

**Proposed Interim Remedial Measure
Action Plan
Operable Unit 02
On-Site Groundwater
Utility Manufacturing/Wonder King
700 Main Street
Westbury, New York
Site #1-30-043H**

Not Done - They will
do A/S/SVE

July 7, 2000

Executive Summary

Anson Environmental Ltd. (AEL) has been retained by Utility Manufacturing (Utility) to conduct an on-site Interim Remedial Measure (IRM) at 700 Main Street, Westbury, New York. This site lies within the New Cassel Industrial Area and is a Class 2 inactive hazardous waste disposal site as designated by the New York State Department of Environmental Conservation (DEC). The preparation of this IRM has been performed, to the maximum extent practicable, in accordance with the provisions of the Consent Order Site #1-30-043H.

The DEC performed investigations off-site and downgradient of Utility and described their findings in the March 1996 "Multi-Site PSA Report" prepared by Lawler, Matusky & Skelly Engineers LLP. The findings of that investigation can be summarized as:

"The PCE-related contaminant-impacted area for the Utility Manufacturing/Wonder King Chemical site is isolated to the shallow and intermediate depths; the highest concentration was seen at GP-138 (Figure 6-14). At the intermediate depth only several points (GP-138, GP-137) exceeded 100 ppb (Figure 6-15). At the greatest depth none of the sampled points exceed 100 ppb (Figure 6-16). The plume appears to be emerging from the southern end of 700-712 Main Street property and the downgradient flow may be affected by the suspected perched water seen at ANSON MW-9.

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The TCA-related contaminant-impacted area in the Utility Manufacturing/Wonder King Chemical site exceeds 100 ppb in a single probe at the intermediate depth (GP-137 119 ppb). None of the other sample points in the shallow and intermediate depths exceed 100 ppb (Figures 6-17, 6-18 and 6-19)."

Past Groundwater Investigations

The DEC's March 1996 report defines the vertical and horizontal extent of groundwater contamination with PCE downgradient of the Utility site. Although it has been five years since the groundwater sampling was performed, the oval shape of the plume is typical of a plume moving very slowly which is supported by the DEC's report stating the ... "calculated flow velocities range from 7.0×10^{-3} to 7.0×10^{-4} ft/day". That would mean that the contaminated groundwater has not moved a significant distance since 1996.

These groundwater data are consistent with the findings of AEL during its groundwater sampling on-site. These data are summarized on the attached figure entitled 'PCE Detected in Groundwater at Utility Manufacturing site' and are presented in Table 1.

Table 1 1995 Groundwater Sampling

Location	Feet Depth Below Grade	Concentrations in $\mu\text{g/L}$	
		PCE	TCE
SB#1	60	13	0.94
	75	2.2	1.4
	95	3.1	ND
SB#2	60	100	5.4
	75	19	1.3
	85	39	1.3
SB#3	60	94	7.3
	75	79	4.3
	95	100	3.5
SB#4	60	110	8.4
	75	12	1.2
	95	20	0.79
SB#5	60	24	2.5
	75	12	1.9
	95	14	ND
SB#6	60	35	3.4
	75	62	2.3
	95	19	1.1

These groundwater data coupled with those data gathered by the DEC define a contained plume of relatively low concentrations of volatile organic compounds, the primary component of which is tetrachloroethylene.

Proposed Groundwater Investigation

The plume of contamination on-site, as defined by the DEC, is illustrated on Figure 1. This figure also includes the location of the existing four on-site and three proposed new groundwater monitoring wells. Three of the existing wells are screened at approximately 55 to 65 feet and MW-4 is screened in the shallower perched groundwater.

The 1995 groundwater quality data collected by AEL and the DEC will be confirmed by collecting groundwater at four additional locations at the perched water table where it occurs (approximately 40 feet), 60 feet, 70 feet and 85 feet below grade in each boring location. These sixteen samples will be collected in the southern portion of the Utility site. Three of the boring locations will be approximately twenty feet from MW#5 and the fourth boring will be as close to MW#5 as is feasible (see Figure 3).

The depth to water will be measured in MW#4 prior to installing the first boring to determine the depth of the perched groundwater. If that depth differs from 40 feet, the depth of the perched water sampling will be adjusted accordingly.

At each boring location, Geoprobe will be used to bore to a depth of 85 feet, where the first groundwater sample will be collected. The rods of the Geoprobe will then be retracted to a depth of 70 feet, where another groundwater sample will be collected. The process will be repeated at the 60 and 40 foot levels. All sixteen samples, including trip and field blanks will be analyzed via EPA method 8260.

These four borings will be installed in the vicinity of MW#4 and MW#5. The threefold purpose of the sampling at these locations is to better define the horizontal and vertical extent of contamination on-site; to better locate the three proposed groundwater wells and determine the screening depth for introduction of ISOTEC treatment; and to collect the samples required by ISOTEC for their bench test.

Once the vertical and horizontal extent of contamination has been defined, the three new wells (MW-6, MW-7 and MW-8) will be installed following the monitoring well installation protocol in the approved work plan using

hollow-stem augers and a truck-mounted drill rig. The proposed four inch diameter monitoring wells will be constructed of PVC. The final screened interval and depth to the bottom of the wells will be determined by the above laboratory data.

Following the installation of the new wells, the surface elevation of the wells will be surveyed. When the wells are developed, the development water will be placed in 55 gallon drums and stored for proper disposal. The depth to water will be measured and the direction of groundwater flow calculated. Two weeks following well installation, a round of groundwater samples will be collected from the three new wells and MW-4 and MW-5. These samples will be submitted for laboratory analysis via EPA method 8260.

These groundwater data, along with the sixteen samples collected with the Geoprobe, will define the existing groundwater quality prior to groundwater remediation.

The existing monitoring wells designated MW-4 and MW-5, as well as the three new groundwater monitoring wells, will be used as injection wells for the ISOTEC hydrogen peroxide product.

All laboratory analysis will be performed by a New York State Department of Health ELAP certified laboratory. All laboratory analysis will be reported in a NYSDEC ASP Category B deliverable package.

Groundwater Remediation

The DEC prepared a "Remedial Investigation/Feasibility Study (RI/FS) Frost Street Sites" in April 1999. The remedial techniques identified in that document were reviewed for applicability to the plume downgradient of the Utility property.

The on-site shallow groundwater contamination in the southwestern portion of the Utility property will be remediated using in-situ oxidation (hydrogen peroxide injection). This alternative remedial technology will require the installation of application wells constructed of PVC. The hydrogen peroxide will be injected via a gravity feed through the screened portion of the wells. An oxidation-reduction reaction occurs when the hydrogen peroxide combines with the volatile organic compounds in the groundwater and saturated soils. Pilot testing will be conducted to determine if the ISOTEC application is operating in an efficient manner so as to remediate

the contamination in a timely manner. This remedial technique will be less costly and more rapid than those previously evaluated.

A hydrogen peroxide-based in-situ oxidative remedial technique was identified because of its proven success addressing PCE and TCA contamination in groundwater. The manufacturer of this product is In-Situ Oxidative Technologies, Inc. (ISOTEC). The company is currently revising their May 3, 2000 proposal which summarizes the two step application process. Once that proposal has been received, a copy will be forwarded to the DEC.

Step One will be the performance of a Laboratory Study by ISOTEC to evaluate the site-specific efficiency of the ISOTEC proprietary compounds. Soil and groundwater samples will be submitted to ISOTEC's research department. The company will then perform tests to determine the effects of the ISOTEC products on the contaminants of concern (PCE) and determine the optimum treatment quantities required. The Laboratory Study will take approximately four weeks.

