 8 to 10 gallons of a non-phosphate detergent solution, such as Alconox, for 5 minutes and flush other equipment with fresh detergent solution for 5 minutes. Use the detergent sparingly.

C) Rinse: Operate pump in a deep basin of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.

D) Disassemble pump.

E) Wash pump parts: Place the disassembled parts of the pump into a deep basin containing 8 to 10 gallons of non-phosphate detergent solution. Scrub all pump parts with a test tube brush.

F) Rinse pump parts with potable water.

G) Rinse the following pump parts with distilled/ deionized water: inlet screen, the shaft, the suction interconnector, the motor lead assembly, and the stator housing.

H) Place impeller assembly in a large glass beaker and rinse with 1% nitric acid (HNO_3).

I) Rinse impeller assembly with potable water.

J) Place impeller assembly in a large glass bleaker and rinse with isopropanol.

K) Rinse impeller assembly with distilled/deionized water.

18. **Between-Well Decon**

A) Pre-rinse: Operate pump in a deep basin containing 8 to 10 gallons of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.

B) Wash: Operate pump in a deep basin containing 8 to 10 gallons of a non-phosphate detergent solution, such as Alconox, for 5 minutes and flush other equipment with fresh detergent solution for 5 minutes. Use the detergent sparingly.

C) Rinse: Operate pump in a deep basin of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.

D) Final Rinse: Operate pump in a deep basin of distilled/deionized water to pump out 1 to 2 gallons of this final rinse water.

VIII. FIELD LOG BOOK

A field log book must be kept each time ground water monitoring activities are conducted in the field. The field log book should document the following:

- Well identification number and physical condition.
- Well depth, and measurement technique.
- Static water level depth, date, time, and measurement technique.
- Presence and thickness of immiscible liquid layers and detection method.
- Collection method for immiscible liquid layers.
- Pumping rate, drawdown, indicator parameters values, and clock time, at three to five minute intervals; calculate or measure total volume pumped.
- Well sampling sequence and time of sample collection.
- Types of sample bottles used and sample identification numbers.
- Preservatives used.
- Parameters requested for analysis.

- Field observations of sampling event.
- Name of sample collector(s).
- Weather conditions.
- QA/QC data for field instruments.

IX. REFERENCES

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