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MID 082 767 591

ANNUAL MONITORING SUMMARY REPORT AND

ADDITIONAL HYDROGEOLGIC INVESTIGATION

for...

Quanex Corporation
Michigan Seamless Tube Division
South Lyon, Michigan

prepared for...

Quanex Corporation
South Lyon, Michigan

prepared by...

WW Engineering & Science, Inc.
39209 West Six Mile Road, Suite 110
Livonia, Michigan 48152

RECEIVED
FEB 28 1992
Waste Management
Division

Project No. 83160.00

March, 1992

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1.0 INTRODUCTION

At the request of Quanex Corporation, WW Engineering & Science (WWES) is performing quarterly ground-water monitoring at the Michigan Seamless Tube Division facility located in South Lyon, Michigan. This document presents the annual monitoring report, including a summary and a statistical evaluation of analytical data gathered during the 1991 quarterly monitoring events. Also included in this document are the results of an additional hydrogeological investigation completed by WWES in response to issues raised during an Operation and Maintenance (O&M) inspection conducted at the Quanex plant in December 1990 by the Michigan Department of Natural Resources (MDNR). The MDNR requested that Quanex supply additional hydrogeologic and water quality data to support the assertion that detected arsenic concentrations in ground water beneath the Quanex plant are naturally occurring. This study was conducted in accordance with a work plan prepared by WWES in June 1991 and subsequently approved by MDNR. The following presents a summary of the study objectives and findings.

1.1 Additional Investigation Objectives

The primary objective of this investigation was to supply data supporting the conclusion that arsenic concentrations detected in ground water at the Quanex site are naturally occurring. Additional hydrogeologic information was also obtained to further define vertical ground-water gradients and ground-water chemistry.

The objectives were met by completing the following tasks:

- Installation of four (4) upgradient monitoring wells. In addition, damaged monitoring wells 6A and 6B were abandoned and well 6A was replaced.
- Survey of new monitoring well locations and top of casing elevations
- Collection of water level data
- Collection of ground-water samples on a monthly basis for arsenic analysis. In addition, ground water was analyzed for a complete set of major cations and anions to document variations in ground-water chemistry at the site.
- Preparation of a report summarizing the findings

1.2 Site Location and Description

The Quanex Corporation, Michigan Seamless Tube Division is located at 400 McMunn Street, Township 1 North, Range 7 East, Section 30, Oakland County, South Lyon, Michigan. Quanex operates a steel finishing facility on the approximately 65-acre site. The site is surrounded by residential properties to the north, east and south. Figure 1, Site Location, presents the general location of the facility. Figure 2, Site Map, shows the study area, including two former surface impoundments and the majority of the soil borings and monitoring wells completed at the Quanex Site.

2.0 ANNUAL SUMMARY REPORT

2.1 Ground-Water Monitoring Events

The former surface impoundments were used by Quanex to manage neutralized pickle liquor. As a result, the ground water there was monitored quarterly in 1991, in accordance with the Ground Water Quality Assessment Program dated April, 1986 as amended. In response to the December 1990 O&M inspection report prepared by the MDNR, Quanex submitted a work plan for additional ground-water studies. Activities performed under this work plan included the installation of four new upgradient monitoring wells (MW-1B, MW-1C, MW-17A and MW-17B) in July 1991, replacement of downgradient monitoring well 6A, and sampling of the existing monitoring wells 12C and 13C.

Monitoring well MW-6A replaced a nearby well, MW-14A, as a downgradient sampling location in the ground-water monitoring program. During the period of February, 1988 through July, 1991 monitoring well casings for 6A and 6B were bent and could not be sampled. During July, 1991 a new monitoring well to replace MW-6A was installed in the same vicinity and at a similar depth. The soil boring log and well construction diagram for the new MW-6A are provided in Appendix A. Monitoring well 6A was replaced to provide an additional downgradient monitoring location and was sampled during the 1991 third and fourth quarter monitoring events in lieu of MW-14A.

Ground-water samples were collected and water-level elevations were calculated quarterly on the following dates: March 18, 1991; June 13, 1991; September 19, 1991; and December 3, 1991. Two sets of shallow water-table elevations collected in 1991 were contoured and are presented on Figures 3 and 4. Current and historical water-level

elevations and survey data are provided in Appendix B. During the quarterly events the following constituents were analyzed: arsenic, barium, cadmium, chromium, copper, lead, selenium, silver and 1,1-dichloroethane. Additional samples (duplicates and triplicates) were obtained during each monitoring event to confirm the previous quarters' results. During the 1991 third and fourth quarter monitoring events, the new wells (MW-1B, MW-1C, MW-17A, and MW-17B) were included in the sampling program and the samples were analyzed for the constituents listed above.

In addition to the quarterly monitoring, the four new monitoring wells (MW-1B, MW-1C, MW-17A and MW-17B) were sampled during the months of August, October November and January 1992. These samples were only analyzed for arsenic. Since the new monitoring wells and MW-12C and MW-13C were not part of the approved monitoring plan, the results of their analyses were not incorporated into the quarterly statistical evaluations.

During the third quarter 1991 monitoring event the annual parameters (iron, sulfate, chloride and manganese) and an additional suite of cations and anions (sodium, potassium, calcium, magnesium, bicarbonate alkalinity and carbonate alkalinity) were analyzed to aid in the interpretation of the major ion chemistry of the ground water.

An evaluation of the major ions occurring in ground water on-site was performed using the September, 1991 data. A compilation of the major ions and historical ground-water monitoring data can be referenced in Appendix C. Additional cations and anions were analyzed and the findings are discussed in Section 3.3.1, Major Ion Chemistry.

2.2 Statistical Evaluation

Analytical data obtained from the downgradient monitoring well samples in 1991 were compared to analytical data from upgradient monitoring well (MW-1) samples by applying a continuity correction to Cochran's Approximation to the Behrens-Fisher Student's t-test. Samples from the monitoring wells which were found to have concentrations of constituents above the calculated mean background concentration were resampled in triplicate during the next sampling event. Because of the low calculated mean background concentrations, most of the constituents which were found in detectable quantities also measured above the calculated mean background levels. The initial analytical results were then combined with the results of the triplicate resampling

to perform the statistical analysis. The statistical test that was used checked the null hypothesis:

Ho: the concentration of the constituent in the downgradient well is not greater than the concentration in the upgradient well (MW-1).

Versus the alternate hypothesis:

Hi: the concentration of the constituent in the downgradient well is greater than the concentrations the upgradient well (MW-1).

When the statistical test indicated that Ho could be rejected with a confidence level of 99%, then Hi was accepted. The decision to accept or reject Ho is documented in Appendix D (1991 Statistical Evaluations). The statistical test is described in further detail in Section 6.2 of the Quanex Corporation Michigan Seamless Tube Division Ground Water Quality Assessment Program dated April, 1986 as amended.

During 1991, the concentrations that were found to reject the null hypothesis are listed below.

(First Quarter 1991)

Well Sample	Constituent Tested	Analytical Results (ug/l)
MW-11A	1,1 DCA	3.0, 4.0, 4.0, 3.0
MW-11B	1,1 DCA	4.0, 3.0, 4.0, 3.0
MW-11D	arsenic	6.5, 5.6, 5.4, 5.4
MW-12B	arsenic	7.7. 6.4, 7.0, 6.6
MW-13B	arsenic	5.7, 5.2, 4.8, 5.0

(Second Quarter 1991)

Well Sample	Constituent Tested	Analytical Results ug/l
MW-11A	1,1 DCA	4.0, 4.0, 5.0, 4.0
MW-11B	1,1 DCA	3.0, 4.0, 4.0, 4.0
MW-11D	arsenic	5.6, 5.0, 5.0, 4.5
MW-12B	arsenic	6.4, 6.6, 7.7, 7.9
MW-13B	arsenic	5.2, 4.6, 5.7, 5.7

(Third Quarter 1991)

Well Sample	Constituent Tested	Analytical Results ug/l
MW-11A	1,1 DCA	4.0, 5.0, 5.0, 5.0
MW-11B	1,1 DCA	4.0, 4.0, 4.0, 4.0
MW-11D	arsenic	5.0, 6.2, 4.3, 4.7
MW-12B	arsenic	6.6, 6.7, 6.6, 6.3
MW-13A	arsenic	3.0, 4.0, 4.1, 3.9
MW-13B	arsenic	4.6, 5.4, 4.8, 5.4

(Fourth Quarter 1991)

Well Sample	Constituent Tested	Analytical Results ug/l
MW-6A	arsenic	25, 34, 31, 34
MW-6A	1,1 DCA	35.0, 39.0, 34.0, 32.0
MW-11A	1,1 DCA	5.0, 11.0, 11.0, 12.0
MW-11B	arsenic	3.5, 5.8, 6.6, 4.8
MW-11D	arsenic	6.2, 6.5, 7.1, 7.8
MW-12B	arsenic	6.7, 8.3, 11.0, 9.9
MW-13A	arsenic	4.0, 3.3, 5.7, 5.4

3.0 ADDITIONAL HYDROGEOLOGIC INVESTIGATION

3.1 Field Activities

3.1.1 Soil Boring and Monitoring Well Installation

Five monitoring wells were installed by Stearns Drilling, of Dutton, Michigan, during the period of July 15 through July 19, 1991, under the direct supervision of a geologist from WWES. Soil borings were drilled and completed as monitoring wells to document soil types and to provide ground-water sampling locations within the shallow, intermediate and deeper portions of the aquifer. Upgradient monitoring wells, with respect to the inactive surface impoundments, were installed adjacent to existing well MW-1 which has been relabeled as MW-1A. The new wells at that location were completed at depths of 40 and 75 feet below grade and are designated as MW-1B and MW-1C, respectively. A second upgradient well cluster consisting of two wells was installed near the location of soil boring SB-23. The wells were completed at depths of 20 and 75 feet below grade and are designated as MW-17A and MW-17B, respectively. During well installation

activities and at the request of Quanex, WWES replaced a damaged monitoring well, MW-6A, and properly abandoned another damaged well, MW-6B. The new monitoring well locations were surveyed and correlated to previous surveyed elevations using known benchmarks and buildings. Figure 2 presents a partial site map showing the focus of the investigation and the location of each new monitoring well.

Boreholes were completed to depths of 15 to 75 feet with a CME-75 truck mounted rotary drilling rig using 4 1/4-inch inner diameter hollow-stem augers. A deep soil boring was drilled and sampled at each well cluster location to characterize soil types. Shallow wells were then installed in profile borings drilled adjacent to the deep boreholes. Within each deep soil boring, soil samples were obtained with a split-spoon sampler using the Standard Penetration Test Method as described in ASTM Procedure D 1586. This sampling method permits the collection of discrete, relatively undisturbed soil samples for visual classification. Boreholes 1C and 17B were sampled at 2.5-foot intervals to a depth of 30 feet and then at 5.0-foot intervals to 75 feet. Soil boring logs are provided in Appendix A of this report.

Monitoring wells installed in each soil boring were constructed of new, 2-inch inner-diameter, flush-jointed, schedule-40 PVC well casing and screen. Each well has a 5-foot screen section with 0.010-inch slot openings. After extending the borehole to the required depth, the well assembly was lowered into the borehole and native soils were allowed to collapse around the screen. Graded silica filter sand was used in cases where the formation material did not collapse at least two feet above the screened interval. A minimum two foot thick bentonite pellet or slurry seal was emplaced above the filter pack. The annulus between the borehole and the PVC casing was sealed with cement/bentonite grout from the top of the bentonite seal to the ground surface. A steel, locking, protective casing was installed over the well casing. The monitoring well construction details follow the appropriate soil boring log in Appendix A.

The monitoring wells were developed by Stearns Drilling Company under the direction of the supervising geologist. Following the placement of a well assembly into the borehole, the well was alternately pumped for a few minutes and then allowed to recharge. This procedure was repeated several times during a period of approximately thirty minutes. Each time the pump was restarted, the discharge water exhibited slight turbidity and then became visually clear after a brief time.

Prior to the initiation of drilling and between each boring location, all drilling equipment, well casings and screen sections, split-spoon samplers, and tools were decontaminated by steam cleaning. Quanex Corporation provided potable water from the Quanex facility water supply. Between sample intervals, sampling equipment was hand washed with Alconox and water, and rinsed with potable water followed by distilled water to minimize the potential for cross contamination.

3.1.2 Ground-Water Sampling and Analysis

Ground-water samples obtained during this investigation were collected in accordance with the sampling procedures detailed in the Ground Water Quality Assessment Program dated April, 1986 as amended. Ground-water samples were collected monthly from the new upgradient well clusters and analyzed for dissolved arsenic during the period of August, 1991 through January, 1992. The results of the arsenic analyses have been summarized and are presented in Table 1. Arsenic analytical results are included in Appendix E. A complete statistical evaluation of arsenic concentrations at the site is presented in Section 3.3.3

In addition, a complete set of cations and anions (sodium, potassium, calcium, magnesium, iron, chloride, bicarbonate, sulfate, and carbonate) were analyzed during the September, 1991 annual sampling event to document variations in ground-water chemistry beneath the site. Stiff and Piper diagrams have been plotted for selected sampling locations and are included in Appendix F. The Stiff diagrams are also presented to scale on the subsurface profiles (Figures 6 through 9). The results of the additional sampling and analysis are discussed in Section 3.3.

3.2 Hydrogeologic Conditions

3.2.1 Regional Overview

Descriptions of regional and site hydrogeology for the Quanex facility have been included in the Ground Water Quality Assessment Program report. The regional geology beneath the Quanex plant and South Lyon area consists of unconsolidated glacial deposits overlying sedimentary bedrock. The glacial deposits in this region consist of outwash, moraines and ice contact deposits that are up to 400 feet thick and overlie bedrock of the Coldwater shale. The bedrock surface is estimated to occur at an approximate elevation of 650 feet above mean sea level (msl).

The topography of the area surrounding the Quanex facility generally slopes to the west with surface elevations ranging from 910 to 920 feet msl. Ground surface elevations 1.7 miles northeast of the site extend to a maximum elevation of 1,000 feet msl. Surface water and shallow ground water flows from the topographically higher areas and discharges to Inchwagh Lake, located less that one mile to the southwest of the facility boundary. Inchwagh Lake represents a local ground-water discharge point with an elevation of 887 feet msl. Yerkes Drain, located along the south property line of the Quanex facility, generally contains water throughout the year which flows from east to west and eventually discharges into Inchwagh Lake.

3.2.2 Site Hydrogeology

The following discussion has been developed from previous studies and the additional subsurface information obtained during this study. Subsurface conditions beneath the Quanex facility have been interpreted from soil boring and water level data and are presented in four subsurface profiles, Figures 6 through 9. Profile lines are shown on Figure 2. The selection of profile lines was based on the new soil boring data, the proximity of the new well clusters to existing well clusters, and the availability of existing soil boring logs.

Soils - Soils encountered during the installation of the additional upgradient monitoring wells are consistent with information presented in the WWES Ground-Water Quality Assessment Program Report. The uppermost soils consisted of poorly sorted sand and gravel and can generally be described as outwash deposits. These deposits were encountered at every borehole location and range in thickness from approximately 25 feet beneath the northern, eastern, and central portion of the site to over 75 feet beneath the southwestern corner of the property. An interbedded sequence of sand, silt and clay soils was found to underlie the outwash materials at most borehole locations. The contact between the two general soil types is shown with a heavy black line on the subsurface profiles. The profiles demonstrate a lack of correlation between individual soil layers within the interbedded soil sequence. (Figures 6 through 8; Profiles A-A', AA-A' and B'-B). Beneath the southwest portion of the site, interbedded sands, silts and clays were not encountered and only outwash deposits were documented in boreholes completed to a depth of 75 feet below ground surface (Figure 9, Profile C-C').

Ground Water - Shallow ground water exists within soils beneath the site under water table conditions. Water levels measured in shallow on-site wells on September 19, 1991, December 13, 1991, and January 6, 1992, were used to construct water-table contour maps presented in Figures 3 through 5. Ground-water flow beneath the site is to the west-southwest and is generally parallel to the regional ground-water flow direction. The water level data collected over time indicates minimal changes in shallow flow patterns other than seasonal fluctuations in water level elevations (see Figure 5, Ground-Water Contour Map-January 6, 1992).

Shallow ground-water levels measured within the outwash deposits beneath the north-central to northeast portion of the site are slightly elevated with respect to shallow water levels measured in areas to the south and west. This difference in shallow water levels across the site is the result of changes in subsurface soil conditions. Shallow ground-water elevations beneath the northern, eastern and central portions of the site are in the general range of 908 to 910 feet msl. Shallow ground-water elevations measured beneath the southwestern portion of the site are in the general range of 905 to 907 feet msl. Elevated ground-water conditions occur at the north, east and central portions of the site as a result of clay soils within the interbedded soil sequence that inhibit downward movement of ground water. This elevated water-level condition is illustrated at the locations of well clusters MW-1ABC and MW-17AB. In the southwest area of the site, clay soils were not encountered (well cluster MW-11ABCD) and less significant differences in water levels between wells screened at various depths were noted.

Ground-water gradients beneath the Quanex site have been evaluated using water levels observed in site monitoring wells during the period of August 15, 1991 through January 6, 1992. Low to nearly horizontal water-table gradients were measured beneath the north, east and central portions of the site. Calculated horizontal gradients between wells MW-1A and MW-17A range from 0.0004 ft/ft to 0.002 ft/ft and gradients between wells MW-17A and MW-13A range from 0.0001 ft/ft to 0.0008 ft/ft. Horizontal water-table gradients increase slightly beneath the west-central and southwest portions of the site; in areas where increases in outwash deposit thicknesses were noted. Calculated horizontal gradients between wells MW-13A and MW-11A were 0.01 ft/ft and gradients between wells MW-13A and 6A range from 0.005 ft/ft to 0.006 ft/ft.

An evaluation of water levels measured in monitoring wells during the present and previous investigations suggests slightly downward to essentially no vertical gradients

beneath the site. Slight downward gradients were noted between wells located above the interbedded soil sequence and wells located at depth within the interbedded soil sequence. Calculated vertical gradients between wells MW-1A and MW-1B ranged from 0.09 ft/ft to 0.04 ft/ft downward and between wells MW-17A and MW-17B gradients ranged from 0.03 ft/ft to 0.04 ft/ft downward. No significant differences were noted between shallow and deeper water levels in wells MW-11ABCD installed in the outwash deposits.

Ground-water flow beneath the site can be further illustrated with the use of a vertical flow net. Two flow nets were constructed upon Figure 7, the AA-A' subsurface profile, using water-level data collected on September 19, 1991 and January 6, 1992, (Figures 10 and 11). These flow nets are considered generalized and representative of the general ground-water flow patterns beneath the Quanex property. Ground-water flow lines are perpendicular to the lines of equipotential on a profile, drawn with no vertical exaggeration, and flow occurs from the higher potential toward lower potential. Figure 7 contains some vertical exaggeration and the flow lines shown on Figures 10 and 11 are approximate and were not drawn perpendicular to the equipotential lines. Changes between the generalized flow nets shown in Figure 10 and 11 are the result of seasonal variations in site water levels.

An illustration of apparent upward gradients in the MW-13 area is provided on Figure 10. In this area, ground-water flow within the interbedded soil sequence is influenced by changes in soil permeability. Granular soils of higher permeability included within soils of lower permeability will result in the "lens effect", or localized flow direction changes. Ground-water flow will tend to converge at the upgradient end of the granular soil lens and diverge at the downgradient end of the granular soil lens. These flow direction changes can result in the appearance of a vertically upward gradient. The lens effect can be demonstrated between monitoring well clusters MW-13B and MW-13C; MW-13B is completed within a granular soil type which is more permeable than the surrounding soils. Within the heterogeneous materials, abrupt changes in permeability that may result in local variations in ground-water flow are expected. Flow conditions within the granular outwash deposits are expected to be more uniform when compared to flow within the interbedded soil sequence.

3.3 Analytical Results

3.3.1 Major Ion Chemistry

Ground-water samples collected in September, 1991 were analyzed for a complete set of major cations and anions. The analytical results were plotted on both Stiff and Piper diagrams to illustrate the chemical variability of ground water at the site. Stiff diagrams provide a graphic presentation of ground-water chemistry at a point within an aquifer thereby allowing a visual comparison of water quality at various locations within the aquifer system. Piper trilinear diagrams are a convenient method used to illustrate changes in ground-water chemistry obtained from multiple sampling locations on one diagram and can be used to classify ground water according to hydrochemical conditions, or facies. When used with other hydrogeological information, these graphical representations may differentiate ground water from different flow systems or may identify changes in ground-water chemistry within a single flow system.

Stiff diagrams, included within Appendix F, were prepared for selected well locations to illustrate variations in ground-water quality both horizontally across the site and vertically within the shallow, intermediate and deeper portions of the aquifer. For visual comparison, Stiff diagrams have also been included on geologic profiles, Figures 6 through 9 . Referring to Figure 7, changes in sulfate concentrations downgradient of the surface impoundments can be noted in MW-11A, MW-11B and MW-16A. Ground water at MW-13B, completed in a sand layer within the interbedded sequence, also exhibits higher sulfate concentrations. Sulfate in the deeper downgradient wells, MW-11D and MW-13C, decreases in concentration.

An inspection of the summary plot of the Piper trilinear diagrams show that ground water upgradient of the surface impoundments within the shallow, intermediate and deeper portions of the aquifer is primarily of the calcium-bicarbonate hydrochemical facies. Ground-water chemistry downgradient of the surface impoundments within the upper portion of the aquifer generally shows increases in concentrations of sulfate and is characterized as a calcium-sulfate water. Ground-water chemistry in the deeper portions of the aquifer downgradient of the impoundments at the locations of MW-11D and MW-6A classifies as no dominant type. Stiff diagrams and summary plots of the piper trilinear diagrams with acetate overlays showing hydrochemical facies are provided in Appendix F.

3.3.2 Arsenic

Arsenic is known to occur naturally in Michigan ground waters. Ground water obtained from the new wells installed at the MW-1 and MW-17 locations and MW-1A was sampled monthly for six months and analyzed for dissolved arsenic to provide sufficient background data for a statistical evaluation. The results of the monthly sampling and analysis for arsenic have been summarized on Table 1. At the Quanex facility, arsenic concentrations in ground water upgradient of the surface impoundments ranged from less than 1 ppb to 19 ppb. Arsenic concentrations in wells upgradient of the surface impoundments show consistent increases with depth. At the location of well cluster MW-1ABC, arsenic concentrations increased with depth to a maximum of 10 ppb at a depth of 75 feet. At the location of well cluster MW-17AB, arsenic concentrations averaged 7.6 ppb at a depth of approximately 20 feet and 15.8 ppb at a depth of 75 feet.

The highest arsenic concentrations occur at MW-6A, (up to 34 ppb) located downgradient of surface impoundments. Other downgradient wells, MW-11A through MW-11D, MW-15A and MW-16A have arsenic concentrations ranging from nondetect to 7.8 ppb. Arsenic concentrations at MW-6A do not appear to be related to the surface impoundments since other downgradient wells closer to the inactive impoundments do not show arsenic above 10 ppb. Arsenic concentrations in ground water at the site are below 50 ug/l, the National Drinking Water Standard for arsenic. A discussion of the statistical evaluation of arsenic is presented in the following paragraphs.

3.3.3 Statistical Evaluation of Arsenic

A more complete, representative set of site background arsenic concentrations has been established following the installation and sampling of new upgradient monitoring wells MW-1B, MW-1C, MW-17A, and MW-17B. The new mean background concentration was calculated by using the most recent arsenic monitoring data from MW-1A and from the new upgradient monitoring wells. To avoid biasing the arsenic concentrations from MW-1A, only the arsenic data from corresponding sampling dates were utilized in the new calculation. The results of these calculations are presented in Appendix G - 1991 Statistical Evaluations with New Mean Background, and are listed by quarter. The new calculated mean background concentration was then substituted into each of the statistical

analyses for arsenic that were performed during 1991. The results of these analyses are also presented in Appendix G.

The concentration of arsenic at MW-6A exceeded the revised background data set. None of the other wells have arsenic concentrations above the more complete set of background data. Since MW-6A is not immediately adjacent to the surface impoundments, and since monitoring wells which are located closer to the impoundments do not have elevated levels of arsenic, the impoundments do not appear to have impacted the concentration of arsenic in ground water beneath the Quanex Site.

4.0 CONCLUSIONS

This annual ground-water quality report for the Quanex Site presents the following conclusions:

1. Ground-water flow beneath the site is generally horizontal and is consistently to the west-southwest.

2. Ground-water elevations are slightly higher and show more variation with depth in the north and northeast portions of the Quanex site in an area where shallow sand and gravel is underlain by interbedded clay, silt and sand soils. In the south and southwest portions of the site, subsurface soils consist of sands and gravel and water levels measured within well clusters show little variation with depth.

3. Slight downward to essentially no vertical gradients are observed at the site. The major component of ground-water flow is horizontal. Water levels measured in some well clusters completed within the interbedded sequence (i.e., MW-13ABC) exhibit apparent slight upward gradients. This can be attributed to the "lens effect", whereby ground-water flow tends to converge upon a lens or layer exhibiting a relatively higher permeability than the surrounding soils and diverge as ground water exits the lens.

4. Ground-water chemistry upgradient of the surface impoundments can be classified within the calcium-bicarbonate hydrochemical facies. Ground water downgradient of the surface impoundments at some locations classifies as a calcium-sulfate type water.

5. The revised mean background arsenic concentration is more representative of site conditions.

6. Arsenic concentrations, ranging from less than 1 ppb to 19 ppb were detected in ground water in wells located upgradient of the surface impoundments. Arsenic concentrations in upgradient wells show consistent increases with depth. Based on the additional arsenic data, it appears that arsenic is naturally occurring upgradient of the surface impoundments.

7. Using the revised mean background arsenic concentration, statistical exceedances occur at MW-6A which is located downgradient of the surface impoundments. Other downgradient wells, MW-11A through MW-11D, MW-15A and MW-16A do not show increases above the mean background concentration for arsenic. The exceedance at MW-6A appears to be localized and does not appear to be related to the surface impoundments since other downgradient wells do not show statistically significant increases in arsenic.

8. Arsenic concentrations in ground water at the site do not exceed established Primary National Drinking Water Standards for maximum arsenic levels which are currently 50 ug/l.

4.0 RECOMMENDATIONS

Based on the additional arsenic data collected during this study, it is recommended that arsenic concentrations from monitoring well locations MW-1A through MW-1C, MW-17A and MW-17B be included in the background population used to establish representative background conditions at the Quanex Site. The revised mean background concentrations for arsenic should be used for future statistical comparisons. It is also recommended that the Quanex sampling and analysis plan be revised to include wells MW-1B, MW-1C, MW-17A, and MW-17B.

TABLE

TABLE 1

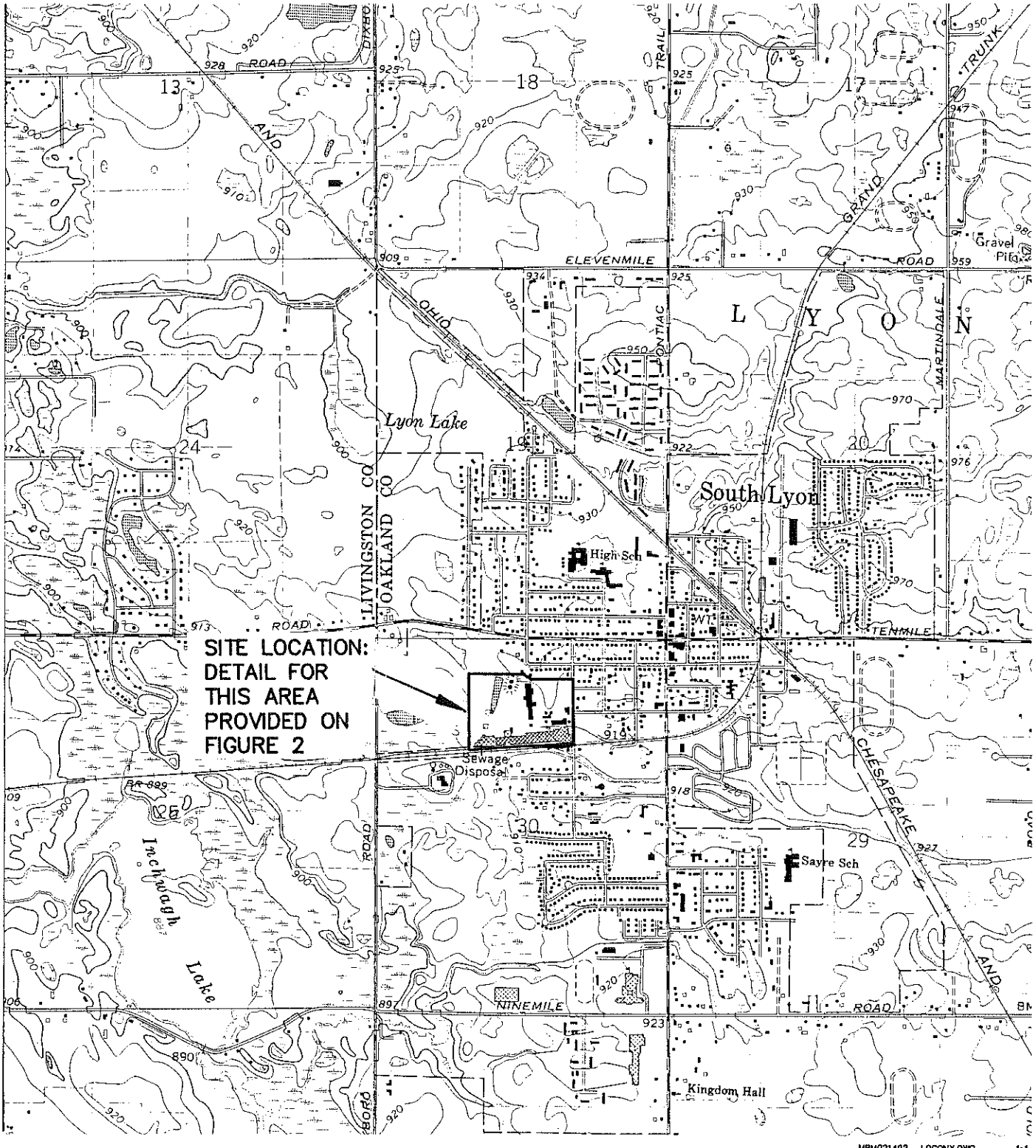
SUMMARY OF MEASURED ARSENIC CONCENTRATIONS (ug/l)
Quanex Corporation
Michigan Seamless Tube Division
South Lyon, Michigan

MONITORING WELLS	MONTHLY SAMPLING RESULTS					
	Aug-91	Sep-91	Oct-91	Nov-91	Dec-91	Jan-92
MW-1A	<1.0	<1.0	1.3	<1.0	<1.0	<1.0
MW-1B	5.0	5.5	6.2	4.1	5.4	4.6
MW-1C	7.6	9.0	<1.0	8.8	10.0	8.0
MW-6A		25.0			34.0, 31.0, 34.0*	
MW-11A		1.8, 1.7, 2.3*			3.2, 3.0, 2.4*	
MW-11B		1.9, 3.7, 3.5*			5.8, 6.6, 4.8*	
MW-11D		4.3, 4.7, 6.2*			6.5, 7.1, 7.8*	
MW-12A		<1.0			<1.0	
MW-12B		6.6, 6.3, 6.7*			8.3, 11.0, 9.9*	
MW-12C		4.4, 4.6, 4.2*			<1.0	
MW-13A		4.1, 3.9, 4.0*			3.3, 5.7, 5.4*	
MW-13B		4.8, 5.4, 5.4*			5.4, 26.0, 7.1*	
MW-13C		17.0			20.0	
MW-15A		<1.0			<1.0	
MW-16A		<1.0			<1.0	
MW-17A	7.4	8.6	8.5	7.4	8.3	5.5
MW-17B	14.0	17.0	16.0	15.0	19.0	14.0

* Triplicate samples collected
ug/l = micrograms per liter

83160.00

FIGURES



LEGEND

NOTE:
BASE MAP TAKEN FROM U.S.G.S.
TOPOGRAPHIC QUADRANGLE
SOUTH LYON, MI (1983)
CONTOUR INTERVAL = 10 FEET

0 2000 4000
SCALE IN FEET

NORTH

SITE LOCATION
QUANEX CORPORATION
MICHIGAN SEAMLESS TUBE DIVISION
SOUTH LYON, MICHIGAN

MARCH 1992 PROJECT NO. 83160

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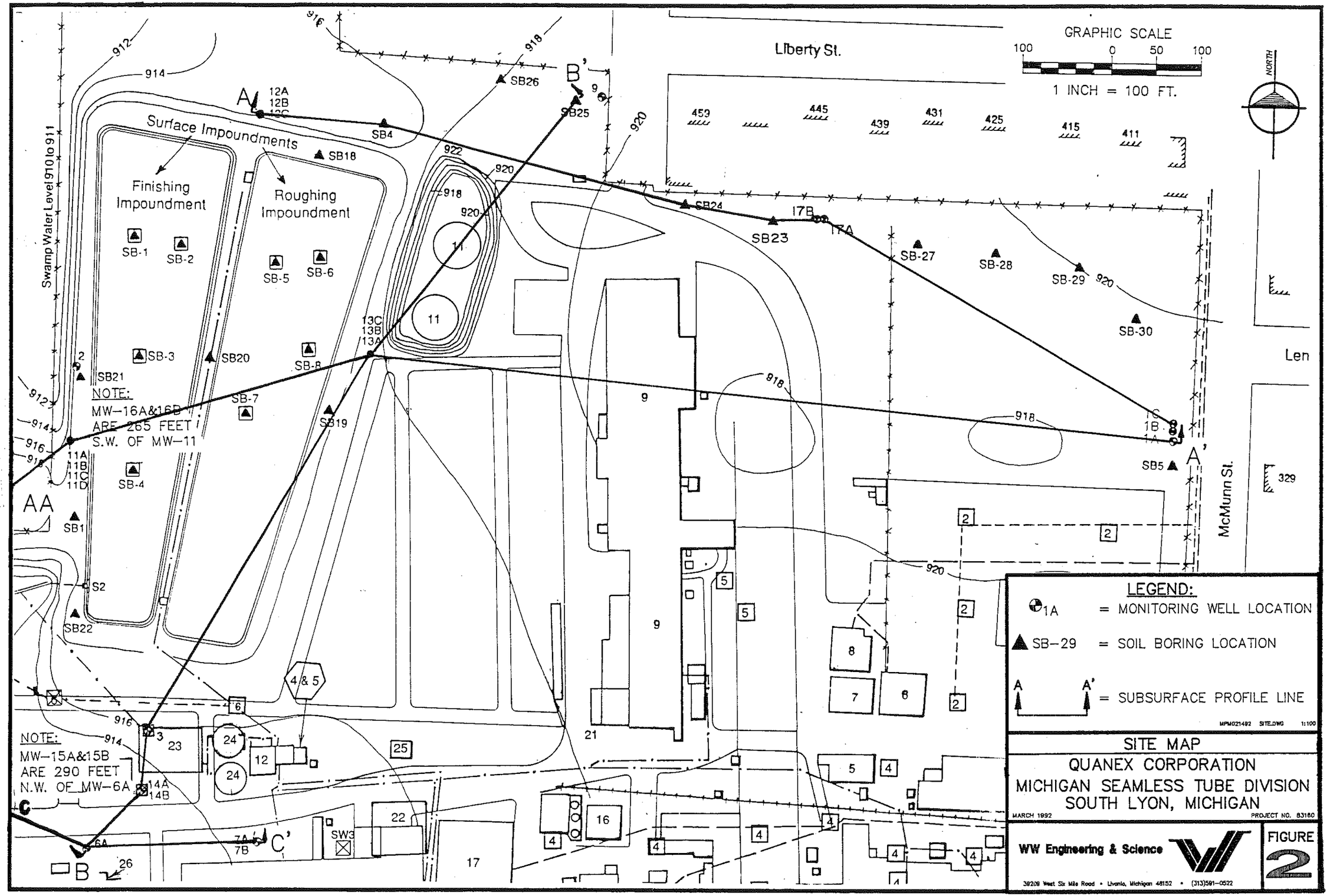
FIGURE 1



SITE MAP

QUANEX CORPORATION
MICHIGAN SEAMLESS TUBE DIVISION
SOUTH LYON, MICHIGAN

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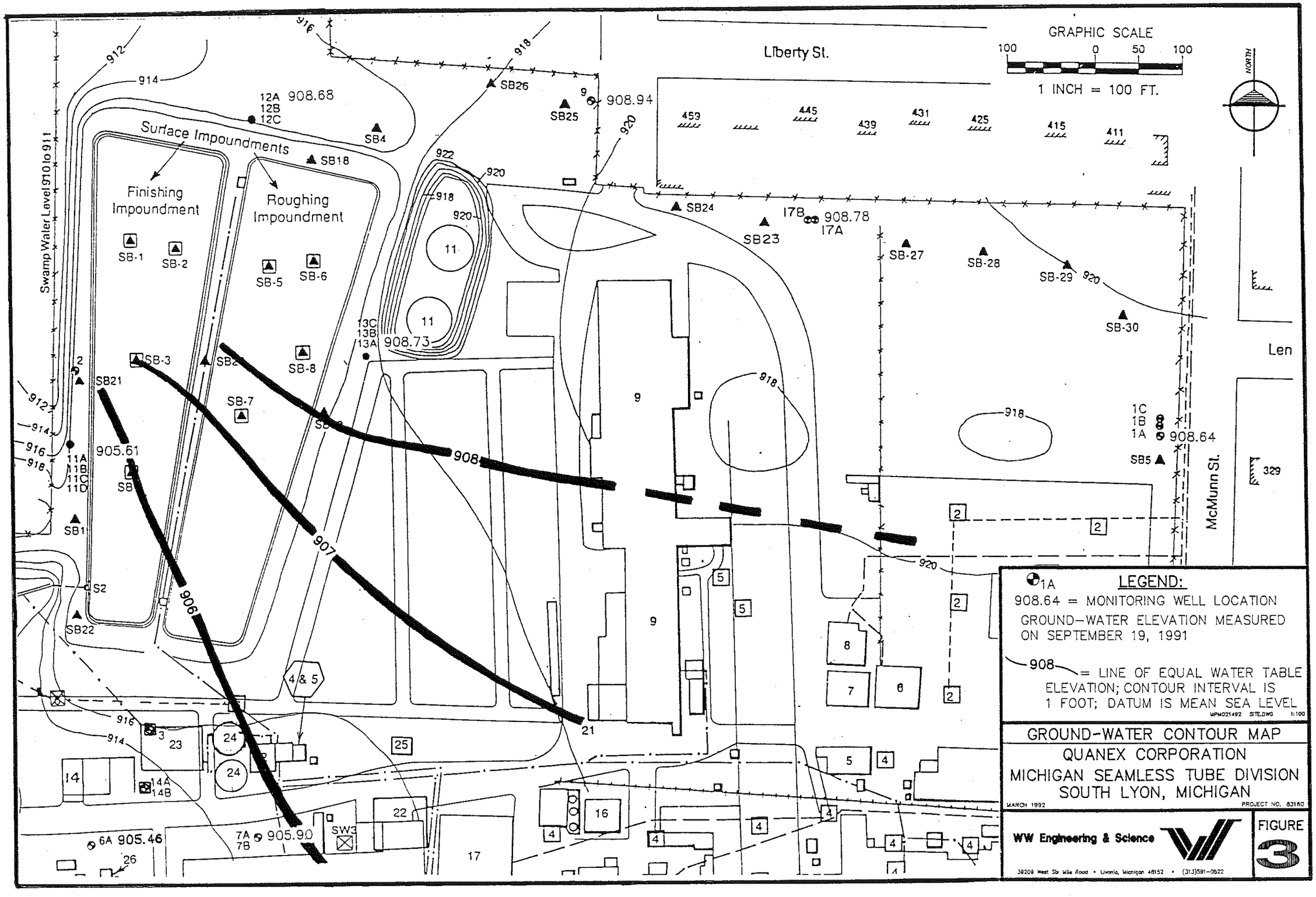
FIGURE 2