Once the ISOTEC Laboratory Study has been completed, ISOTEC will perform a "remedial pilot treatment program: (1) to gather additional data to evaluate the effectiveness of this remedial treatment; (2) as an initial step toward remediating the on-site plume; and (3) to reduce the organic loading in the treated area." (quote from page 2 of ISOTEC proposal in Appendix 1).

The anticipated radius of influence of the application wells will be 20 to 25 feet. Therefore, three new wells and existing wells MW-4 and MW-5 will be used as application points. The radius of influence of these wells is illustrated on Figure 2. The radius of influence was identified by ISOTEC (see attached ISOTEC proposal).

ISOTEC recommends two applications of their hydrogen peroxide-based proprietary compound. Three weeks following the first application of ISOTEC, a round of groundwater samples will be collected from the MW#4, MW#5, MW#6, MW#7, MW#8 and field and trip blanks. If the first application of ISOTEC has remediated the contamination, the second application will not be made. However, if the concentrations of PCE are still elevated, the second application will be made.

Three weeks following the second application, the wells should be re-sampled for volatile organic compounds.

The groundwater samples will be collected from MW-4, MW-5, MW-6, MW-7 and MW-8. These samples and the field and trip blanks will be analyzed via EPA method 8260. The second round of groundwater samples will be collected and analyzed three months later.

At each sampling event, depth to water measurements will be taken and direction of groundwater flow calculated.

Project Schedule

The project schedule is summarized below:

Step One - Installation of the Geoprobe borings, groundwater sampling and collection of samples necessary for ISOTEC laboratory test. **July 17 thru August 18, 2000**

Step Two - ISOTEC performs laboratory bench test. This step may be performed concurrently with Steps One and Three **July 24 thru August 18, 2000**

Step Three - Establish final monitoring well placement, well screen length and submit the final IRM design in accordance with Subparagraph IV.A.3 of the Consent Order which requires that the detailed documents and specifications be prepared, signed and sealed by a Professional Engineer. **August 21 thru Sept. 1, 2000**

Step Four - Installation of the three proposed monitoring wells in accordance with the final IRM design and sampling of two existing wells and three newly installed wells. **Sept. 4 thru Oct. 9, 2000**

Step Five - ISOTEC pilot test of remedial treatment and the sampling of two existing wells and three newly installed wells. First Application. **Oct. 9 thru Nov. 10, 2000**

Second Application, if necessary. **Nov. 13 thru Dec. 15, 2000**

Step Six - Groundwater monitoring three months after final ISOTEC treatment. **Marsh 15, 2000**

Establishment of groundwater monitoring schedule may be required by the Department.

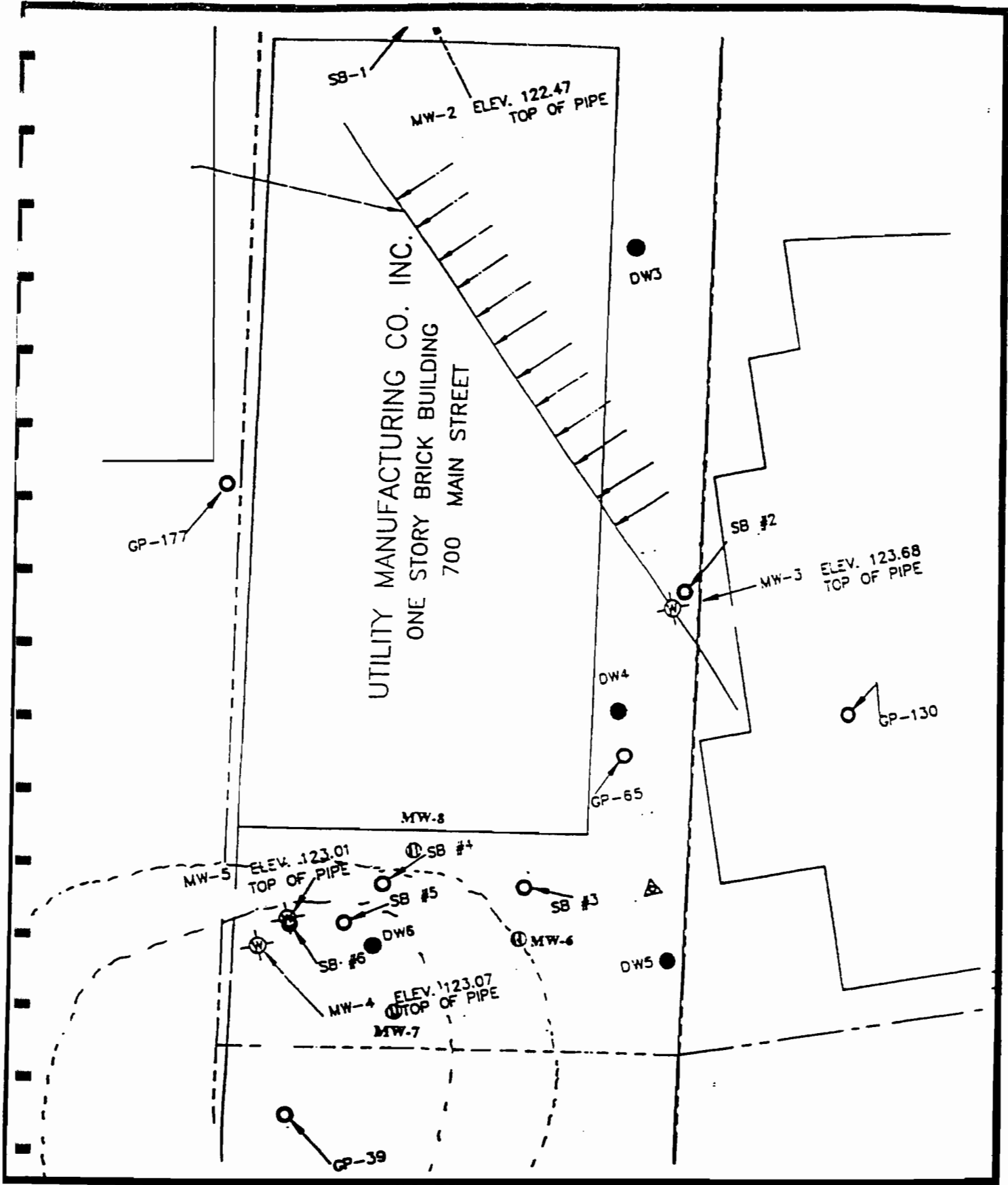


Figure 1 Site Map
Utility Manufacturing
Westbury, New York

not to scale

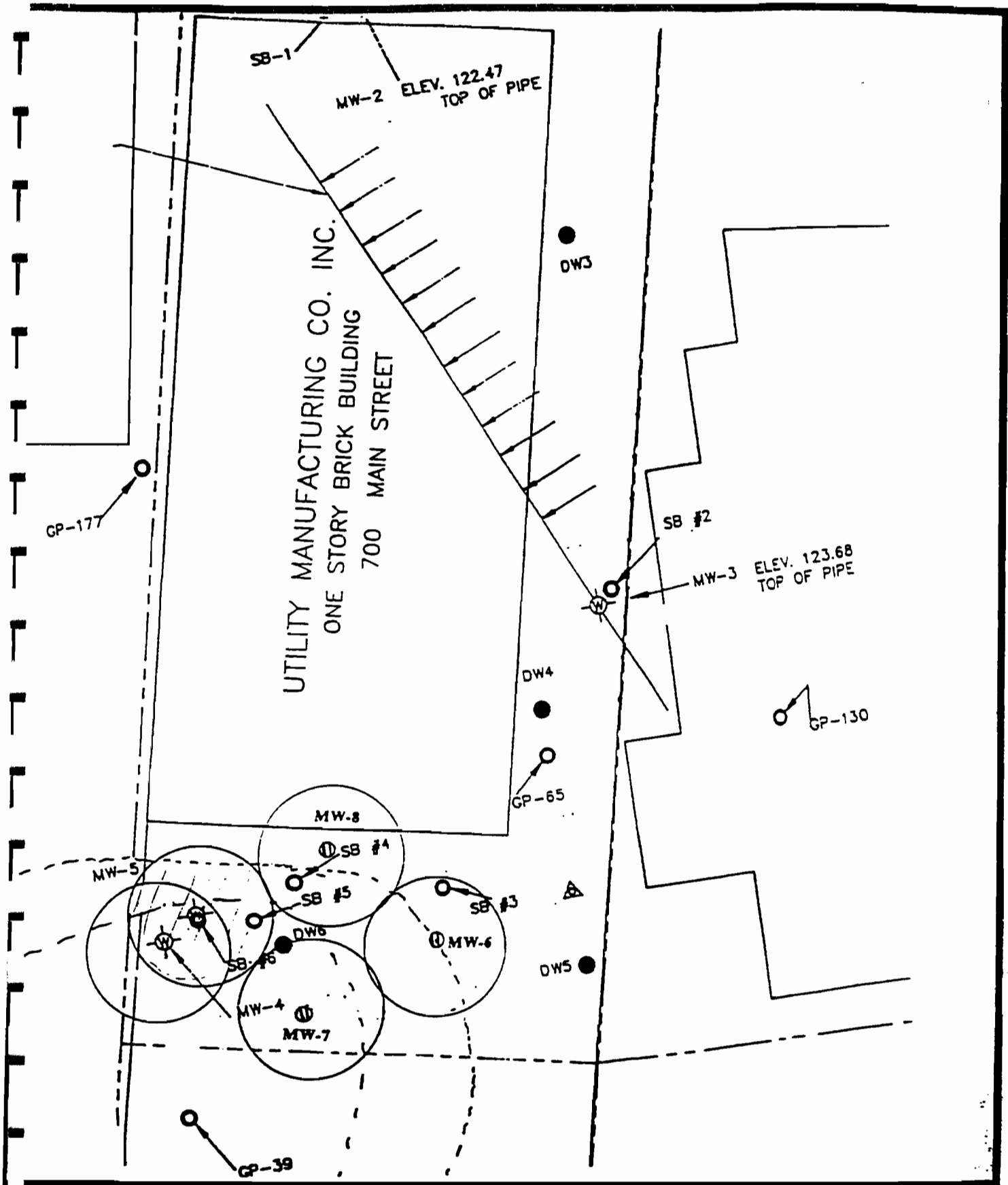


Figure 2 Groundwater Remediation