GRAPHIC SCALE
100 0 50 100
1 INCH = 100 FT.
NORTH
Liberty St.
McMunn St.
Len
Surface Impoundments
Finishing Impoundment
Roughing Impoundment
Swamp Water Level 910 to 911
12A 908.68
12B
12C
SB4
SB18
SB26
SB25
9 908.94
SB24
SB23
17B 908.78
17A
SB-27
SB-28
SB-29
SB-30
SB-1
SB-2
SB-5
SB-6
SB-3
SB-8
SB-7
SB21
13C
13B
13A 908.73
11A
11B
11C
11D
905.61
SB1
S2
SB22
1C
1B
1A 908.64
SB5
6A 905.46
7A
7B 905.90
SW3
4 & 5
908
907
906
912
914
916
918
920
922
1A
LEGEND:
908.64 = MONITORING WELL LOCATION
GROUND-WATER ELEVATION MEASURED ON SEPTEMBER 19, 1991
908 = LINE OF EQUAL WATER TABLE ELEVATION; CONTOUR INTERVAL IS 1 FOOT; DATUM IS MEAN SEA LEVEL
MPM021492 SITE.DWG 1:100
GROUND-WATER CONTOUR MAP
QUANEX CORPORATION
MICHIGAN SEAMLESS TUBE DIVISION
SOUTH LYON, MICHIGAN
MARCH 1992
PROJECT NO. 83180
WW Engineering & Science
39209 West Six Mile Road • Livonia, Michigan 48152 • (313)591-0522
FIGURE 3

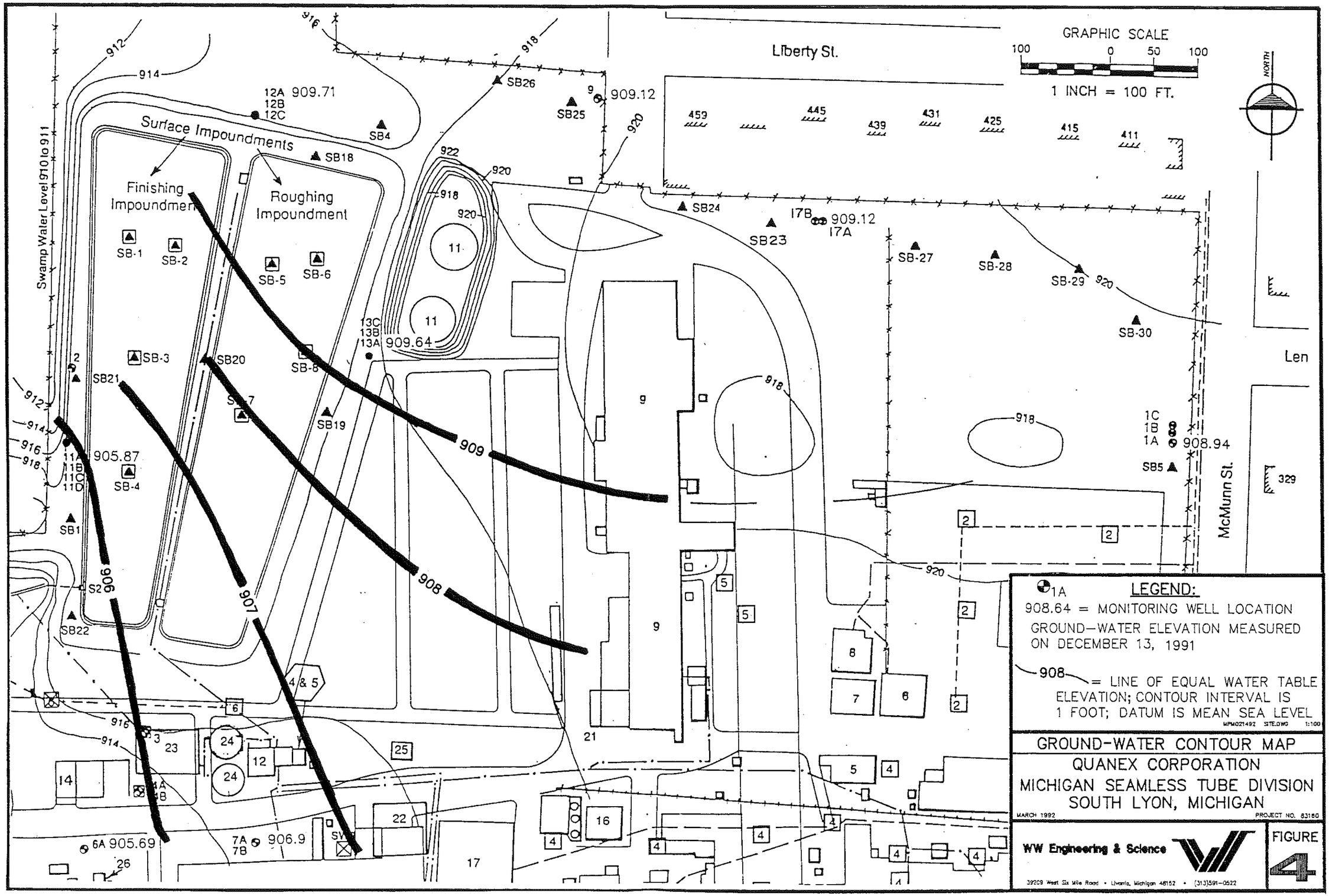

GRAPHIC SCALE
100 0 50 100
1 INCH = 100 FT.
NORTH
Liberty St.
McMunn St.
Len
Swamp Water Level 910 to 911
Surface Impoundments
Finishing Impoundment
Roughing Impoundment
12A 909.71
12B
12C
SB4
SB18
SB26
SB25
9 909.12
SB24
SB23
17B 909.12
17A
SB-27
SB-28
SB-29
SB-30
SB-1
SB-2
SB-5
SB-6
SB-3
SB20
SB-8
SB21
SB19
13C
13B
13A 909.64
11A 905.87
11B
11C
11D
SB-4
SB1
S2
SB22
1C
1B
1A 908.94
SB5
6A 905.69
7A
7B 906.9
909
908
907
906
912
914
916
918
920
922
329
459
445
439
431
425
415
411
LEGEND:
1A
908.64 = MONITORING WELL LOCATION
GROUND-WATER ELEVATION MEASURED ON DECEMBER 13, 1991
908 = LINE OF EQUAL WATER TABLE ELEVATION; CONTOUR INTERVAL IS 1 FOOT; DATUM IS MEAN SEA LEVEL
MPM021492 SITE.DWG 1:100
GROUND-WATER CONTOUR MAP
QUANEX CORPORATION
MICHIGAN SEAMLESS TUBE DIVISION
SOUTH LYON, MICHIGAN
MARCH 1992
PROJECT NO. 83160
WW Engineering & Science
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FIGURE 4

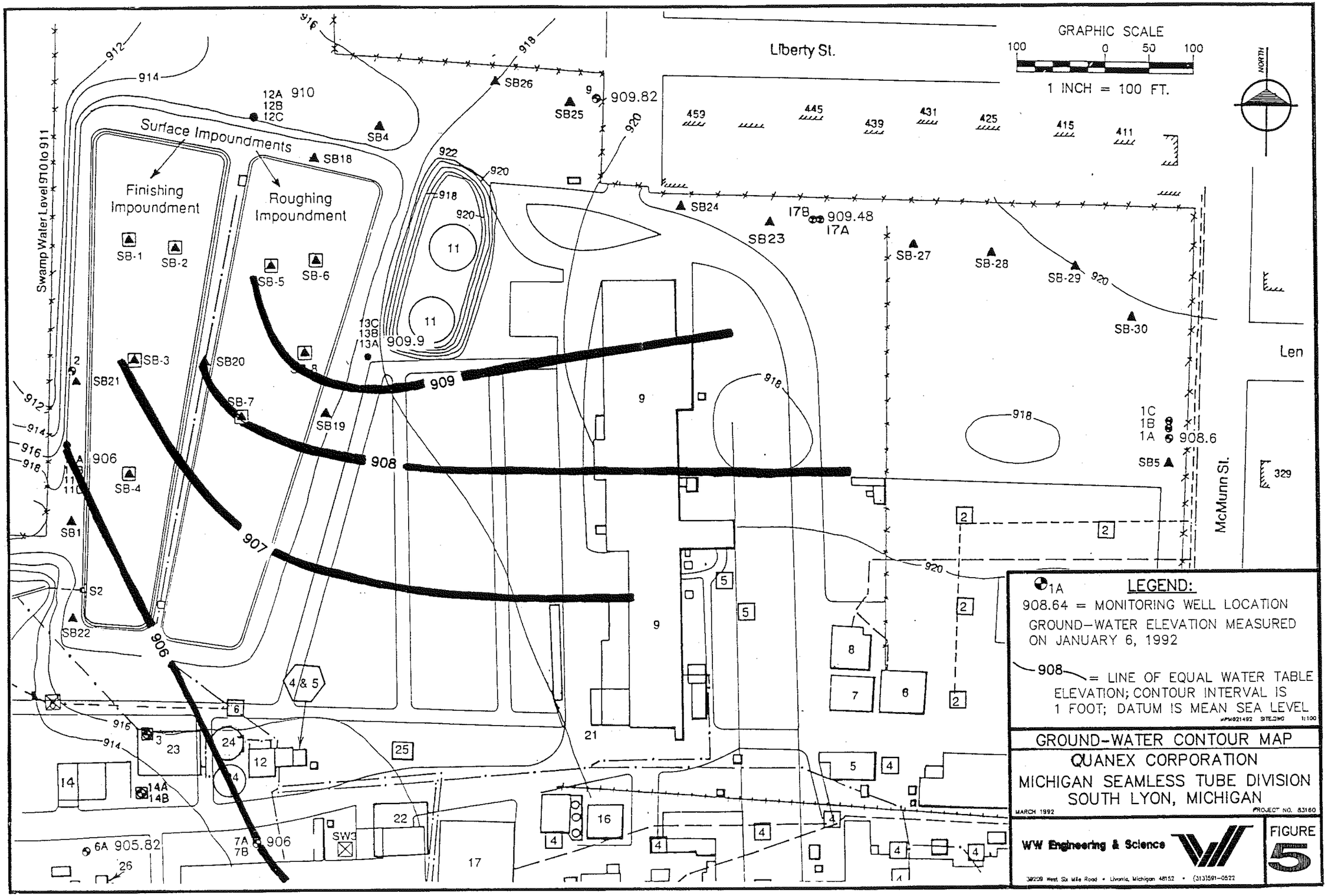
GRAPHIC SCALE
100 0 50 100
1 INCH = 100 FT.
NORTH
Liberty St.
McMunn St.
Len
Surface Impoundments
Finishing Impoundment
Roughing Impoundment
Swamp Water Level 910 to 911
12A 910
12B
12C
909.82
17B 909.48
17A
13C
13B
13A 909.9
1C
1B
1A 908.6
6A 905.82
7A 906
7B
SB1
SB2
SB3
SB4
SB5
SB6
SB7
SB18
SB19
SB20
SB21
SB22
SB23
SB24
SB25
SB26
SB27
SB28
SB29
SB30
S2
SW3
4 & 5
459
445
439
431
425
415
411
329
912
914
916
918
920
922
909
908
907
906
LEGEND:
1A
908.64 = MONITORING WELL LOCATION
GROUND-WATER ELEVATION MEASURED ON JANUARY 6, 1992
908 = LINE OF EQUAL WATER TABLE ELEVATION; CONTOUR INTERVAL IS 1 FOOT; DATUM IS MEAN SEA LEVEL
GROUND-WATER CONTOUR MAP
QUANEX CORPORATION
MICHIGAN SEAMLESS TUBE DIVISION
SOUTH LYON, MICHIGAN
MARCH 1992
PROJECT NO. 83160
WW Engineering & Science
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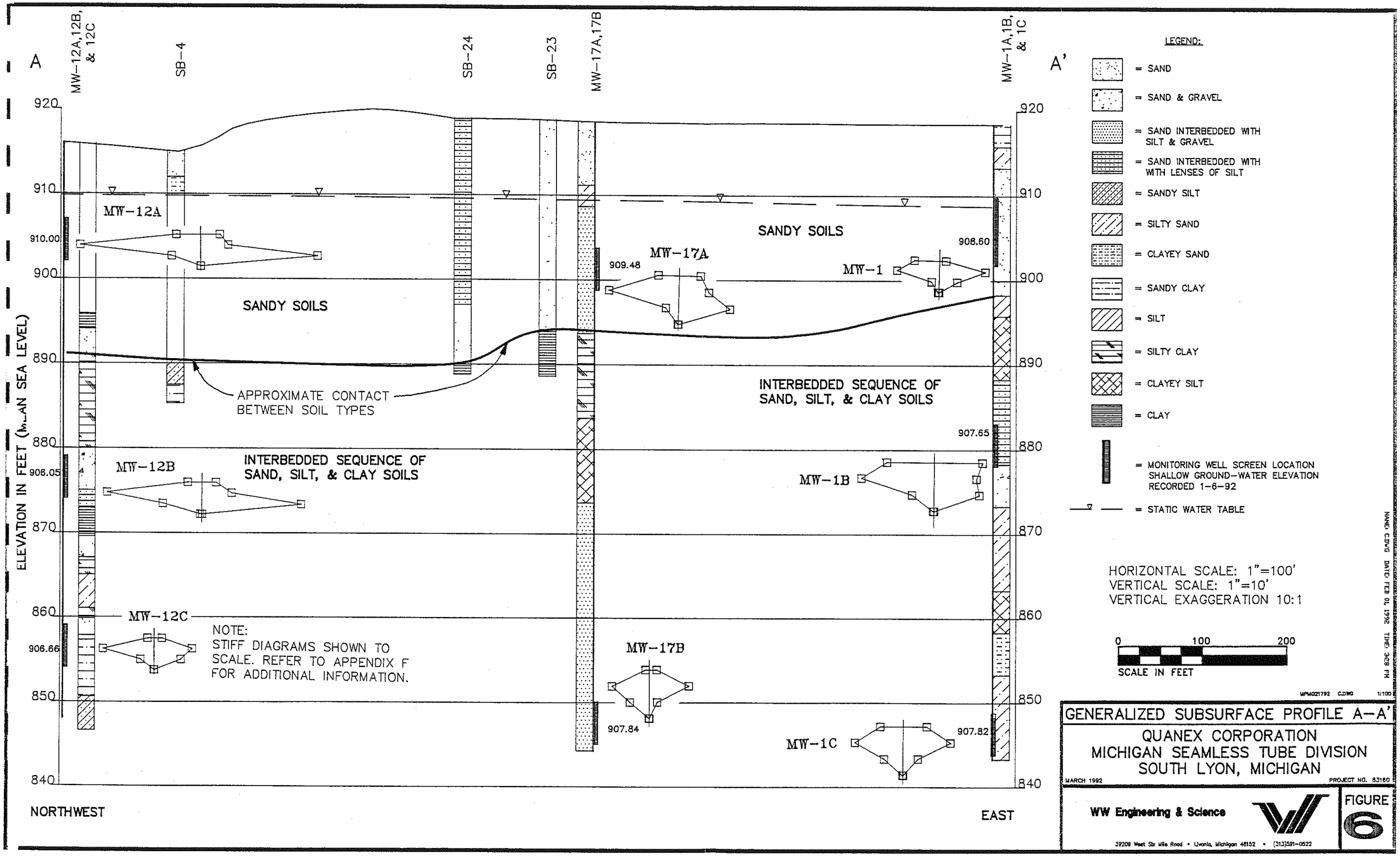
FIGURE 5



GENERALIZED SUBSURFACE PROFILE A–A'

QUANEX CORPORATION
MICHIGAN SEAMLESS TUBE DIVISION
SOUTH LYON, MICHIGAN

MARCH 1992 PROJECT NO. 83160

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FIGURE 6

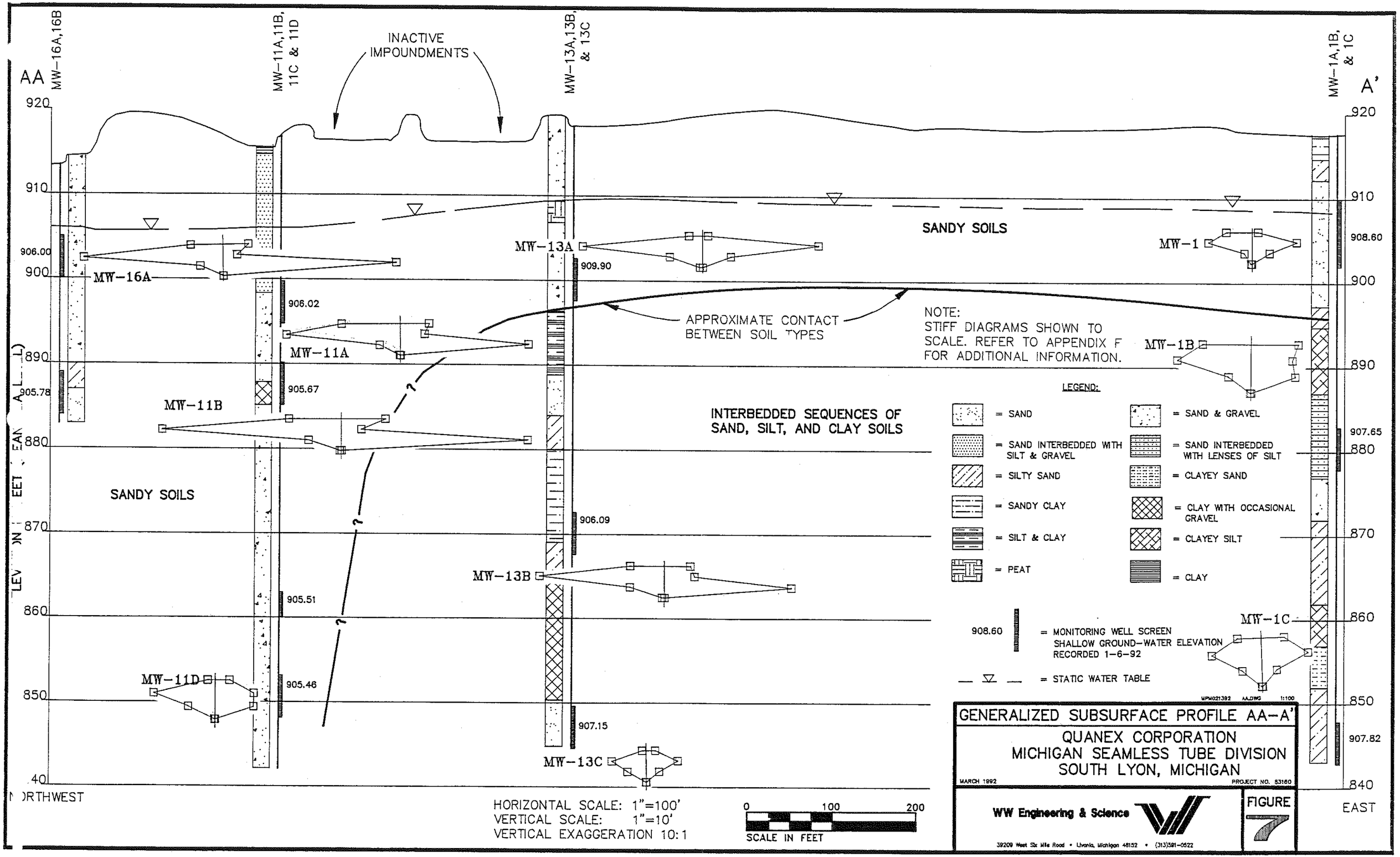
AA
A'
MW-16A,16B
MW-11A,11B, 11C & 11D
MW-13A,13B, & 13C
MW-1A,1B, & 1C
INACTIVE IMPOUNDMENTS
920
910
900
890
880
870
860
850
840
906.00
908.60
909.90
906.02
905.78
905.67
906.09
905.51
905.46
907.15
907.65
907.82
MW-16A
MW-13A
MW-1
MW-11A
MW-1B
MW-11B
MW-13B
MW-1C
MW-11D
MW-13C
SANDY SOILS
SANDY SOILS
APPROXIMATE CONTACT BETWEEN SOIL TYPES
NOTE:
STIFF DIAGRAMS SHOWN TO SCALE. REFER TO APPENDIX F FOR ADDITIONAL INFORMATION.
INTERBEDDED SEQUENCES OF SAND, SILT, AND CLAY SOILS
LEGEND:
= SAND
= SAND & GRAVEL
= SAND INTERBEDDED WITH SILT & GRAVEL
= SAND INTERBEDDED WITH LENSES OF SILT
= SILTY SAND
= CLAYEY SAND
= SANDY CLAY
= CLAY WITH OCCASIONAL GRAVEL
= SILT & CLAY
= CLAYEY SILT
= PEAT
= CLAY
908.60 = MONITORING WELL SCREEN SHALLOW GROUND-WATER ELEVATION RECORDED 1-6-92
= STATIC WATER TABLE
NORTHWEST
EAST
HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=10'
VERTICAL EXAGGERATION 10:1
0 100 200
SCALE IN FEET
GENERALIZED SUBSURFACE PROFILE AA-A'
QUANEX CORPORATION
MICHIGAN SEAMLESS TUBE DIVISION
SOUTH LYON, MICHIGAN
MARCH 1992
PROJECT NO. 83160
WW Engineering & Science
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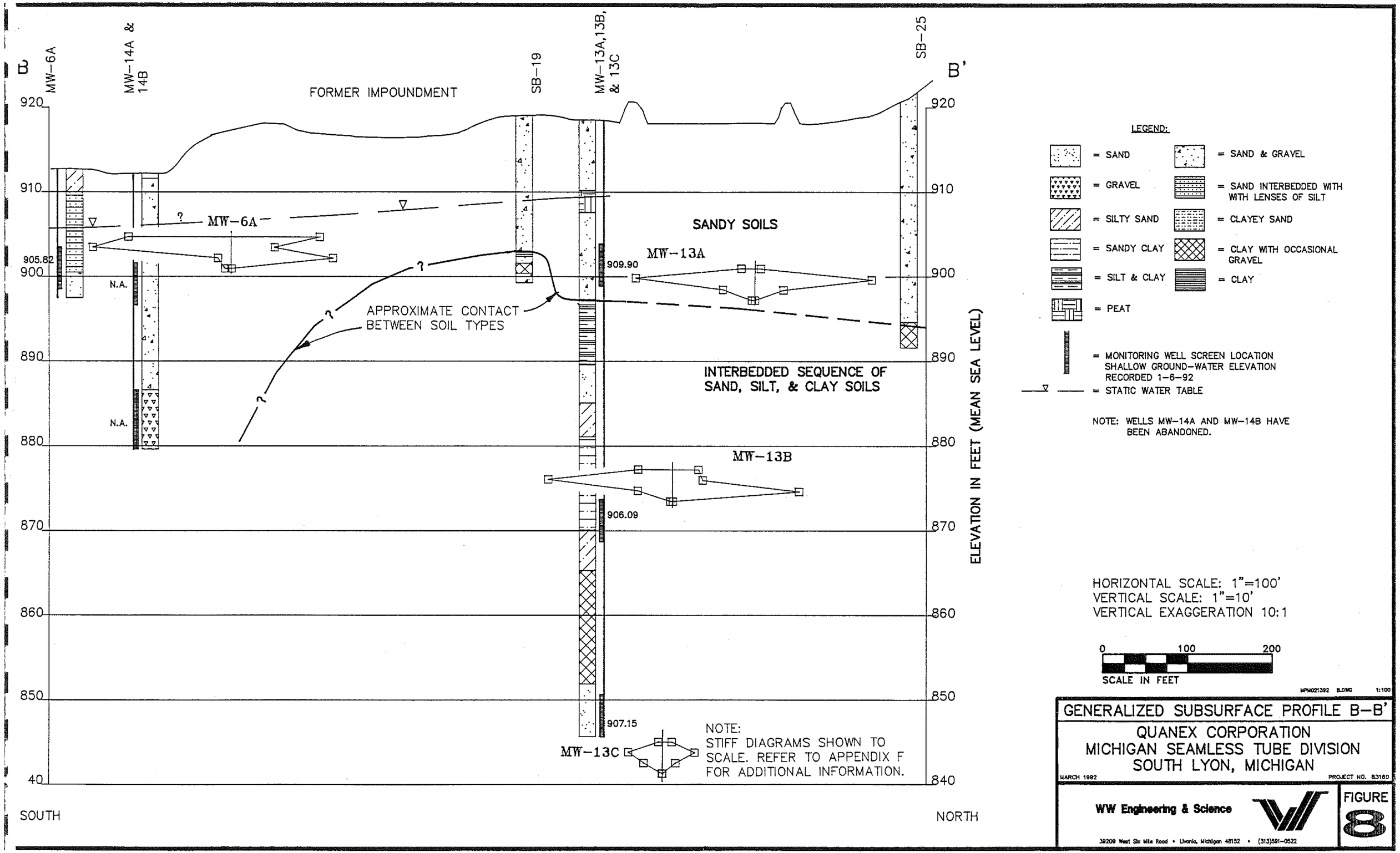
FIGURE



GENERALIZED SUBSURFACE PROFILE B-B'

QUANEX CORPORATION
MICHIGAN SEAMLESS TUBE DIVISION
SOUTH LYON, MICHIGAN

MARCH 1992

PROJECT NO. 83160

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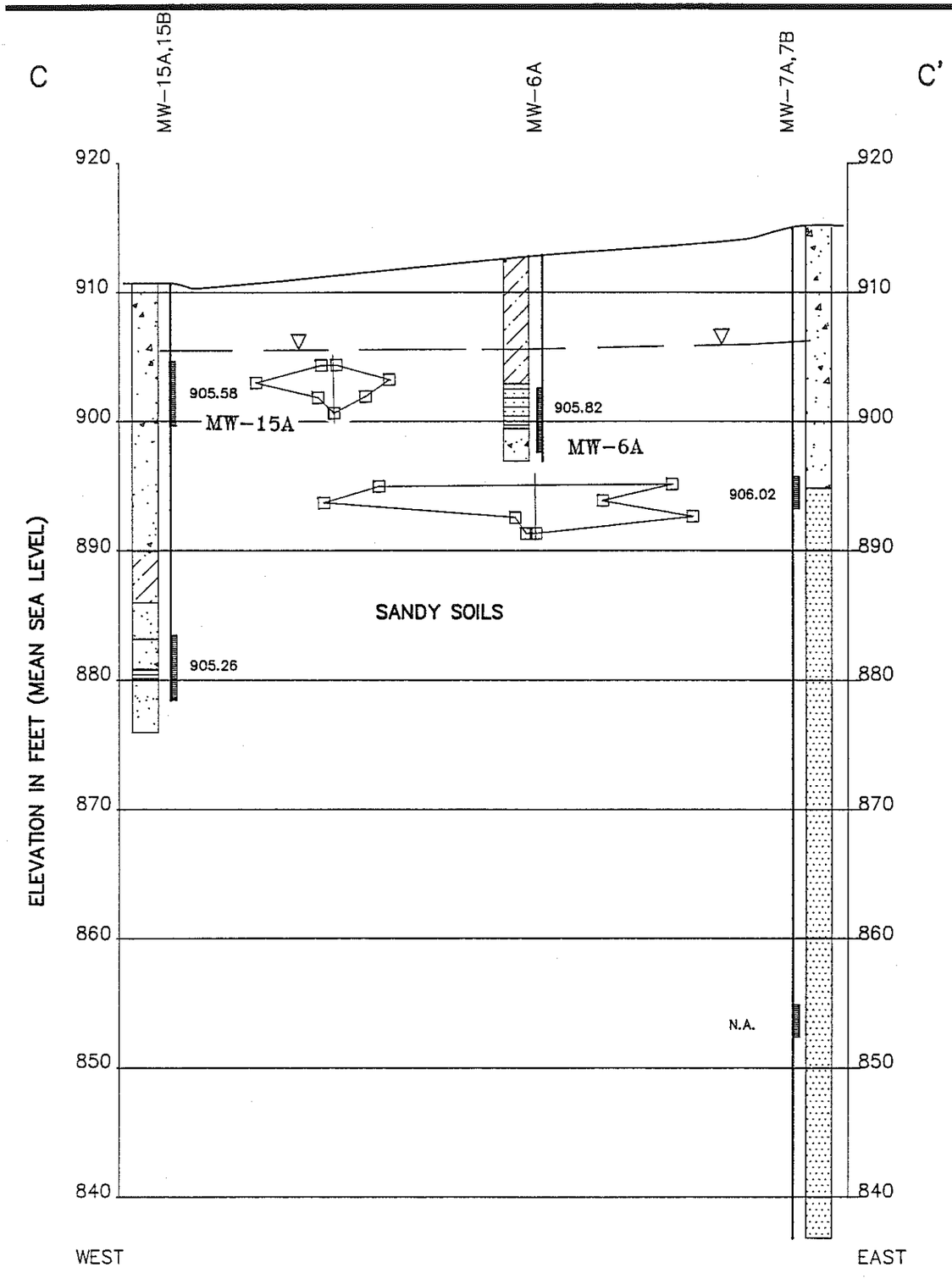
FIGURE 8



LEGEND:

- = SAND
- = SAND & GRAVEL
- = SAND INTERBEDDED WITH SILT & GRAVEL
- = SAND INTERBEDDED WITH WITH LENSES OF SILT
- = SILTY SAND
- = CLAY
- = MONITORING WELL SCREEN LOCATION SHALLOW GROUND-WATER ELEVATION RECORDED 1-6-92
- = STATIC WATER TABLE

NOTE:
STIFF DIAGRAMS SHOWN TO SCALE. REFER TO APPENDIX F FOR ADDITIONAL INFORMATION.

HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=10'
VERTICAL EXAGGERATION 10:1

0 100 200
SCALE IN FEET

MPM021792 A.DWG 1:100

GENERALIZED SUBSURFACE PROFILE C-C'

QUANEX CORPORATION
MICHIGAN SEAMLESS TUBE DIVISION
SOUTH LYON, MICHIGAN

MARCH 1992 PROJECT NO. 83160

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FIGURE 9

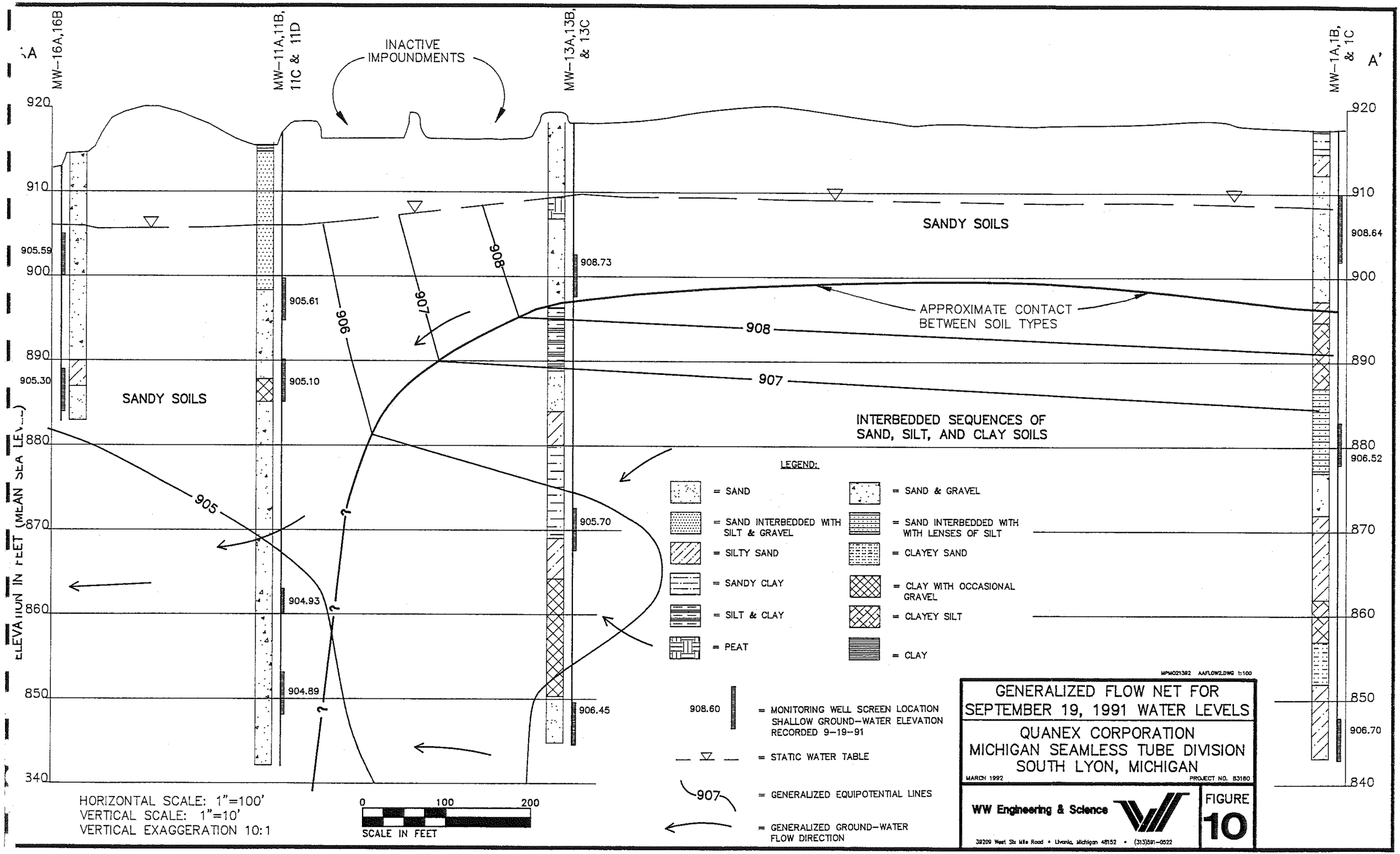
A
A'
MW-16A,16B
MW-11A,11B, 11C & 11D
MW-13A,13B, & 13C
MW-1A,1B, & 1C
INACTIVE IMPOUNDMENTS
ELEVATION IN FEET (MEAN SEA LEVEL)
920
910
900
890
880
870
860
850
840
905.59
905.30
905.61
905.10
904.93
904.89
908.73
905.70
906.45
908.64
906.52
906.70
SANDY SOILS
SANDY SOILS
APPROXIMATE CONTACT BETWEEN SOIL TYPES
INTERBEDDED SEQUENCES OF SAND, SILT, AND CLAY SOILS
905
906
907
908
LEGEND:
= SAND
= SAND & GRAVEL
= SAND INTERBEDDED WITH SILT & GRAVEL
= SAND INTERBEDDED WITH WITH LENSES OF SILT
= SILTY SAND
= CLAYEY SAND
= SANDY CLAY
= CLAY WITH OCCASIONAL GRAVEL
= SILT & CLAY
= CLAYEY SILT
= PEAT
= CLAY
908.60
= MONITORING WELL SCREEN LOCATION SHALLOW GROUND-WATER ELEVATION RECORDED 9-19-91
= STATIC WATER TABLE
907
= GENERALIZED EQUIPOTENTIAL LINES
= GENERALIZED GROUND-WATER FLOW DIRECTION
HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=10'
VERTICAL EXAGGERATION 10:1
0
100
200
SCALE IN FEET
MPH021392 AAFLOW2.DWG 1:100
GENERALIZED FLOW NET FOR SEPTEMBER 19, 1991 WATER LEVELS
QUANEX CORPORATION
MICHIGAN SEAMLESS TUBE DIVISION
SOUTH LYON, MICHIGAN
MARCH 1992
PROJECT NO. 83160
WW Engineering & Science
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FIGURE
10

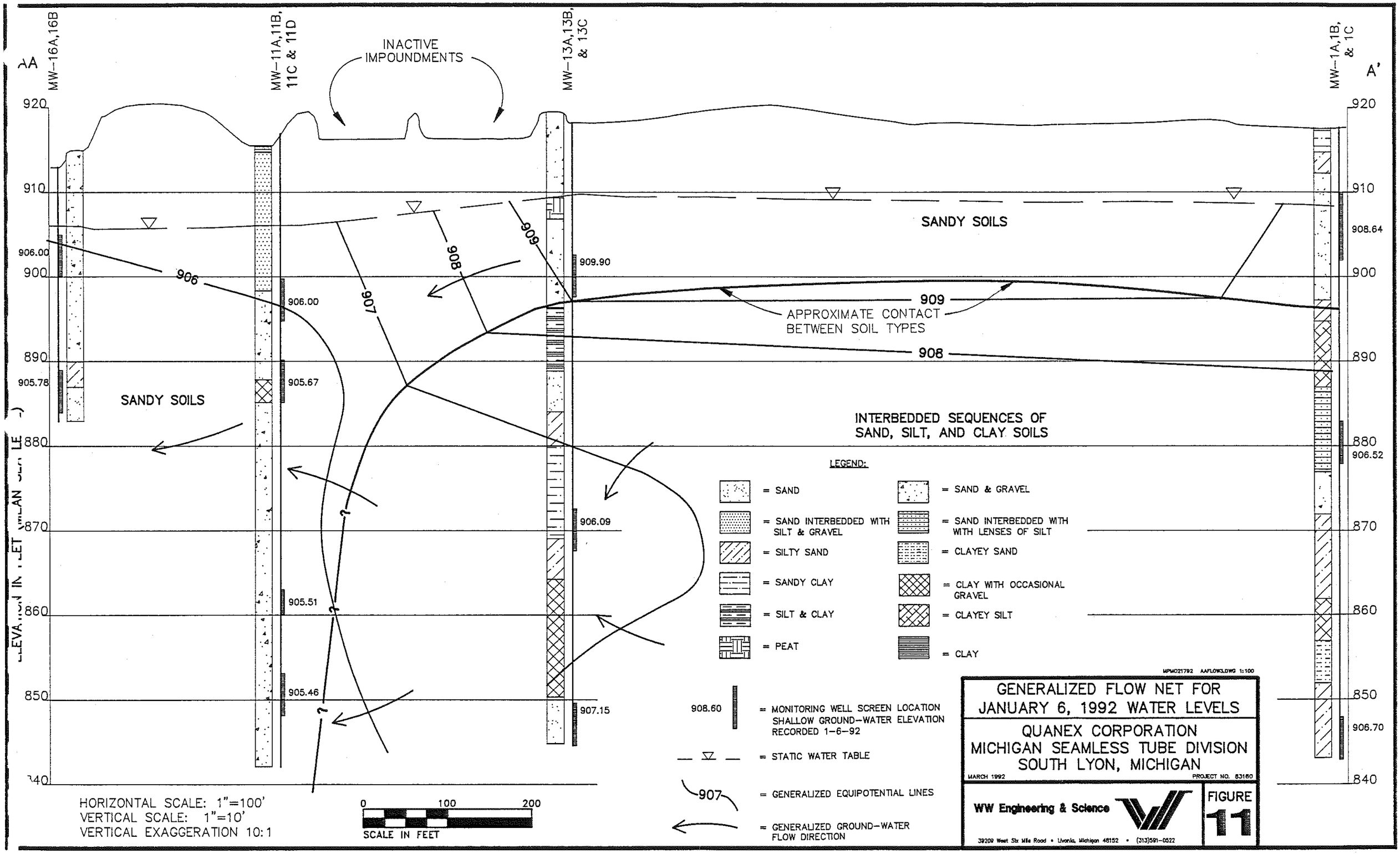
A
A'
MW-16A,16B
MW-11A,11B, 11C & 11D
MW-13A,13B, & 13C
MW-1A,1B, & 1C
INACTIVE IMPOUNDMENTS
920
910
900
890
880
870
860
850
840
906.00
905.78
906.00
905.67
905.51
905.46
909.90
906.09
907.15
908.64
906.52
906.70
906
907
908
909
SANDY SOILS
SANDY SOILS
APPROXIMATE CONTACT BETWEEN SOIL TYPES
INTERBEDDED SEQUENCES OF SAND, SILT, AND CLAY SOILS
LEGEND:
= SAND
= SAND & GRAVEL
= SAND INTERBEDDED WITH SILT & GRAVEL
= SAND INTERBEDDED WITH WITH LENSES OF SILT
= SILTY SAND
= CLAYEY SAND
= SANDY CLAY
= CLAY WITH OCCASIONAL GRAVEL
= SILT & CLAY
= CLAYEY SILT
= PEAT
= CLAY
908.60
= MONITORING WELL SCREEN LOCATION SHALLOW GROUND-WATER ELEVATION RECORDED 1-6-92
= STATIC WATER TABLE
907
= GENERALIZED EQUIPOTENTIAL LINES
= GENERALIZED GROUND-WATER FLOW DIRECTION
HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=10'
VERTICAL EXAGGERATION 10:1
0
100
200
SCALE IN FEET
MPM021792 AAFLOWSL.DWG 1:100
GENERALIZED FLOW NET FOR JANUARY 6, 1992 WATER LEVELS
QUANEX CORPORATION
MICHIGAN SEAMLESS TUBE DIVISION
SOUTH LYON, MICHIGAN
MARCH 1992
PROJECT NO. 83160
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FIGURE 11

APPENDIX A

Soil Boring Logs and Monitoring Well Construction Diagrams

GENERAL SOIL SAMPLE NOTES

Unless noted, all terms utilized herein refer to the "Standard Definitions" presented in ASTM D 653.