 Plan Radius of Influence
 Utility Manufacturing
 Westbury, New York
 not to scale

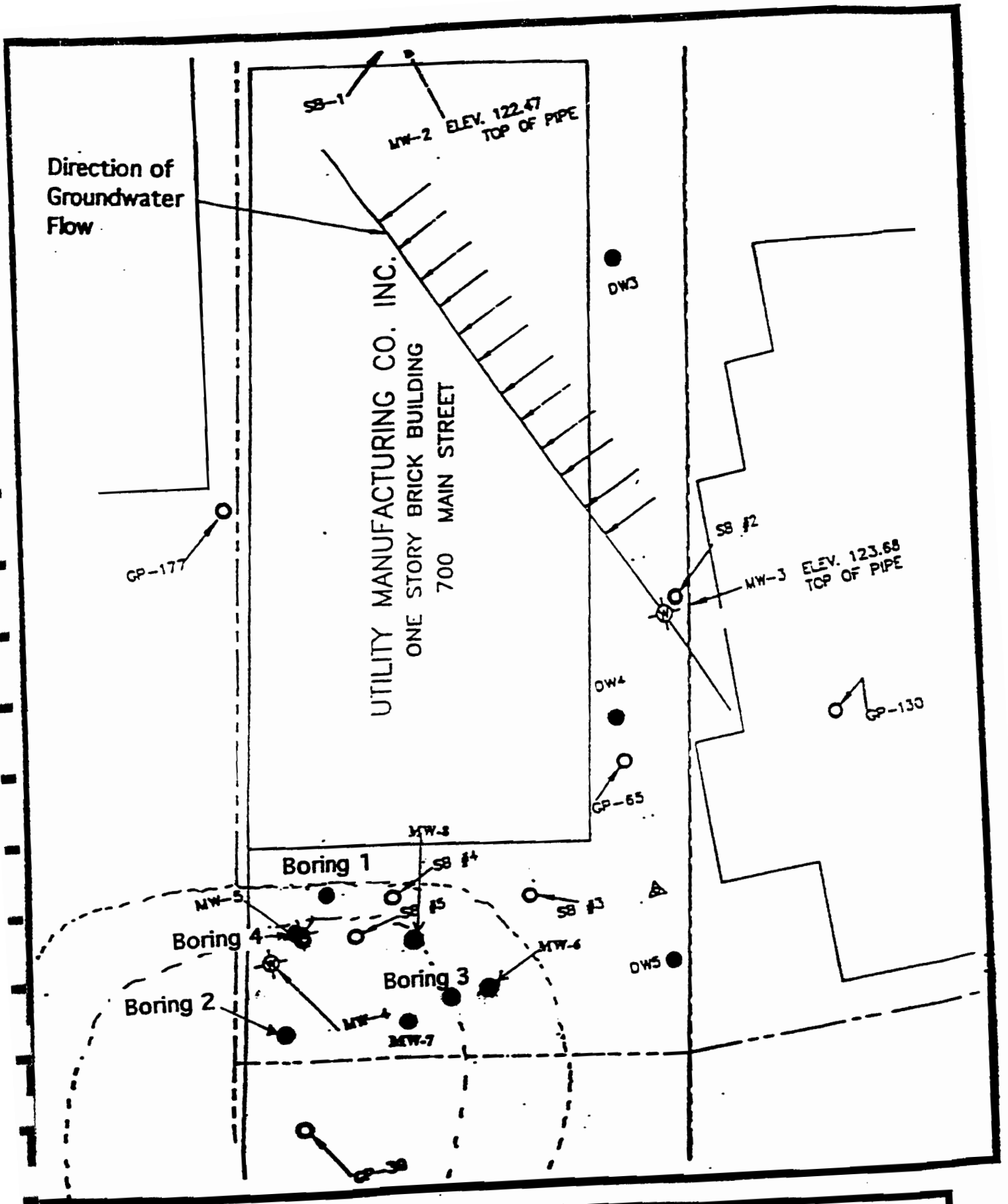
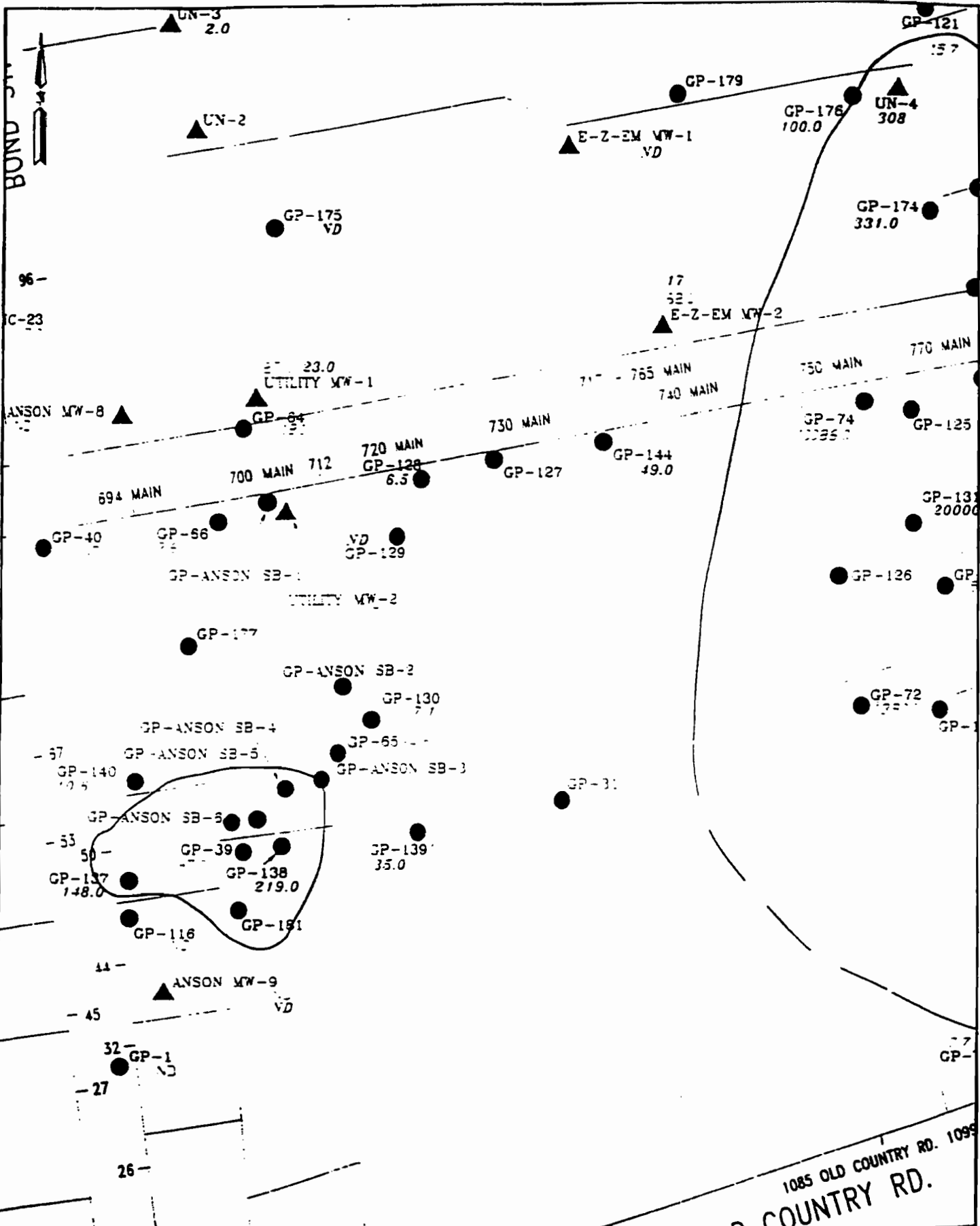
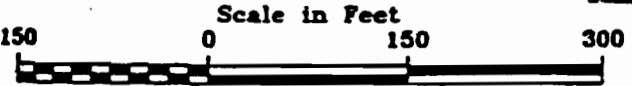