Standard Penetration Test (ASTM D 1586) - A 2.0-inch outside-diameter, 1 $^3/_8$-inch inside-diameter split barrel sampler is driven into undisturbed soil by means of a 140-pound weight falling freely through a vertical distance of 30 inches. The sampler is normally driven three successive 6-inch increments. The total number of blows required for the final 12 inches of penetration is the Standard Penetration Resistance (N).

COHESIVE SOILS *

CONSISTENCY	APPROXIMATE RANGE OF (N)
Very Soft	0-2
Soft	3-4
Medium	5-8
Stiff	9-15
Very Stiff	16-30
Hard	31-50
Very Hard	Over 50

COHESIONLESS SOILS

DENSITY CLASSIFICATION	APPROXIMATE RANGE OF (N)
Very Loose	0-4
Loose	5-10
Medium Compact	11-30
Compact	31-50
Very Compact	Over 50

* If clay content is sufficient so that clay dominates soil properties, clay becomes the principal noun with the other major soil constituent as modifier, i.e., silty clay. Other minor soil constituents may be included in accordance with the classification breakdown for cohesionless soils, i.e., silty clay, trace of sand, little gravel.

CLASSIFICATION

The major soil constituent is the principal noun, i.e., sand, silt, gravel. The second major soil constituent and other minor constituents are reported as follows:

Second Major Constituent (percent by weight)	Minor Constituents (percent by weight)
Trace - 1 to 11 percent	Trace - 1 to 11 percent
Adjective - 12 to 35 percent (clayey, silty, etc.)	Little - 12 to 22 percent
	Some - 23 to 33 percent
And - Over 35 percent	

PARTICLE SIZES

Boulders	- Greater than 12 inches (305 mm)
Cobbles	- 3 inches (76.2mm) to 12 inches (305mm)
Gravel-Coarse	- $^3/_4$ inches (19.05mm) to 3 inches (76.2mm)
Gravel-Fine	- No. 4, $^3/_{16}$ inches (4.75mm) to $^3/_4$ inches (19.05mm)
Sand-Coarse	- No. 10 (2.00mm) to No. 4 (4.75mm)
Sand-Medium	- No. 40 (0.425mm) to No. 10 (2.00mm)
Sand-Fine	- No. 200 (0.074mm) to No. 40 (0.425mm)
Silt	- 0.005mm to 0.074mm
Clay	- Less than 0.005mm

SAMPLE AND TESTING DESIGNATIONS

AS - Auger Sample - Directly from Auger Flight.
SS - Split Spoon Sample
LS - Split Spoon Sample (S) with Liner Insert 3 Inches in Length.
ST - Shelby Tube Sample - 3-Inch Diameter Unless Otherwise Noted.
PS - Piston Sample - 3-Inch Diameter Unless Otherwise Noted.
S - Miscellaneous Samples (Bottle or Bag).
RC - Rock Core - NX Core Unless Otherwise Noted.

SSW - Soil Sample Collected from an Excavation Wall
SSF - Soil Sample Collected from an Excavation Floor
WS - Water Sample

SB - Soil Boring
TB - Test Boring
HAB - Hand Auger Boring
TP - Test Pit
MW - Monitoring Well
OW - Observation Well
P - Piezometer

WW Engineering & Science

Log of Boring

Project No. 83160

Client: Quanex MST Division
Location: 400 McMunn, South Lyon, MI
Logged By: Sally Tacy
Contractor: Stearns Drilling
Driller: Mike Hefferan

Boring Designation: MW-1C
Start Date: 7/15/91 Completed: 7/16/91
Ground Surface Elevation: 918.33 at MW-1C
918.40 at MW-1B and 918.32 at MW-1A

Drilling Method(s): 4 1/4-inch Hollow Stem Auger — Depth Range: 0-75 feet

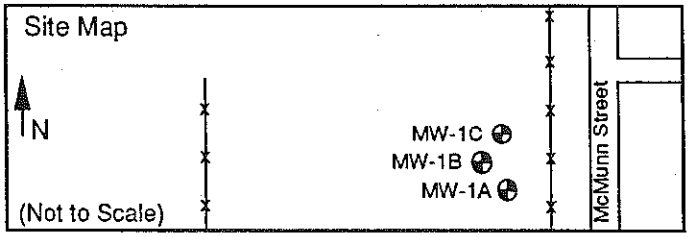
Sampling Method(s): 2-inch Split Spoon — Depth Range: 2.5 and 5.0 Foot Intervals

Grouting Material/Method — Depth Range:
Soil boring was completed as Monitoring Well MW-1C. See "Log of Well Installation" for construction details.

Water Level Data
Ground water encountered at 10.0 feet during drilling.

General Notes
Monitoring well MW-1C is screened from 69.4 to 74.4 feet. Based on this soil log, MW-1B was screened from 35 to 40 feet. MW-1A was previously installed.

Site Map



Borehole Depth (feet)	Sample Type and Number	Depth of Sample Tip (feet)	Sample Recovered (inches)	Hammer Blows (6-inch Intervals)	Standard Penetration (N)	Graphic Log	Depth (feet)	Subsurface Description
1, 2	SS-1	2.5	12	3, 5, 5	10		2.5	Loose Dark Brown FINE SANDY CLAY, organic-rich, orange stained, dry
3, 4, 5	SS-2	5.0	12	3, 6, 7	13		5.0	Medium Compact Gray SILTY COARSE TO FINE SAND, dry
6, 7, 8	SS-3	7.5	12	3, 5, 5	10			
9, 10	SS-4	10.0	13	2, 3, 5	8		10.0	Loose COARSE TO FINE SAND, moist to wet
11, 12, 13	SS-5	12.5	10	3, 3, 5	8			
14, 15	SS-6	15.0	18	4, 3, 5	8		15.0	Loose SILTY COARSE TO FINE SAND, trace gravel, saturated
16, 17, 18	SS-7	17.5	14	1, 3, 3	6			
19, 20	SS-8	20.0	18	3, 4, 4	8		20	Loose COARSE TO FINE SAND, trace gravel and silt, saturated

Figure A-1a

WW Engineering & Science

Log of Boring

Project No. 83160

Client Quanex MST Division
Location 400 McMunn, South Lyon, MI

Boring Designation MW-1C
Start Date 7/15/91 Completed 7/16/91
Ground Surface Elevation: 918.33 feet

Borehole Depth (feet)	Sample Type and Number	Depth of Sample Tip (feet)	Sample Recovered (Inches)	Hammer Blows (6-Inch Intervals)	Standard Penetration (N)	Graphic Log	Depth (feet)	Subsurface Description
21								
22	SS-9	22.5	18	4 5 7	12		22.5	Medium Compact Gray SILT, saturated
23								
24								
25	SS-10	25.0	12	1 2 4	6			
26								
27	SS-11	27.5	18	2 2 3	5			
28								
29								
30	SS-12	30.0	12	1 2 2	4		30.0	Loose to Very Loose Gray CLAYEY SILT, saturated
31								
32								
33								
34								
35	SS-13	35.0	13	2 3 4	7			
36								
37								
38								
39								
40	SS-14	40.0	18	10 19 26	45		40.0	Loose to Compact Gray FINE TO VERY FINE SAND, with thin silt lenses, saturated
41								
42								
43								
44								
45	SS-15	45.0	8	7 12 15	27		45.0	Medium Compact Gray COARSE TO FINE SAND AND GRAVEL, trace silt, saturated
46								
47								
48								
49								
50	SS-16	50.0	11	7 10 16	26			

Figure A-1b

WW Engineering & Science

Log of Boring

Project No. 83160

Client Quanex MST Division
Location 400 McMunn, South Lyon, MI

Boring Designation MW-1C
Start Date 7/15/91 Completed 7/16/91
Ground Surface Elevation: 918.33 feet

Borehole Depth (feet)	Sample Type and Number	Depth of Sample Tip (feet)	Sample Recovered (inches)	Hammer Blows (6-Inch Intervals)	Standard Penetration (N)	Graphic Log	Depth (feet)	Subsurface Description
51								
52								
53								
54				8 / 18				
55	SS-17	55.0	10	24	42		55.0	Medium Compact to Compact SILTY FINE TO COARSE SAND, trace to little gravel, saturated
56								
57								
58								
59				14 / 20				
60	SS-18	60.0	9	55	75		60.0	Very Compact Brownish-Gray CLAYEY SILT, trace fine sand, wet
61								
62								
63								
64				35 / 63				
65	SS-19	65.0	14	68	131		65.0	Very Compact Brown CLAYEY FINE SAND, interbedded with silt and sandy silt, wet
66								
67								
68								
69				29 / 46				
70	SS-20	70.0	18	73	119			
71								
72								
73								
74				6 / 6				
75	SS-21	75.0	18	8	14		75.0	Medium to Very Compact Brown SILTY FINE TO MEDIUM SAND, trace clay, saturated
76								END OF BORING
77								
78								
79								
80								

Figure A-1c

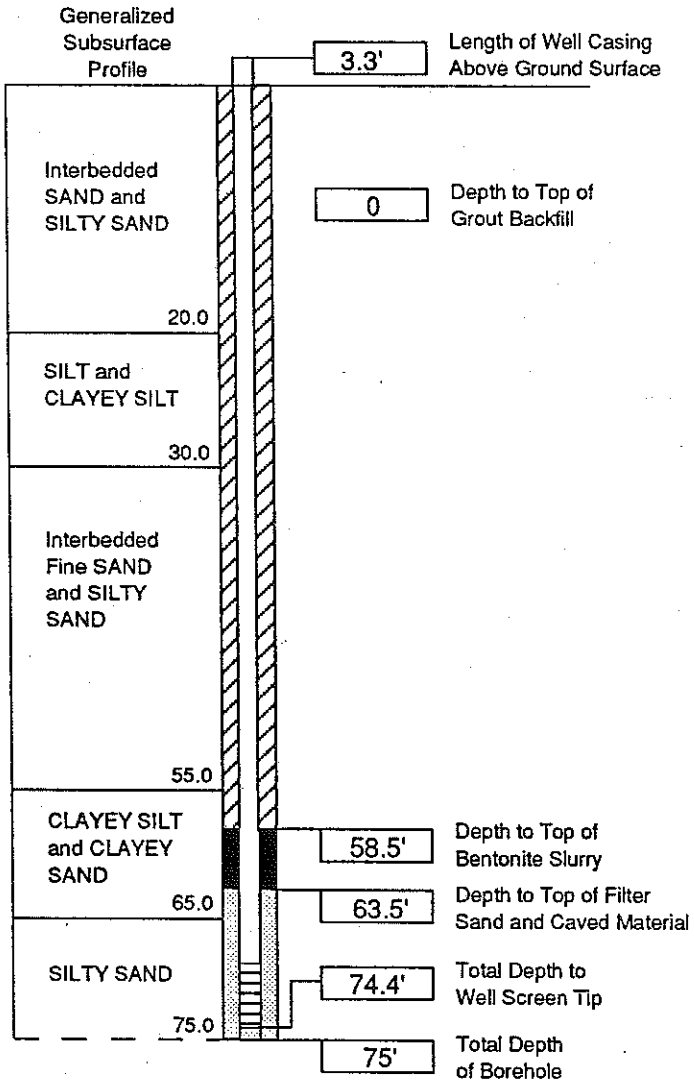
WW Engineering & Science

Project Name: Quanex MST Division
400 McMunn, South Lyon, MI
Project No.: 83160

Log of Well Installation

Well Description: MW-1C

Date(s) of Installation 7/15/91 To 7/16/91



Top of Casing Elevation:	921.58'
Ground Surface Elevation:	918.33'
Well Screen Tip Elevation:	843.93'

Well Casing

Diameter: 2-inch
Total Length: 72.7 feet
Material: Schedule 40 PVC
Cap (Y/N) Yes-Locking Plug

Well Screen

Diameter: 2-inch
Length: 5.0 feet
Mesh: 0.010-inches slot size
Material: Schedule 40 PVC
Screen Plug (Y/N): Yes-Threaded PVC

Protective Well Casing

Material: Steel Flip-top
Diameter: 4-inch
Length: 5.0 feet
Length Above Ground: 3.5 feet
Lock (Y/N): Yes-Masterlock P506

Inspector: S. Tacy
Contractor Stearns Drilling Co.
Driller: M. Hefferen
Drilling Equipment: CME 75
4 1/4" Hollow Stem Auger

Water Level Data

Datum: U.S.G.S. MSL

Date	Water Level Elevation
8-15-91	906.82
11-13-91	907.31
1-6-92	907.82

Notes:

Well Screen Filter Material: Native Soils & Silica Sand
Grout Backfill Material: Portland Type I Cement
Quick Gel
Other well materials used: Bentonite Slurry

General Notes:

Figure B-1a

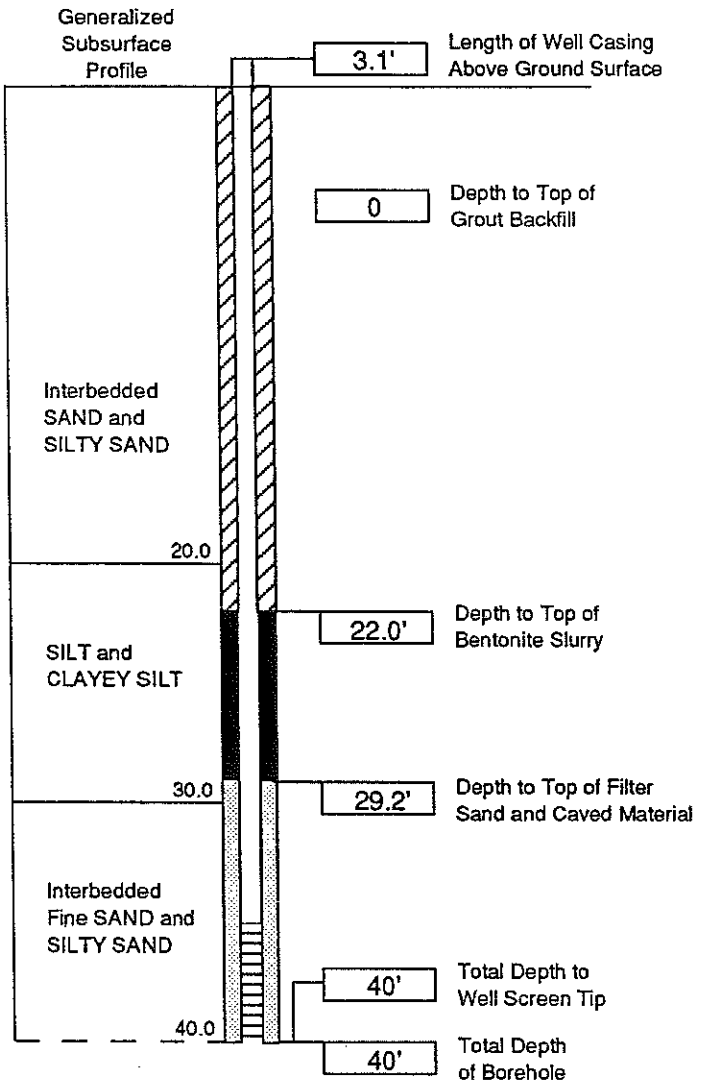
WW Engineering & Science

Project Name: Quanex MST Division
400 McMunn, South Lyon, MI
Project No.: 83160

Log of Well Installation

Well Description: MW-1B

Date(s) of Installation 7/17/91 To 7/17/91



Top of Casing Elevation:	921.45'
Ground Surface Elevation:	918.40'
Well Screen Tip Elevation:	878.4'

Well Casing
- Diameter: 2-inch
- Total Length: 38.1 feet
- Material: Schedule 40 PVC
- Cap (Y/N) Yes-Locking Plug

Well Screen
- Diameter: 2-inch
- Length: 5.0 feet
- Mesh: 0.010-inches slot size
- Material: Schedule 40 PVC
- Screen Plug (Y/N): Yes-Threaded PVC

Protective Well Casing
- Material: Steel Flip-top
- Diameter: 4-inch
- Length: 5.0 feet
- Length Above Ground: 3.3 feet
- Lock (Y/N): Yes-Masterlock P506

Inspector: S. Tacy
Contractor Stearns Drilling Co.
Driller: M. Hefferen
Drilling Equipment: CME 75
4 1/4" Hollow Stem Auger

Water Level Data

Datum: U.S.G.S. MSL

Date	Water Level Elevation
8-15-91	906.62
11-13-91	907.15
1-6-92	907.65

Notes:

Well Screen Filter Material: Native Soils & Silica Sand
Grout Backfill Material: Portland Type I Cement
Quick Gel
Other well materials used: Bentonite Slurry

General Notes: Confirmed the soil type for the screen interval by sampling from 32-33.5 feet and from 35-36.5 feet (fine sand with silt lenses at 35 feet)

Figure B-1b

WW Engineering & Science

Log of Boring

Project No. 83160

Client: Quanex MST Division
Location: 400 McMunn, South Lyon, MI
Logged By: Sally Tacy
Contractor: Stearns Drilling
Driller: Mike Hefferan

Boring Designation: MW-6A
Start Date: 7/19/91 Completed: 7/19/91
Ground Surface Elevation: 911.70 feet

Drilling Method(s): 4 1/4 inch Hollow Stem Auger — Depth Range: 0-15 feet

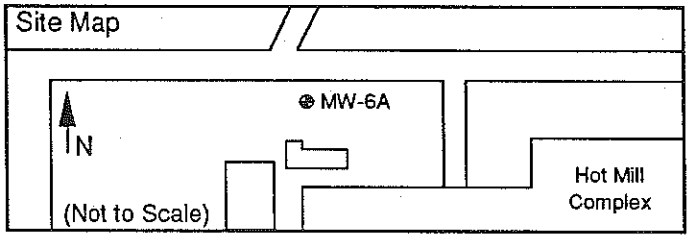
Sampling Method(s): 2-inch Split Spoon — Depth Range: 2.5 Foot Intervals

Grouting Material/Method — Depth Range:
Soil boring was completed as Monitoring Well MW-6A. See "Log of Well Installation" for construction details.

Water Level Data
Saturated conditions encountered at 7.5 feet below ground surface.

General Notes
Monitoring well is screened from 9.3 to 14.3 feet. The original MW-6A & 6B were abandoned and MW-6A was replaced.

Site Map



Borehole Depth (feet)	Sample Type and Number	Depth of Sample Tip (feet)	Sample Recovered (inches)	Hammer Blows (6-Inch Intervals)	Standrad Penetration (N)	Graphic Log	Depth (feet)	Subsurface Description
1								
2	SS-1	2.5	15	7 5 8	13		2.5	Medium Compact Dark Brown SILTY FINE SAND, little clay, volatile hydrocarbon odor
3								
4				2 2 2				
5	SS-2	5.0	18		4		5.0	Very Loose Light Tan FINE SAND, moist to wet
6								
7	SS-3	7.5	17	1 2 2	4			
8								
9				1 3				
10	SS-4	10.0	18	2	5			
11								
12	SS-5	12.5	14	2 3 4	7		12.5	Very Loose to Loose Dark Tan FINE TO COARSE SAND, interbedded with thin lenses of silt, orange and black staining, saturated
13								
14				11 11				
15	SS-6	15.0	12	23	34		15.0	Compact Brown SANDY GRAVEL, trace silt, orange and black staining, saturated
16								END OF BORING
17								
18								
19								
20								

Figure A-2a

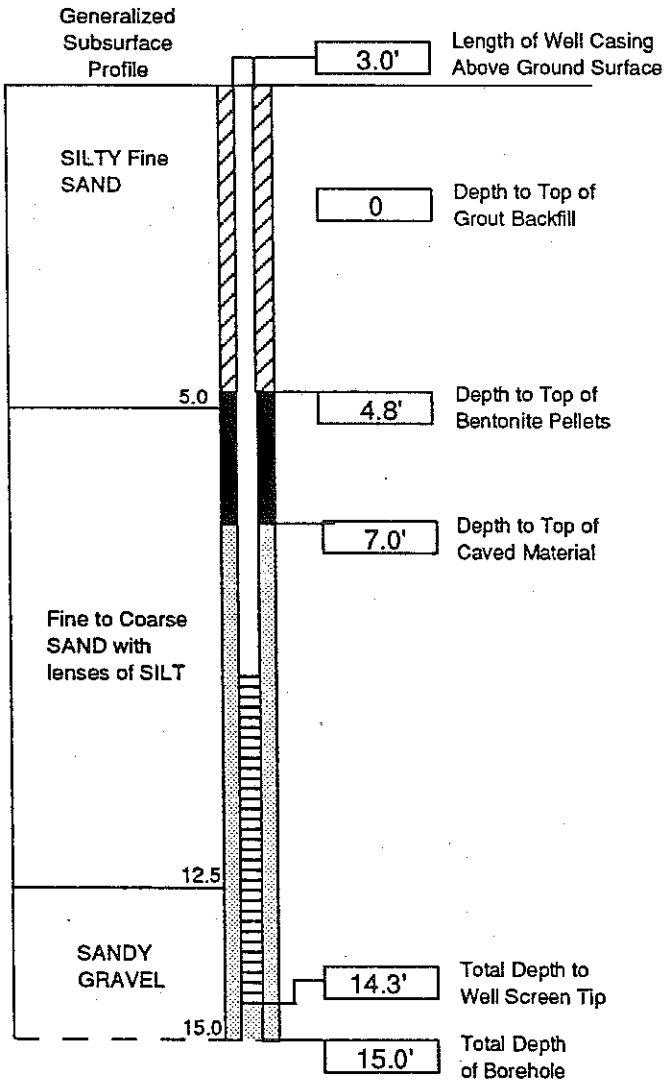
WW Engineering & Science

Project Name: Quanex MST Division
400 McMunn, South Lyon, MI
Project No.: 83160

Log of Well Installation

Well Description: MW-6A

Date(s) of Installation 7/19/91 To 7/19/91



Top of Casing Elevation:	914.60'
Ground Surface Elevation:	911.70'
Well Screen Tip Elevation:	897.4'

Well Casing
- Diameter: 2-inch
- Total Length: 12.3 feet
- Material: Schedule 40 PVC
- Cap (Y/N) Yes-Locking Plug

Well Screen
- Diameter: 2-inch
- Length: 5.0 feet
- Mesh: 0.010-inches slot size
- Material: Schedule 40 PVC
- Screen Plug (Y/N): Yes-Threaded PVC

Protective Well Casing
- Material: Steel Flip-top
- Diameter: 4-inch
- Length: 5.0 feet
- Length Above Ground: 3.1 feet
- Lock (Y/N): Yes-Masterlock P506

Inspector: S. Tacy
Contractor Stearns Drilling Co.
Driller: M. Hefferen
Drilling Equipment: CME-75
4 1/4" Hollow Stem Auger

Water Level Data

Datum: U.S.G.S. MSL

Date	Water Level Elevation
7-19-91	906.6
1-6-92	905.82

Notes:

Well Screen Filter Material: Native Soils
Grout Backfill Material: Portland Type I Cement and Quick Gel
Other well materials used: Granular Bentonite

General Notes: Two protective posts were installed within 3 feet of MW-6A. The steel posts are 8.5 feet long and sealed at one end. Each post was filled with concrete and cemented into a 4 foot hole.

Figure B-2a

WW Engineering & Science

Log of Boring

Project No. 83160

Client: Quanex MST Division
Location: 400 McMunn, South Lyon, MI
Logged By: Sally Tacy
Contractor: Stearns Drilling
Driller: Mike Hefferan

Boring Designation: MW-17B
Start Date: 7/17/91 Completed: 7/18/91
Ground Surface Elevation: 918.85 at MW-17B, and 918.89 at MW-17A

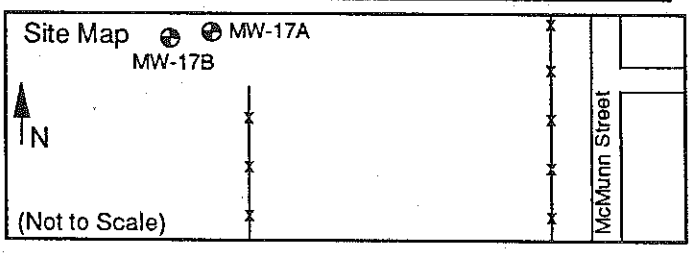
Drilling Method(s): 4 1/4 inch Hollow Stem Auger — Depth Range: 0-75 feet

Sampling Method(s): 2-inch Split Spoon — Depth Range: 2.5 and 5.0 Foot Intervals

Grouting Material/Method: Soil Boring was completed as Monitoring Well MW-17B. See "Log of Well Installation" for construction details. — Depth Range:

Water Level Data: Saturated conditions encountered at 10 feet below ground surface.

General Notes: NR=No Recovery Monitoring well MW-17B is screened from 68.9 to 73.9 feet. Based on this soil loc MW-17A was screened from 15.3 to 20.3 feet.



Borehole Depth (feet)	Sample Type and Number	Depth of Sample Tip (feet)	Sample Recovered (inches)	Hammer Blows (6-Inch Intervals)	Standard Penetration (N)	Graphic Log	Depth (feet)	Subsurface Description
1								
2	SS-1	2.5	15	6 6 5	11			
3								
4				7 9				
5	SS-2	5.0	2	10	19		5.0	Medium Compact Brown FINE SAND, little silt and clay, dry
6								
7	SS-3	7.5	15	3 4 5	9		7.5	Loose Gray-Brown FINE SAND, moist
8								
9				3 6				
10	SS-4	10.0	14	6	12		10.0	Medium Compact Brown SILTY FINE TO COARSE SAND, trace gravel, saturated
11								
12		12.5	NR	3 8 10	18			
13								
14				3 4				
15	SS-5	15.0	18	15	19			
16								
17	SS-6	17.5	18	3 4 5	9			
18								
19				2 2				
20	SS-7	20.0	18	2	4			

Figure A-3a

WW Engineering & Science

Log of Boring

Project No. 83160

Client Quanex MST Division
Location 400 McMunn, South Lyon, MI

Boring Designation MW-17 B
Start Date 7/17/91 Completed 7/18/91
Ground Surface Elevation: 918.85 feet

Borehole Depth (feet)	Sample Type and Number	Depth of Sample Tip (feet)	Sample Recovered (inches)	Hammer Blows (6-Inch Intervals)	Standard Penetration (N)	Graphic Log	Depth (feet)	Subsurface Description
21								
22	SS-8	22.5	18	4 5 7	12			
23								
24								
25	SS-9	25.0	18	1 2 4	6		25.0	Loose to Medium Compact Gray-Brown FINE TO COARSE SAND, with interbedded silt and occasional gravel, saturated
26								
27	SS-10	27.5	8	2 2 3	5			
28								
29								
30	SS-11	30.0	8	1 2 2	4			
31								
32	SS-12	32.5	18	6 10 17				
33								
34								
35	SS-13	35.0	15	2 3 4	7		35.0	Stiff to Very Stiff Gray SILTY CLAY, some fine sand, occasional gravel, moist to saturated
36								
37								
38								
39								
40	SS-14	40.0	18	10 19 26	45			
41								
42								
43								
44								
45	SS-15	45.0	18	7 12 15	27		45.0	Compact to Very Compact Gray CLAYEY SILT, trace fine to medium sand, saturated
46								
47								
48								
49								
50	SS-16	50.0	12	7 10 16	26			

Figure A-3b

WW Engineering & Science

Log of Boring

Project No. 83160

Client Quanex MST Division
Location 400 McMunn, South Lyon, MI

Boring Designation MW-17 B
Start Date 7/17/91 Completed 7/18/91
Ground Surface Elevation: 918.85 feet

Borehole Depth (feet)	Sample Type and Number	Depth of Sample Tip (feet)	Sample Recovered (inches)	Hammer Blows (6-Inch Intervals)	Standard Penetration (N)	Graphic Log	Depth (feet)	Subsurface Description
51								
52								
53								
54				15 / 16				
55	SS-17	55.0	13	25	41			
56								
57								
58								
59				30 / 72				
60	SS-18	60.0	18	94	166			
61								
62								
63								
64				6 / 13				
65	SS-19	65.0	13	36	49			
66								
67								
68								
69				25 / 45				
70	SS-20	70.0	12	65	110			
71								
72								
73								
74				12 / 65				
75	SS-21	75.0	12	100/3	165		75.0	Compact to Very Compact Gray-Brown SILTY FINE SAND, interbedded with sand lenses and silt lenses, occasional gravel
76								END OF BORING
77								
78								
79								
80								

Figure A-3c

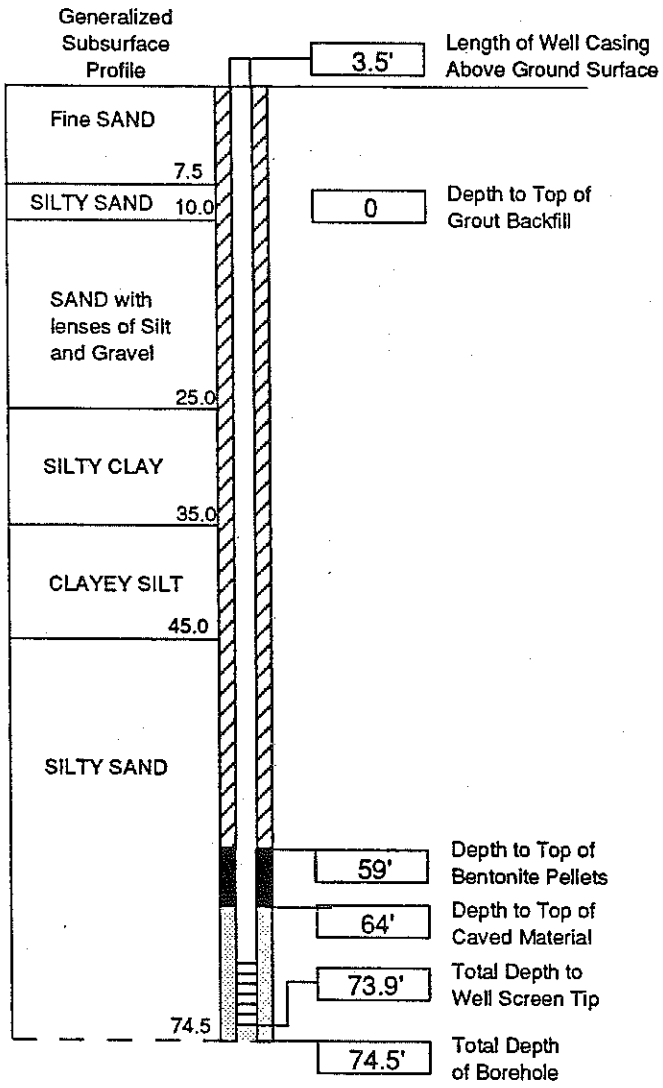
WW Engineering & Science

Project Name: Quanex MST Division
400 McMunn, South Lyon, MI
Project No.: 83160

Log of Well Installation

Well Description: MW-17B

Date(s) of Installation 7/18/91 To 7/18/91



Top of Casing Elevation:	922.32'
Ground Surface Elevation:	918.85'
Well Screen Tip Elevation:	844.95'

Well Casing
- Diameter: 2-inch
- Total Length: 72.4 feet
- Material: Schedule 40 PVC
- Cap (Y/N) Yes-Locking Plug

Well Screen
- Diameter: 2-inch
- Length: 5.0 feet
- Mesh: 0.010-inches slot size
- Material: Schedule 40 PVC
- Screen Plug (Y/N): Yes-Threaded PVC

Protective Well Casing
- Material: Steel Flip-top
- Diameter: 4-inch
- Length: 5.0 feet
- Length Above Ground: 3.7 feet
- Lock (Y/N): Yes-Masterlock P506

Inspector: S. Tacy
Contractor Stearns Drilling Co.
Driller: M. Hefferen
Drilling Equipment: CME 75
4 1/4" Hollow Stem Auger

Water Level Data

Datum: U.S.G.S. MSL

Date	Water Level Elevation
8-15-91	906.78
11-13-91	907.16
1-6-92	907.84

Notes:

Well Screen Filter Material: Native Soils
Grout Backfill Material: Portland Type I Cement and Quick Gel
Other well materials used: Bentonite Slurry

General Notes: Protective posts were installed within 3 feet of MW-17B. The steel post is 8.5 feet long and sealed at one end. The post was filled with concrete and cemented into a 4 foot hole.

Figure B-3a

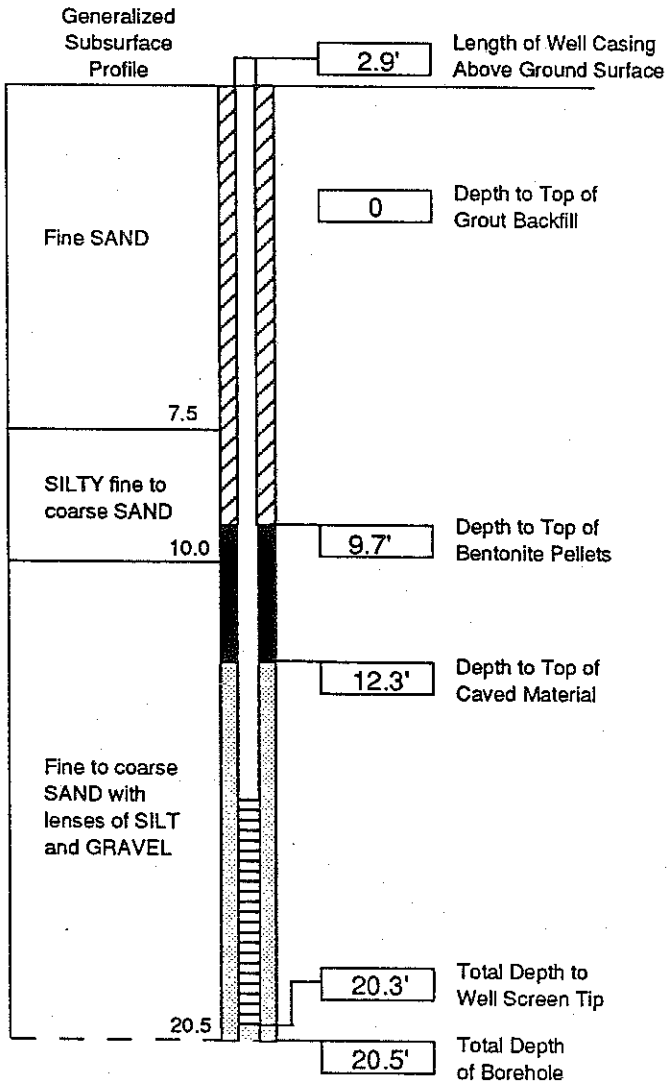
WW Engineering & Science

Project Name: Quanex MST Division
400 McMunn, South Lyon, MI
Project No.: 83160

Log of Well Installation

Well Description: MW-17A

Date(s) of Installation 7/19/91 To 7/19/91



Top of Casing Elevation:	921.80'
Ground Surface Elevation:	918.89'
Well Screen Tip Elevation:	898.6'

Well Casing
- Diameter: 2-inch
- Total Length: 18.2 feet
- Material: Schedule 40 PVC
- Cap (Y/N) Yes-Locking Plug

Well Screen
- Diameter: 2-inch
- Length: 5.0 feet
- Mesh: 0.010-inches slot size
- Material: Schedule 40 PVC
- Screen Plug (Y/N): Yes-Threaded PVC

Protective Well Casing
- Material: Steel Flip-top
- Diameter: 4-inch
- Length: 5.0 feet
- Length Above Ground: 3.0 feet
- Lock (Y/N): Yes-Masterlock P506

Inspector: S. Tacy
Contractor Stearns Drilling Co.
Driller: M. Hefferen
Drilling Equipment: CME 75
4 1/4" Hollow Stem Auger

Water Level Data

Datum: U.S.G.S. MSL

Date	Water Level Elevation
8-15-91	908.96
11-13-91	908.78
1-6-92	909.48

Notes:

Well Screen Filter Material: Native Soils & Silica Sand
Grout Backfill Material: Portland Type I Cement
Quick Gel
Other well materials used: Granular Bentonite

General Notes: Confirmed the soil type for the screen interval by sampling from 17-18.5 feet (sand with silt lenses)
Protective posts were installed within 3 feet of MW-17A.
The steel post is 8.5 feet long and sealed at one end.
The post was filled with concrete and cemented into a 4 foot hole.

Figure B-3b

APPENDIX B

Water Level Data

WATER LEVEL MEASURMENTS
QUANEX CORPORATION
Michigan Seamless Tube Division

WELL	T.O.C.	11/12/87 from TOC	11/12/87 S.W.L.	02/10/88 from T.O.C	02/10/88 S.W.L	05/10/88 from T.O.C.	05/10/88 S.W.L	06/29/88 from T.O.C	06/29/88 S.W.L	08/10/88 from T.O.C.	08/10/88 S.W.L.	11/03/88 from T.O.C	11/03/88 S.W.L
1 +	921.54	12.39	908.23	11.82	908.80	11.63	908.99	12.67	907.95	12.54	908.08	12.32	908.30
1 B *	921.45	-	-	-	-	-	-	-	-	-	-	-	-
1 C *	921.58	-	-	-	-	-	-	-	-	-	-	-	-
2	921.42	-	broken	-	broker	-	-	-	-	-	-	-	-
3	915.02	8.92	906.10	8.74	906.28	-	-	-	-	-	-	-	-
4	907.94	4.47	903.47	4.01	903.93	-	-	5.49	902.45	4.22	903.72	4.46	903.48
5	909.25	4.76	904.49	4.65	904.60	-	-	6.29	902.96	5.13	904.12	4.96	904.29
6 A **	914.60	8.24	905.79	8.02	906.01	BENT	BENT	BENT	BENT	BENT	BENT	BENT	BENT
6 B	913.46	8.04	905.42	7.80	905.66	BENT	BENT	BENT	BENT	BENT	BENT	BENT	BENT
7 A	914.94	8.98	905.96	8.81	906.13	-	-	10.26	904.68	9.02	905.92	9.2	905.74
7 B	915.63	10.11	905.52	9.88	905.75	-	-	11.04	904.59	BENT	BENT	BENT	BENT
9	921.48	11.34	910.14	11.11	910.37	-	-	11.83	909.65	10.21	911.27	11.15	910.33
11 A	921.00	14.86	906.14	14.63	906.37	18.49	902.51	16.25	904.75	14.74	906.26	15.1	905.90
11 B	921.05	15.41	905.64	15.07	905.98	18.24	902.81	16.49	904.56	15.28	905.77	15.55	905.50
11 C	921.97	16.69	905.28	16.28	905.69	-	-	17.59	904.38	16.70	905.27	16.76	905.21
11 D	920.76	15.5	905.26	15.12	905.64	17.61	903.15	16.45	904.31	15.57	905.19	15.6	905.16
12 A	918.16	7.59	910.57	7.41	910.75	6.51	911.65	8.35	909.81	6.59	911.57	7.78	910.38
12 B	918.15	12.02	906.13	11.70	906.45	15.52	902.63	13.40	904.75	11.27	906.88	12.3	905.85
12 C	918.38	12.16	906.22	11.78	906.60	-	-	13.04	905.34	12.25	906.13	12.29	906.09
13 A	920.52	9.96	910.56	9.84	910.68	9.16	911.36	10.62	909.90	8.68	911.84	10.18	910.34
13 B	920.31	13.61	906.70	13.95	906.36	17.73	902.58	15.53	904.78	14.04	906.27	14.47	905.84
13 C	920.12	13.45	906.67	13.17	906.95	-	-	14.24	905.88	13.82	906.30	13.77	906.35
14 A	914.02	7.84	906.18	7.84	906.18	-	-	removed	removed	removed	removed	removed	removed
14 B	914.25	8.34	905.91	8.12	906.13	-	-	removed	removed	removed	removed	removed	removed
15 A	913.37	7.45	905.92	7.20	906.17	-	913.37	8.79	904.58	7.21	906.16	7.64	905.73
15 B	913.30	7.7	905.60	7.45	905.85	-	-	8.90	904.40	7.61	905.69	7.83	905.47
16 A	915.32	9.22	906.10	8.97	906.35	12.61	902.71	10.63	904.69	9.06	906.26	9.48	905.84
16 B	915.65	9.86	905.79	9.62	906.03	-	-	11.11	904.54	9.71	905.94	10	905.65
17 A *	921.80	-	-	-	-	-	-	-	-	-	-	-	-
17 B *	922.32	-	-	-	-	-	-	-	-	-	-	-	-

* new well installed July 1991
** well replaced July 1991
\+ well repaired September 1990, TOC elevation resurveyed September 1991

WATER LEVEL MEASURMENTS
QUANEX CORPORATION
Michigan Seamless Tube Division

		03/09/89		3/26/90		6/18/90		9/24/90		12/20/90		03/18/91	
WELL	T.O.C.	from T.O.C.	S.W.L	from T.O.C	S.W.L.	from T.O.C	S.W.L.	from T.O.C	S.W.L.	from T.O.C	S.W.L	from T.O.C.	S.W.L.
1 +	921.54	-	-	10.75	909.87	Bent	Bent	12.42+	909.12+	11.98	909.56	11.62	909.92
1 B *	921.45	-	-	-	-	-	-	-	-	-	-	-	-
1 C *	921.58	-	-	-	-	-	-	-	-	-	-	-	-
2	921.42	-	-	-	-	-	-	-	-	-	-	-	-
3	915.02	-	-	-	-	-	-	-	-	-	-	-	-
4	907.94	-	-	-	-	-	-	-	-	-	-	-	-
5	909.25	-	-	-	-	-	-	-	-	-	-	-	-
6 A **	914.60	BENT	BENT	BENT	BENT	BENT	BENT	BENT	BENT	BENT	BENT	BENT	BENT
6 B	913.46	BENT	BENT	BENT	BENT	BENT	BENT	BENT	BENT	BENT	BENT	BENT	BENT
7 A	914.94	-	-	8.21	906.73	8.80	906.14	8.94	906.00	8.71	906.23	8.12	906.82
7 B	915.63	-	-	BENT	BENT	BENT	BENT	BENT	BENT	BENT	BENT	-	-
9	921.48	-	-			11.08	910.40	11.93	909.55	11.21	910.27	10.89	910.59
11 A	921.00	15.2	905.80	14.05	906.95	14.72	906.28	14.94	906.06	14.56	906.44	14.28	906.72
11 B	921.05	15.53	905.52	14.50	906.55	14.50	906.55	15.40	905.65	15.00	906.05	14.69	906.36
11 C	921.97	16.7	905.27	15.56	906.41	16.20	905.77	16.45	905.52	16.04	905.93	15.71	906.26
11 D	920.76	15.48	905.28	14.38	906.38	15.03	905.73	15.28	905.48	14.88	905.88	14.54	906.22
12 A	918.16	8.88	909.28	7.12	911.04	7.78	910.38	8.59	909.57	7.76	910.40	7.44	910.72
12 B	918.15	12.33	905.82	11.12	907.03	11.86	906.29	12.07	906.08	11.68	906.47	11.42	906.73
12 C	918.38	12.15	906.23	10.80	907.58	11.50	906.88	11.90	906.48	11.44	906.94	11.02	907.36
13 A	920.52	11.58	908.94	9.77	910.75	10.26	910.26	10.97	909.55	10.34	910.18	10.08	910.44
13 B	920.31	14.5	905.81	13.34	906.97	14.02	906.29	14.22	906.09	13.84	906.47	13.53	906.78
13 C	920.12	13.43	906.69	12.11	908.01	12.78	907.34	13.03	907.09	12.65	907.47	12.20	907.92
14 A	914.02	removed	removed	removed	removed	removed	removed	removed	removed	removed	removed	removed	-
14 B	914.25	removed	removed	removed	removed	removed	removed	removed	removed	removed	removed	removed	-
15 A	913.37	-	-	6.64	906.73	7.24	906.13	7.34	906.03	6.99	906.38	6.83	906.54
15 B	913.30	-	-	6.84	906.46	7.48	905.82	7.64	905.66	7.25	906.05	7.01	906.29
16 A	915.32	-	-	8.38	906.94	9.06	906.26	9.23	906.09	8.88	906.44	8.62	906.70
16 B	915.65	-	-	8.95	906.70	9.61	906.04	9.80	905.85	9.41	906.24	9.20	906.45
17 A *	921.80	-	-	-	-	-	-	-	-	-	-	-	-
17 B *	922.32	-	-	-	-	-	-	-	-	-	-	-	-

* new well installed July 1991
** well replaced July 1991
\+ well repaired September 1990, TOC elevation resurveyed September 1991

WATER LEVEL MEASURMENTS
QUANEX CORPORATION
Michigan Seamless Tube Division

WELL	T.O.C.	06/13/91 from T.O.C.	06/13/91 S.W.L	08/15/91 from T.O.C	08/15/91 S.W.L.	09/19/91 from T.O.C	09/19/91 S.W.L.	10/16/91 from T.O.C	10/16/91 S.W.L.	11/13/91 from T.O.C	11/13/91 S.W.L	12/03/91 from T.O.C.	12/03/91 S.W.L.	01/06/92 from T.O.C	01/06/92 S.W.L
1 +	921.54	11.75	909.79	12.79	908.75	12.90	908.64	13.08	908.46	12.91	908.63	12.60	908.94	12.94	908.60
1 B *	921.45	-	-	14.83	906.62	14.93	906.52	14.07	907.38	14.30	907.15	13.35	908.10	13.80	907.65
1 C *	921.58	-	-	14.76	906.82	14.88	906.70	14.05	907.53	14.27	907.31	13.35	908.23	13.76	907.82
2	921.42	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	915.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	907.94	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	909.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6 A **	914.60	BENT	BENT	-	-	9.14	905.46	-	-	-	-	8.91	905.69	8.78	905.82
6 B	913.46	BENT	BENT	-	-	ABANDONED		-	-	-	-	ABANDONED		ABANDONED	
7 A	914.94	7.96	906.98	-	-	9.04	905.90	-	-	-	-	8.04	906.90	8.92	906.02
7 B	915.63	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	921.48	10.95	910.53	-	-	12.54	908.94	-	-	-	-	12.36	909.12	11.66	909.82
11 A	921.00	14.13	906.87	-	-	15.39	905.61	-	-	-	-	15.13	905.87	14.98	906.02
11 B	921.05	14.69	906.36	-	-	15.95	905.10	-	-	-	-	15.59	905.46	15.38	905.67
11 C	921.97	15.82	906.15	-	-	17.04	904.93	-	-	-	-	16.71	905.26	16.46	905.51
11 D	920.76	14.65	906.11	-	-	15.87	904.89	-	-	-	-	15.47	905.29	15.30	905.46
12 A	918.16	7.64	910.52	-	-	9.44	908.72	-	-	-	-	8.44	909.72	8.13	910.03
12 B	918.15	11.25	906.90	-	-	12.54	905.61	-	-	-	-	12.30	905.85	12.10	906.05
12 C	918.38	11.16	907.22	-	-	12.42	905.96	-	-	-	-	11.98	906.40	11.72	906.66
13 A	920.52	10.18	910.34	-	-	11.79	908.73	-	-	-	-	10.88	909.64	10.62	909.90
13 B	920.31	13.37	906.94	-	-	14.61	905.70	-	-	-	-	14.38	905.93	14.22	906.09
13 C	920.12	12.32	907.80	-	-	13.67	906.45	-	-	-	-	13.15	906.97	12.97	907.15
14 A	914.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14 B	914.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15 A	913.37	6.69	906.68	-	-	7.90	905.47	-	-	-	-	7.96	905.41	7.79	905.58
15 B	913.30	7.01	906.29	-	-	8.20	905.10	-	-	-	-	8.21	905.09	8.04	905.26
16 A	915.32	8.45	906.87	-	-	9.73	905.59	-	-	-	-	9.49	905.83	9.32	906.00
16 B	915.65	9.1	906.55	-	-	10.35	905.30	-	-	-	-	10.04	905.61	9.87	905.78
17 A *	921.80	-	-	12.84	908.96	13.02	908.78	13.19	908.61	13.02	908.78	12.68	909.12	12.32	909.48
17 B *	922.32	-	-	15.54	906.78	15.73	906.59	15.42	906.9	15.16	907.16	14.64	907.68	14.48	907.84

* new well installed July 1991
** well replaced July 1991
\+ well repaired September 1990, TOC elevation resurveyed September 1991

WELL	T.O.C.	elev. ground	elev. bottom screen	9/91 Survey	8/87 Survey	11/85 Survey	Depth of Well 1/6/92
1 +	921.54	918.3	901.6	921.54	920.62	921.01	19.9
1 B *	921.45	918.4	878.8	921.45	-	-	42.7
1 C *	921.58	918.3	845.0	921.58	-	-	76.6
2	921.42	918.4	-	-	-	921.42	-
3	915.02	911.7	-	-	915.02	-	-
4	907.94	904.7	-	-	907.94	-	-
5	909.25	907.2	-	-	909.25	-	-
6 A **	914.60	911.7	897.6	914.60	914.03	913.86	17.0
6 B	913.46	911.8	-	-	913.46	914.43	-
7 A	914.94	914.3	894.8	914.9	914.94	915.33	20.1
7 B	915.63	914.3	-	-	915.63	916.04	-
9	921.48	920.5	901.8	-	921.48	921.72	19.7
11 A	921.00	918.5	900.2	-	921.00	921.29	20.8
11 B	921.05	918.5	884.8	-	921.05	921.34	36.2
11 C	921.97	918.5	840.2	-	921.97	921.27	81.8
11 D	920.76	918.2	848.1	-	920.76	921.07	72.6
12 A	918.16	916.2	902.2	-	918.16	918.45	16.0
12 B	918.15	916.1	874.6	-	918.15	918.44	43.5
12 C	918.38	915.9	854.3	-	918.38	918.66	64.1
13 A	920.52	917.5	899.0	-	920.52	920.81	21.5
13 B	920.31	917.6	868.5	-	920.31	920.61	51.8
13 C	920.12	917.7	845.8	-	920.12	920.39	74.3
14 A	914.02	911.4	-	-	914.02	914.21	-
14 B	914.25	911.5	-	-	914.25	914.54	-
15 A	913.37	910.6	902.4	-	913.37	913.66	11.0
15 B	913.30	910.6	881.1	-	913.30	913.59	32.2
16 A	915.32	912.8	901.0	-	915.32	915.62	14.3
16 B	915.65	913.2	884.5	-	915.65	915.35	31.1
17 A *	921.80	918.9	898.6	921.80	-	-	23.2
17 B *	922.32	918.9	844.8	922.32	-	-	77.5

APPENDIX C

Historical Ground-Water Monitoring Data

GROUND WATER MONITORING DATA

Ground Water Quality Assessment Plan Monitoring

Arsenic, dissolved (ug/l)

SAMPLED FROM -	TO	1	1-B	1-C	6-A	9	11-A	11-B	11-D	12-A
10/17/86		< 2.0					< 2.0	4.2	5.6	< 2.0
12/22/86								6.3	6.9	
12/22/86								7.8	6.0	
12/22/86								17	5.9	
03/11/87	03/12/87	< 2.0				< 2.0	< 2.0	3.3	4.6	< 2.0
05/18/87	05/19/87	< 2.0					< 2.0	2.4	5.3	< 2.0
05/18/87	05/19/87							3.5	5.6	
05/18/87	05/19/87							4.0	5.4	
08/18/87	08/19/87	< 2.0					< 2.0	4.9	5.9	< 2.0
11/12/87		< 2.0					< 2.0	3.7	4.6	< 2.0
11/12/87								3.5	5.5	
11/12/87								4.2	4.8	
02/10/88		< 2.0					2.1	4.0	6.0	< 2.0
05/10/88		< 2.0			4.1		5.4	3.9	6.7	< 2.0
05/10/88							6.4	4.2	8.1	
05/10/88							7.7	4.1	10	
08/10/88		< 2.0			7.9		< 2.0	4.0	6.7	< 2.0
08/10/88					9.1					
08/10/88					9.2					
11/03/88		< 2.0			13		2.2	2.3	7.5	< 2.0
11/03/88								< 2.0	5.5	
11/03/88								< 2.0	7.3	
03/26/90	03/27/90	< 2.0					< 2.0	2.9	5.1	< 2.0
06/18/90		< 2.0					2.4	4.1	5.4	< 2.0
06/18/90 dup								2.7	5.6	
06/18/90 trip								3.2	6.1	
06/18/90 quad								3.3	5.7	
09/24/90		< 2.0					3.1	3.0	4.1	< 2.0
09/24/90 dup							3.5			
09/24/90 trip							3.7			
12/20/90		< 2.0					5.3	4.6	6.5	< 2.0
12/20/90 dup							4.5	4.1	6.4	
12/20/90 trip							3.9	3.5	5.4	
03/18/91		< 1.0					2.4	3.0	5.6	< 1.0
03/18/91 dup							2.6	3.4	5.4	
03/18/91 trip							2.9	5.1	5.4	
06/13/91		< 1.0					1.7	2.6	5.0	< 1.0
06/13/91 dup							1.7	4.4	5.0	
06/13/91 trip							1.6	3.5	4.5	
08/15/91		< 1.0	5.0	7.6						
09/19/91		< 1.0	5.5	9.0	25		2.3	3.5	6.2	< 1.0
09/19/91 dup							1.8	1.9	4.3	
09/19/91 trip							1.7	3.7	4.7	
10/16/91		< 1.0	6.2	< 1.0						
11/13/91		< 1.0	4.1	8.8						
12/03/91		< 1.0	5.4	10.0	34		3.2	5.8	6.5	< 1.0
12/03/91 dup					31		3.0	6.6	7.1	
12/03/91 trip					34		2.4	4.8	7.8	
01/07/92		< 1.0	4.6	8.0						

GROUND WATER MONITORING DATA

Ground Water Quality Assessment Plan Monitoring

Arsenic, dissolved (ug/l)

SAMPLED FROM -	TO	12-B	12-C	13-A	13-B	13-C	14-A	15-A	16-A	17-A
10/17/86		5.3		< 2.0	5.2		6.4		< 2.0	
12/22/86		16			11		11			
12/22/86		15			13		13			
12/22/86		20			16		18			
03/11/87	03/12/87	9.5		< 2.0	5.0		9.3		< 2.0	
05/18/87	05/19/87	9.3		< 2.0	7.6		8.7		< 2.0	
05/18/87	05/19/87	11			6.3		4.8			
05/18/87	05/19/87	11			6.6		4.8			
08/18/87	08/19/87	9.4		< 2.0	5.9		8.6		< 2.0	
11/12/87		9.2		< 2.0	5.6		8.4		< 2.0	
11/12/87		9.1			5.4		9.8			
11/12/87		8.9			5.2		8.7			
02/10/88		8.0		< 2.0	5.5		6.6		< 2.0	
05/10/88		6.4		< 2.0	8.5	plugged		< 2.0	< 2.0	
05/10/88		8.0			9.1					
05/10/88		7.6			9.5					
08/10/88		7.1		< 2.0	5.4			< 2.0	< 2.0	
08/10/88										
08/10/88										
11/03/88		10		< 2.0	8.5			< 2.0	< 2.0	
11/03/88		8.6			9.5					
11/03/88		8.1			8.6					
03/26/90	03/27/90	6.7		2.1	4.6			< 2.0	< 2.0	
06/18/90		7.6		< 2.0	4.9			< 2.0	< 2.0	
06/18/90	dup	9.0		3.0	4.7					
06/18/90	trip	9.8		2.6	5.2					
06/18/90	quad	6.8		3.0	4.6					
09/24/90		5.4		3.0	4.6			< 2.0	< 2.0	
09/24/90	dup									
09/24/90	trip									
12/20/90		7.7		2.7	5.7			< 2.0	< 2.0	
12/20/90	dup	6.1		4.3	5.6					
12/20/90	trip	6.8		6.2	5.5					
03/18/91		6.4	8.7	4.0	5.2	16		< 1.0	< 1.0	
03/18/91	dup	7.0		6.0	4.8					
03/18/91	trip	6.6		5.9	5.0					
06/13/91		6.6	1.2	3.0	4.6	15		< 1.0	< 1.0	
06/13/91	dup	7.7		5.6	5.7					
06/13/91	trip	7.9		7.0	5.7					
08/15/91										7.4
09/19/91		6.7	4.2	4.0	5.4	17		< 1.0	< 1.0	8.6
09/19/91	dup	6.6	4.4	4.1	4.8					
09/19/91	trip	6.3	4.6	3.9	5.4					
10/16/91										8.5
11/13/91										7.4
12/03/91		8.3	< 1.0	3.3	5.4	20		< 1.0	< 1.0	8.3
12/03/91	dup	11		5.7	26					
12/03/91	trip	9.9		5.4	7.1					
01/07/92										5.5

GROUND WATER MONITORING DATA

Ground Water Quality Assessment Plan Monitoring

Arsenic, dissolved (ug/l)

SAMPLED FROM -	TO	17-B	EQUIP. BLANK	TRIP BLANK
10/17/86			< 2.0	< 2.0
12/22/86				
12/22/86				
12/22/86				
03/11/87	03/12/87		< 2.0	< 2.0
05/18/87	05/19/87		< 2.0	
05/18/87	05/19/87			
05/18/87	05/19/87			
08/18/87	08/19/87		< 2.0	
11/12/87				< 2.0
11/12/87				
11/12/87				
02/10/88			< 2.0	< 2.0
05/10/88			< 2.0	
05/10/88				
05/10/88				
08/10/88			< 2.0	
08/10/88				
08/10/88				
11/03/88				
11/03/88				
11/03/88				
03/26/90	03/27/90		< 2.0	< 2.0
06/18/90			< 2.0	< 2.0
06/18/90	dup			
06/18/90	trip			
06/18/90	quad			
09/24/90			< 2.0	< 2.0
09/24/90	dup			
09/24/90	trip			
12/20/90			< 2.0	< 2.0
12/20/90	dup			
12/20/90	trip			
03/18/91			< 1.0	< 1.0
03/18/91	dup			
03/18/91	trip			
06/13/91			< 1.0	
06/13/91	dup			
06/13/91	trip			
08/15/91		14		
09/19/91		17	< 1.0	< 1.0
09/19/91	dup			
09/19/91	trip			
10/16/91		16		
11/13/91		15		
12/03/91		19	< 1.0	
12/03/91	dup			
12/03/91	trip			
01/07/92		14		

GROUND WATER MONITORING DATA

Ground Water Quality Assessment Plan Monitoring

Barium, dissolved (mg/l)

SAMPLED FROM -	TO	1	1-B	1-C	6-A	9	11-A	11-B	11-D	12-A	12-B	12-C	13-A
10/17/86		0.10					< 0.10	< 0.10	0.13	< 0.10	< 0.10		< 0.10
03/11/87	03/12/87	< 0.10				< 0.10	< 0.10	< 0.10	0.15	< 0.10	< 0.10		< 0.10
05/18/87	05/19/87	< 1.0					0.20	< 0.10	0.13	0.18	< 1.0		< 1.0
08/18/87	08/19/87	< 1.0					< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		< 1.0
08/18/87	08/19/87						< 1.0		< 1.0	< 1.0			
08/18/87	08/19/87						< 1.0		< 1.0	< 2.0			
11/12/87		< 1.0					< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		< 1.0
02/10/88		0.31					0.47	0.32	0.34	0.15	0.27		0.57
05/10/88		0.28			< 1.0		< 0.10	< 0.10	0.12	< 0.10	< 0.10		< 0.10
05/10/88							< 1.0						< 1.0
05/10/88							< 0.10						< 1.0
08/10/88		< 0.10			< 0.10		< 0.10	0.17	0.33	< 0.10	< 0.10		0.15
08/10/88									0.26				
08/10/88									0.31				
11/03/88		< 0.10			< 0.10		< 0.10	< 0.10	0.18	< 0.10	< 0.10		< 0.10
03/26/90	03/27/90	< 0.20					< 0.20	< 0.20	< 0.20	< 0.20	< 0.20		< 0.20
06/18/90		0.03					0.04	< 0.20	0.18	0.05	0.04		0.15
09/24/90		0.03					0.06	0.02	0.15	0.05	0.03		0.16
12/20/90		0.03					0.04	0.02	0.14	0.05	0.04		0.18
03/18/91		0.02					0.05	0.02	0.12	0.05	0.03	< 0.02	0.15
06/13/91		0.02					0.06	0.02	0.12	0.05	0.03	0.03	0.13
09/19/91		0.06	0.04	0.08	0.02		0.06	0.02	0.10	0.04	0.04	0.06	0.14
12/03/91		0.07	0.04	0.08	0.02		0.05	0.03	0.10	0.05	0.04	0.08	0.24

GROUND WATER MONITORING DATA

Ground Water Quality Assessment Plan Monitoring

Barium, dissolved (mg/l)

SAMPLED FROM -	TO	13-B	13-C	14-A	15-A	16-A	17-A	17-B	EQUIP. BLANK	TRIP BLANK
10/17/86		< 0.10		< 0.10		< 0.10			< 0.10	< 0.10
03/11/87	03/12/87	0.10		< 0.10		< 0.10			< 0.10	< 0.10
05/18/87	05/19/87	< 1.0		< 1.0		< 0.10			< 0.10	
08/18/87	08/19/87	< 1.0		< 1.0		< 1.0			< 0.10	
08/18/87	08/19/87									
08/18/87	08/19/87									
11/12/87		< 1.0		< 1.0		< 1.0				< 0.10
02/10/88		0.26		0.26		0.32			< 0.10	< 0.10
05/10/88		< 1.0	plugged		< 0.10	< 0.10			< 0.10	
05/10/88										
05/10/88										
08/10/88		< 0.10			0.11	0.15			0.11	
08/10/88										
08/10/88										
11/03/88		< 0.10			< 0.10	< 0.10				
03/26/90	03/27/90	< 0.20			< 0.20	< 0.20			< 0.20	< 0.02
06/18/90		0.03			0.02	0.06			< 0.02	< 0.02
09/24/90		0.03			0.03	0.06			< 0.02	< 0.02
12/20/90		0.03			0.06	0.06			< 0.02	< 0.02
03/18/91		0.03	0.23		0.05	0.04			< 0.02	< 0.02
06/13/91		0.03	0.22		0.03	0.04			< 0.02	
09/19/91		0.02	0.23		0.03	0.07	0.04	0.14	< 0.01	< 0.01
12/03/91		0.03	0.23		0.02	0.05	0.04	0.16	< 0.01	

GROUND WATER MONITORING DATA

Ground Water Quality Assessment Plan Monitoring

Cadmium, dissolved (mg/l)

SAMPLED FROM -	TO	1	1-B	1-C	6-A	9	11-A	11-B	11-D	12-A	12-B	12-C	13-A
10/17/86		< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
03/11/87	03/12/87	< 0.01				< 0.01	< 0.01	< 0.01	0.05	< 0.01	< 0.01		< 0.01
05/18/87	05/19/87	< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
05/18/87	05/19/87								< 0.01				
05/18/87	05/19/87								< 0.01				
08/18/87	08/19/87	< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
11/12/87		< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
02/10/88		< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
05/10/88		< 0.01			< 0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
08/10/88		< 0.01			< 0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
11/03/88		< 0.02			< 0.02		< 0.02	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02
03/26/90	03/27/90	< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
06/18/90		< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
09/24/90		< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
12/20/90		< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
03/18/91		< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
06/13/91		< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
09/19/91		< 0.01	< 0.01	< 0.01	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
12/03/91		< 0.01	< 0.01	< 0.01	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

GROUND WATER MONITORING DATA

Ground Water Quality Assessment Plan Monitoring

Cadmium, dissolved (mg/l)

SAMPLED FROM -	TO	13-B	13-C	14-A	15-A	16-A	17-A	17-B	EQUIP. BLANK	TRIP BLANK
10/17/86		< 0.01		< 0.01		< 0.01			< 0.01	< 0.01
03/11/87	03/12/87	< 0.01		< 0.01		< 0.01			0.82	< 0.01
05/18/87	05/19/87	< 0.01		< 0.01		< 0.01			< 0.01	
05/18/87	05/19/87									
05/18/87	05/19/87									
08/18/87	08/19/87	< 0.01		< 0.01		< 0.01			< 0.01	
11/12/87		< 0.01		< 0.01		< 0.01				< 0.01
02/10/88		< 0.01		< 0.01		< 0.01			< 0.01	< 0.01
05/10/88		< 0.01		plugged	< 0.01	< 0.01			< 0.01	
08/10/88		< 0.01			< 0.01	< 0.01			< 0.01	
11/03/88		< 0.02			< 0.02	< 0.02				
03/26/90	03/27/90	< 0.01			< 0.01	< 0.01			< 0.01	
06/18/90		< 0.01			< 0.01	< 0.01			< 0.01	< 0.01
09/24/90		< 0.01			< 0.01	< 0.01			< 0.01	< 0.01
12/20/90		< 0.01			< 0.01	< 0.01			< 0.01	< 0.01
03/18/91		< 0.01	< 0.01		< 0.01	< 0.01			< 0.01	< 0.01
06/13/91		< 0.01	< 0.01		< 0.01	< 0.01			< 0.01	<
09/19/91		< 0.01	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
12/03/91		< 0.01	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<

GROUND WATER MONITORING DATA

Ground Water Quality Assessment Plan Monitoring

Copper, dissolved (mg/l)

SAMPLED FROM -	TO	1	1-B	1-C	6-A	9	11-A	11-B	11-D	12-A	12-B	12-C	13-A
10/17/86		0.02					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
03/11/87	03/12/87	< 0.01				< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
05/18/87	05/19/87	< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
08/18/87	08/19/87	< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
11/12/87		< 0.01					< 0.01	< 0.01	< 0.01	0.01	< 0.01		< 0.01
02/10/88		< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
02/10/88										< 0.01			
02/10/88										< 0.01			
05/10/88		< 0.01			< 0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
08/10/88		< 0.01			< 0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
11/03/88		0.03			0.03		< 0.03	< 0.03	< 0.03	< 0.03	< 0.03		< 0.03
03/26/90	03/27/90	< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
06/18/90		< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
09/24/90		< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
12/20/90		< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
03/18/91		< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
06/13/91		< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
09/19/91		< 0.01	< 0.01	< 0.01	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
12/03/91		< 0.01	< 0.01	< 0.01	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
12/03/91	dup							< 0.01					
12/03/91	trip							< 0.01					

GROUND WATER MONITORING DATA

Ground Water Quality Assessment Plan Monitoring

Copper, dissolved (mg/l)

SAMPLED FROM -	TO	13-B	13-C	14-A	15-A	16-A	17-A	17-B	EQUIP. BLANK	TRIP BLANK
10/17/86		< 0.01		< 0.01		< 0.01			< 0.01	< 0.01
03/11/87	03/12/87	< 0.01		< 0.01		< 0.01			0.03	< 0.01
05/18/87	05/19/87	< 0.01		< 0.01		< 0.01			< 0.01	
08/18/87	08/19/87	< 0.01		< 0.01		< 0.01			< 0.01	
11/12/87		< 0.01		< 0.01		0.03				< 0.01
02/10/88		< 0.01		< 0.01		< 0.01			< 0.01	< 0.01
02/10/88						< 0.01				
02/10/88						< 0.01				
05/10/88		< 0.01	plugged		< 0.01	< 0.01			< 0.01	
08/10/88		< 0.01			< 0.01	< 0.01			< 0.01	
11/03/88		< 0.03			< 0.03	< 0.03				
03/26/90	03/27/90	< 0.01			< 0.01	< 0.01			0.01	0.02
06/18/90		< 0.01			< 0.01	< 0.01			< 0.01	< 0.01
09/24/90		< 0.01			< 0.01	< 0.01			< 0.01	< 0.01
12/20/90		< 0.01			< 0.01	< 0.01			< 0.01	< 0.01
03/18/91		< 0.01	< 0.01		< 0.01	< 0.01			< 0.01	< 0.01
06/13/91		< 0.01	< 0.01		< 0.01	< 0.01			0.02	
09/19/91		< 0.01	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
12/03/91		< 0.01	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
12/03/91	dup									
12/03/91	trip									

GROUND WATER MONITORING DATA

Ground Water Quality Assessment Plan Monitoring

Chromium, dissolved (mg/l)

SAMPLED FROM -	TO	1	1-B	1-C	6-A	9	11-A	11-B	11-D	12-A	12-B	12-C	13-A
10/17/86		< 0.05					< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
03/11/87	03/12/87	< 0.05				< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
05/18/87	05/19/87	< 0.05					< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
08/18/87	08/19/87	< 0.05					< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
11/12/87		< 0.05					< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
02/10/88		< 0.05					< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
05/10/88		< 0.05			< 0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
08/10/88		< 0.05			< 0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
11/03/88		< 0.08			< 0.08		< 0.08	< 0.08	< 0.08	< 0.08	< 0.08		< 0.08
03/26/90	03/27/90	0.06					< 0.05	< 0.05	0.05	< 0.05	< 0.05		< 0.05
06/18/90		0.06					< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
06/18/90	dup	0.06							0.06				
06/18/90	trip	0.06							0.06				
06/18/90	quad	0.08							0.08				
09/24/90		< 0.05					< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
09/24/90	dup												
09/24/90	trip												
12/20/90		< 0.05					< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
03/18/91		< 0.05					< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.05	0.05
06/13/91		< 0.05					< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
06/13/91	dup												< 0.05
06/13/91	trip												< 0.05
09/19/91		< 0.05	< 0.05	< 0.05	< 0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
12/03/91		< 0.05	< 0.05	< 0.05	< 0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

GROUND WATER MONITORING DATA

Ground Water Quality Assessment Plan Monitoring

Chromium, dissolved (mg/l)

SAMPLED FROM -	TO	13-B	13-C	14-A	15-A	16-A	17-A	17-B	EQUIP. BLANK	TRIP BLANK
10/17/86		< 0.05		< 0.05		< 0.05			< 0.05	< 0.05
03/11/87	03/12/87	< 0.05		< 0.05		< 0.05			< 0.05	< 0.05
05/18/87	05/19/87	< 0.05		< 0.05		< 0.05			< 0.05	
08/18/87	08/19/87	< 0.05		< 0.05		< 0.05			< 0.05	
11/12/87		< 0.05		< 0.05		< 0.05				< 0.05
02/10/88		< 0.05		< 0.05		< 0.05			< 0.05	< 0.05
05/10/88		< 0.05		plugged	< 0.05	< 0.05			< 0.05	
08/10/88		< 0.05			< 0.05	< 0.05			< 0.05	
11/03/88		< 0.08			< 0.08	< 0.08				
03/26/90	03/27/90	< 0.05			< 0.05	< 0.05			< 0.05	< 0.05
06/18/90		0.08			< 0.05	< 0.05			0.08	< 0.05
06/18/90	dup									
06/18/90	trip									
06/18/90	quad									
09/24/90		< 0.05			< 0.05	< 0.05			< 0.05	< 0.05
09/24/90	dup	< 0.05								
09/24/90	trip	< 0.05								
12/20/90		< 0.05			< 0.05	< 0.05			< 0.05	< 0.05
03/18/91		< 0.05	< 0.05		< 0.05	< 0.05			< 0.05	< 0.05
06/13/91		< 0.05	< 0.05		< 0.05	< 0.05			< 0.05	
06/13/91	dup									
06/13/91	trip									
09/19/91		< 0.05	< 0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
12/03/91		< 0.05	< 0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	

GROUND WATER MONITORING DATA

Ground Water Quality Assessment Plan Monitoring

1,1-Dichloroethane (ug/l)

SAMPLED FROM -	TO	1	1-B	1-C	6-A	9	11-A	11-B	11-D	12-A
10/17/86 (note 1)		< 2					6	6		< 2
12/22/86		< 1					3.0	5.1		
12/22/86		< 1					3.4	4.9		
12/22/86							3.6	4.7		
03/11/87	03/12/87	< 1				< 1	< 1	4	< 1	< 1
05/18/87	05/19/87	< 1					3.0	2.1	< 1	< 1
05/18/87	05/19/87							2.2		
05/18/87	05/19/87							2.3		
08/18/87	08/19/87	< 1					9.9	6.1	< 1	< 1
08/18/87	08/19/87						5.2			
08/18/87	08/19/87						4.7			
11/12/87		< 1					4.1	5.3	< 1	< 1
11/12/87								5.5		
11/12/87								5.2		
02/10/88		< 1					BROKE BTL	3.5	< 1	< 1
02/10/88							1.8			
02/10/88							< 1			
05/10/88		< 1			42		1.0	3.4	< 1	< 1
05/10/88								3.5		
05/10/88								3.8		
08/10/88		< 1			42		3.7	3.0	< 1	< 1
08/10/88					58		3.6			
08/10/88					53		3.7			
11/03/88		< 1			70		< 1	4.5	< 1	< 1
11/03/88								4.5		
11/03/88								4.4		
03/26/90	03/27/90	< 1					2	< 1	< 1	< 1
06/18/90		< 1					3	3	< 1	< 1
06/18/90	dup						3			
06/18/90	trip						3			
06/18/90	quad						3			
09/24/90		< 1					2	3	< 1	< 1
09/24/90	dup							2		
09/24/90	trip							2		
12/20/90		< 1					2	3	< 1	< 1
12/20/90	dup						3	3		
12/20/90	trip						3	4		
03/18/91		< 1					4	3	< 1	< 1
03/18/91	dup						4	4		
03/18/91	trip						3	3		
06/13/91		< 1					4	4	< 1	< 1
06/13/91	dup						5	4		
06/13/91	trip						4	4		
09/19/91		< 1	< 1	< 1	35		5	4	< 1	< 1
09/19/91	dup						5	4		
09/19/91	trip						5	4		
12/03/91		< 1	< 1	< 1	39		11	< 1	< 1	< 1
12/03/91	dup				34		11	< 1		
12/03/91	trip				32		12	< 1		

NOTE 1: The 10/17/86 volatile organic data is also listed under the VOA scan

GROUND WATER MONITORING DATA

Ground Water Quality Assessment Plan Monitoring

1,1-Dichloroethane (ug/l)

SAMPLED FROM -	TO	12-B	12-C	13-A	13-B	13-C	14-A	15-A	16-A	17-A
10/17/86	(note 1)			< 2						
12/22/86										
12/22/86										
12/22/86										
03/11/87	03/12/87	< 1		< 1	< 1		< 1		< 1	
05/18/87	05/19/87	< 1		< 1	< 1		< 1		< 1	
05/18/87	05/19/87									
05/18/87	05/19/87									
08/18/87	08/19/87	< 1		< 1	< 1		1.1		< 1	
08/18/87	08/19/87									
08/18/87	08/19/87									
11/12/87		< 1		< 1	< 1		1.2		< 1	
11/12/87							1.4			
11/12/87							1.1			
02/10/88		< 1		< 1	< 1		1.2		< 1	
02/10/88										
02/10/88										
05/10/88		< 1		< 1	< 1		plugged	< 1	< 1	
05/10/88										
05/10/88										
08/10/88		< 1		< 1	< 1			< 1	< 1	
08/10/88										
08/10/88										
11/03/88		< 1		< 1	< 1			< 1	< 1	
11/03/88										
11/03/88										
03/26/90	03/27/90	< 1		< 1	< 1			< 1	< 1	
06/18/90		< 1		< 1	< 1			< 1	< 1	
06/18/90	dup									
06/18/90	trip									
06/18/90	quad									
09/24/90		< 1		< 1	< 1			< 1	< 1	
09/24/90	dup									
09/24/90	trip									
12/20/90		< 1		< 1	< 1			< 2	< 2	
12/20/90	dup									
12/20/90	trip									
03/18/91		< 1	< 1	< 1	< 1	< 1		< 1	< 1	
03/18/91	dup									
03/18/91	trip									
06/13/91		< 1	< 1	< 1	< 1	< 1		< 1	< 1	
06/13/91	dup									
06/13/91	trip									
09/19/91		< 1	< 1	< 1	< 1	< 1		< 1	< 1	< 1
09/19/91	dup									
09/19/91	trip									
12/03/91		< 1	< 1	< 1	< 1	< 1		< 1	< 1	< 1
12/03/91	dup									
12/03/91	trip									

GROUND WATER MONITORING DATA

Ground Water Quality Assessment Plan Monitoring

1,1-Dichloroethane (ug/l)

SAMPLED FROM -	TO	17-B		EQUIP. BLANK		TRIP BLANK	
10/17/86	(note 1)					<	2
12/22/86							
12/22/86							
12/22/86							
03/11/87	03/12/87			<	1	<	1
05/18/87	05/19/87			<	1		
05/18/87	05/19/87						
05/18/87	05/19/87						
08/18/87	08/19/87			<	1		
08/18/87	08/19/87						
08/18/87	08/19/87						
11/12/87				<	1	<	1
11/12/87							
11/12/87							
02/10/88						<	1
02/10/88							
02/10/88							
05/10/88				<	1		
05/10/88							
05/10/88							
08/10/88							
08/10/88							
08/10/88							
11/03/88							
11/03/88							
11/03/88							
03/26/90	03/27/90			<	1	<	1
06/18/90				<	1	<	1
06/18/90	dup						
06/18/90	trip						
06/18/90	quad						
09/24/90				<	1	<	1
09/24/90	dup						
09/24/90	trip						
12/20/90				<	2	<	2
12/20/90	dup						
12/20/90	trip						
03/18/91				<	1	<	1
03/18/91	dup						
03/18/91	trip						
06/13/91				<	1	<	1
06/13/91	dup						
06/13/91	trip						
09/19/91		<	1	<	1	<	1
09/19/91	dup						
09/19/91	trip						
12/03/91		<	1	<	1		
12/03/91	dup						
12/03/91	trip						