Figure 3 Boring Location Plan
 Utility Manufacturing
 Westbury, New York scale = 1 inch = 20 ft
 Revised 6/28/00

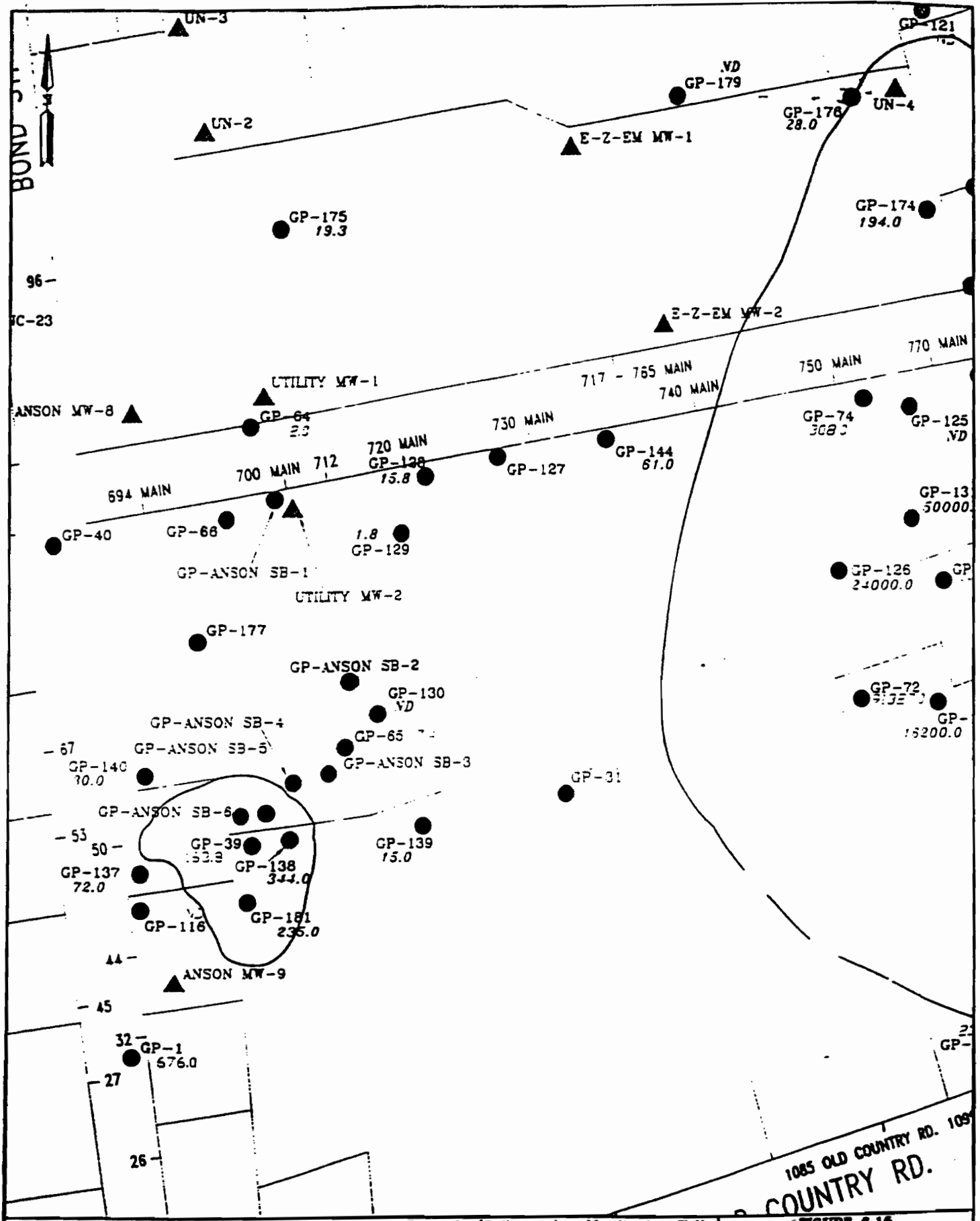


● - Geoprobe/Soil Sample Location ▲ - Monitoring Well Sample Location



120 1993 Sample Data
 120 1994 Sample Data
 120 1995 Sample Data

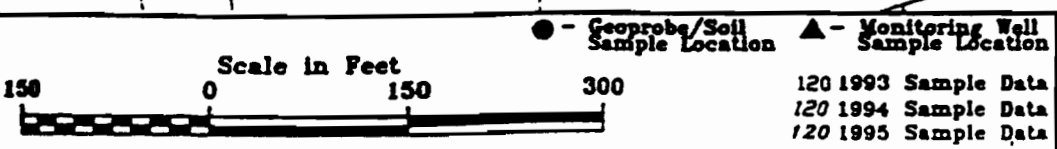
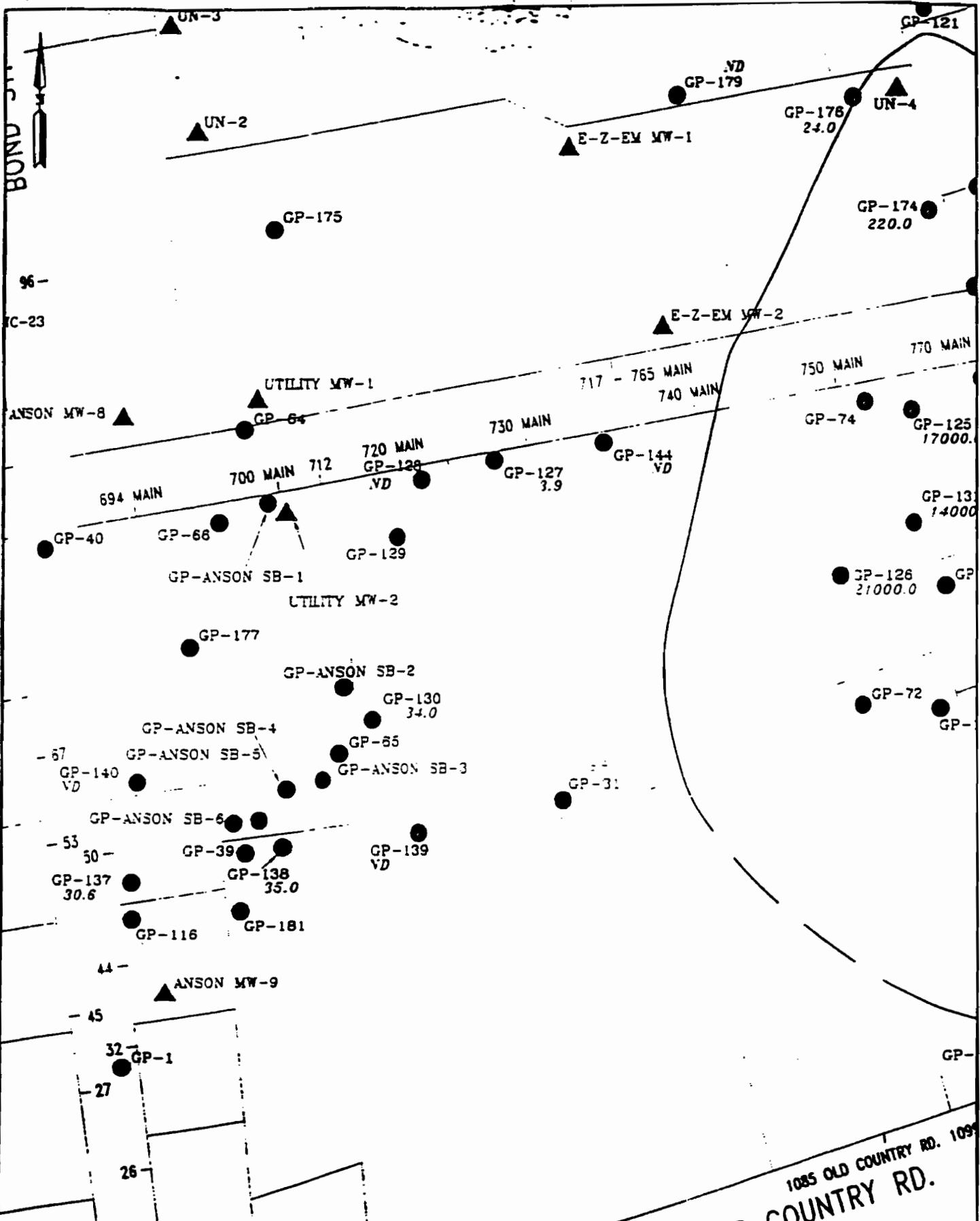
FIGURE 6.14
 UTILITY MANUFACTURING/
 WONDER KING CHEMICAL SITE
 GROUNDWATER CONTAMINANTS
 CONCENTRATIONS
 (PCE: WATER TABLE TO 65 FT)
 Lawler, Matusky &
 Skelly Engineers, LLP



● - Geoprobe/Soil Sample Location ▲ - Monitoring Well Sample Location

120 1993 Sample Data
 120 1994 Sample Data
 120 1995 Sample Data

FIGURE 6.15
 UTILITY MANUFACTURING/
 WYNDER KING CHEMICAL SITE
 GROUNDWATER CONTAMINANTS
 CONCENTRATIONS
 (PCE: 65 TO 85 FT)
 Lawler, Matosky &
 Skelly Engineers, LLP



120 1993 Sample Data
 120 1994 Sample Data
 120 1995 Sample Data

FIGURE 8.16
 UTILITY MANUFACTURING/
 WONDER KING CHEMICAL SITE
 GROUNDWATER CONTAMINANTS
 CONCENTRATIONS
 (PCE: 85 FT +)
 Lawler, Matusky &
 Skelly Engineers, LLP

51 Everett Drive
Suite A-10
West Windsor, New Jersey 08550
(609) 275-8500 phone
(609) 275-9608 fax

5200 DTC Parkway
Suite 150
Englewood, Colorado 80111
(303) 843-9079 phone
(303) 843-9094 fax

Sent Via Fax and First Class Mail
(631) 351-3615



June 12, 2000

Anson Environmental Ltd.
771 New York Avenue
Huntington, NY 11743
Attn: Mr. Dean Anson II

RE: ***Revised Proposal for ISOTECSM Laboratory and Pilot Programs***
Utility Manufacturing/New Cassel Industrial Area
Westbury, New York (L.I.)
ISOTEC Proposal #800271R

Dear Mr. Anson:

In-Situ Oxidative Technologies, Inc. (ISOTECSM) has reviewed the information received with respect to the above referenced site for possible use with their remedial treatment process. Based on our review of the information received, plus type and levels of contaminants present, we believe this site to be a viable candidate to reduce the organic contaminant loading using the ISOTEC process. Costs associated with the ISOTEC laboratory study and remedial treatment pilot program will be charged on a lump sum basis as indicated. ISOTEC has been asked to provide a pilot program proposal to reduce contaminant levels in upper aquifer ground water of dissolved organic compounds (see attached map). The contaminants of concern are primarily PCE, TCE and DCE. Unsaturated soils **do not** appear to be a continuing source of ground water contamination within the target area. For this pilot proposal ISOTEC will target ground water contamination (ground water, saturated soils and unsaturated soils at the soil/water interface) in and around SB-6 and GP-39. Depth to shallow ground water is 55' below grade within the target area with contamination extending to an approximate depth of 75' below grade. Levels of targeted ground water contaminants were approximately 900 ppb within the shallow ground water plume during a recent sampling event. The shallow aquifer has a reported hydraulic conductivity of 2.4-217 ft/day while the deeper zone has a conductivity of .15-84 ft/day. The geology of the shallow aquifer (55-75' below grade) is a mixture of permeable medium sands. The ISOTEC process is most effective on dissolved phase contamination in areas with no ongoing sources of contamination. **ISOTEC does not utilize any acids or pH modifiers as part of their treatment process. ISOTEC injection activities utilize low peroxide concentrations and a gravity feed or low pressure injection system (15-30 psi). This proposal covers ten days of chemical injection activities into five newly installed PVC injection points. These costs are lump sum and cover pilot program costs. These costs are not guaranteed cleanup costs.**

The ISOTEC Process

ISOTEC is an in-situ remedial technology that destroys organic contamination through a novel remediation process. ISOTEC's process treats organic contaminants within the subsurface, by utilizing our proprietary blends of catalysts, oxidizers, viscosity enhancers and mobility control agents. ISOTEC compounds are injected through a site specific delivery system providing sufficient distribution to selectively treat the contaminants around an area of concern. A specific stoichiometry is first determined through a lab study, with preliminary treatment quantities calculated. Application is typically tested in the field during a pilot program to determine the efficiency and extent of treatment which varies depending on the site's subsurface characteristics. Based upon a successful lab study and remedial pilot treatment program, design and implementation of full scale remediation is proposed (if required). The ISOTEC approach works via the in-situ destruction of contaminants, while creating minimal disturbance to site operations.