GROUND WATER MONITORING DATA

Ground Water Quality Assessment Plan Monitoring

Lead, dissolved (mg/l)

SAMPLED FROM -	TO	1	1-B	1-C	6-A	9	11-A	11-B	11-D	12-A	12-B	12-C	13-A
10/17/86		< 0.05					< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
03/11/87	03/12/87	< 0.05				< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
05/18/87	05/19/87	< 0.05					< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
08/18/87	08/19/87	< 0.05					< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
11/12/87		< 0.05					< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
02/10/88		< 0.05					< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
05/10/88		< 0.05			< 0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
08/10/88		< 0.05			< 0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
11/03/88		< 0.05			< 0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
03/26/90	03/27/90	< 0.05					< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
06/18/90		< 0.05					< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
09/24/90		< 0.05					< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
12/20/90		< 0.05					< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
03/18/91		< 0.05					< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
06/13/91		< 0.05					< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
09/19/91		< 0.05	< 0.05	< 0.05	< 0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
12/03/91		< 0.05	< 0.05	< 0.05	< 0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

GROUND WATER MONITORING DATA

Ground Water Quality Assessment Plan Monitoring

Lead, dissolved (mg/l)

SAMPLED FROM -	TO	13-B	13-C	14-A	15-A	16-A	17-A	17-B	EQUIP. BLANK	TRIP BLANK
10/17/86		< 0.05		< 0.05		< 0.05			< 0.05	< 0.05
03/11/87	03/12/87	< 0.05		< 0.05		< 0.05			< 0.05	< 0.05
05/18/87	05/19/87	< 0.05		< 0.05		< 0.05			< 0.05	
08/18/87	08/19/87	< 0.05		< 0.05		< 0.05			< 0.05	
11/12/87		< 0.05		< 0.05		< 0.05				< 0.05
02/10/88		< 0.05		< 0.05		< 0.05			< 0.05	< 0.05
05/10/88		< 0.05	plugged		< 0.05	< 0.05			< 0.05	
08/10/88		< 0.05			< 0.05	< 0.05			< 0.05	
11/03/88		< 0.05			< 0.05	< 0.05				
03/26/90	03/27/90	< 0.05			< 0.05	< 0.05			< 0.05	< 0.05
06/18/90		< 0.05			< 0.05	< 0.05			< 0.05	< 0.05
09/24/90		< 0.05			< 0.05	< 0.05			< 0.05	< 0.05
12/20/90		< 0.05			< 0.05	< 0.05			< 0.05	< 0.05
03/18/91		< 0.05	< 0.05		< 0.05	< 0.05			< 0.05	< 0.05
06/13/91		< 0.05	< 0.05		< 0.05	< 0.05			< 0.05	
09/19/91		< 0.05	< 0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
12/03/91		< 0.05	< 0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	

GROUND WATER MONITORING DATA

Ground Water Quality Assessment Plan Monitoring

pH (field) (standard pH units)

SAMPLED FROM -	TO	1	1-B	1-C	6-A	9	11-A	11-B	11-D	12-A	12-B	12-C	13-A	13-B	13-C	14-A	15-A	16-A	17-A	17-B
10/17/86		0.00					7.57	7.56	7.42	7.54	7.36		7.11	7.34		7.04		7.45		
03/11/87	03/12/87	6.61				6.40	5.96	6.65	6.65	6.60	6.62		7.48	7.37		7.20		7.64		
05/18/87	05/19/87	7.06					7.42	7.11	6.95	7.48	7.21		6.84	7.00		6.80		7.33		
08/18/87	08/19/87	7.42					7.34	7.29	7.34	7.39	7.26		7.05	6.90		6.99		7.47		
11/12/87		7.48					7.34	7.33	7.59	7.50	7.23		7.06	7.21		7.07		7.54		
02/10/88		7.32					7.57	7.42	7.43	7.66	7.41		7.15	7.25		7.28		7.37		
05/10/88		7.47			7.07		7.04	6.88	7.07	7.15	6.99		7.01	6.97		plugged	7.11	7.04		
08/10/88		7.24			6.94		7.32	7.20	7.20	7.24	7.20		6.79	6.93			7.39	7.38		
11/03/88		7.45			7.08		7.51	7.73	7.50	7.74	7.56		7.26	7.35			7.56	7.46		
03/26/90	03/27/90	6.95					6.89	6.96	7.01	7.20	7.00		6.58	6.52			7.14	6.88		
06/18/90		7.32					6.97	7.02	7.27	7.45	7.22		6.97	7.18			7.26	7.10		
09/24/90		7.28					7.22	7.22	7.21	7.44	7.23		7.18	7.34			7.74	7.07		
12/20/90		6.98					6.82	6.97	6.73	7.17	7.20		6.65	6.88			7.39	7.15		
03/18/91		7.15					6.84	6.88	7.04	7.18	7.02	7.36	6.67	6.95	7.19		7.27	7.14		
06/13/91		6.97					7.14	7.16	7.21	7.21	7.20	7.35	6.99	6.97	7.10		7.33	7.09		
09/19/91		7.15	7.07	7.14	6.69		6.97	6.96	7.03	7.00	7.01	7.29	6.80	6.92	7.07		7.01	7.00	6.98	7.05
12/03/91		6.90	6.53	6.77	6.59		6.77	6.79	6.61	7.09	6.94	7.02	6.18	6.61	7.14		6.94	6.96	6.89	6.90

GROUND WATER MONITORING DATA

Ground Water Quality Assessment Plan Monitoring

Selenium, dissolved (ug/l)

SAMPLED FROM -	TO	1	1-B	1-C	6-A	9	11-A	11-B	11-D	12-A	12-B	12-C	13-A
10/17/86		< 2.0					< 2.0	< 2.0	< 2.0	< 2.0	< 2.0		< 2.0
03/11/87	03/12/87	< 2.0				< 2.0	< 2.0	< 2.0	< 2.0	3.0	< 2.0		< 2.0
05/18/87	05/19/87	< 2.0					< 2.0	< 2.0	< 2.0	< 2.0	< 2.0		< 2.0
05/18/87	05/19/87									< 2.0			
05/18/87	05/19/87									< 2.0			
08/18/87	08/19/87	< 2.0					< 2.0	< 2.0	< 2.0	< 2.0	< 2.0		< 2.0
11/12/87		< 2.0					< 2.0	< 2.0	< 2.0	2.9	< 2.0		< 2.0
02/10/88		2.4					< 2.0	< 2.0	< 2.0	10	< 2.0		< 2.0
02/10/88										11			
02/10/88										11			
05/10/88		< 2.0			< 2.0		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0		< 2.0
08/10/88		< 2.0			< 2.0		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0		< 2.0
11/03/88		< 2.0			< 2.0		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0		< 2.0
03/26/90	03/27/90	2.6					< 2.0	< 2.0	< 2.0	< 2.0	< 2.0		< 2.0
06/18/90		< 2.0					< 2.0	< 2.0	< 2.0	< 2.0	< 2.0		< 2.0
06/18/90	dup	< 2.0											
06/18/90	trip	< 2.0											
06/18/90	quad	< 2.0											
09/24/90		< 2.0					< 2.0	< 2.0	< 2.0	< 2.0	< 2.0		< 2.0
12/20/90		< 2.0					< 2.0	< 2.0	< 2.0	< 2.0	< 2.0		< 2.0
12/20/90	dup												
12/20/90	trip												
03/18/91		< 2.0					< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
06/13/91		< 2.0					< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
09/19/91		< 2.0	< 2.0	< 2.0	< 2.0		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
12/03/91		< 2.0	< 2.0	< 2.0	< 2.0		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

GROUND WATER MONITORING DATA

Ground Water Quality Assessment Plan Monitoring

Selenium, dissolved (ug/l)

SAMPLED FROM -	TO	13-B	13-C	14-A	15-A	16-A	17-A	17-B	EQUIP. BLANK	TRIP BLANK
10/17/86		< 2.0		< 2.0		< 2.0			< 2.0	< 2.0
03/11/87	03/12/87	< 2.0		< 2.0		< 2.0			< 2.0	< 2.0
05/18/87	05/19/87	< 2.0		< 2.0		< 2.0			< 2.0	
05/18/87	05/19/87									
05/18/87	05/19/87									
08/18/87	08/19/87	< 2.0		< 2.0		< 2.0			< 2.0	
11/12/87		< 2.0		< 2.0		< 2.0				< 2.0
02/10/88		< 2.0		< 2.0		< 2.0			< 2.0	< 2.0
02/10/88										
02/10/88										
05/10/88		< 2.0	plugged		< 2.0	< 2.0			< 2.0	
08/10/88		< 2.0			< 2.0	< 2.0			< 2.0	
11/03/88		< 2.0			2.4	< 2.0			< 2.0	
03/26/90	03/27/90	< 2.0			< 2.0	< 2.0			< 2.0	< 2.0
06/18/90		< 2.0			< 2.0	< 2.0			< 2.0	< 2.0
06/18/90	dup									
06/18/90	trip									
06/18/90	quad									
09/24/90		< 2.0			2.5	< 2.0			< 2.0	< 2.0
12/20/90		< 2.0			< 2.0	< 2.0			< 2.0	< 2.0
12/20/90	dup				< 2.0					
12/20/90	trip				< 2.0					
03/18/91		< 2.0	< 2.0		< 2.0	< 2.0			< 2.0	< 2.0
06/13/91		< 2.0	< 2.0		< 2.0	< 2.0			< 2.0	
09/19/91		< 2.0	< 2.0		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
12/03/91		< 2.0	< 2.0		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	

GROUND WATER MONITORING DATA

Ground Water Quality Assessment Plan Monitoring

Silver, dissolved (mg/l)

SAMPLED FROM -	TO	1	1-B	1-C	6-A	9	11-A	11-B	11-D	12-A	12-B	12-C	13-A
10/17/86		< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
03/11/87	03/12/87	< 0.01				< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
05/18/87	05/19/87	< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
08/18/87	08/19/87	< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
11/12/87		< 0.01					< 0.01	< 0.01	< 0.01	0.01	< 0.01		< 0.01
02/10/88		< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
05/10/88		< 0.01			< 0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
08/10/88		< 0.01			< 0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
11/03/88		< 0.01			< 0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
03/26/90	03/27/90	< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
06/18/90		< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
09/24/90		< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
12/20/90		< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
03/18/91		< 0.01					< 0.01	0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01
06/13/91		< 0.01					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
06/13/91	dup							< 0.01		< 0.01			
06/13/91	trip							< 0.01		< 0.01			
09/19/91		< 0.005	< 0.005	< 0.005	< 0.005		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
12/03/91		< 0.005	< 0.005	< 0.005	< 0.005		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005

GROUND WATER MONITORING DATA

Ground Water Quality Assessment Plan Monitoring

Silver, dissolved (mg/l)

SAMPLED FROM -	TO	13-B	13-C	14-A	15-A	16-A	17-A	17-B	EQUIP. BLANK	TRIP BLANK
10/17/86		< 0.01		< 0.01		< 0.01			< 0.01	< 0.01
03/11/87	03/12/87	< 0.01		< 0.01		< 0.01			< 0.01	< 0.01
05/18/87	05/19/87	< 0.01		< 0.01		< 0.01			< 0.01	
08/18/87	08/19/87	< 0.01		< 0.01		< 0.01			< 0.01	
11/12/87		< 0.01		< 0.01		< 0.01				< 0.01
02/10/88		< 0.01		< 0.01		< 0.01			< 0.01	< 0.01
05/10/88		< 0.01	plugged		< 0.01	< 0.01			< 0.01	
08/10/88		< 0.01			< 0.01	< 0.01			< 0.01	
11/03/88		< 0.01			< 0.01	< 0.01				
03/26/90	03/27/90	< 0.01			< 0.01	< 0.01			< 0.01	< 0.01
06/18/90		< 0.01			< 0.01	< 0.01			< 0.01	< 0.01
09/24/90		< 0.01			< 0.01	< 0.01			< 0.01	< 0.01
12/20/90		< 0.01			< 0.01	< 0.01			< 0.01	< 0.01
03/18/91		< 0.01	< 0.01		< 0.01	< 0.01			< 0.01	< 0.01
06/13/91		< 0.01	< 0.01		< 0.01	< 0.01			< 0.01	
06/13/91	dup									
06/13/91	trip									
09/19/91		< 0.005	< 0.005		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
12/03/91		< 0.005	< 0.005		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	

GROUND WATER MONITORING DATA

Ground Water Quality Assessment Plan Monitoring

Specific Conductivity (field) (umhos/cm)

SAMPLED FROM -	TO	1	1-B	1-C	6-A	9	11-A	11-B	11-D	12-A	12-B	12-C	13-A	13-B	13-C	14-A	15-A	16-A	17-A	17-B	EQUIP. BLANK	TRIP BLANK
10/17/86		2300					1200	1200	810	1300	1400		2300	1400		1600		1200			67	65
03/11/87	03/12/87	2210				1130	1450	1340	887	1210	1410		2240	1500		1650		1450			122	117
05/18/87	05/19/87	2194					1803	1661	908	1355	1555		2372	1606		1952		1328				
08/18/87	08/19/87	1690					1746	1955	842	1280	1446		2080	1662		1825		1630				
11/12/87		1991					1171	1388	879	1475	1606		2651	1993		1912		1644				
02/10/88		1745					1758	1676	859	1212	1550		2161	1799		1714		1638				
05/10/88		1939			2557		1387	1791	904	1343	1494		2383	1499		plugged	1663	1657				
08/10/88		1712			2599		1888	1910	924	1907	1475		2453	1512			1135	1829				
11/03/88		1834			2482		1702	1669	900	1476	1412		2530	1880			1264	1612				
03/26/90	03/27/90	1338					1295	1452	703	1258	1224		1141	1536			473	1050				
06/18/90		1659					1830	2126	956	1719	1508		1990	1987			665	1650				
09/24/90		1563					1695	2058	982	1665	1386		1950	1978			792	1617				
12/20/90		1575					1884	1986	1030	1817	1442		1969	1999			1219	1699				
03/18/91		1407					1954	2101	991	1842	1432	1618	1901	2011	637		1029	1509				
06/13/91		1404					1994	2280	1046	1736	1322	829	1724	1987	687		839	1366				
09/19/91		808	1404	1004	2334		1809	2228	1044	1557	1299	810	1560	1622	631		738	1594	1059	640		
12/03/91		738	1305	912	1893		1262	2040	976	717	1236	1489	1601	1610	646		541	1546	951	665		

GROUND WATER MONITORING DATA
Ground Water Quality Assessment Plan Monitoring
Annual Parameters (mg/l)

Well	Date	Chloride	Sulfate	Manganese	Iron
1	10/17/86	130.00	2400.00	1.10	3.50
1	11/12/87	65.00	900.00	0.84	4.80
1	11/03/88	150.00	674.00	0.59	6.50
1	06/18/90	76.00	744.00	0.61	4.20
1	09/19/91	27.00	102.00	0.25	2.60
1B	09/19/91	203.00	258.00	0.10	3.00
1C	09/19/91	100.00	85.00	0.04	2.20
6-A	11/03/88	85.00	1380.00	0.11	22.00
	09/19/91	383.00	595.00	0.17	20.00
11-A	10/17/86	36.00	880.00	0.27	0.10
11-A	11/12/87	57.00	690.00	0.62	2.60
11-A	11/03/88	60.00	823.00	0.46	0.84
11-A	06/18/90	97.00	886.00	0.52	2.30
11-A	09/19/91	123.00	743.00	0.38	0.91
11-B	10/17/86	37.00	920.00	0.31	1.50
11-B	11/12/87	99.00	800.00	0.42	2.60
11-B	11/03/88	61.00	837.00	0.35	0.57
11-B	06/18/90	134.00	900.00	0.49	5.00
11-B	09/19/91	190.00	1080.00	4.30	0.47
11-D	10/17/86	48.00	150.00	0.05	1.70
11-D	11/12/87	55.00	120.00	0.04	1.90
11-D	11/03/88	65.00	134.00	0.04	2.60
11-D	06/18/90	66.00	176.00	0.06	2.80
11-D	09/19/91	63.00	228.00	3.20	0.05
12-A	10/17/86	35.00	540.00	0.03	< 0.01
12-A	11/12/87	62.00	370.00	0.03	0.04
12-A	11/03/88	59.00	637.00	< 0.01	< 0.01
12-A	06/18/90	74.00	824.00	0.06	< 0.01
12-A	09/19/91	82.00	681.00	0.07	< 0.01
12-B	10/17/86	69.00	540.00	0.10	3.40
12-B	11/12/87	66.00	540.00	0.13	4.40
12-B	11/03/88	63.00	547.00	0.11	3.60
12-B	06/18/90	65.00	606.00	0.16	4.50
12-B	09/19/91	60.00	576.00	0.09	5.30
13-A	10/17/86	45.00	2900.00	0.96	6.10
13-A	11/12/87	42.00	1330.00	0.87	6.30
13-A	11/03/88	67.00	1290.00	0.81	6.10
13-A	06/18/90	56.00	698.00	0.92	9.00
13-A	09/19/91	24.00	164.00	0.79	9.80
13-B	10/17/86	39.00	860.00	0.22	4.30
13-B	11/12/87	62.00	890.00	0.31	7.70
13-B	11/03/88	58.00	992.00	0.25	8.50
13-B	06/18/90	151.00	870.00	0.31	7.00
13-B	09/19/91	110.00	733.00	0.20	7.50
14-A	10/17/86	140.00	610.00	0.12	11.00
14-A	11/12/87	130.00	390.00	0.16	21.00

GROUND WATER MONITORING DATA
Ground Water Quality Assessment Plan Monitoring
Annual Parameters (mg/l)

Well	Date	Chloride	Sulfate	Manganese	Iron
15-A	11/03/88	38.00	460.00	< 0.01	< 0.01
15-A	06/18/90	11.00	74.00	< 0.01	< 0.01
15-A	09/19/91	10.00	121.00	< 0.01	0.04
16-A	10/17/86	37.00	500.00	0.18	0.05
16-A	11/12/87	73.00	610.00	0.08	0.07
16-A	06/18/90	70.00	759.00	0.08	< 0.01
16-A	09/19/91	109.00	1000.00	0.32	< 0.01
17A	09/19/91	90.00	297.00	0.24	1.10
17B	09/19/91	31	46.00	0.02	1.50
EQP BLK	10/17/86	6.20	< 5	< 0.01	< 0.01
EQP BLK	11/12/87	< 1	< 5		< 0.01
EQP BLK	06/18/90	< 2	< 5	< 0.01	< 0.01
EQP BLK	09/19/91	2	< 5	< 0.01	< 0.01
TRP BLK	10/17/86	3.80	< 5	< 0.01	< 0.01
TRP BLK	11/12/87	1.90	< 5	< 0.01	< 0.01
TRP BLK	06/18/90	< 2	< 5	< 0.01	< 0.01
TRP BLK	09/19/91	< 2	< 5	< 0.01	< 0.01
EPA STD		250	250	0.05	0.3

GROUND WATER MONITORING DATA
Ground Water Quality Assessment Plan Monitoring
Additional Cations and Anions (mg/L) Third Quarter 1991

Well	Date	Sodium Dissolved	Potassium Dissolved	Calcium Dissolved	Magnesium Dissolved	Alkalinity Bicarbonate	Carbonate Alkalinity
1	09/19/91	67	5.6	105	11	333	<2.0
1B	09/19/91	130	8.3	179	33	306	<2.0
1C	09/19/91	63	4.8	120	29	346	<2.0
6A	09/19/91	284	5.5	338	19	321	<2.0
11A	09/19/91	107	97	277	30	176	<2.0
11B	09/19/91	127	30	436	47	146	<2.0
11D	09/19/91	20	2.8	151	40	292	<2.0
12A	09/19/91	63	7.2	293	42	203	<2.0
12B	09/19/91	38	2.6	230	57	220	<2.0
12C	09/19/91	16	3.4	126	20	277	<2.0
13A	09/19/91	34	5.8	291	48	850	<2.0
13B	09/19/91	92	6.4	301	51	219	<2.0
13C	09/19/91	11	2.1	84	28	234	<2.0
15A	09/19/91	19	3.8	124	15	270	<2.0
16A	09/19/91	72	31	342	34	102	<2.0
17A	09/19/91	57	4.5	171	19	219	<2.0
17B	09/19/91	9.6	2	91	29	292	<2.0
TRP BLK	09/19/91	<0.50	<0.50	<0.50	<0.50	<2.0	<2.0
EQP BLK	09/19/91	<0.50	<0.50	<0.50	<0.50	<2.0	<2.0

APPENDIX D

1991 Statistical Evaluation

First Quarter 1991 Statistical Evaluations

ARSENIC
Well 1
BACKGROUND

Date	Actual	x	x2	delta	delta2
23-Dec-83	<1	0.5	0.25	0.5	0.25
14-Mar-84	<10	5	25	5	25
20-Jun-84	1	1	1	0.5	0.25
27-Sep-84	ND(1)	0.5	0.25	0.5	0.25
24-Sep-85	<1	0.5	0.25	0.5	0.25
23-Oct-85	4.4	4.4	19.36	0.05	0.0025
17-Oct-86	<2	1	1	1	1
11-Mar-87	<1	0.5	0.25	0.5	0.25
18-May-87	<2	1	1	1	1
18-Aug-87	<2	1	1	1	1
12-Nov-87	<2	1	1	1	1
10-Feb-88	<2	1	1	1	1
09-May-88	<2	1	1	1	1
10-Aug-88	<2	1	1	1	1
03-Nov-88	<2	1	1	1	1
26-Mar-90	<2	1	1	1	1
18-Jun-90	<2	1	1	1	1
24-Sep-90	<2	1	1	1	1
20-Dec-90	<2	1	1	1	1
18-Mar-91	<1	0.5	0.25	0.5	0.25

BACKGROUND:

n=	20
SUM(x)	24.9000
SUM(x2)	58.6100
SUM(delta2)	38.5025
MEAN=	1.2450
LLVOM=	0.4813
VAR(x)=S2=	2.1286
s2/n=	0.1064
W=	0.4813
d.f.=	19
t=	2.539
alpha=	0.01

FOREGROUND
ARSENIC, WELL 11A

Date	Actual	x	x2	delta	delta2
20-Dec-90	5.3	5.3	28.09	0.05	0.0025
18-Mar-91	2.4	2.4	5.76	0.05	0.0025
18-Mar-91	2.6	2.6	6.76	0.05	0.0025
18-Mar-91	2.9	2.9	8.41	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	13.2000
SUM(x2)	49.0200
SUM(delta2)	0.0100
MEAN=	3.3000
LLVOM=	0.0006
VAR(x)=S2=	1.8211
s2/n=	0.4553
W=	0.4553
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	20
d.f.=	19
t=	2.539
W=	0.4812812
MEAN=	1.245

STATISTIC:

alpha=	0.01
t(star)=	2.123
t(sub-c)=	3.512

t(star) < t(sub-c)

Accept Ho

FOREGROUND
ARSENIC, WELL 11B

Date	Actual	x	x2	delta	delta2
20-Dec-90	4.6	4.6	21.16	0.05	0.0025
18-Mar-91	3.0	3.0	9	0.05	0.0025
18-Mar-91	3.4	3.4	11.56	0.05	0.0025
18-Mar-91	3.1	3.1	9.61	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	14.1000
SUM(x2)	51.3300
SUM(delta2)	0.0100
MEAN=	3.5250
LLVOM=	0.0006
VAR(x)=S2=	0.5436
s2/n=	0.1359
W=	0.1359
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	20
d.f.=	19
t=	2.539
W=	0.4812812
MEAN=	1.245

STATISTIC:

alpha=	0.01
t(star)=	2.902
t(sub-c)=	2.980

t(star) < t(sub-c)

Accept Ho

FOREGROUND
ARSENIC, WELL 11D

Date	Actual	x	x2	delta	delta2
20-Dec-90	6.5	6.5	42.25	0.05	0.0025
18-Mar-91	5.6	5.6	31.36	0.05	0.0025
18-Mar-91	5.4	5.4	29.16	0.05	0.0025
18-Mar-91	5.4	5.4	29.16	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	22.9000
SUM(x2)	131.9300
SUM(delta2)	0.0100
MEAN=	5.7250
LLVOM=	0.0006
VAR(x)=S2=	0.2769
s2/n=	0.0692
W=	0.0692
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	20
d.f.=	19
t=	2.539
W=	0.4812812
MEAN=	1.245

STATISTIC:

alpha=	0.01
t(star)=	6.038
t(sub-c)=	2.791

t(star >or= t(sub-c)

Reject Ho in favor of Hi

FOREGROUND
ARSENIC, WELL 12B

Date	Actual	x	x2	delta	delta2
20-Dec-90	7.7	7.7	59.29	0.05	0.0025
18-Mar-91	6.4	6.4	40.96	0.05	0.0025
18-Mar-91	7.0	7.0	49	0.05	0.0025
18-Mar-91	6.6	6.6	43.56	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	27.7000
SUM(x2)	192.8100
SUM(delta2)	0.0100
MEAN=	6.9250
LLVOM=	0.0006
VAR(x)=S2=	0.3303
s2/n=	0.0826
W=	0.0826
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	20
d.f.=	19
t=	2.539
W=	0.4812812
MEAN=	1.245

STATISTIC:

alpha=	0.01
t(star)=	7.564
t(sub-c)=	2.832

t(star >or= t(sub-c)

Reject Ho in favor of Hi

FOREGROUND
ARSENIC, WELL 13A

Date	Actual	x	x2	delta	delta2
20-Dec-90	2.7	2.7	7.29	0.05	0.0025
18-Mar-91	4.0	4.0	16	0.05	0.0025
18-Mar-91	6.0	6.0	36	0.05	0.0025
18-Mar-91	5.9	5.9	34.81	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	18.6000
SUM(x2)	94.1000
SUM(delta2)	0.0100
MEAN=	4.6500
LLVOM=	0.0006
VAR(x)=S2=	2.5378
s2/n=	0.6344
W=	0.6344
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	20
d.f.=	19
t=	2.539
W=	0.4812812
MEAN=	1.245

STATISTIC:

alpha=	0.01
t(star)=	3.224
t(sub-c)=	3.677

t(star) < t(sub-c)

Accept Ho

FOREGROUND
ARSENIC, WELL 13B

Date	Actual	x	x2	delta	delta2
20-Dec-90	5.7	5.7	32.49	0.05	0.0025
18-Mar-91	5.2	5.2	27.04	0.05	0.0025
18-Mar-91	4.8	4.8	23.04	0.05	0.0025
18-Mar-91	5.0	5.0	25.00	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	20.7000
SUM(x2)	107.5700
SUM(delta2)	0.0100
MEAN=	5.1750
LLVOM=	0.0006
VAR(x)=S2=	0.1503
s2/n=	0.0376
W=	0.0376
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	20
d.f.=	19
t=	2.539
W=	0.4812812
MEAN=	1.245

STATISTIC:

alpha=	0.01
t(star)=	5.456
t(sub-c)=	2.684

t(star >or= t(sub-c)

Reject Ho in favor of Hi

1,1-DCA
Well 1
BACKGROUND

Date	Actual	x	x2	delta	delta2
24-Sep-85	<1	0.5	0.25	0.5	0.25
17-Oct-86	<2	1	1	1	1
22-Dec-86	<1	0.5	0.25	0.5	0.25
22-Dec-86	<1	0.5	0.25	0.5	0.25
11-Mar-87	<1	0.5	0.25	0.5	0.25
18-May-87	<1	0.5	0.25	0.5	0.25
18-Aug-88	<1	0.5	0.25	0.5	0.25
12-Nov-87	<1	0.5	0.25	0.5	0.25
10-Feb-88	<1	0.5	0.25	0.5	0.25
10-May-88	<1	0.5	0.25	0.5	0.25
10-Aug-88	<1	0.5	0.25	0.5	0.25
03-Nov-88	<1	0.5	0.25	0.5	0.25
26-Mar-90	<1	0.5	0.25	0.5	0.25
18-Jun-90	<1	0.5	0.25	0.5	0.25
24-Sep-90	<1	0.5	0.25	0.5	0.25
20-Dec-90	<1	0.5	0.25	0.5	0.25
18-Mar-91	<1	0.5	0.25	0.5	0.25

BACKGROUND:

n=	17
SUM(x)	9.0000
SUM(x2)	5.0000
SUM(delta2)	5.0000
MEAN=	0.5294
LLVOM=	0.0735
VAR(x)=S2=	0.1189
s2/n=	0.0070
W=	0.0735
d.f.=	16
t=	2.583
alpha=	0.01

FOREGROUND 1,1-DCA, WELL 11A

Date	Actual	x	x2	delta	delta2
20-Dec-90	3.0	3.0	9	0.05	0.0025
18-Mar-91	4.0	4.0	16	0.05	0.0025
18-Mar-91	4.0	4.0	16	0.05	0.0025
18-Mar-91	3.0	3.0	9	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	14.0000
SUM(x2)	50.0000
SUM(delta2)	0.0100
MEAN=	3.5000
LLVOM=	0.0006
VAR(x)=S2=	0.3344
s2/n=	0.0836
W=	0.0836
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	17
d.f.=	16
t=	2.583
W=	0.0735294
MEAN=	0.5294117

STATISTIC:

alpha=	0.01
t(star)=	7.494
t(sub-c)=	3.625

t(star >or= t(sub-c)

Reject Ho in favor of Hi

FOREGROUND 1,1-DCA, WELL 11B

Date	Actual	x	x2	delta	delta2
20-Dec-90	4.0	4.0	16	0.05	0.0025
18-Mar-91	3.0	3.0	9	0.05	0.0025
18-Mar-91	4.0	4.0	16	0.05	0.0025
18-Mar-91	3.0	3.0	9	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	14.0000
SUM(x2)	50.0000
SUM(delta2)	0.0100
MEAN=	3.5000
LLVOM=	0.0006
VAR(x)=S2=	0.3344
s2/n=	0.0836
W=	0.0836
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	17
d.f.=	16
t=	2.583
W=	0.0735294
MEAN=	0.5294117

STATISTIC:

alpha=	0.01
t(star)=	7.494
t(sub-c)=	3.625

t(star >or= t(sub-c)

Reject Ho in favor of Hi

ARSENIC
Well 1
BACKGROUND

Date	Actual	x	x2	delta	delta2
23-Dec-83	<1	0.5	0.25	0.5	0.25
14-Mar-84	<10	5	25	5	25
20-Jun-84	1	1	1	0.5	0.25
27-Sep-84	ND(1)	0.5	0.25	0.5	0.25
24-Sep-85	<1	0.5	0.25	0.5	0.25
23-Oct-85	4.4	4.4	19.36	0.05	0.0025
17-Oct-86	<2	1	1	1	1
11-Mar-87	<1	0.5	0.25	0.5	0.25
18-May-87	<2	1	1	1	1
18-Aug-87	<2	1	1	1	1
12-Nov-87	<2	1	1	1	1
10-Feb-88	<2	1	1	1	1
09-May-88	<2	1	1	1	1
10-Aug-88	<2	1	1	1	1
03-Nov-88	<2	1	1	1	1
26-Mar-90	<2	1	1	1	1
18-Jun-90	<2	1	1	1	1
24-Sep-90	<2	1	1	1	1
20-Dec-90	<2	1	1	1	1
18-Mar-91	<1	0.5	0.25	0.5	0.25
13-Jun-91	<1	0.5	0.25	0.5	0.25
19-Sep-91	<1	0.5	0.25	0.5	0.25
03-Dec-91	<1	0.5	0.25	0.5	0.25

BACKGROUND:

n=	23
SUM(x)	26.4000
SUM(x2)	59.3600
SUM(delta2)	39.2525
MEAN=	1.1478
LLVOM=	0.4267
VAR(x)=S2=	1.9155
s2/n=	0.0833
W=	0.4267
d.f.=	22
t=	2.508
alpha=	0.01

FOREGROUND
ARSENIC, WELL 6A

Date	Actual	x	x2	delta	delta2
19-Sep-91	25	25	625	0.5	0.25
03-Dec-91	34	34	1156	0.5	0.25
03-Dec-91	31	31	961	0.5	0.25
03-Dec-91	34	34	1156	0.5	0.25

FOREGROUND:

n=	4
SUM(x)	124.0000
SUM(x2)	3898.0000
SUM(delta2)	1.0000
MEAN=	31.0000
LLVOM=	0.0625
VAR(x)=S2=	18.1111
s2/n=	4.5278
W=	4.5278
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	23
d.f.=	22
t=	2.508
W=	0.4266576
MEAN=	1.1478260

STATISTIC:

alpha=	0.01
t(star)=	13.412
t(sub-c)=	4.366

t(star >or= t(sub-c)

Reject Ho in favor of Hi

FOREGROUND
ARSENIC, WELL 11A

Date	Actual	x	x2	delta	delta2
19-Sep-91	2.3	2.3	5.29	0.05	0.0025
03-Dec-91	3.2	3.2	10.24	0.05	0.0025
03-Dec-91	3.0	3.0	9	0.05	0.0025
03-Dec-91	2.4	2.4	5.76	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	10.9000
SUM(x2)	30.2900
SUM(delta2)	0.0100
MEAN=	2.7250
LLVOM=	0.0006
VAR(x)=S2=	0.1969
s2/n=	0.0492
W=	0.0492
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	23
d.f.=	22
t=	2.508
W=	0.4266576
MEAN=	1.1478260

STATISTIC:

alpha=	0.01
t(star)=	2.286
t(sub-c)=	2.718

t(star) < t(sub-c)

Accept Ho

FOREGROUND
ARSENIC, WELL 11B

Date	Actual	x	x2	delta	delta2
19-Sep-91	3.5	3.5	12.25	0.05	0.0025
03-Dec-91	5.8	5.8	33.64	0.05	0.0025
03-Dec-91	6.6	6.6	43.56	0.05	0.0025
03-Dec-91	4.8	4.8	23.04	0.05	0.0025

FOREGROUND:

n=	4	BACKGROUND:	
SUM(x)	20.7000	n=	23
SUM(x2)	112.4900	d.f.=	22
SUM(delta2)	0.0100	t=	2.508
MEAN=	5.1750	W=	0.4266576
LLVOM=	0.0006	MEAN=	1.1478260
VAR(x)=S2=	1.7903	STATISTIC:	
s2/n=	0.4476	alpha=	0.01
W=	0.4476	t(star)=	4.307
d.f.=	3	t(sub-c)=	3.549
t=	4.541	t(star >or= t(sub-c)	
alpha=	0.01	Reject Ho in favor of Hi	

FOREGROUND
ARSENIC, WELL 11D

Date	Actual	x	x2	delta	delta2
19-Sep-91	6.2	6.2	38.44	0.05	0.0025
03-Dec-91	6.5	6.5	42.25	0.05	0.0025
03-Dec-91	7.1	7.1	50.41	0.05	0.0025
03-Dec-91	7.8	7.8	60.84	0.05	0.0025

FOREGROUND:

n=	4	BACKGROUND:	
SUM(x)	27.6000	n=	23
SUM(x2)	191.9400	d.f.=	22
SUM(delta2)	0.0100	t=	2.508
MEAN=	6.9000	W=	0.4266576
LLVOM=	0.0006	MEAN=	1.1478260
VAR(x)=S2=	0.5011	STATISTIC:	
s2/n=	0.1253	alpha=	0.01
W=	0.1253	t(star)=	7.743
d.f.=	3	t(sub-c)=	2.969
t=	4.541	t(star >or= t(sub-c)	
alpha=	0.01	Reject Ho in favor of Hi	

FOREGROUND
ARSENIC, WELL 12B

Date	Actual	x	x2	delta	delta2
19-Sep-91	6.7	6.7	44.89	0.05	0.0025
03-Dec-91	8.3	8.3	68.89	0.05	0.0025
03-Dec-91	11.0	11.0	121	0.05	0.0025
03-Dec-91	9.9	9.9	98.01	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	35.9000
SUM(x2)	332.7900
SUM(delta2)	0.0100
MEAN=	8.9750
LLVOM=	0.0006
VAR(x)=S2=	3.5303
s2/n=	0.8826
W=	0.8826
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	23
d.f.=	22
t=	2.508
W=	0.4266576
MEAN=	1.1478260

STATISTIC:

alpha=	0.01
t(star)=	6.841
t(sub-c)=	3.878

t(star >or= t(sub-c)

Reject Ho in favor of Hi

FOREGROUND
ARSENIC, WELL 13A

Date	Actual	x	x2	delta	delta2
19-Sep-91	4.0	4.0	16	0.05	0.0025
03-Dec-91	3.3	3.3	10.89	0.05	0.0025
03-Dec-91	5.7	5.7	32.49	0.05	0.0025
03-Dec-91	5.4	5.4	29.16	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	18.4000
SUM(x2)	88.5400
SUM(delta2)	0.0100
MEAN=	4.6000
LLVOM=	0.0006
VAR(x)=S2=	1.3011
s2/n=	0.3253
W=	0.3253
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	23
d.f.=	22
t=	2.508
W=	0.4266576
MEAN=	1.1478260

STATISTIC:

alpha=	0.01
t(star)=	3.981
t(sub-c)=	3.387

t(star >or= t(sub-c)

Reject Ho in favor of Hi

FOREGROUND
ARSENIC, WELL 13B

Date	Actual	x	x2	delta	delta2
19-Sep-91	5.4	5.4	29.16	0.05	0.0025
03-Dec-91	5.4	5.4	29.16	0.05	0.0025
03-Dec-91	26.0	26.0	676	0.05	0.0025
03-Dec-91	7.1	7.1	50.41	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	43.9000
SUM(x2)	784.7300
SUM(delta2)	0.0100
MEAN=	10.9750
LLVOM=	0.0006
VAR(x)=S2=	100.9769
s2/n=	25.2442
W=	25.2442
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	23
d.f.=	22
t=	2.508
W=	0.4266576
MEAN=	1.1478260

STATISTIC:

alpha=	0.01
t(star)=	1.940
t(sub-c)=	4.507

t(star) < t(sub-c)

Accept Ho

1,1-DCA
Well 1
BACKGROUND

Date	Actual	x	x2	delta	delta2
24-Sep-85	<1	0.5	0.25	0.5	0.25
17-Oct-86	<2	1	1	1	1
22-Dec-86	<1	0.5	0.25	0.5	0.25
22-Dec-86	<1	0.5	0.25	0.5	0.25
11-Mar-87	<1	0.5	0.25	0.5	0.25
18-May-87	<1	0.5	0.25	0.5	0.25
18-Aug-88	<1	0.5	0.25	0.5	0.25
12-Nov-87	<1	0.5	0.25	0.5	0.25
10-Feb-88	<1	0.5	0.25	0.5	0.25
10-May-88	<1	0.5	0.25	0.5	0.25
10-Aug-88	<1	0.5	0.25	0.5	0.25
03-Nov-88	<1	0.5	0.25	0.5	0.25
26-Mar-90	<1	0.5	0.25	0.5	0.25
18-Jun-90	<1	0.5	0.25	0.5	0.25
24-Sep-90	<1	0.5	0.25	0.5	0.25
20-Dec-90	<1	0.5	0.25	0.5	0.25
18-Mar-91	<1	0.5	0.25	0.5	0.25
13-Jun-91	<1	0.5	0.25	0.5	0.25
19-Sep-91	<1	0.5	0.25	0.5	0.25
03-Dec-91	<1	0.5	0.25	0.5	0.25

BACKGROUND:

n=	20
SUM(x)	10.5000
SUM(x2)	5.7500
SUM(delta2)	5.7500
MEAN=	0.5250
LLVOM=	0.0719
VAR(x)=S2=	0.1134
s2/n=	0.0057
W=	0.0719
d.f.=	19
t=	2.539
alpha=	0.01

FOREGROUND 1,1-DCA, WELL 6A

Date	Actual	x	x2	delta	delta2
19-Sep-91	35.0	35.0	1225	0.05	0.0025
03-Dec-91	39.0	39.0	1521	0.05	0.0025
03-Dec-91	34.0	34.0	1156	0.05	0.0025
03-Dec-91	32.0	32.0	1024	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	140.0000
SUM(x2)	4926.0000
SUM(delta2)	0.0100
MEAN=	35.0000
LLVOM=	0.0006
VAR(x)=S2=	8.6678
s2/n=	2.1669
W=	2.1669
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	20
d.f.=	19
t=	2.539
W=	0.071875
MEAN=	0.525

STATISTIC:

alpha=	0.01
t(star)=	23.041
t(sub-c)=	4.477

t(star >or= t(sub-c)

Reject Ho in favor of Hi

FOREGROUND 1,1-DCA, WELL 11A

Date	Actual	x	x2	delta	delta2
19-Sep-91	5.0	5.0	25	0.05	0.0025
03-Dec-91	11.0	11.0	121	0.05	0.0025
03-Dec-91	11.0	11.0	121	0.05	0.0025
03-Dec-91	12.0	12.0	144	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	39.0000
SUM(x2)	411.0000
SUM(delta2)	0.0100
MEAN=	9.7500
LLVOM=	0.0006
VAR(x)=S2=	10.2511
s2/n=	2.5628
W=	2.5628
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	20
d.f.=	19
t=	2.539
W=	0.071875
MEAN=	0.525

STATISTIC:

alpha=	0.01
t(star)=	5.683
t(sub-c)=	4.486

t(star >or= t(sub-c)

Reject Ho in favor of Hi

FOREGROUND 1,1-DCA, WELL 11B

Date	Actual	x	x2	delta	delta2
19-Sep-91	4.0	4.0	16	0.05	0.0025
03-Dec-91	<1	0.5	0.25	0.5	0.25
03-Dec-91	<1	0.5	0.25	0.5	0.25
03-Dec-91	<1	0.5	0.25	0.5	0.25

FOREGROUND:

n=	4
SUM(x)	5.5000
SUM(x2)	16.7500
SUM(delta2)	0.7525
MEAN=	1.3750
LLVOM=	0.0470
VAR(x)=S2=	3.1461
s2/n=	0.7865
W=	0.7865
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	20
d.f.=	19
t=	2.539
W=	0.071875
MEAN=	0.525

STATISTIC:

alpha=	0.01
t(star)=	0.917
t(sub-c)=	4.373

t(star) < t(sub-c)

Accept Ho

Copper
Well 1
BACKGROUND

Date	Actual	x	x2	delta	delta2
17-Oct-86	0.02	0.02	0.0004	0.005	0.000025
11-Mar-87	<0.01	0.005	0.000025	0.005	0.000025
18-May-87	<0.01	0.005	0.000025	0.005	0.000025
19-Aug-87	<0.01	0.005	0.000025	0.005	0.000025
12-Nov-87	<0.01	0.005	0.000025	0.005	0.000025
10-Feb-88	<0.01	0.005	0.000025	0.005	0.000025
10-May-88	<0.01	0.005	0.000025	0.005	0.000025
10-Aug-88	<0.01	0.005	0.000025	0.005	0.000025
03-Nov-88	0.03	0.03	0.0009	0.005	0.000025
26-Mar-90	<0.01	0.005	0.000025	0.005	0.000025
18-Jun-90	<0.01	0.005	0.000025	0.005	0.000025
24-Sep-90	<0.01	0.005	0.000025	0.005	0.000025
20-Dec-90	<0.01	0.005	0.000025	0.005	0.000025
18-Mar-91	<0.01	0.005	0.000025	0.005	0.000025
13-Jun-91	<0.01	0.005	0.000025	0.005	0.000025
19-Sep-91	<0.01	0.005	0.000025	0.005	0.000025
03-Dec-91	<0.01	0.005	0.000025	0.005	0.000025

BACKGROUND:

n=	17
SUM(x)	0.125000
SUM(x2)	0.001675
SUM(delta2)	0.000425
MEAN=	0.007353
LLVOM=	0.000006
VAR(x)=S2=	0.000056
s2/n=	0.000003
W=	0.000006
d.f.=	16
t=	2.583
alpha=	0.01

FOREGROUND
Copper, WELL 11B

Date	Actual	x	x2	delta	delta2
19-Sep-91	0.01	0.01	0.0001	0.005	0.000025
03-Dec-91	<0.01	0.005	0.000025	0.005	0.000025
03-Dec-91	<0.01	0.005	0.000025	0.005	0.000025
03-Dec-91	<0.01	0.005	0.000025	0.005	0.000025

FOREGROUND:

n=	4
SUM(x)	0.025000
SUM(x2)	0.000175
SUM(delta2)	0.000100
MEAN=	0.006250
LLVOM=	0.000006
VAR(x)=S2=	0.000017
s2/n=	0.000004
W=	0.000006
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	17
d.f.=	16
t=	2.583
W=	0.0000062
MEAN=	0.0073529

STATISTIC:

alpha=	0.01
t(star)=	-0.312
t(sub-c)=	3.562

t(star) < t(sub-c)

Accept Ho

APPENDIX E

Laboratory Data Sheets

WW Engineering & Science, Inc.
Environmental Laboratory Division
5500 Glenwood Hills Pkwy SE • PO Box 874
Grand Rapids, Michigan 49588-0874

Chain of Custody Record

№ 19799

Project No.: 83160

Project Name: Quanex (South Lyon)

Samplers (signature): [signature]

Date	Time	Matrix*	Comp	GRAB	Sample I.D.	No. of Containers	Container Type & Volume	Preservation Method	Analysis Required/Comments
8-15-91	9:20A	WTR		✓	MW-17B	1	250ml plastic	HNO_3	(Field Filtered) Dissolved Arsenic
"	9:30A	"		✓	MW-17A	1	"	"	"
"	10:43A	"		✓	MW-17C	1	"	"	"
"	11:05A	"		✓	MW-1B	1	"	"	"
"	11:18A	"		✓	MW-1C	1	"	"	"

Relinquished by: (signature)	Date / Time	Received by:	Relinquished by:	Date / Time	Received by: (signature)	
[signature]	8-15-91 11:25Am					
Dispatched by: (signature)	**Date / Time**	**Carrier:**	**Received to lab by:**	**Date / Time**	**Logged in by:**	**Date/Time**

* MATRIX: WATER (WTR), WASTEWATER (WW), SOIL (SOL), SLUDGE (SLU), AIR, OIL, HAZARDOUS WASTE (HW)

03 EDI/Chain of Cust-Disk Files

WW ENGINEERING & SCIENCE
ENVIRONMENTAL LABORATORY DIVISION

CLIENT: QUANEX
PROJECT NO.: 25741
LOCATION: SOUTH LYON
SAMPLED BY: JAMES M. WOOSTER
DESCRIPTION: WATER ANALYSIS

DATE SAMPLED: 08/15/91 TIME:
DATE RECEIVED: 08/16/91 TIME: 12:00 PM
DATE COMPLETED: 08/29/91
SCHEDULED COMPLETION: 09/03/91
ANALYST: DJ
QUALITY CONTROL REVIEW BY: CS
WORKSHEET NO: 5

	MW 1A	MW 1B	MW 1C	MW 17A	DETECTION LIMIT	UNITS
LAB SAMPLE NO:	71248	71249	71250	71251		
ARSENIC,DISSOLVED	<1.0	5.0	7.6	7.4	1.0	ug/l
TIME SAMPLED:	11:18 AM	11:05 AM	10:43 AM	9:30 AM		

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WW ENGINEERING & SCIENCE
ENVIRONMENTAL LABORATORY DIVISION

CLIENT: QUANEX
PROJECT NO.: 25741
LOCATION: SOUTH LYON
SAMPLED BY: JAMES M. WOOSTER
DESCRIPTION: WATER ANALYSIS

DATE SAMPLED: 08/15/91 TIME: 9:20 AM
DATE RECEIVED: 08/16/91 TIME: 12:00 PM
DATE COMPLETED: 08/29/91
SCHEDULED COMPLETION: 09/03/91
ANALYST: DJ
QUALITY CONTROL REVIEW BY: CS
WORKSHEET NO: 6

	MW 17B	DETECTION LIMIT	UNITS
LAB SAMPLE NO:	71252		
ARSENIC,DISSOLVED	14	1.0	ug/l
TIME SAMPLED:	9:20 AM		

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WW ENGINEERING & SCIENCE
ENVIRONMENTAL LABORATORY DIVISION

CLIENT: QUANEX
PROJECT NO.: 25741
LOCATION:
SAMPLED BY: ROBERT THOMAS
DESCRIPTION: QUARTERLY/ANNUAL SAMPLING

DATE SAMPLED: 09/19/91 TIME:
DATE RECEIVED: 09/20/91 TIME: 1:00 PM
DATE COMPLETED: 10/17/91
SCHEDULED COMPLETION: 10/11/91
ANALYST: DJ,GR,GW,JW
QUALITY CONTROL REVIEW BY: CCH,DC
WORKSHEET NO: 20

	MW 1	MW 6A	MW 11A	MW 11B	DETECTION LIMIT	UNITS
LAB SAMPLE NO:	73498	73499	73500	73501		
ARSENIC,DISSOLVED	<1.0	25	2.3	3.5	1.0	ug/l
BARIUM,DISSOLVED	0.06	0.02	0.06	0.02	0.01	mg/l
CADMIUM,DISSOLVED	<0.01	<0.01	<0.01	<0.01	0.01	mg/l
CHROMIUM,DISSOLVED	<0.05	<0.05	<0.05	<0.05	0.05	mg/l
COPPER, DISSOLVED	<0.01	<0.01	<0.01	0.01	0.01	mg/l
LEAD, DISSOLVED	<0.05	<0.05	<0.05	<0.05	0.05	mg/l
SELENIUM,DISSOLVED	<2.0	<2.0	<2.0	<2.0	2.0	ug/l
SILVER,DISSOLVED	<0.005	<0.005	<0.005	<0.005	0.005	mg/l
1,1-DICHLOROETHANE	<1.0	35	5.0	4.0	1.0	ug/l
pH (FIELD)	7.15	6.69	6.97	6.96	---	std. units
CONDUCTIVITY (FIELD)	808	2,334	1,809	2,228	5	umhos/cm
TIME SAMPLED:	2:06 PM	1:06 PM	8:33 AM	8:40 AM		

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ENVIRONMENTAL LABORATORY DIVISION

CLIENT: QUANEX
PROJECT NO.: 25741
LOCATION:
SAMPLED BY: ROBERT THOMAS
DESCRIPTION: QUARTERLY/ANNUAL SAMPLING

DATE SAMPLED: 09/19/91 TIME:
DATE RECEIVED: 09/20/91 TIME: 1:00 PM
DATE COMPLETED: 10/17/91
SCHEDULED COMPLETION: 10/11/91
ANALYST: JW,RR,AMF,LAB
QUALITY CONTROL REVIEW BY: DC,BJD
WORKSHEET NO: 21

	MW 1	MW 6A	MW 11A	MW 11B	DETECTION LIMIT	UNITS
LAB SAMPLE NO:	73498	73499	73500	73501		
CHLORIDE, TOTAL	27	383	123	190	2.0	mg/l
SULFATE	102	595	743	1,080	5.0	mg/l
IRON, DISSOLVED	2.6	20	0.91	4.3	0.01	mg/l
MANGANESE,DISSOLVED	0.25	0.17	0.38	0.47	0.01	mg/l
TIME SAMPLED:	2:06 PM	1:06 PM	8:33 AM	8:40 AM		

WW ENGINEERING & SCIENCE
ENVIRONMENTAL LABORATORY DIVISION

CLIENT: QUANEX
PROJECT NO.: 25741
LOCATION: EXTRA PARAMETERS
SAMPLED BY: ROBERT THOMAS
DESCRIPTION: QUARTERLY/ANNUAL SAMPLING

DATE SAMPLED: 09/19/91 TIME:
DATE RECEIVED: 09/20/91 TIME: 1:00 PM
DATE COMPLETED: 10/03/91
SCHEDULED COMPLETION: 10/11/91
ANALYST: MRJ,JW,DJ,KV,RR
QUALITY CONTROL REVIEW BY: CS,BJD
WORKSHEET NO: 32

	MW 1	MW 6A	MW 11A	MW 11B	DETECTION LIMIT	UNITS
LAB SAMPLE NO:	73498	73499	73500	73501		
SODIUM, DISSOLVED	67	284	107	127	0.50	mg/l
POTASSIUM, DISSOLVED	5.6	5.5	97	30	0.50	mg/l
CALCIUM,DISSOLVED	105	338	277	436	0.50	mg/l
MAGNESIUM,DISSOLVED	11	19	30	47	0.50	mg/l
ALKALINITY, BICARB.	333	321	176	146	2.0	mg/l CaCO3
CARBONATE, ALK.	<2.0	<2.0	<2.0	<2.0	2.0	mg/l CaCO3
TIME SAMPLED:	2:06 PM	1:06 PM	8:33 AM	8:40 AM		

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ENVIRONMENTAL LABORATORY DIVISION

CLIENT: QUANEX
PROJECT NO.: 25741
LOCATION:
SAMPLED BY: ROBERT THOMAS
DESCRIPTION: QUARTERLY/ANNUAL SAMPLING

DATE SAMPLED: 09/19/91 TIME:
DATE RECEIVED: 09/20/91 TIME: 1:00 PM
DATE COMPLETED: 10/17/91
SCHEDULED COMPLETION: 10/11/91
ANALYST: DJ,GR,GW,JW
QUALITY CONTROL REVIEW BY: CCH,DC
WORKSHEET NO: 22

	MW 11D	MW 12A	MW 12B	MW 12C	DETECTION LIMIT	UNITS
LAB SAMPLE NO:	73502	73503	73504	73505		
ARSENIC,DISSOLVED	6.2	<1.0	6.7	4.2	1.0	ug/l
BARIUM,DISSOLVED	0.10	0.04	0.04	0.06	0.01	mg/l
CADMIUM,DISSOLVED	<0.01	<0.01	<0.01	<0.01	0.01	mg/l
CHROMIUM,DISSOLVED	<0.05	<0.05	<0.05	<0.05	0.05	mg/l
COPPER, DISSOLVED	<0.01	<0.01	<0.01	<0.01	0.01	mg/l
LEAD, DISSOLVED	<0.05	<0.05	<0.05	<0.05	0.05	mg/l
SELENIUM,DISSOLVED	<2.0	<2.0	<2.0	<2.0	2.0	ug/l
SILVER,DISSOLVED	<0.005	<0.005	<0.005	<0.005	0.005	mg/l
1,1-DICHLOROETHANE	<1.0	<1.0	<1.0	<1.0	1.0	ug/l
pH (FIELD)	7.03	7.00	7.01	7.29	---	std. units
CONDUCTIVITY (FIELD)	1,044	1,557	1,299	810	5	umhos/cm
TIME SAMPLED:	9:01 AM	10:17 AM	10:22 AM	10:59 AM		

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ENVIRONMENTAL LABORATORY DIVISION

CLIENT: QUANEX
PROJECT NO.: 25741
LOCATION:
SAMPLED BY: ROBERT THOMAS
DESCRIPTION: QUARTERLY/ANNUAL SAMPLING

DATE SAMPLED: 09/19/91 TIME:
DATE RECEIVED: 09/20/91 TIME: 1:00 PM
DATE COMPLETED: 10/17/91
SCHEDULED COMPLETION: 10/11/91
ANALYST: JW,RR,AMF,LAB
QUALITY CONTROL REVIEW BY: DC,BJD
WORKSHEET NO: 23

	MW 11D	MW 12A	MW 12B	MW 12C	DETECTION LIMIT	UNITS
LAB SAMPLE NO:	73502	73503	73504	73505		
CHLORIDE, TOTAL	63	82	60	33	2.0	mg/l
SULFATE	228	681	576	152	5.0	mg/l
IRON, DISSOLVED	3.2	<0.01	5.3	0.50	0.01	mg/l
MANGANESE,DISSOLVED	0.05	0.07	0.09	0.07	0.01	mg/l
TIME SAMPLED:	9:01 AM	10:17 AM	10:22 AM	10:59 AM		

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CLIENT: QUANEX
PROJECT NO.: 25741
LOCATION: EXTRA PARAMETERS
SAMPLED BY: ROBERT THOMAS
DESCRIPTION: QUARTERLY/ANNUAL SAMPLING

DATE SAMPLED: 09/19/91 TIME:
DATE RECEIVED: 09/20/91 TIME: 1:00 PM
DATE COMPLETED: 10/03/91
SCHEDULED COMPLETION: 10/11/91
ANALYST: MRJ,JW,DJ,KV,RR
QUALITY CONTROL REVIEW BY: BJD,CS
WORKSHEET NO: 33

	MW 11D	MW 12A	MW 12B	MW 12C	DETECTION LIMIT	UNITS
LAB SAMPLE NO:	73502	73503	73504	73505		
SODIUM, DISSOLVED	20	63	38	16	0.50	mg/l
POTASSIUM, DISSOLVED	2.8	7.2	2.6	3.4	0.50	mg/l
CALCIUM,DISSOLVED	151	293	230	126	0.50	mg/l
MAGNESIUM,DISSOLVED	40	42	57	20	0.50	mg/l
ALKALINITY, BICARB.	292	203	220	277	2.0	mg/l CaCO3
CARBONATE, ALK.	<2.0	<2.0	<2.0	<2.0	2.0	mg/l CaCO3
TIME SAMPLED:	9:01 AM	10:17 AM	10:22 AM	10:59 AM		

WW ENGINEERING & SCIENCE
ENVIRONMENTAL LABORATORY DIVISION

CLIENT: QUANEX
PROJECT NO.: 25741
LOCATION:
SAMPLED BY: ROBERT THOMAS
DESCRIPTION: QUARTERLY/ANNUAL SAMPLING

DATE SAMPLED: 09/19/91 TIME:
DATE RECEIVED: 09/20/91 TIME: 1:00 PM
DATE COMPLETED: 10/17/91
SCHEDULED COMPLETION: 10/11/91
ANALYST: DJ,GR,GW,JW
QUALITY CONTROL REVIEW BY: CCH,DC
WORKSHEET NO: 24

	MW 13A	MW 13B	MW 13C	MW 15A	DETECTION LIMIT	UNITS
LAB SAMPLE NO:	73506	73507	73508	73509		
ARSENIC,DISSOLVED	4.0	5.4	17	<1.0	1.0	ug/l
BARIUM,DISSOLVED	0.14	0.02	0.23	0.03	0.01	mg/l
CADMIUM,DISSOLVED	<0.01	<0.01	<0.01	<0.01	0.01	mg/l
CHROMIUM,DISSOLVED	<0.05	<0.05	<0.05	<0.05	0.05	mg/l
COPPER, DISSOLVED	<0.01	<0.01	<0.01	<0.01	0.01	mg/l
LEAD, DISSOLVED	<0.05	<0.05	<0.05	<0.05	0.05	mg/l
SELENIUM,DISSOLVED	<2.0	<2.0	<2.0	<2.0	2.0	ug/l
SILVER,DISSOLVED	<0.005	<0.005	<0.005	<0.005	0.005	mg/l
1,1-DICHLOROETHANE	<1.0	<1.0	<1.0	<1.0	1.0	ug/l
pH (FIELD)	6.80	6.92	7.07	7.01	---	std. units
CONDUCTIVITY (FIELD)	1,560	1,622	631	738	5	umhos/cm
TIME SAMPLED:	11:51 AM	11:56 AM	12:29 PM	7:30 AM		

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CLIENT: QUANEX
PROJECT NO.: 25741
LOCATION:
SAMPLED BY: ROBERT THOMAS
DESCRIPTION: QUARTERLY/ANNUAL SAMPLING

DATE SAMPLED: 09/19/91 TIME:
DATE RECEIVED: 09/20/91 TIME: 1:00 PM
DATE COMPLETED: 10/17/91
SCHEDULED COMPLETION: 10/11/91
ANALYST: JW,RR,AMF,LAB
QUALITY CONTROL REVIEW BY: DC,BJD
WORKSHEET NO: 25

	MW 13A	MW 13B	MW 13C	MW 15A	DETECTION LIMIT	UNITS
LAB SAMPLE NO:	73506	73507	73508	73509		
CHLORIDE, TOTAL	24	110	40	10	2.0	mg/l
SULFATE	164	733	75	121	5.0	mg/l
IRON, DISSOLVED	9.8	7.5	0.94	0.04	0.01	mg/l
MANGANESE,DISSOLVED	0.79	0.20	0.02	<0.01	0.01	mg/l
TIME SAMPLED:	11:51 AM	11:56 AM	12:29 PM	7:30 AM		

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CLIENT: QUANEX
PROJECT NO.: 25741
LOCATION: EXTRA PARAMETERS
SAMPLED BY: ROBERT THOMAS
DESCRIPTION: QUARTERLY/ANNUAL SAMPLING

DATE SAMPLED: 09/19/91 TIME:
DATE RECEIVED: 09/20/91 TIME: 1:00 PM
DATE COMPLETED: 10/03/91
SCHEDULED COMPLETION: 10/11/91
ANALYST: MRJ,JW,DJ,KV,GR
QUALITY CONTROL REVIEW BY: BJD,CS
WORKSHEET NO: 34

	MW 13A	MW 13B	MW 13C	MW 15A	DETECTION LIMIT	UNITS
LAB SAMPLE NO:	73506	73507	73508	73509		
SODIUM, DISSOLVED	34	92	11	19	0.50	mg/l
POTASSIUM, DISSOLVED	5.8	6.4	2.1	3.8	0.50	mg/l
CALCIUM,DISSOLVED	291	301	84	124	0.50	mg/l
MAGNESIUM,DISSOLVED	48	51	28	15	0.50	mg/l
ALKALINITY, BICARB.	850	219	234	270	2.0	mg/l CaCO3
CARBONATE, ALK.	<2.0	<2.0	<2.0	<2.0	2.0	mg/l CaCO3
TIME SAMPLED:	11:51 AM	11:56 AM	12:29 PM	7:30 AM		

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CLIENT: QUANEX
PROJECT NO.: 25741
LOCATION:
SAMPLED BY: ROBERT THOMAS
DESCRIPTION: QUARTERLY/ANNUAL SAMPLING

DATE SAMPLED: 09/19/91 TIME:
DATE RECEIVED: 09/20/91 TIME: 1:00 PM
DATE COMPLETED: 10/17/91
SCHEDULED COMPLETION: 10/11/91
ANALYST: DJ,GR,GW,JW
QUALITY CONTROL REVIEW BY: WH,DC
WORKSHEET NO: 26

	MW 16A	TRIP BLANK	EQUIPMENT BLANK	DETECTION LIMIT	UNITS
LAB SAMPLE NO:	73510	73511	73512		
ARSENIC,DISSOLVED	<1.0	<1.0	<1.0	1.0	ug/l
BARIUM,DISSOLVED	0.07	<0.01	<0.01	0.01	mg/l
CADMIUM,DISSOLVED	<0.01	<0.01	<0.01	0.01	mg/l
CHROMIUM,DISSOLVED	<0.05	<0.05	<0.05	0.05	mg/l
COPPER, DISSOLVED	<0.01	<0.01	<0.01	0.01	mg/l
LEAD, DISSOLVED	<0.05	<0.05	<0.05	0.05	mg/l
SELENIUM,DISSOLVED	<2.0	<2.0	<2.0	2.0	ug/l
SILVER,DISSOLVED	<0.005	<0.005	<0.005	0.005	mg/l
1,1-DICHLOROETHANE	<1.0	<1.0	<1.0	1.0	ug/l
pH (FIELD)	7.00	----------	----------	---	std. units
CONDUCTIVITY (FIELD)	1,594	----------	----------	5	umhos/cm
TIME SAMPLED:	8:10 AM	----------	10:05 AM		

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CLIENT: QUANEX
PROJECT NO.: 25741
LOCATION:
SAMPLED BY: ROBERT THOMAS
DESCRIPTION: QUARTERLY/ANNUAL SAMPLING

DATE SAMPLED: 09/19/91 TIME:
DATE RECEIVED: 09/20/91 TIME: 1:00 PM
DATE COMPLETED: 10/17/91
SCHEDULED COMPLETION: 10/11/91
ANALYST: JW,RR,AMF,LAB
QUALITY CONTROL REVIEW BY: DC,BJD
WORKSHEET NO: 27

	MW 16A	TRIP BLANK	EQUIPMENT BLANK	DETECTION LIMIT	UNITS
LAB SAMPLE NO:	73510	73511	73512		
CHLORIDE, TOTAL	109	<2.0	<2.0	2.0	mg/l
SULFATE	1,000	<5.0	<5.0	5.0	mg/l
IRON, DISSOLVED	<0.01	<0.01	<0.01	0.01	mg/l
MANGANESE,DISSOLVED	0.32	<0.01	<0.01	0.01	mg/l
TIME SAMPLED:	8:10 AM	————	10:05 AM		

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CLIENT: QUANEX
PROJECT NO.: 25741
LOCATION: EXTRA PARAMETERS
SAMPLED BY: ROBERT THOMAS
DESCRIPTION: QUARTERLY/ANNUAL SAMPLING

DATE SAMPLED: 09/19/91 TIME:
DATE RECEIVED: 09/20/91 TIME: 1:00 PM
DATE COMPLETED: 10/03/91
SCHEDULED COMPLETION: 10/11/91
ANALYST: MRJ,JW,DJ,KV,RR
QUALITY CONTROL REVIEW BY: BJD,CS
WORKSHEET NO: 35

	MW 16A	TRIP BLANK	EQUIPMENT BLANK	DETECTION LIMIT	UNITS
LAB SAMPLE NO:	73510	73511	73512		
SODIUM, DISSOLVED	72	<0.50	<0.50	0.50	mg/l
POTASSIUM, DISSOLVED	31	<0.50	<0.50	0.50	mg/l
CALCIUM,DISSOLVED	342	<0.50	<0.50	0.50	mg/l
MAGNESIUM,DISSOLVED	34	<0.50	<0.50	0.50	mg/l
ALKALINITY, BICARB.	102	<2.0	<2.0	2.0	mg/l CaCO3
CARBONATE, ALK.	<2.0	<2.0	<2.0	2.0	mg/l CaCO3
TIME SAMPLED:	8:10 AM	————	10:05 AM		

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CLIENT: QUANEX
PROJECT NO.: 25741
LOCATION:
SAMPLED BY: ROBERT THOMAS
DESCRIPTION: QUARTERLY/ANNUAL SAMPLING

DATE SAMPLED: 09/19/91 TIME:
DATE RECEIVED: 09/20/91 TIME: 1:00 PM
DATE COMPLETED: 10/17/91
SCHEDULED COMPLETION: 10/11/91
ANALYST: DJ,GR,GW
QUALITY CONTROL REVIEW BY: CCH,DC
WORKSHEET NO: 28

	MW 11A DUPLICATE	MW 11A TRIPLICATE	MW 11B DUPLICATE	MW 11B TRIPLICATE	DETECTION LIMIT	UNITS
LAB SAMPLE NO:	73513	73514	73515	73516		
ARSENIC,DISSOLVED	1.8	1.7	1.9	3.7	1.0	ug/l
1,1-DICHLOROETHANE	5.0	5.0	4.0	4.0	1.0	ug/l
TIME SAMPLED:	8:41 AM	8:50 AM	8:56 AM	9:11 AM		

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LOCATION:
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DESCRIPTION: QUARTERLY/ANNUAL SAMPLING

DATE SAMPLED: 09/19/91 TIME:
DATE RECEIVED: 09/20/91 TIME: 1:00 PM
DATE COMPLETED: 10/17/91
SCHEDULED COMPLETION: 10/11/91
ANALYST: DJ,GR
QUALITY CONTROL REVIEW BY: DC
WORKSHEET NO: 29

	MW 11D DUPLICATE	MW 11D TRIPLICATE	MW 12B DUPLICATE	MW 12B TRIPLICATE	DETECTION LIMIT	UNITS
LAB SAMPLE NO:	73517	73518	73519	73520		
ARSENIC,DISSOLVED	4.3	4.7	6.6	6.3	1.0	ug/l
TIME SAMPLED:	9:31 AM	10:01 AM	10:33 AM	10:46 AM		

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DESCRIPTION: QUARTERLY/ANNUAL SAMPLING

DATE SAMPLED: 09/19/91 *TIME:*
DATE RECEIVED: 09/20/91 *TIME:* 1:00 PM
DATE COMPLETED: 10/17/91
SCHEDULED COMPLETION: 10/11/91
ANALYST: DJ,GR
QUALITY CONTROL REVIEW BY: DC
WORKSHEET NO: 30

	MW 12C DUPLICATE	MW 12C TRIPLICATE	MW 13A DUPLICATE	MW 13A TRIPLICATE	DETECTION LIMIT	UNITS
LAB SAMPLE NO:	73521	73522	73523	73524		
ARSENIC,DISSOLVED	4.4	4.6	4.1	3.9	1.0	ug/l
TIME SAMPLED:	10:59 AM	10:59 AM	12:02 PM	12:10 PM		

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PROJECT NO.: 25741
LOCATION:
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DESCRIPTION: QUARTERLY/ANNUAL SAMPLING

DATE SAMPLED: 09/19/91 TIME:
DATE RECEIVED: 09/20/91 TIME: 1:00 PM
DATE COMPLETED: 10/17/91
SCHEDULED COMPLETION: 10/11/91
ANALYST: DJ,GR
QUALITY CONTROL REVIEW BY: DC
WORKSHEET NO: 31

	MW 13B DUPLICATE	MW 13B TRIPLICATE	DETECTION LIMIT	UNITS
LAB SAMPLE NO:	73525	73526		
ARSENIC,DISSOLVED	4.8	5.4	1.0	ug/l
TIME SAMPLED:	12:21 PM	12:42 PM		

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DESCRIPTION: QUARTERLY/ANNUAL SAMPLING

DATE SAMPLED: 09/19/91 TIME:
DATE RECEIVED: 09/20/91 TIME: 1:00 PM
DATE COMPLETED: 10/18/91
SCHEDULED COMPLETION: 10/11/91
ANALYST: DJ,GR,GW
QUALITY CONTROL REVIEW BY: CCH,DC
WORKSHEET NO: 36

	MW 1B	MW 1C	MW 17A	MW 17B	DETECTION LIMIT	UNITS
LAB SAMPLE NO:	73494	73495	73496	73497		
ARSENIC,DISSOLVED	5.5	9.0	8.6	17	1.0	ug/l
BARIUM,DISSOLVED	0.04	0.08	0.04	0.14	0.01	mg/l
CADMIUM,DISSOLVED	<0.01	<0.01	<0.01	<0.01	0.01	mg/l
CHROMIUM,DISSOLVED	<0.05	<0.05	<0.05	<0.05	0.05	mg/l
COPPER, DISSOLVED	<0.01	<0.01	<0.01	<0.01	0.01	mg/l
LEAD, DISSOLVED	<0.05	<0.05	<0.05	<0.05	0.05	mg/l
SELENIUM,DISSOLVED	<2.0	<2.0	<2.0	<2.0	2.0	ug/l
SILVER,DISSOLVED	<0.005	<0.005	<0.005	<0.005	0.005	mg/l
1,1-DICHLOROETHANE	<1.0	<1.0	<1.0	<1.0	1.0	ug/l
pH (FIELD)	7.07	7.14	6.98	7.05	---	std. units
CONDUCTIVITY (FIELD)	1,404	1,004	1,059	640	5	umhos/cm
TIME SAMPLED:	2:18 PM	2:29 PM	1:22 PM	1:52 PM		

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PROJECT NO.: 25741
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DATE SAMPLED: 09/19/91 TIME:
DATE RECEIVED: 09/20/91 TIME: 1:00 PM
DATE COMPLETED: 10/18/91
SCHEDULED COMPLETION: 10/11/91
ANALYST: JW,RR,AMF,LAB
QUALITY CONTROL REVIEW BY: BJD
WORKSHEET NO: 37

	MW 1B	MW 1C	MW 17A	MW 17B	DETECTION LIMIT	UNITS
LAB SAMPLE NO:	73494	73495	73496	73497		
CHLORIDE, TOTAL	203	100	90	31	2.0	mg/l
SULFATE	258	85	297	46	5.0	mg/l
IRON, DISSOLVED	3.0	2.2	1.1	1.5	0.01	mg/l
MANGANESE,DISSOLVED	0.10	0.04	0.24	0.02	0.01	mg/l
TIME SAMPLED:	2:18 PM	2:29 PM	1:22 PM	1:52 PM		

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DESCRIPTION: QUARTERLY/ANNUAL SAMPLING

DATE SAMPLED: 09/19/91 TIME:
DATE RECEIVED: 09/20/91 TIME: 1:00 PM
DATE COMPLETED: 10/18/91
SCHEDULED COMPLETION: 10/11/91
ANALYST: MRJ,JW,DJ,KV,RR
QUALITY CONTROL REVIEW BY: BJD
WORKSHEET NO: 38

	MW 1B	MW 1C	MW 17A	MW 17B	DETECTION LIMIT	UNITS
LAB SAMPLE NO:	73494	73495	73496	73497		
SODIUM, DISSOLVED	130	63	57	9.6	0.50	mg/l
POTASSIUM, DISSOLVED	8.3	4.8	4.5	2.0	0.50	mg/l
CALCIUM,DISSOLVED	179	120	171	91	0.50	mg/l
MAGNESIUM,DISSOLVED	33	29	19	29	0.50	mg/l
ALKALINITY, BICARB.	306	346	219	292	2.0	mg/l CaCO3
CARBONATE, ALK.	<2.0	<2.0	<2.0	<2.0	2.0	mg/l CaCO3
TIME SAMPLED:	2:18 PM	2:29 PM	1:22 PM	1:52 PM		

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Grand Rapids, Michigan 48588-0874

Chain of Custody Record

№ 13608

Project No. 83160

Project Name: Quannex South Lyon

Samplers (signature): James M Waste

Date	Time	Matrix*	Comp	GRAB	Sample I.D.	No. of Containers	Container Type & Volume	Preservation Method	Analysis Required/Comments
10-16-91	8:95A	WTR		✓	MW-1A	1	250ml plastic	HNO3	Field Filtered Dissolved Arsenic
"	8:45A	"		✓	MW-1B	1	"	"	
"	8:55A	"		✓	MW-1C	1	"	"	
"	8:00Am	"		✓	MW-17A	1	"	"	
"	8:20Am	"		✓	MW-17B	1	"	"	

Relinquished by: (signature)	Date / Time	Received by:	Relinquished by:	Date / Time	Received by: (signature)	
James M Waste	10-16-91 9:10Am					
Dispatched by: (signature)	**Date / Time**	**Carrier:**	**Received to lab by:**	**Date / Time**	**Logged in by:**	**Date/Time**

* MATRIX: WATER (WTR), WASTEWATER (WW), SOIL (SOL), SLUDGE (SLU), AIR, OIL, HAZARDOUS WASTE (HW)

03 EDI/Chain of Cust-Disk Files

WW Engineering & Science, Inc.
Environmental Laboratory Division

ANALYTICAL REPORT

Quanex South Lyon
roj: Arsenic Analysis
in Groundwater
Subm: October 1991 Sampling

Submittal Number: 616- 1
Location: South Lyon, MI
CCS Number 83152.00
CCS Manager: Pam Dodt

	MW-1A	MW-1B	MW-1C	Detection Limit	Units
WWES Sample No:	3384	3385	3386		
Arsenic, Dissolved	1.3	6.2	<1.0	1.0	ug/l
ampled by:	J. Wooster	J. Wooster	J. Wooster		
Date Sampled:	10/16/91	10/16/91	10/16/91		
Time Sampled:	08:35	08:45	08:55		
te Received:	10/17/91	10/17/91	10/17/91		
ime Received:	07:00	07:00	07:00		

WW Engineering & Science, Inc.
Environmental Laboratory Division

ANALYTICAL REPORT

Quanex South Lyon
'roj: Arsenic Analysis
in Groundwater
Subm: October 1991 Sampling

Submittal Number: 616- 1
Location: South Lyon, MI
CCS Number 83152.00
CCS Manager: Pam Dodt

	MW-17A	MW-17B	Detection Limit	Units
WWES Sample No:	3387	3388		
Arsenic, Dissolved	8.5	16	1.0	ug/l
Sampled by:	J. Wooster	J. Wooster		
Date Sampled:	10/16/91	10/16/91		
Time Sampled:	08:00	08:20		
ate Received:	10/17/91	10/17/91		
ime Received:	07:00	07:00		

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Chain of Custody Record

№ 24975

Project No. 83160

Project Name: Quannex South Lyons

Samplers (signature): James M Waste

Date	Time	Matrix*	Comp	GRAB	Sample I.D.	No. of Containers	Container Type & Volume	Preservation Method	Analysis Required/Comments
11-13-91	11:35A	WTR		✓	MW-1A	1	125ml Plastic	HNO3	Dissolved Arsenic
"	11:20A	"		✓	MW-1B	1	"	"	"
"	10:50A	"		✓	MW-1C	1	"	"	"
"	10:05A	"		✓	MW-17A	1	"	"	"
"	9:50A	"		✓	MW-17B	1	"	"	"

Relinquished by: (signature)	Date / Time	Received by:	Relinquished by:	Date / Time	Received by: (signature)	
James M Waste	11-13-91 12:00pm					
Dispatched by: (signature)	**Date / Time**	**Carrier:**	**Received to lab by:**	**Date / Time**	**Logged in by:**	**Date/Time**

*MATRIX: WATER (WTR), WASTEWATER (WW), SOIL (SOL), SLUDGE (SLU), AIR, OIL, HAZARDOUS WASTE (HW)

03 EDI/Chain of Cust-Disk Files

WW Engineering & Science, Inc.
Environmental Laboratory Division

ANALYTICAL REPORT

Quanex South Lyon
Proj: Arsenic Analysis
in Groundwater
Subm: November 13, 1991 Sampling

Submittal Number: 616- 2
Location:
CCS Number 83160.00
CCS Manager: Pam Dodt

	MW-1A	MW-1B	MW-1C	Detection Limit	Units
WWES Sample No:	5467	5468	5469		
Arsenic, Dissolved	<1.0	4.1	8.8	1.0	ug/l
Sampled by:	J.W.	J.W.	J.W.		
Date Sampled:	11/13/91	11/13/91	11/13/91		
Time Sampled:	11:35	11:20	10:50		
Date Received:	11/15/91	11/15/91	11/15/91		
Time Received:	08:00	08:00	08:00		

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Environmental Laboratory Division

ANALYTICAL REPORT

Quanex South Lyon
roj: Arsenic Analysis
in Groundwater
Subm: November 13, 1991 Sampling

Submittal Number: 616- 2
Location:
CCS Number 83160.00
CCS Manager: Pam Dodt

	MW-17A	MW-17B	Detection Limit	Units
WWES Sample No:	5470	5471		
Arsenic, Dissolved	7.4	15	1.0	ug/l
ampled by:	J.W.	J.W.		
ate Sampled:	11/13/91	11/13/91		
Time Sampled:	10:05	09:50		
ate Received:	11/15/91	11/15/91		
ime Received:	08:00	08:00		