Lab Study

In order to further evaluate the site specific efficiency of ISOTEC, we require ground water and soil samples, exhibiting detectable levels of dissolved phase contamination, be collected and sent to our research department. The samples will be subjected to a series of studies using the ISOTEC process to first evaluate if the ISOTEC process can successfully treat the contamination and, if the process is successful, to determine the optimum treatment quantities based on the contaminants detected. The initial and treated samples will be further analyzed following each run to determine the effects of the ISOTEC process on the contaminants of concern. Results, which will be available within four weeks of sample collection, will be submitted within a letter report.

Should the lab study indicate that the ISOTEC process could not successfully treat the compounds noted, there will be only a charge for the lab study, and no further costs would be incurred by you for the remedial treatment program.

ISOTEC Laboratory Study (Lump Sum)

\$6,000.00

Remedial Pilot Treatment Program

Based on a successful ISOTEC lab study, ISOTEC will perform a remedial pilot treatment program: (1) to gather additional data to evaluate the effectiveness of this remedial alternative; (2) as an initial step toward remediating the plume; and (3) to reduce the organic loading in the treated areas. The pilot program consist of introducing ISOTEC's proprietary blend of catalyst, oxidizer, viscosity enhancers and mobility

In-Situ Oxidative Technologies, Inc.

control agents into the subsurface over a short time period. The contamination which will be targeted during the pilot program consists of dissolved phase organic compounds consisting primarily of PCE, TCE and DCE. The injection pathway system should produce an estimated radial effect of 20-25' around each proposed 4" injection point at this site.

During this pilot program ISOTEC is proposing to reduce the organic contamination within the pilot target area through a series of five 4" PVC injection points. Depth to ground water is approximately 55' below grade with targeted contamination extending to an approximate depth of 75' below grade. The new injection points should be placed at a depth corresponding with the ground water contaminant zone of the aquifer. ISOTEC believes the proposed injection system would provide sufficient distribution of our proprietary blend of catalysts, oxidizers, viscosity enhancers and mobility control agents into the impacted media at the location. *The pilot test will determine if additional injection points or additional treatment applications will be necessary to adequately treat the area of contamination.* Installation of the injection system will be the responsibility of Anson Environmental. The extent of remediation is preliminary during the initial injection event and may vary plus/minus pending site subsurface characteristics. Since ISOTEC (i.e. chemical oxidation) is a contact treatment, the numerous injection points would help ensure total interaction of reagents within the target area, with the ultimate goal of slightly overlapping treatment areas.

A typical ISOTEC injection team consists of a field supervisor, along with 1-2 field technicians. All members of the injection team have completed health and safety training consistent with the Occupational Safety and Health Act (Title 29 of the Code of Federal Regulations 1910.120). Based on review of the subsurface characteristics, field activities for the pilot program are estimated at 10 working days (this would consist of two 5 day field events). ISOTEC proposes to complete the initial application (10 injection days) over a 60 day period in an effort to: 1) reach cleanup objectives in the areas to be treated and/or 2) substantially reduce the organic loading in the areas treated. ISOTEC can typically begin injections within 45 days of receipt of regulatory approval.

Specific site monitoring should be performed during the treatment program to obtain information related to the treatment process and subsurface characteristics. Sufficient monitoring locations to determine ISOTEC efficiency and regulatory compliance should be sampled and analyzed. ISOTEC suggests utilizing a representative number of monitoring points within the area of treatment for ground water analyses. Ground water samples should be collected and analyzed for targeted organics, total organic carbon (TOC), total dissolved solids (TDS), total iron (Fe), sulfate, pH and any other regulatory parameter required by the State. Field parameters measured by ISOTEC during the treatment program include aqueous qualitative tests for the oxidizer and ISOTEC's proprietary method of detecting hydroxyl radicals directly utilizing a color free radical trap. **Post treatment samples should be collected three weeks after each five day round of field injection activities has taken place.** It is ISOTEC's understanding

In-Situ Oxidative Technologies, Inc.

Anson Environmental will be responsible for all ground water monitoring and any soil sampling which may be conducted. Pre and post soil sampling may be warranted to verify soil organic loading decreases. ISOTEC may ask for split samples during each sampling event. All split sample costs will be the responsibility of ISOTEC. Results of all ground water and soil samples should be submitted to ISOTEC for inclusion into the final pilot report.

A bound report, will be submitted outlining details of the ISOTEC process, field activities, laboratory analysis, with recommendations and/or a proposal for continued remediation of the entire contaminant plume, as necessary.

Treatment Program & Reporting costs include:

Initial Treatment Application (5 injection points) \$42,465.00

- *includes: estimated 10 days of field injection activities, ISOTEC chemicals; all labor, equipment, travel, mobilization and demobilization costs, ISOTEC treatability study workplan, health and safety plan plus pilot program summary report.*

Notes:

1. *ISOTEC will require standard AC electrical power and a source of water supply to perform pilot program activities. Access and costs associated with this request will be provided/incurred by the Client and/or Property Owner. ISOTEC will supply AC electrical power at a cost of \$100/day, if requested.*
2. *Work to be performed in modified Level D personal protective equipment (PPE). Higher level PPE will require a change order for additional costs associated with such.*
3. *Should regulatory and or regulatory/client meetings be necessary to obtain approvals, only direct travel and associated direct expenses will be billed.*
4. *Additional injection activities into the same injection points are typically billed at a rate of 8-10% less than the initial treatment application cost.*

The ISOTEC Oxidative Approach

ISOTEC's 10 day treatment approach (2 five day field events) for the site is based upon the high levels of dissolved phase organic contamination in ground water, anticipated levels of sorbed contamination within the target area saturated zone and residual contamination at the soil/water interface. The ISOTEC process works through contaminant desorption from the soil phase, the conversion of product into an aqueous phase, followed by oxidation in the aqueous phase. Areas where high concentrations of organics exist require a greater amount of reagent to be applied as the high organic concentration causes a more aggressive reaction and the oxidant is rapidly consumed. ISOTEC utilizes a stabilized low concentration hydrogen peroxide as their oxidant, which allows the reaction (i.e. formation of hydroxyl radicals) to continue for up to 21 days. Therefore, detectable levels of dissolved phase contaminants sometime increase in an area during the initial oxidative field events. This is caused by the desorption process of

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organics from the site soils and initial reagent quantities calculated not being sufficient to oxidize all organic contamination which may have been present in the treatment area. This is overcome by additional treatment applications, as proposed by ISOTEC, and an increase in total reagent volume injected.