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ANALYTICAL REPORT

Quanex South Lyon
Proj: Water Analysis

Subm: December 3rd Sampling

Submittal Number: 834- 1
Location:
CCS Number 20515.01
CCS Manager: Jim Tolbert

	Equipment Blank	MW-17B	MW-1A	Detection Limit	Units
WWES Sample No:	6628	6629	6630		
Arsenic, Dissolved	<1.0	19	<1.0	1.0	ug/l
Barium, Dissolved	<0.01	0.16	0.07	0.01	mg/l
Cadmium, Dissolved	<0.01	<0.01	<0.01	0.01	mg/l
Chromium, Dissolved	<0.05	<0.05	<0.05	0.05	mg/l
Copper, Dissolved	<0.01	<0.01	<0.01	0.01	mg/l
Lead, Dissolved	<50	<50	<50	50	ug/l
Selenium, Dissolved	<2.0	<2.0	<2.0	2.0	ug/l
Silver, Dissolved	<5.0	<5.0	<5.0	5.0	ug/l
1,1-Dichloroethane	<1.0	<1.0	<1.0	1.0	ug/l
pH (Field)		6.60	6.90	1.00	pH Units
Conductivity (Field)		665	738	5	umhos/cm
Sampled by:	J. Wooster	J. Wooster	J. Wooster		
Date Sampled:	12/03/91	12/03/91	12/03/91		
Time Sampled:	15:50	16:10	16:25		
Date Received:	12/03/91	12/03/91	12/03/91		
Time Received:	19:30	19:30	19:30		

WW Engineering & Science, Inc.
Environmental Laboratory Division

ANALYTICAL REPORT

Quanex South Lyon
Proj: Water Analysis

Subm: December 3rd Sampling

Submittal Number: 834- 1
Location:
CCS Number 20515.01
CCS Manager: Jim Tolbert

	MW-1B	MW-1C	Detection Limit	Units
WWES Sample No:	6631	6632		
Arsenic, Dissolved	5.4	10	1.0	ug/l
Barium, Dissolved	0.04	0.08	0.01	mg/l
Cadmium, Dissolved	<0.01	<0.01	0.01	mg/l
Chromium, Dissolved	<0.05	<0.05	0.05	mg/l
Copper, Dissolved	<0.01	<0.01	0.01	mg/l
Lead, Dissolved	<50	<50	50	ug/l
Selenium, Dissolved	<2.0	<2.0	2.0	ug/l
Silver, Dissolved	<5.0	<5.0	5.0	ug/l
1,1-Dichloroethane	<1.0	<1.0	1.0	ug/l
pH (Field)	6.53	6.77	1.00	pH Units
Conductivity (Field)	1305	912	5	umhos/cm
Sampled by:	J. Wooster	J. Wooster		
Date Sampled:	12/03/91	12/03/91		
Time Sampled:	16:35	16:50		
Date Received:	12/03/91	12/03/91		
Time Received:	19:30	19:30		

WW Engineering & Science, Inc.
Environmental Laboratory Division

ANALYTICAL REPORT

Quanex South Lyon
Proj: Water Analysis

Subm: December 3rd Sampling

Submittal Number: 834- 1
Location:
CCS Number 20515.01
CCS Manager: Jim Tolbert

	MW-6A	MW-6A Duplicate	MW-6A Triplicate	Detection Limit	Units
WWES Sample No:	6601	6602	6603		
Arsenic, Dissolved	34	31	34	1.0	ug/l
Barium, Dissolved	0.02			0.01	mg/l
Cadmium, Dissolved	<0.01			0.01	mg/l
Chromium, Dissolved	<0.05			0.05	mg/l
Copper, Dissolved	<0.01			0.01	mg/l
Lead, Dissolved	<50			50	ug/l
Selenium, Dissolved	<2.0			2.0	ug/l
Silver, Dissolved	<5.0			5.0	ug/l
1,1-Dichloroethane	39	34	32	1.0	ug/l
pH (Field)	6.59	6.60	6.63	1.00	pH Units
Conductivity (Field)	1893	1883	1872	5	umhos/cm
Sampled by:	J. Wooster	J. Wooster	J. Wooster		
Date Sampled:	12/03/91	12/03/91	12/03/91		
Time Sampled:	09:30	09:40	09:50		
Date Received:	12/03/91	12/03/91	12/03/91		
Time Received:	19:30	19:30	19:30		

WW Engineering & Science, Inc.
Environmental Laboratory Division

ANALYTICAL REPORT

Quanex South Lyon
Proj: Water Analysis

Subm: December 3rd Sampling

Submittal Number: 834- 1
Location:
CCS Number 20515.01
CCS Manager: Jim Tolbert

	MW-11A	MW-11A Duplicate	MW-11A Triplicate	Detection Limit	Units
WWES Sample No:	6604	6605	6606		
Arsenic, Dissolved	3.2	3.0	2.4	1.0	ug/l
Barium, Dissolved	0.05			0.01	mg/l
Cadmium, Dissolved	<0.01			0.01	mg/l
Chromium, Dissolved	<0.05			0.05	mg/l
Copper, Dissolved	<0.01			0.01	mg/l
Lead, Dissolved	<50			50	ug/l
Selenium, Dissolved	<2.0			2.0	ug/l
Silver, Dissolved	<5.0			5.0	ug/l
,1-Dichloroethane	11	11	12	1.0	ug/l
pH (Field)	6.77	6.79	6.79	1.00	pH Units
Conductivity (Field)	1262	1269	1271	5	umhos/cm
Sampled by:	J. Wooster	J. Wooster	J. Wooster		
Date Sampled:	12/03/91	12/03/91	12/03/91		
Time Sampled:	11:05	11:15	11:25		
Date Received:	12/03/91	12/03/91	12/03/91		
Time Received:	19:30	19:30	19:30		

WW Engineering & Science, Inc.
Environmental Laboratory Division

ANALYTICAL REPORT

Quanex South Lyon
Proj: Water Analysis

Subm: December 3rd Sampling

Submittal Number: 834- 1
Location:
CCS Number 20515.01
CCS Manager: Jim Tolbert

	MW-11B	MW-11B Duplicate	MW-11B Triplicate	Detection Limit	Units
WWES Sample No:	6607	6608	6609		
Arsenic, Dissolved	5.8	6.6	4.8	1.0	ug/l
Barium, Dissolved	0.03			0.01	mg/l
Cadmium, Dissolved	<0.01			0.01	mg/l
Chromium, Dissolved	<0.05			0.05	mg/l
Copper, Dissolved	<0.01	<0.01	<0.01	0.01	mg/l
Lead, Dissolved	<50			50	ug/l
Selenium, Dissolved	<2.0			2.0	ug/l
Silver, Dissolved	<5.0			5.0	ug/l
1,1-Dichloroethane	<1.0	<1.0	<1.0	1.0	ug/l
pH (Field)	6.79	6.77	6.81	1.00	pH Units
Conductivity (Field)	2040	2030	2030	5	umhos/cm
Sampled by:	J. Wooster	J. Wooster	J. Wooster		
Date Sampled:	12/03/91	12/03/91	12/03/91		
Time Sampled:	11:15	11:30	11:45		
Date Received:	12/03/91	12/03/91	12/03/91		
Time Received:	19:30	19:30	19:30		

WW Engineering & Science, Inc.
Environmental Laboratory Division

ANALYTICAL REPORT

Quanex South Lyon
Proj: Water Analysis

Subm: December 3rd Sampling

Submittal Number: 834- 1
Location:
CCS Number 20515.01
CCS Manager: Jim Tolbert

	MW-11D	MW-11D Duplicate	MW-11D Triplicate	Detection Limit	Units
WWES Sample No:	6610	6611	6612		
Arsenic, Dissolved	6.5	7.1	7.8	1.0	ug/l
Barium, Dissolved	0.10			0.01	mg/l
Cadmium, Dissolved	<0.01			0.01	mg/l
Chromium, Dissolved	<0.05			0.05	mg/l
Copper, Dissolved	<0.01			0.01	mg/l
Lead, Dissolved	<50			50	ug/l
Selenium, Dissolved	<2.0			2.0	ug/l
Silver, Dissolved	<5.0			5.0	ug/l
1,1-Dichloroethane	<1.0			1.0	ug/l
pH (Field)	6.61	6.63	6.63	1.00	pH Units
Conductivity (Field)	976	978	983	5	umhos/cm
Sampled by:	J. Wooster	J. Wooster	J. Wooster		
Date Sampled:	12/03/91	12/03/91	12/03/91		
Time Sampled:	11:55	12:35	13:15		
Date Received:	12/03/91	12/03/91	12/03/91		
Time Received:	19:30	19:30	19:30		

WW Engineering & Science, Inc.
Environmental Laboratory Division

ANALYTICAL REPORT

Quanex South Lyon
Proj: Water Analysis

Subm: December 3rd Sampling

Submittal Number: 834- 1
Location:
CCS Number 20515.01
CCS Manager: Jim Tolbert

	MW-12B	MW-12B Duplicate	MW-12B Triplicate	Detection Limit	Units
WWES Sample No:	6613	6614	6615		
Arsenic, Dissolved	8.3	11	9.9	1.0	ug/l
Barium, Dissolved	0.04			0.01	mg/l
Cadmium, Dissolved	<0.01			0.01	mg/l
Chromium, Dissolved	<0.05			0.05	mg/l
Copper, Dissolved	<0.01			0.01	mg/l
Lead, Dissolved	<50			50	ug/l
Selenium, Dissolved	<2.0			2.0	ug/l
Silver, Dissolved	<5.0			5.0	ug/l
1,1-Dichloroethane	<1.0			1.0	ug/l
pH (Field)	6.94	6.94	6.92	1.00	pH Units
Conductivity (Field)	1236	1242	1241	5	umhos/cm
Sampled by:	J. Wooster	J. Wooster	J. Wooster		
Date Sampled:	12/03/91	12/03/91	12/03/91		
Time Sampled:	13:45	14:05	14:25		
Date Received:	12/03/91	12/03/91	12/03/91		
Time Received:	19:30	19:30	19:30		

WW Engineering & Science, Inc.
Environmental Laboratory Division

ANALYTICAL REPORT

Quanex South Lyon
Proj: Water Analysis

Subm: December 3rd Sampling

Submittal Number: 834- 1
Location:
CCS Number 20515.01
CCS Manager: Jim Tolbert

	MW-13A	MW-13A Duplicate	MW-13A Triplicate	Detection Limit	Units
WWES Sample No:	6616	6617	6618		
Arsenic, Dissolved	3.3	5.7	5.4	1.0	ug/l
Barium, Dissolved	0.24			0.01	mg/l
Cadmium, Dissolved	<0.01			0.01	mg/l
Chromium, Dissolved	<0.05			0.05	mg/l
Copper, Dissolved	<0.01			0.01	mg/l
Lead, Dissolved	<50			50	ug/l
Selenium, Dissolved	<2.0			2.0	ug/l
Silver, Dissolved	<5.0			5.0	ug/l
1,1-Dichloroethane	<1.0			1.0	ug/l
pH (Field)	6.18	6.22	6.24	1.00	pH Units
Conductivity (Field)	1601	1616	1628	5	umhos/cm
Sampled by:	J. Wooster	J. Wooster	J. Wooster		
Date Sampled:	12/03/91	12/03/91	12/03/91		
Time Sampled:	14:05	14:15	14:25		
Date Received:	12/03/91	12/03/91	12/03/91		
Time Received:	19:30	19:30	19:30		

WW Engineering & Science, Inc.
Environmental Laboratory Division

ANALYTICAL REPORT

Quanex South Lyon
Proj: Water Analysis

Subm: December 3rd Sampling

Submittal Number: 834- 1
Location:
CCS Number 20515.01
CCS Manager: Jim Tolbert

	MW-13B	MW-13B Duplicate	MW-13B Triplicate	Detection Limit	Units
WWES Sample No:	6619	6620	6621		
Arsenic, Dissolved	5.4	26	7.1	1.0	ug/l
Barium, Dissolved	0.03			0.01	mg/l
Cadmium, Dissolved	<0.01			0.01	mg/l
Chromium, Dissolved	<0.05			0.05	mg/l
Copper, Dissolved	<0.01			0.01	mg/l
Lead, Dissolved	<50			50	ug/l
Selenium, Dissolved	<2.0			2.0	ug/l
Silver, Dissolved	<5.0			5.0	ug/l
1,1-Dichloroethane	<1.0			1.0	ug/l
pH (Field)	6.61	6.64	6.66	1.00	pH Units
Conductivity (Field)	1610	1620	1630	5	umhos/cm
Sampled by:	J. Wooster	J. Wooster	J. Wooster		
Date Sampled:	12/03/91	12/03/91	12/03/91		
Time Sampled:	14:35	14:55	15:15		
Date Received:	12/03/91	12/03/91	12/03/91		
Time Received:	19:30	19:30	19:30		

WW Engineering & Science, Inc.
Environmental Laboratory Division

ANALYTICAL REPORT

Quanex South Lyon
Proj: Water Analysis

Subm: December 3rd Sampling

Submittal Number: 834- 1
Location:
CCS Number 20515.01
CCS Manager: Jim Tolbert

	MW-13C	MW-12C	MW-12A	Detection Limit	Units
WWES Sample No:	6622	6623	6624		
Arsenic, Dissolved	20	<1.0	<1.0	1.0	ug/l
Barium, Dissolved	0.23	0.08	0.05	0.01	mg/l
Cadmium, Dissolved	<0.01	<0.01	<0.01	0.01	mg/l
Chromium, Dissolved	<0.05	<0.05	<0.05	0.05	mg/l
Copper, Dissolved	<0.01	<0.01	<0.01	0.01	mg/l
Lead, Dissolved	<50	<50	<50	50	ug/l
Selenium, Dissolved	<2.0	<2.0	<2.0	2.0	ug/l
Silver, Dissolved	<5.0	<5.0	<5.0	5.0	ug/l
1,1-Dichloroethane	<1.0	<1.0	<1.0	1.0	ug/l
pH (Field)	7.14	7.02	7.09	1.00	pH Units
Conductivity (Field)	646	1489	717	5	umhos/cm
Sampled by:	J. Wooster	J. Wooster	J. Wooster		
Date Sampled:	12/03/91	12/03/91	12/03/91		
Time Sampled:	15:25	13:45	13:35		
Date Received:	12/03/91	12/03/91	12/03/91		
Time Received:	19:30	19:30	19:30		

WW Engineering & Science, Inc.
Environmental Laboratory Division

ANALYTICAL REPORT

Quanex South Lyon
Proj: Water Analysis

Subm: December 3rd Sampling

Submittal Number: 834- 1
Location:
CCS Number 20515.01
CCS Manager: Jim Tolbert

	MW-15A	MW-16A	MW-17A	Detection Limit	Units
WWES Sample No:	6625	6626	6627		
Arsenic, Dissolved	<1.0	<1.0	8.3	1.0	ug/l
Barium, Dissolved	0.02	0.05	0.04	0.01	mg/l
Cadmium, Dissolved	<0.01	<0.01	<0.01	0.01	mg/l
Chromium, Dissolved	<0.05	<0.05	<0.05	0.05	mg/l
Copper, Dissolved	<0.01	<0.01	<0.01	0.01	mg/l
Lead, Dissolved	<50	<50	<50	50	ug/l
Selenium, Dissolved	<2.0	<2.0	<2.0	2.0	ug/l
Silver, Dissolved	<5.0	<5.0	<5.0	5.0	ug/l
1,1-Dichloroethane	<1.0	<1.0	<1.0	1.0	ug/l
pH (Field)	6.94	6.96	6.89	1.00	pH Units
Conductivity (Field)	541	1546	951	5	umhos/cm
Sampled by:	J. Wooster	J. Wooster	J. Wooster		
Date Sampled:	12/03/91	12/03/91	12/03/91		
Time Sampled:	10:05	10:25	15:45		
Date Received:	12/03/91	12/03/91	12/03/91		
Time Received:	19:30	19:30	19:30		

WW Engineering & Science, Inc.
Environmental Laboratory Division
5555 Glenwood Hills Pkwy SE • PO Box 874
Grand Rapids, Michigan 49588-0874

Chain of Custody Record

№ 17129

Project No.: 83160
Project Name: Quanex - South Lyon
Samplers (signature): [signature]

Date	Time	Matrix*	Comp	GRAB	Sample I.D.	No. of Containers	Container Type & Volume	Preservation Method	Analysis Required/Comments
1-7-92	9:30A	WTR		✓	MW-17A	1	125ml plastic	HNO_3	Dissolved Arsenic
"	9:05A	"		✓	MW-17B	1	"	"	"
"	10:00A	"		✓	MW-1A	1	"	"	"
"	10:15A	"		✓	MW-1B	1	"	"	"
"	10:40A	"		✓	MW-1C	1	"	"	"

Relinquished by: (signature)	Date / Time	Received by:	Relinquished by:	Date / Time	Received by: (signature)	
[signature]	1-7-92 11:00A					
Dispatched by: (signature)	**Date / Time**	**Carrier:**	**Received to lab by:**	**Date / Time**	**Logged in by:**	**Date/Time**

* MATRIX: WATER (WTR), WASTEWATER (WW), SOIL (SOL), SLUDGE (SLU), AIR, OIL, HAZARDOUS WASTE (HW)

03 EDI/Chain of Cust-Disk Files

WW Engineering & Science, Inc.
Environmental Laboratory Division

ANALYTICAL REPORT

Ouanex South Lyon
roj: Arsenic Analysis
in Groundwater
Subm: January 1992 Samples

Submittal Number: 29616- 3
Location:
CCS Number 83160.00
CCS Manager: Pam Dodt

	MW-17A	MW-17B	MW-1A	Detection Limit	Units
WWES Sample No:	9093	9094	9095		
Arsenic, Dissolved	5.5	14	<1.0	1.0	ug/l
ampled by:	J. Wooster	J. Wooster	J. Wooster		
Date Sampled:	01/07/92	01/07/92	01/07/92		
Time Sampled:	09:30	09:05	10:00		
ate Received:	01/08/92	01/08/92	01/08/92		
ime Received:	09:00	09:00	09:00		

WW Engineering & Science, Inc.
Environmental Laboratory Division

ANALYTICAL REPORT

Ouanex South Lyon
roj: Arsenic Analysis
in Groundwater
Subm: January 1992 Samples

Submittal Number: 29616- 3
Location:
CCS Number 83160.00
CCS Manager: Pam Dodt

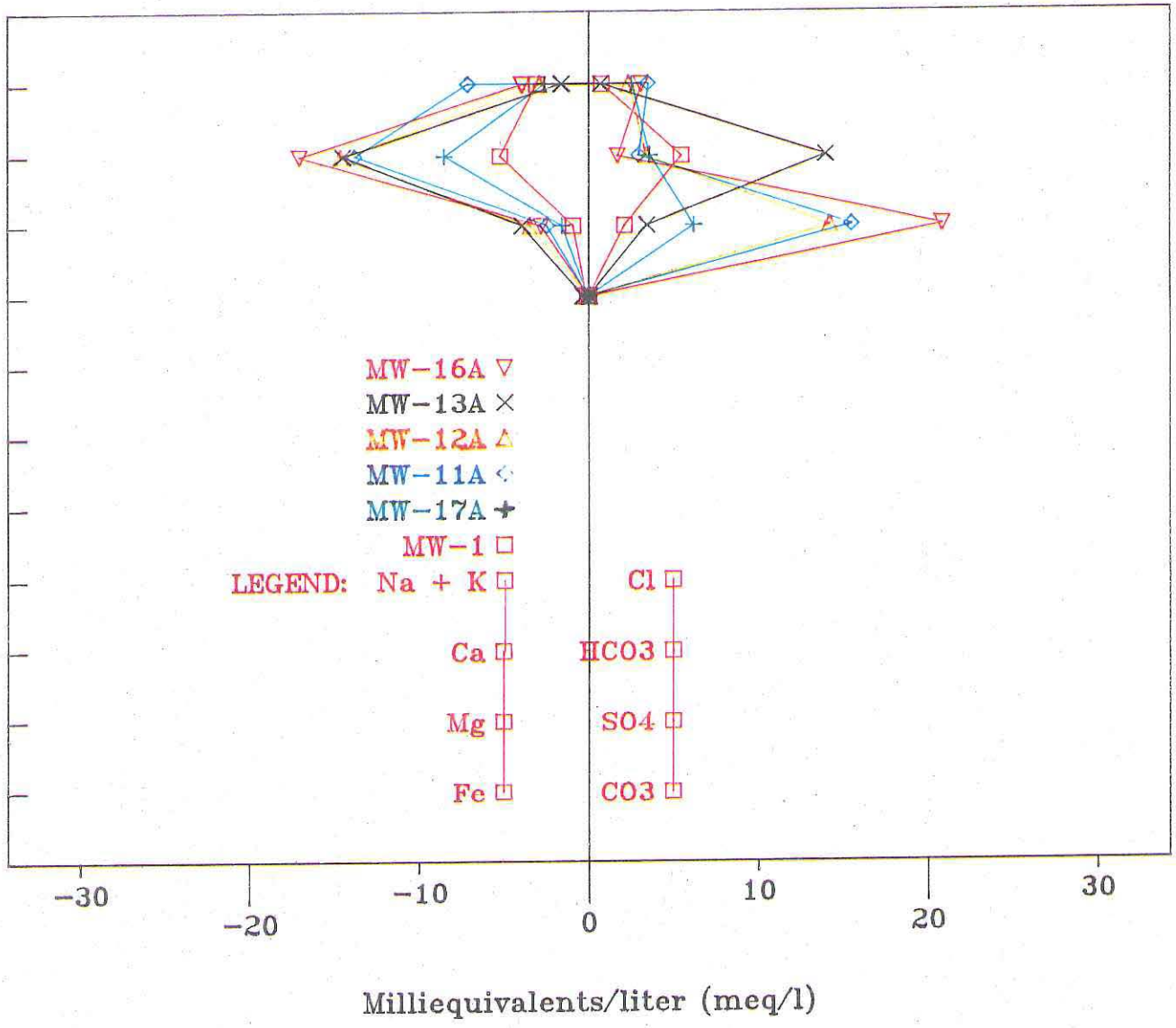
	MW-1B	MW-1C	Detection Limit	Units
WWES Sample No:	9096	9097		
Arsenic, Dissolved	4.6	8.0	1.0	ug/l
ampled by:	J. Wooster	J. Wooster		
Date Sampled:	01/07/92	01/07/92		
Time Sampled:	10:15	10:40		
ıte Received:	01/08/92	01/08/92		
ıime Received:	09:00	09:00		

APPENDIX F

Piper Trilinear and Stiff Diagrams

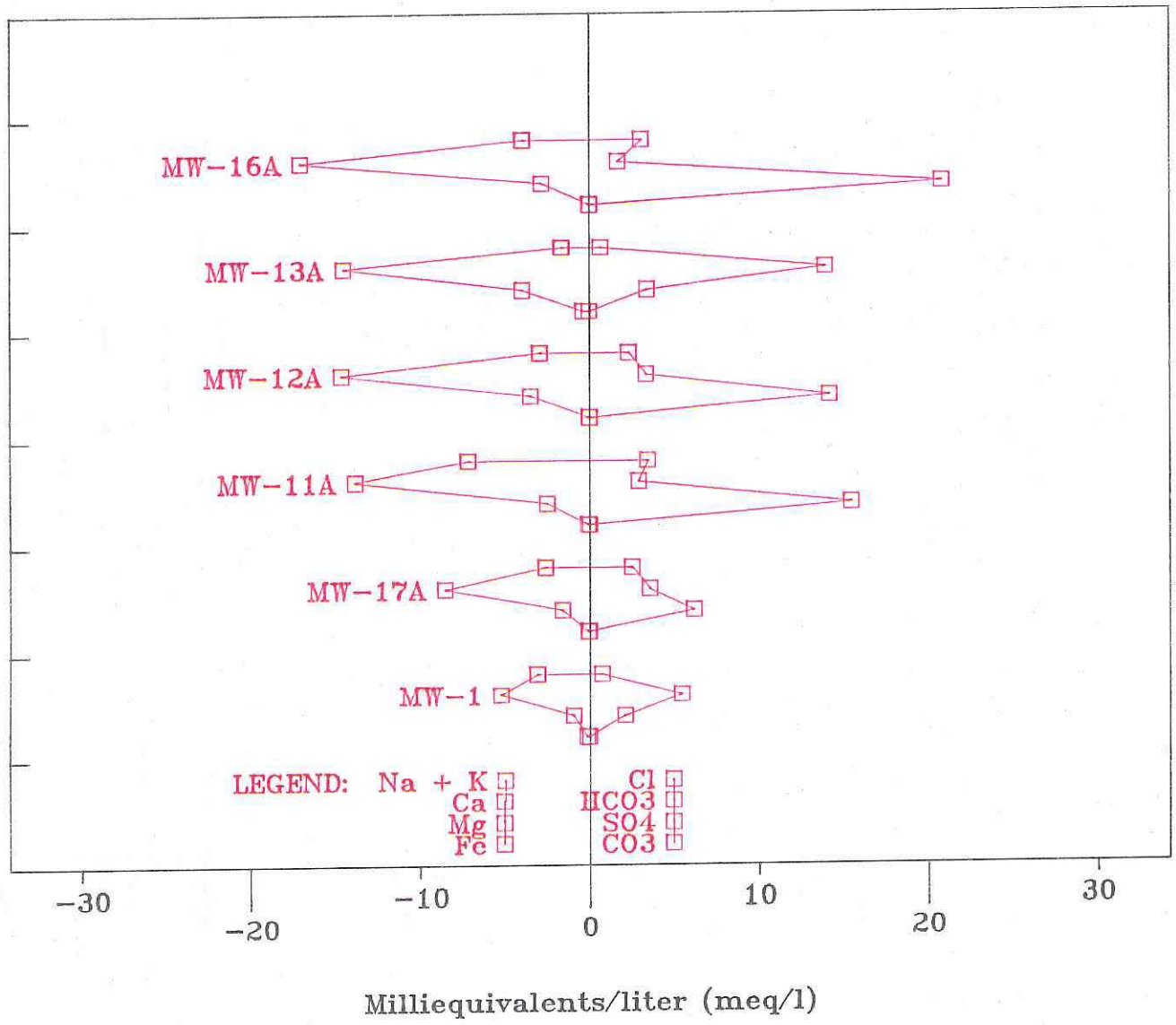
Quanex Stiff Diagrams / Shallow Wells

WW Engineering and Science
September, 1991



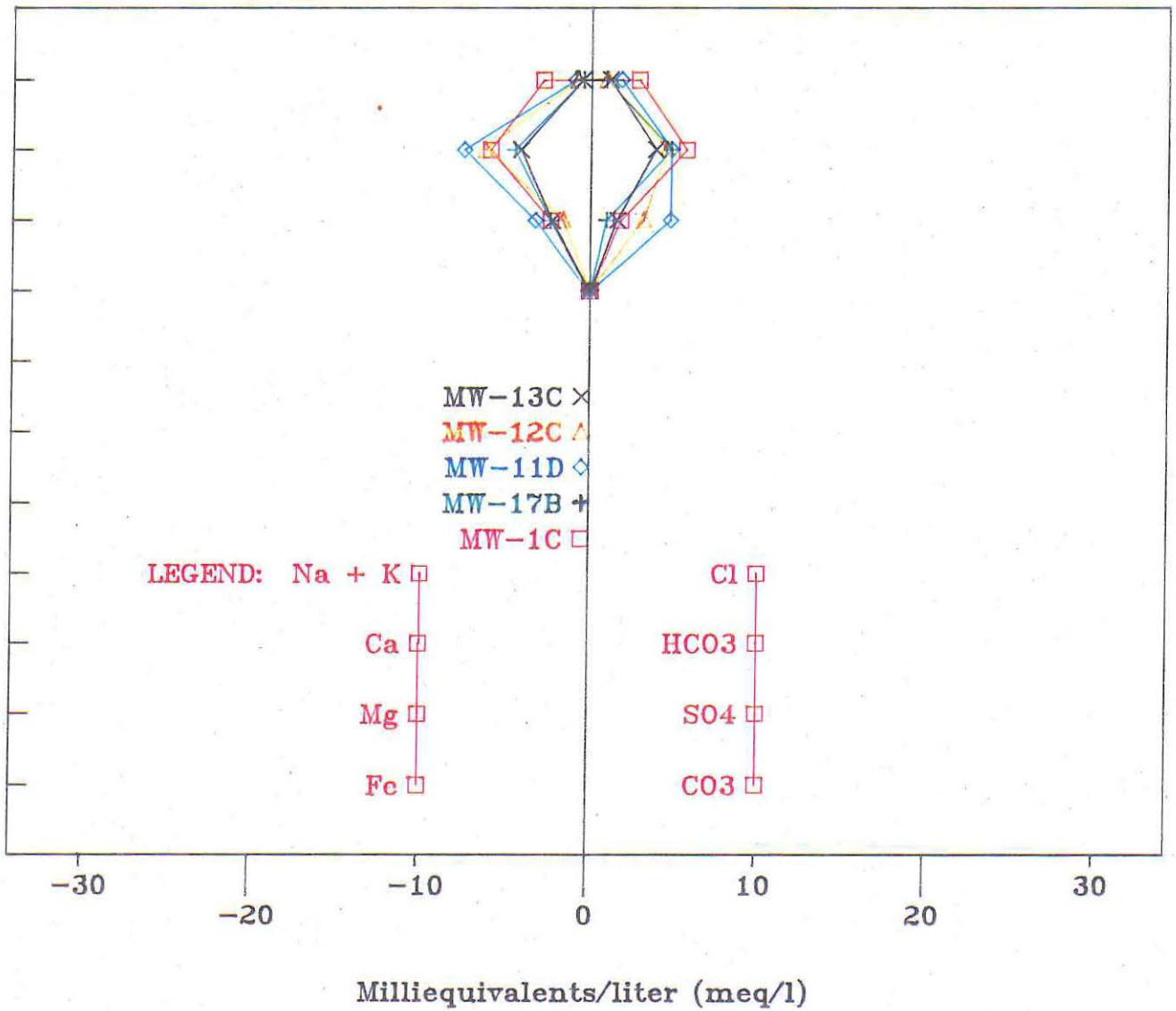
Quanex Stiff Diagrams / Shallow Wells

WW Engineering and Science
September, 1991



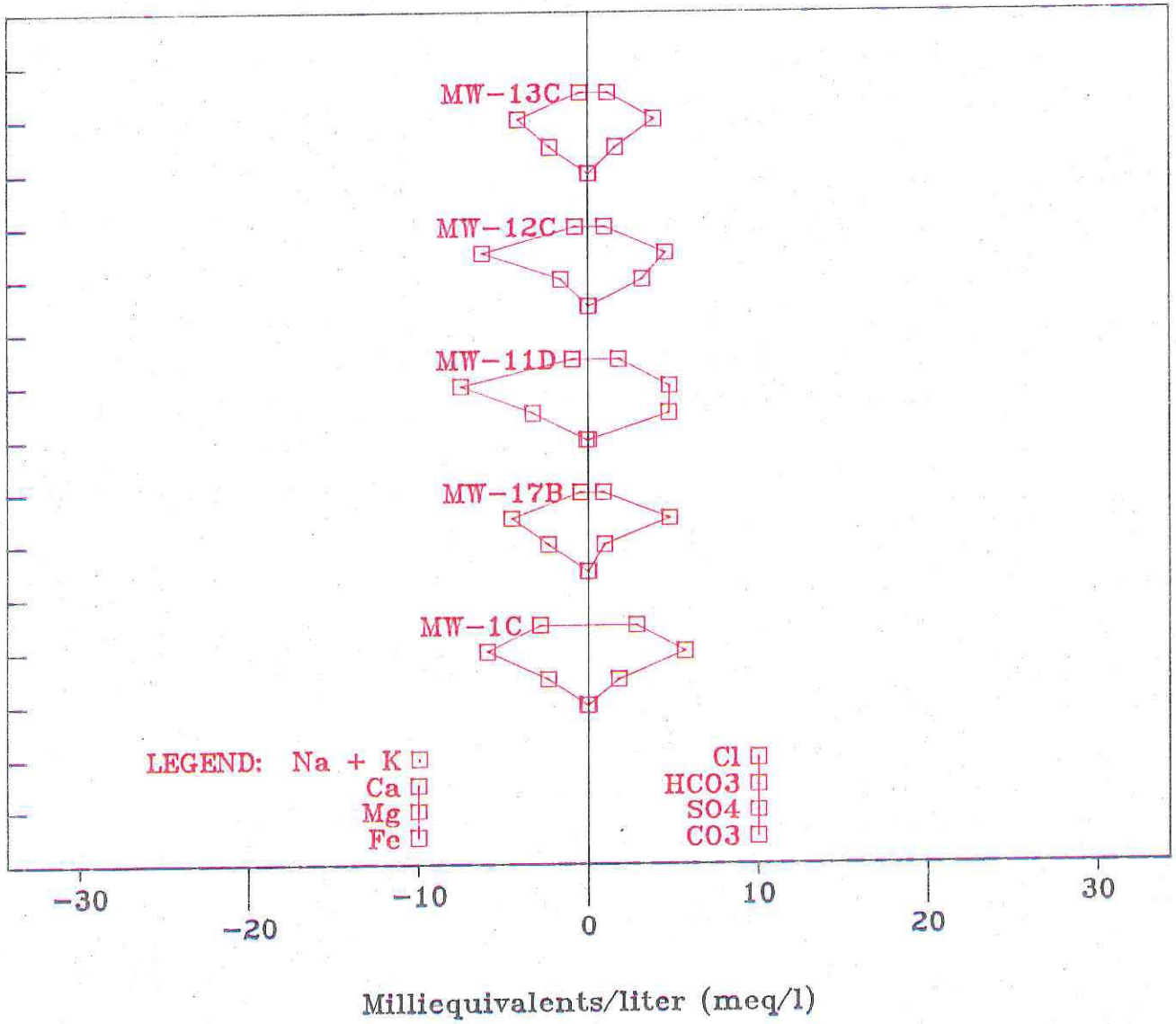
Quanex Stiff Diagrams / Deep Wells

WW Engineering and Science
September, 1991



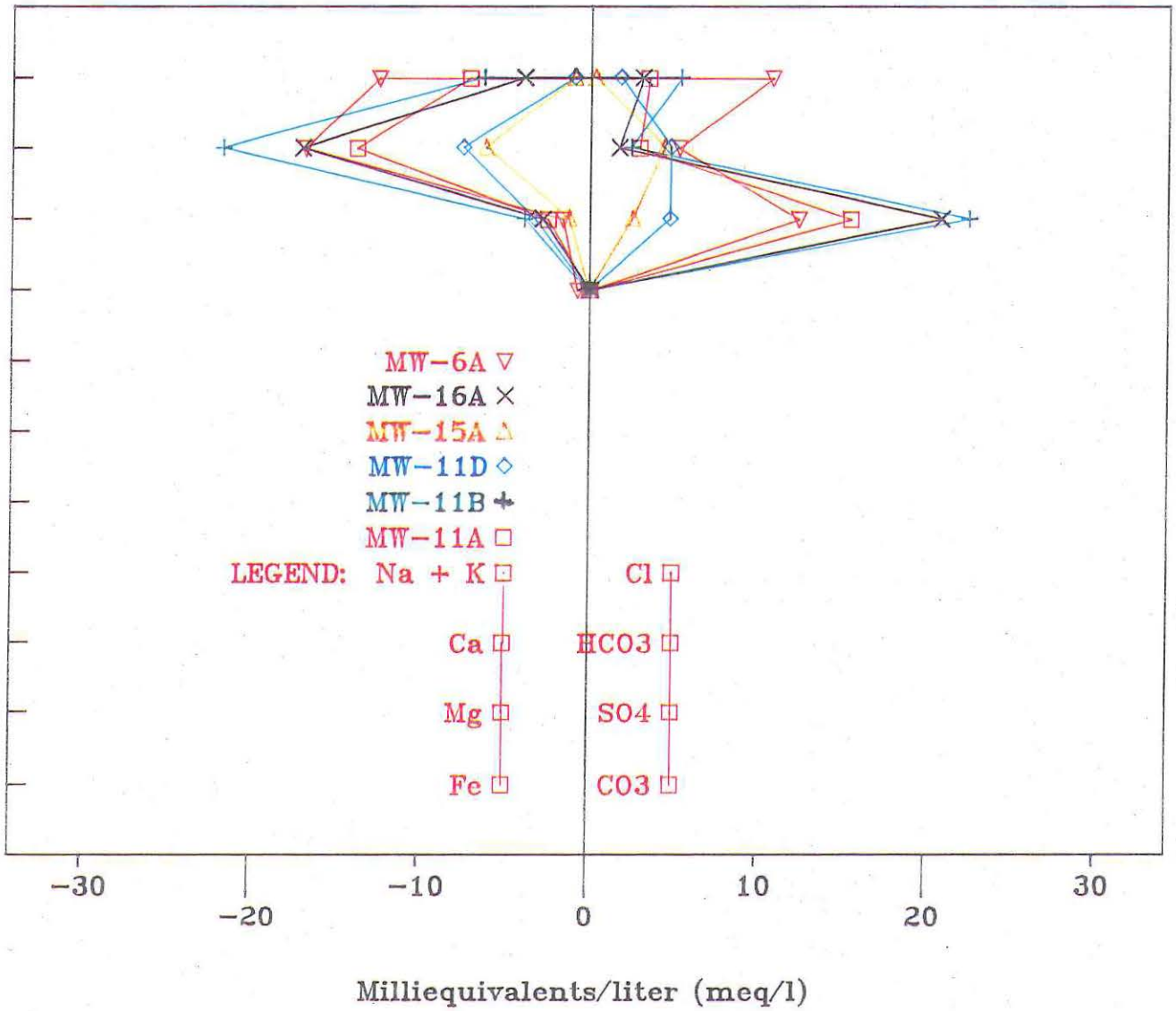
Quanex Stiff Diagrams / Deep Wells

WW Engineering and Science
September, 1991



Quanex Stiff Diagrams / Downgradient Wells

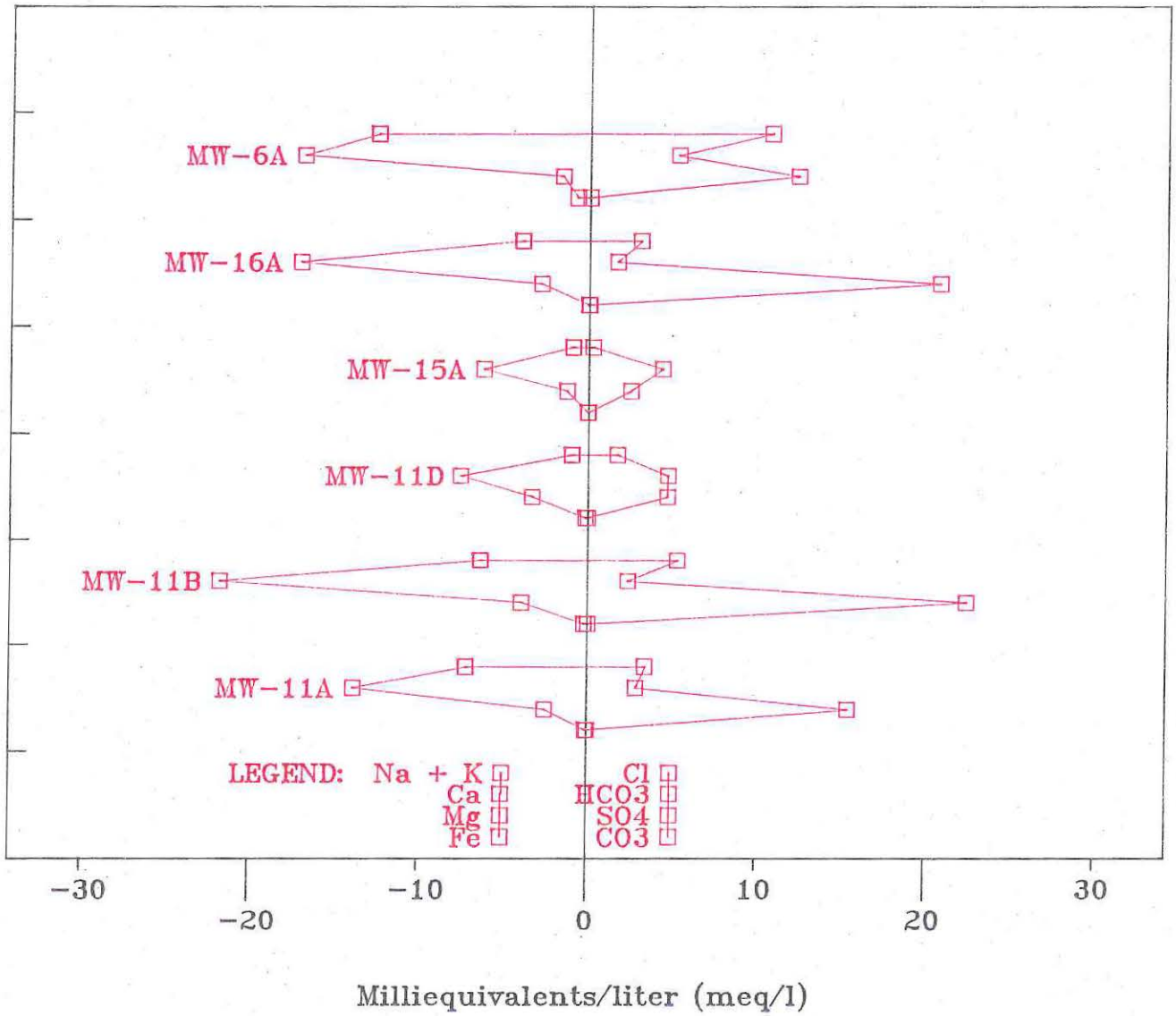
WW Engineering and Science
September, 1991