Agency Approvals and Permits

The ISOTEC process has been accepted by several EPA Region's and numerous state agencies, including California, Florida, Pennsylvania, New York and New Jersey, as a remedial treatment alternative. ISOTEC typically schedules treatment programs within 45 days following issuance of a permit-by-rule authorizing a discharge to a Class V Underground Injection Control (UIC) system under the National Pollutant Discharge Elimination System (NPDES) regulations or similar State guidelines.

Costs associated with regulatory authorization are typically budgeted based upon the status and phase of the project. As this case appears to be under an active program, ISOTEC anticipates minor questions and/or delays in obtaining approvals from the regulatory agency. For this case, ISOTEC would submit a letter report to the regulatory agency requesting a 180 day pilot treatment program (typical regulatory approval time frame). It should be noted that treatment program approval may not be granted until full delineation of the contaminated plume has been completed.

Costs have not been budgeted for the submission of a more comprehensive report, such as a Remedial Action Workplan (RAW), if requested by the regulatory agency. ISOTEC will submit a separate proposal for preparation of a more comprehensive report, if requested.

Summary of Lab Study & Pilot Program Costs

<i>Lab Study (lump sum)</i>	<i>\$6,000.00</i>
<i>Initial Treatment Application</i>	<i>\$42,465.00</i>
<i>Remedial Treatment Report</i>	<i>N/C</i>
<i>TOTAL</i>	<i>\$48,465.00</i>

Terms and Conditions

This estimate is based upon the information submitted. Free phase product if noted during the remedial pilot treatment program and full scale remediation, and additional and/or different contaminant compounds or concentrations not listed within the data supplied will effect the overall degree of contaminant removal.

In-Situ Oxidative Technologies, Inc.

Should any free phase and/or contaminant compounds not noted within the data presented be encountered, ISOTEC shall be allowed an additional amount to cover the cost involved in performing the ISOTEC process on a full scale remedial treatment.

Prices quoted on materials, equipment, excavation and repair costs are subject to federal, state or municipal taxes which may be imposed prior to the actual shipment of materials and equipment.

All consulting prices quoted are pending Agency approval of remedial plans as submitted. Substantial modifications imposed by the approving Agency may incur additional charges. Any additional charges will be discussed with the client for approval prior to the initiation of additional work.

Client agrees to prevent unauthorized persons from entering the work area. If any unauthorized persons enter the work area, ISOTEC will not be responsible for any injury or damage which may occur to that individual or his property. Client shall provide a utility markout and map of all known underground utilities. Injection point locations may be modified pending a review of subsurface utility locations.

The work performed pursuant to this proposal will be undertaken in a professional manner in accordance with best prevailing industry standards. ISOTEC shall not be liable for direct, indirect, incidental, special or consequential damages or liability caused by pollutants remaining on the property or adjacent property due to acts or omissions by ISOTEC or its subcontractors unless such damages or liabilities are caused by ISOTEC's or its subcontractors' failure to act in a professional manner in accord with prevailing industry standards. ISOTEC's liability for such failure to act shall not exceed the value of this contract measured by the fees paid by client or due under this contract and fees previously paid or due for work performed at the property or in connection therewith. No limitation of liability shall apply however for damages, either direct or indirect for bodily injury, property damage, or otherwise due to ISOTEC's or its subcontractors' willful misconduct or gross negligence.

Any payment due which is not received within 30 days will be subject to a service charge of 1.5% monthly. Any payments not received within sixty (60) days will be put out for collection. Payment terms for lump sum and T&M items (invoiced monthly) are net 30 days, and are as follows:

Lab Study	100% at signing of contract
Treatment Program (lump sum)	50% upon written authorization to proceed with each treatment application & prior to field activities
	50% upon completion of each application

This Agreement and the rights and duties of the parties, shall be governed by and construed in accordance with the laws of the State of New Jersey. The parties consent to the jurisdiction of the State courts of the State of New Jersey, and agree that venue shall be proper in any such courts to the exclusion of the courts in any other State or Country. The parties further agree that such designated forum is proper and convenient. The parties hereby unconditionally and irrevocably waive any and all rights to a trial by jury in any suit, counterclaim, or cross-claim arising in connection with, out of, or otherwise relating to this Agreement.

ISOTEC shall help obtain required Agency permits/approvals and comply with all applicable laws. Permit fees are not included within the quoted prices and shall be itemized separately to include an additional 15% handling charge, or be paid directly by the Client.

All prices quoted are valid for a period of sixty (60) days from the time this proposal was written. After a period of 60 days, ISOTEC will not be held to the terms and prices quoted herein.

We hope that this proposal will meet your needs and look forward to working with you on this project to a satisfactory completion. We trust that you find this proposal acceptable and indicate so by signing in the space provided below. If you have any questions or need additional information, please contact me at (609) 275-8500 extension 119.

Very truly yours,
In-Situ Oxidative Technologies, Inc.


David S. Zervas, President

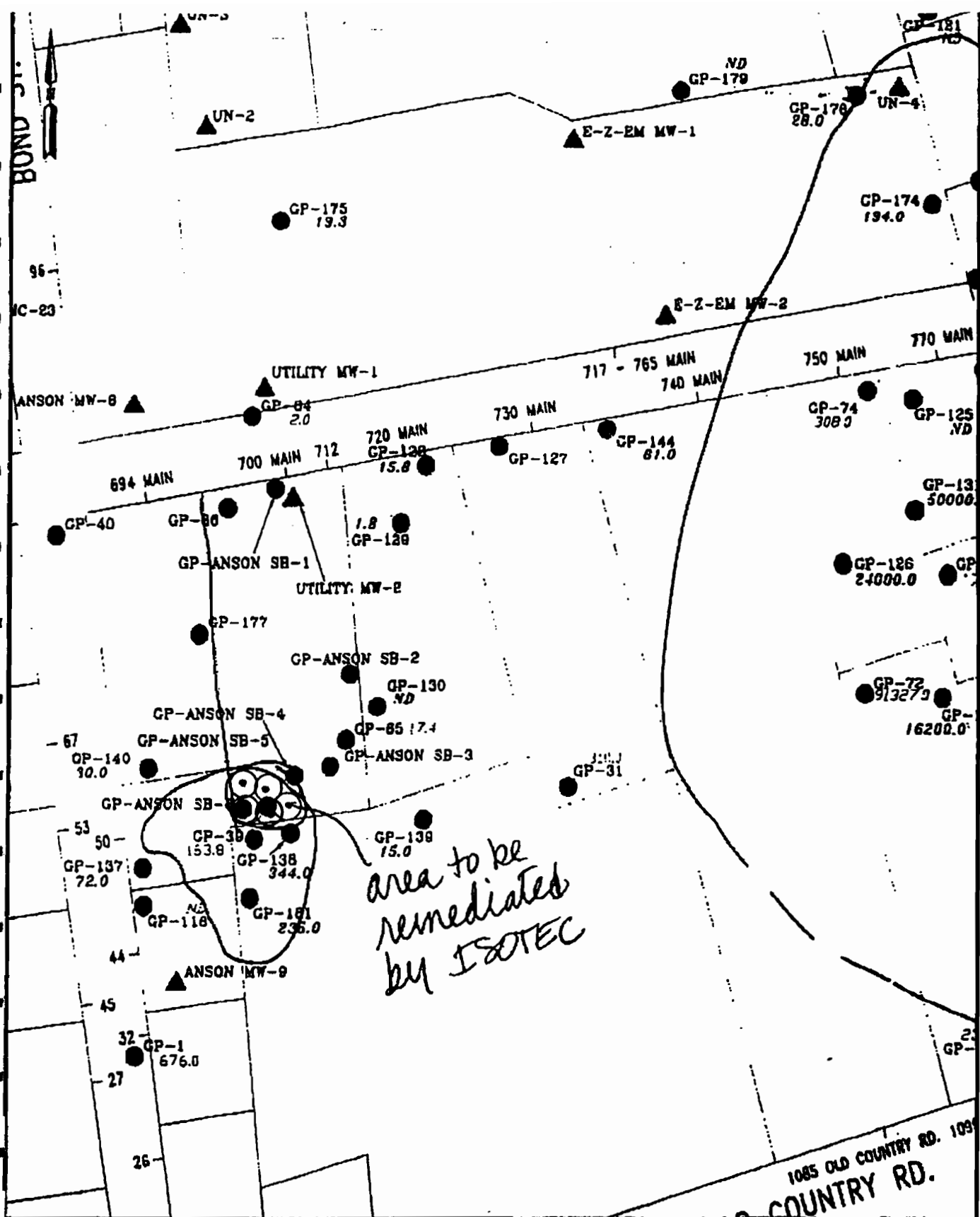
ACKNOWLEDGED AND ACCEPTED:

(print name, title)

(signature, date)

cc: Justin Kaufman, ISOTEC

In-Situ Oxidative Technologies, Inc.



area to be remediated by ISOTEC



● - Geoprobe/Soil Sample Location
 ▲ - Monitoring Well Sample Location

120 1993 Sample Data
 120 1994 Sample Data
 120 1993 Sample Data

FIGURE 6.15
 UTILITY MANUFACTURING /
 BOND KING CHEMICAL SITE
 GROUNDWATER MONITORING
 CONCENTRATIONS
 (PCB 28 TO 85 FT)
 Lewis, Maloney &
 Stally Engineers, LLP

ISOTEC #800271 Revised

ISOTEC Bench Test Procedures for a Soil-Water Matrix

ISOTEC performs bench scale testing to achieve the following objectives:

- Demonstrate proof that the oxidative process is effective under site-specific conditions.
- Demonstrate proof of the effectiveness of the oxidative process in the presence of aquifer solids (i.e. soil).
- Demonstrate proof that the oxidative process is capable of achieving significant contaminant destruction.
- Determine the optimum mix for subsequent pilot scale testing by performing the bench testing using various catalyst/oxidizer amendments.

Sample Collection

Please refer to attached ISOTEC's "Laboratory Study Sample Collection Protocol" for exact information on sample collection. Site soil for bench testing shall be collected at a location representative of site contamination and characteristics. Soils may be collected from different locations and composited, if necessary, to obtain a representative sample. A minimum of 6000 grams of soil should be collected via decontaminated hand auger or sampling trowel. One- (1) liter amber jars with screw top caps may be used to collect soils if they are contaminated. If the soils collected are not contaminated, Zip Lock bags may be used for sample collection. In addition, one soil sample should be collected in a 4-oz jar and tightly capped for use during bench testing for control purposes.

Site groundwater for bench testing shall be collected from a monitoring well point exhibiting highest contamination after 3 well volumes have been purged. Samples from wells containing free product cannot be used during bench scale testing, and shall be excluded. A minimum of 3 liters of groundwater should be collected and stored in glass containers with zero headspace (no preservative to be used). In addition, two samples should be collected in 40-ml vials preserved in HCl to be used during bench testing for control purposes.

Reaction Vessel Preparation

The laboratory experiments will be performed in 120 ml sealed batch reactors. For each vessel, adequate site soil and groundwater will be introduced to achieve 1:1(w/w) soil-water slurry, leaving enough headspace for pre-determined reagent volumes to be injected. The vessels will be sealed with caps fitted with Teflon lined septa to facilitate subsequent injections of reagent. Samples of the site soil and groundwater will be collected for subsequent analyses to determine the initial concentrations of VOCs in the reaction vessels.

Bench Test Treatments

The bench scale experiments will be performed by injecting a series of catalyst and oxidizer amendments into the reaction vessels. The stoichiometric molar ratio of the reagent combination utilized will be different in each reaction vessel. The merits of stepwise injection will be compared to single aggressive treatment for each reagent combination used. The total volume of external reagent solution utilized in each treatment vessel will be equalized by injecting adequate volume of distilled water as may be necessary. The lab study monitoring will be conducted by setting up parallel monitoring vessels in a similar manner, which will receive same doses as the corresponding main reaction vessels. Samples will be periodically withdrawn from the monitoring vessels for hydrogen peroxide analysis. Additional treatments to designated reaction vessels will be injected based on residual peroxide concentrations remaining. One of the reaction vessels will initially be isolated for control purposes and will receive equivalent volume of distilled water to compensate for reagent volumes injected into treatment vessels.

Following the last treatment, all reaction vessels will remain undisturbed at room temperature for 24 hours or until such time that the oxidizer is completely consumed. Soil and groundwater from each of the reaction vessels will be analyzed for residual VOC concentrations.

Sample Analyses

The results of sample analysis of the 40-ml vials collected in the field will establish groundwater quality in the pilot study area at the Site.

The samples generated from the treatability studies will be submitted to a certified analytical laboratory for VOC analyses by Method 624/ 8260. The samples will include:

- The 40 ml vial "field" collected sample;
- The 4 oz jar "field" collected soil sample;
- The "initial conditions" soil and groundwater samples collected during preparation of the reactor vessels;
- The "control" sample from the reactor vessel to which only distilled water was injected; and
- The treatment samples from the reactor vessels to which varying volumes of catalyst and hydrogen peroxide were injected.

In addition, site soil will be tested for Fe, Mn, and TOC concentrations to evaluate the native conditions. Results of analyses performed on these samples will be evaluated to determine if the objectives of the bench testing stated at the beginning have been achieved.

ISOTEC Laboratory Study Sample Collection

In order to perform an ISOTEC lab study, a representative soil and/ or groundwater sample must be collected from an area of concern at the site exhibiting the highest detected levels of contaminants.

Please purge the well prior to groundwater sampling. Field and trip blanks are not required. For soil samples, please collect a representative soil sample or a composite. A summary of the sample containers required for our laboratory study is provided below.

*****Please ensure zero head space in 1 liter jars and 40 ml vials.*****

For Groundwater Treatability Study Only

Container Type	Number of Containers	Preservative
1 liter, amber	2	None
40 ml vials	2	HCl
250 ml, amber	1	None

For Both Soil-Slurry Treatability Study and Groundwater Treatability Study

Container Type	Number of Containers	Sample Type	Preservative
1 liter, amber	3	Groundwater	None
40 ml vials	2	Groundwater	HCl
250 ml, amber	1	Groundwater	None
1 gal-Zip lock bags or 1 liter jars	2 [6000 grams or 13 lbs.]	Soil	None
4-oz jar	1	Soil	None

The samples should be packaged in a cooler and shipped overnight (AM) delivery to the following address:

In-Situ Oxidative Technologies, Inc.
51 Everett Drive, Suite #A-10
West Windsor, New Jersey 08550
Attn: Prasad Kakarla

Should you need to be supplied with sample containers and a sample shuttle, please do not hesitate to contact ISOTEC. Please enclose a standard chain-of-custody with the samples. In addition, please enclose contaminant information by including latest laboratory analytical data on the above samples collected.

ISOTEC must be notified at least 48 hours prior to sample shipment to prepare for lab study.

If you should have any questions concerning the sampling event, please do not hesitate to contact Prasad Kakarla at (609) 275-8500 (ext. 111).