Quanex Stiff Diagrams / Downgradient Wells

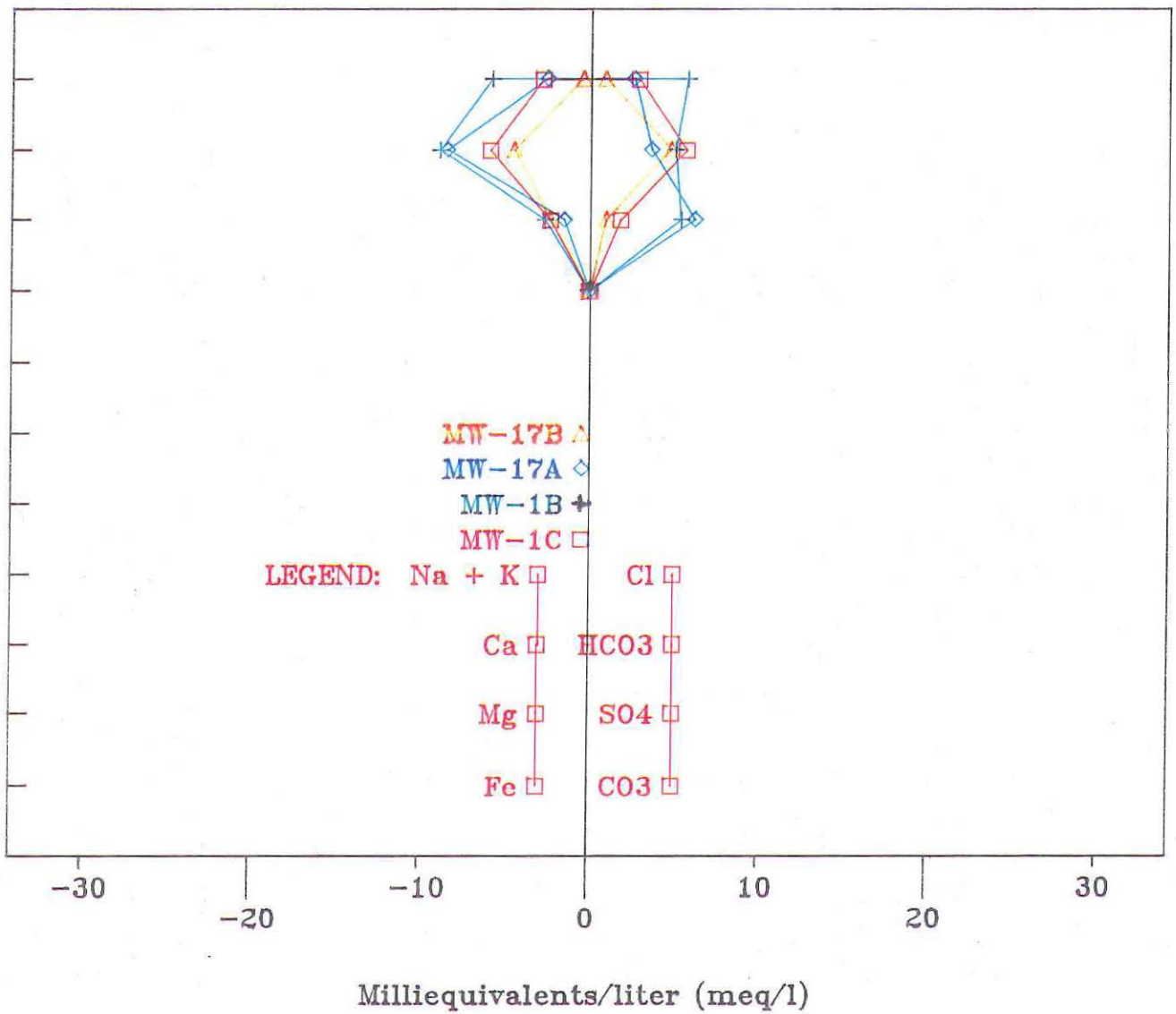
WW Engineering and Science

September, 1991



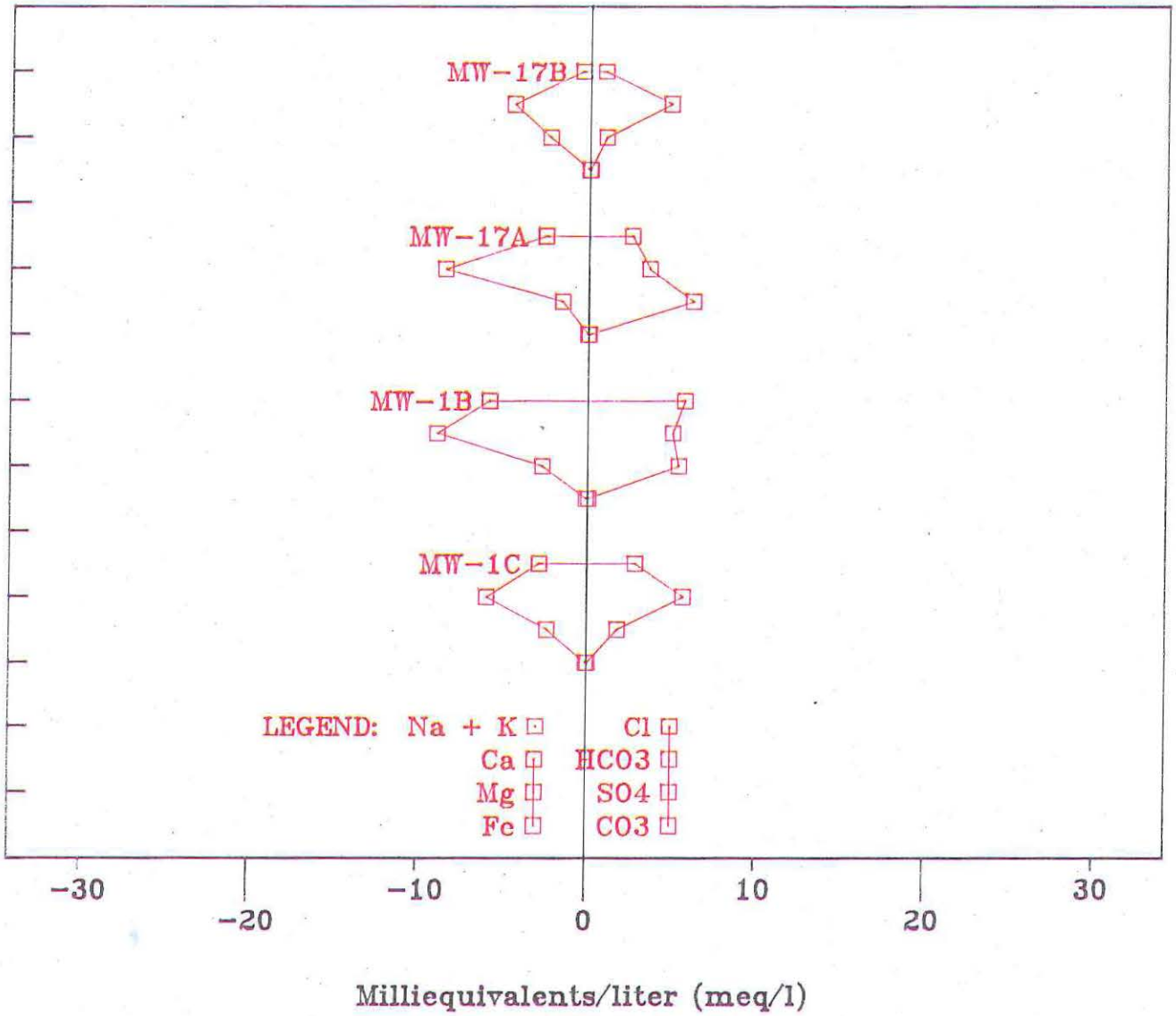
Quanex Stiff Diagrams / Upgradient Wells

WW Engineering and Science
September, 1991



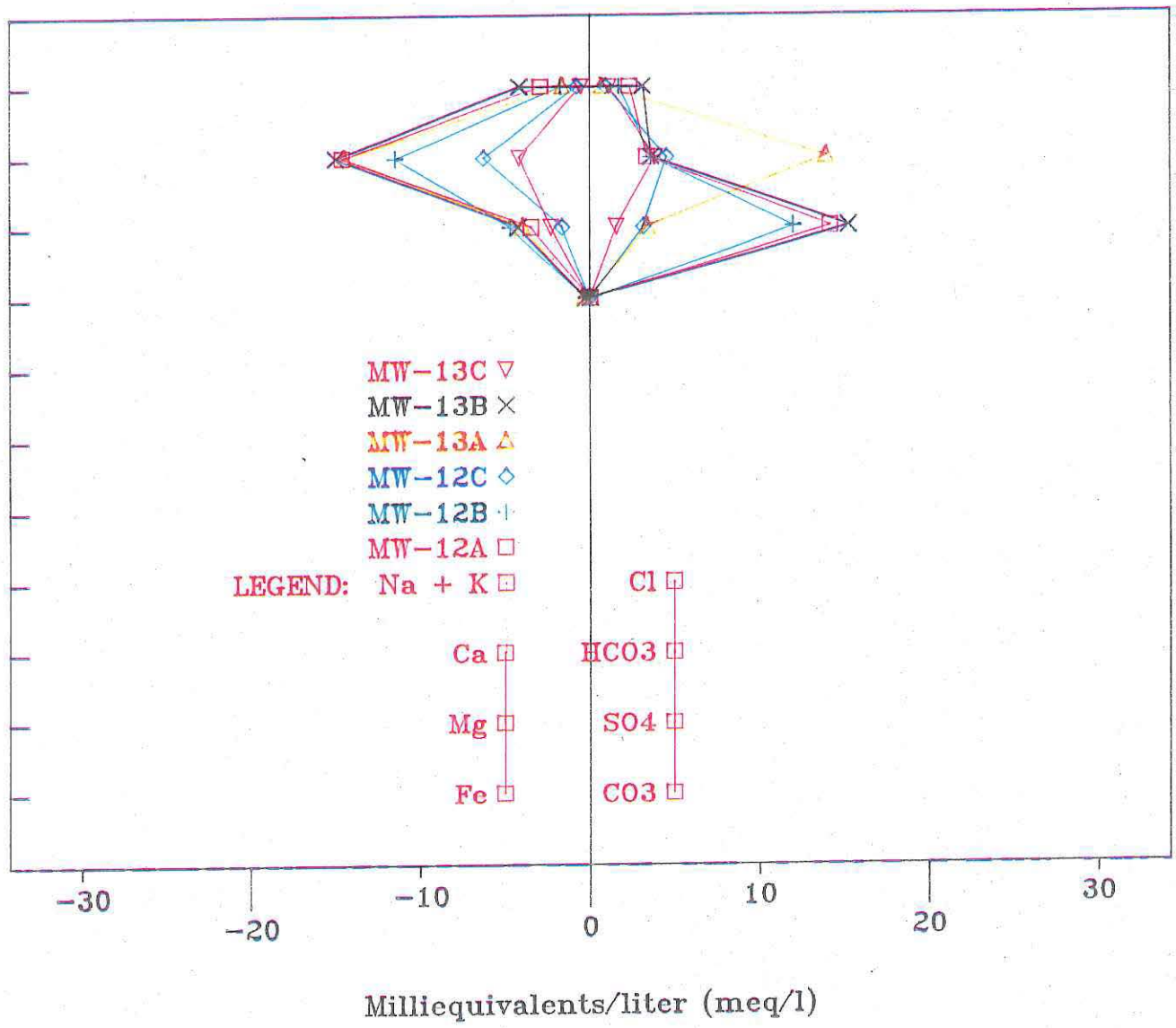
Quanex Stiff Diagrams / Upgradient Wells

WW Engineering and Science
September, 1991



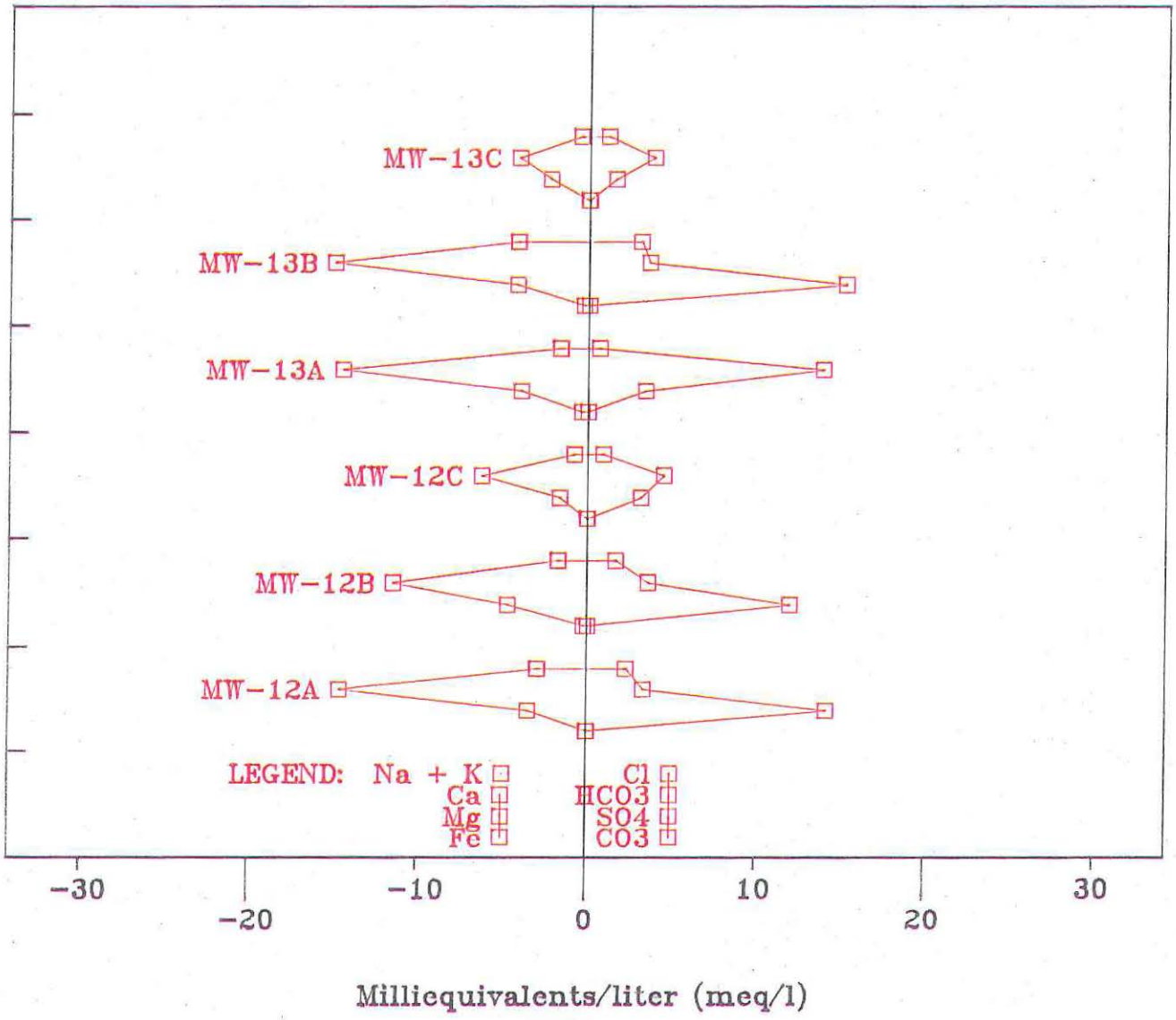
Quanex Stiff Diagrams / Clustered Wells

WW Engineering and Science
September, 1991



Quanex Stiff Diagrams / Clustered Wells

WW Engineering and Science
September, 1991



CATION/ANION BALANCE

SITE			MW-1		MW-17A		MW-11A		MW-12A		MW-13A		MW-16A	
SAMPLE														
DATE			19-SEP-91		19-SEP-91		19-SEP-91		19-SEP-91		19-SEP-91		19-SEP-91	
	molecular weight	charge	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l
Sodium	22.99	1	67	2.914	57	2.4793	107	4.654	63	2.7403	34	1.478	72	3.131
Calcium	40.08	2	105	5.239	171	8.5329	277	13.82	293	14.620	291	14.52	342	17.06
Potassium	39.10	1	5.6	0.143	4.5	0.1150	97	2.480	7.2	0.1841	5.8	0.148	31	0.792
Magnesium	24.31	2	11	0.904	19	1.5631	30	2.468	42	3.4553	48	3.948	34	2.797
Iron	55.85	2	2.6	0.093	1.1	0.0393	0.91	0.032	< .01	0	9.8	0.350	< .01	0
Chloride	35.45	-1	27	-0.76	90	-2.538	123	-3.46	82	-2.313	24	-0.67	109	-3.07
Sulfate	96.06	-2	102	-2.12	297	-6.183	743	-15.4	681	-14.17	164	-3.41	1000	-20.8
Bicarbonate	61.02	-1	333	-5.45	219	-3.589	176	-2.88	203	-3.326	850	-13.9	102	-1.67
(as CaCO3)	100.09	-2		0		0		0		0		0		0
Carbonate	60.01	-2	< 2	0	< 2	0	< 2	0	< 2	0	< 2	0	< 2	0
(as CaCO3)	100.09	-2		0		0		0		0		0		0
CHARGE BALANCE														
Cations				9.295		12.729		23.45		21.000		20.44		23.78
Anions				-8.34		-12.31		-21.8		-19.81		-18.0		-25.5
% error				5.4%		1.7%		3.6%		2.9%		6.3%		-3.6%
(chg imbalance/tot chg)														

CATION/ANION BALANCE

SITE			MW-1C		MW-17B		MW-11D		MW-12C		MW-13C	
SAMPLE												
DATE			19-SEP-91		19-SEP-91		19-SEP-91		19-SEP-91		19-SEP-91	
	molecular weight	charge	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l
Sodium	22.99	1	63	2.740	9.6	0.4175	20	0.869	16	0.6959	11	0.478
Calcium	40.08	2	120	5.988	91	4.5409	151	7.534	126	6.2874	84	4.191
Potassium	39.10	1	4.8	0.122	2	0.0511	2.8	0.071	3.4	0.0869	2.1	0.053
Magnesium	24.31	2	29	2.385	29	2.3858	40	3.290	20	1.6454	28	2.303
Iron	55.85	2	2.2	0.078	1.5	0.0537	3.2	0.114	0.5	0.0179	0.94	0.033
Chloride	35.45	-1	100	-2.82	31	-0.874	63	-1.77	33	-0.930	40	-1.12
Sulfate	96.06	-2	85	-1.76	46	-0.957	228	-4.74	152	-3.164	75	-1.56
Bicarbonate	61.02	-1	346	-5.67	292	-4.785	292	-4.78	277	-4.539	234	-3.83
(as CaCO3)	100.09	-2		0		0		0		0		0
Carbonate	60.01	-2	< 2	0	< 2	0	< 2	0	< 2	0	< 2	0
(as CaCO3)	100.09	-2		0		0		0		0		0
CHARGE BALANCE												
Cations				11.31		7.4492		11.88		8.7336		7.061
Anions				-10.2		-6.617		-11.3		-8.635		-6.52
% error				4.9%		5.9%		2.5%		0.6%		3.9%
(chg imbalance/tot chg)												

CATION/ANION BALANCE

SITE			MW-11A		MW-11B		MW-11D		MW-15A		MW-16A		MW-6A	
SAMPLE														
DATE			19-SEP-91		19-SEP-91		19-SEP-91		19-SEP-91		19-SEP-91		19-SEP-91	
	molecular weight	charge	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l
Sodium	22.99	1	107	4.654	127	5.5241	20	0.869	19	0.8264	72	3.131	284	12.35
Calcium	40.08	2	277	13.82	436	21.756	151	7.534	124	6.1876	342	17.06	338	16.86
Potassium	39.10	1	97	2.480	30	0.7672	2.8	0.071	3.8	0.0971	31	0.792	5.5	0.140
Magnesium	24.31	2	30	2.468	47	3.8667	40	3.290	15	1.2340	34	2.797	19	1.563
Iron	55.85	2	0.91	0.032	4.3	0.1539	3.2	0.114	0.04	0.0014	< .01	0	20	0.716
Chloride	35.45	-1	123	-3.46	190	-5.359	63	-1.77	10	-0.282	109	-3.07	383	-10.8
Sulfate	96.06	-2	743	-15.4	1080	-22.48	228	-4.74	121	-2.519	1000	-20.8	595	-12.3
Bicarbonate	61.02	-1	176	-2.88	146	-2.392	292	-4.78	270	-4.424	102	-1.67	321	-5.26
(as CaCO3)	100.09	-2		0		0		0		0		0		0
Carbonate	60.01	-2	< 2	0	< 2	0	< 2	0	< 2	0	< 2	0	< 2	0
(as CaCO3)	100.09	-2		0		0		0		0		0		0
CHARGE BALANCE														
Cations				23.45		32.068		11.88		8.3467		23.78		31.63
Anions				-21.8		-30.23		-11.3		-7.226		-25.5		-28.4
% error				3.6%		2.9%		2.5%		7.2%		-3.6%		5.3%
(chg imbalance/tot chg)														

CATION/ANION BALANCE

SITE			MW-1C		MW-1B		MW-17A		MW-17B	
SAMPLE										
DATE			19-SEP-91		19-SEP-91		19-SEP-91		19-SEP-91	
	molecular weight	charge	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l
Sodium	22.99	1	63	2.740	130	5.6546	57	2.479	9.6	0.4175
Calcium	40.08	2	120	5.988	179	8.9321	171	8.532	91	4.5409
Potassium	39.10	1	4.8	0.122	8.3	0.2122	4.5	0.115	2	0.0511
Magnesium	24.31	2	29	2.385	33	2.7149	19	1.563	29	2.3858
Iron	55.85	2	2.2	0.078	3	0.1074	1.1	0.039	1.5	0.0537
Chloride	35.45	-1	100	-2.82	203	-5.726	90	-2.53	31	-0.874
Sulfate	96.06	-2	85	-1.76	258	-5.371	297	-6.18	46	-0.957
Bicarbonate	61.02	-1	346	-5.67	306	-5.014	219	-3.58	292	-4.785
(as CaCO3)	100.09	-2		0		0		0		0
Carbonate	60.01	-2	< 2	0	< 2	0	< 2	0	< 2	0
(as CaCO3)	100.09	-2		0		0		0		0
CHARGE BALANCE										
Cations				11.31		17.621		12.72		7.4492
Anions				-10.2		-16.11		-12.3		-6.617
% error				4.9%		4.5%		1.7%		5.9%
(chg imbalance/tot chg)										

CATION/ANION BALANCE

SITE			MW-12A		MW-12B		MW-12C		MW-13A		MW-13B		MW-13C	
SAMPLE														
DATE			19-SEP-91		19-SEP-91		19-SEP-91		19-SEP-91		19-SEP-91		19-SEP-91	
	molecular weight	charge	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l
Sodium	22.99	1	63	2.740	38	1.6528	16	0.695	34	1.4789	92	4.001	11	0.478
Calcium	40.08	2	293	14.62	230	11.477	126	6.287	291	14.520	301	15.01	84	4.191
Potassium	39.10	1	7.2	0.184	2.6	0.0664	3.4	0.086	5.8	0.1483	6.4	0.163	2.1	0.053
Magnesium	24.31	2	42	3.455	57	4.6894	20	1.645	48	3.9489	51	4.195	28	2.303
Iron	55.85	2	< .01	0	5.3	0.1897	0.5	0.017	9.8	0.3509	7.5	0.268	0.94	0.033
Chloride	35.45	-1	82	-2.31	60	-1.692	33	-0.93	24	-0.677	110	-3.10	40	-1.12
Sulfate	96.06	-2	681	-14.1	576	-11.99	152	-3.16	164	-3.414	733	-15.2	75	-1.56
Bicarbonate	61.02	-1	203	-3.32	220	-3.605	277	-4.53	850	-13.93	219	-3.58	234	-3.83
(as CaCO3)	100.09	-2		0		0		0		0		0		0
Carbonate	60.01	-2	< 2	0	< 2	0	< 2	0	< 2	0	< 2	0	< 2	0
(as CaCO3)	100.09	-2		0		0		0		0		0		0
CHARGE BALANCE														
Cations				21.00		18.075		8.733		20.448		23.64		7.061
Anions				-19.8		-17.29		-8.63		-18.02		-21.9		-6.52
% error				2.9%		2.2%		0.6%		6.3%		3.7%		3.9%
(chg imbalance/tot chg)														

Quanex Corporation
Michigan Seamless Tube Division
South Lyon, Michigan

PIPER TRILINEAR DIAGRAMS

September 19, 1991

UPGRADIENT LOCATIONS

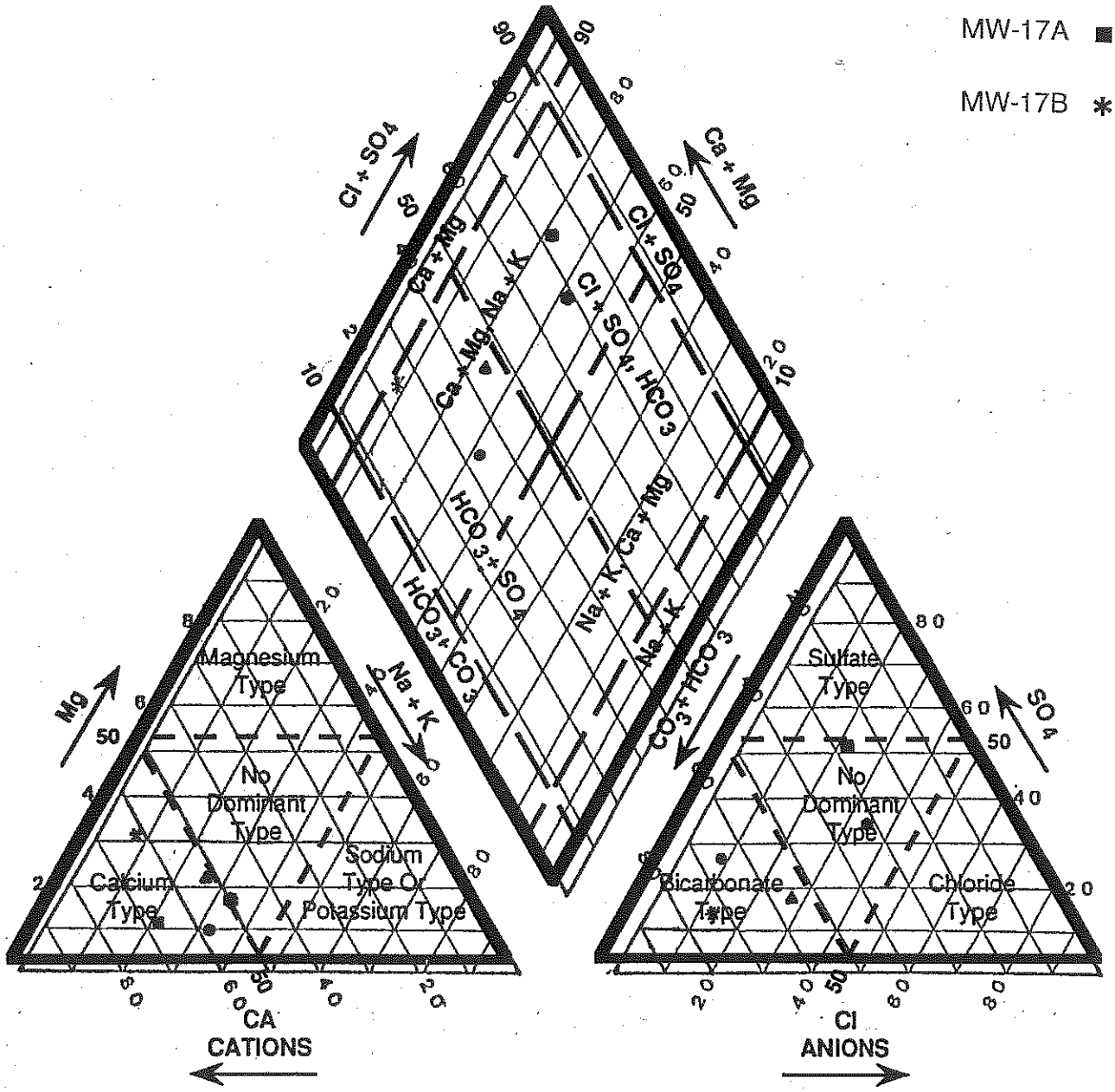
MW-1A ●

MW-1B ⬢

MW-1C ▲

MW-17A ■

MW-17B ✱



HYDROGEOCHEMICAL CLASSIFICATION SYSTEM
for Natural Waters using the Trilinear Diagram

Quanex Corporation
Michigan Seamless Tube Division
South Lyon, Michigan

PIPER TRILINEAR DIAGRAMS

September 19, 1991

DOWNGRADIENT LOCATIONS

MW- 6A △

MW-11A ●

MW-11B ⌀

MW-11D ○

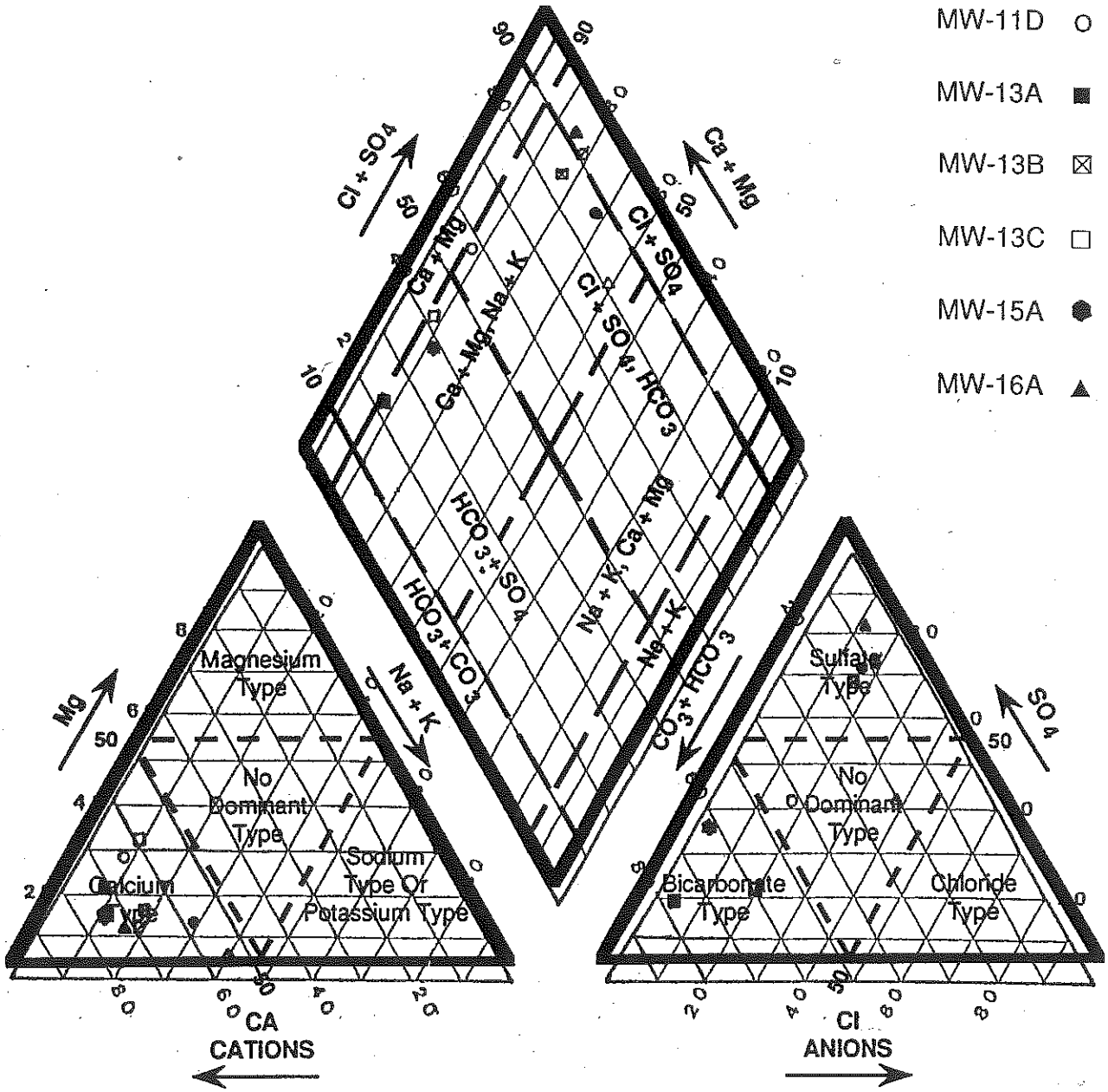
MW-13A ■

MW-13B ⊠

MW-13C □

MW-15A ⬢

MW-16A ▲



HYDROGEOCHEMICAL CLASSIFICATION SYSTEM
for Natural Waters using the Trilinear Diagram

APPENDIX G

1991 Statistical Evaluation With New Mean Background

FIRST QUARTER 1991
NEW CALCULATED MEAN BACKGROUND

ARSENIC
Wells: MW-1,MW-1B,MW-1C,MW-17A,MW-17C
BACKGROUND

	Date	Actual	x	x2	delta	delta2
MW-1	15-Aug-91	<1	0.5	0.25	0.5	0.25
	19-Sep-91	<1	0.5	0.25	0.5	0.25
	16-Oct-91	<1	0.5	0.25	0.5	0.25
	13-Nov-91	<1	0.5	0.25	0.5	0.25
	03-Dec-91	<1	0.5	0.25	0.5	0.25
	07-Jan-92	<1	0.5	0.25	0.5	0.25
MW-1B	15-Aug-91	5	5	25	0.5	0.25
	19-Sep-91	5.5	5.5	30.25	0.05	0.0025
	16-Oct-91	6.2	6.2	38.44	0.05	0.0025
	13-Nov-91	4.1	4.1	16.81	0.05	0.0025
	03-Dec-91	5.4	5.4	29.16	0.05	0.0025
	07-Jan-92	4.6	4.6	21.16	0.05	0.0025
MW-1C	15-Aug-91	7.6	7.6	57.76	0.05	0.0025
	19-Sep-91	9	9	81	0.5	0.25
	16-Oct-91	<1	0.5	0.25	0.5	0.25
	13-Nov-91	8.8	8.8	77.44	0.05	0.0025
	03-Dec-91	10	10	100	0.5	0.25
	07-Jan-92	8.0	8.0	64	0.05	0.0025
MW-17A	15-Aug-91	7.4	7.4	54.76	0.05	0.0025
	19-Sep-91	8.6	8.6	73.96	0.05	0.0025
	16-Oct-91	8.5	8.5	72.25	0.05	0.0025
	13-Nov-91	7.4	7.4	54.76	0.05	0.0025
	03-Dec-91	8.3	8.3	68.89	0.05	0.0025
	07-Jan-92	5.5	5.5	30.25	0.05	0.0025
MW-17B	15-Aug-91	14	14	196	0.5	0.25
	19-Sep-91	17	17	289	0.5	0.25
	16-Oct-91	16	16	256	0.5	0.25
	13-Nov-91	15	15	225	0.5	0.25
	03-Dec-91	19	19	361	0.5	0.25
	07-Jan-92	14	14	196	0.5	0.25

BACKGROUND:	
n=	30
SUM(x)	218.4000
SUM(x2)	2420.6400
SUM(delta2)	4.0350
MEAN=	7.2800
LLVOM=	0.0336
VAR(x)=S2=	28.6908
s2/n=	0.9564
W=	0.9564
d.f.=	29
t=	2.4620
alpha=	0.01

FOREGROUND
ARSENIC, WELL 11A

Date	Actual	x	x2	delta	delta2
20-Dec-90	5.3	5.3	28.09	0.05	0.0025
18-Mar-91	2.4	2.4	5.76	0.05	0.0025
18-Mar-91	2.6	2.6	6.76	0.05	0.0025
18-Mar-91	2.9	2.9	8.41	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	13.2000
SUM(x2)	49.0200
SUM(delta2)	0.0100
MEAN=	3.3000
LLVOM=	0.0006
VAR(x)=S2=	1.8211
s2/n=	0.4553
W=	0.4553
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	30
d.f.=	29
t=	2.462
W=	0.9563597701
MEAN=	7.28

STATISTIC:

alpha=	0.01
t(star)=	-3.350
t(sub-c)=	3.133

t(star) < t(sub-c)

Accept Ho

FOREGROUND
ARSENIC, WELL 11B

Date	Actual	x	x2	delta	delta2
20-Dec-90	4.6	4.6	21.16	0.05	0.0025
18-Mar-91	3.0	3.0	9	0.05	0.0025
18-Mar-91	3.4	3.4	11.56	0.05	0.0025
18-Mar-91	3.1	3.1	9.61	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	14.1000
SUM(x2)	51.3300
SUM(delta2)	0.0100
MEAN=	3.5250
LLVOM=	0.0006
VAR(x)=S2=	0.5436
s2/n=	0.1359
W=	0.1359
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	30
d.f.=	29
t=	2.462
W=	0.9563597701
MEAN=	7.28

STATISTIC:

alpha=	0.01
t(star)=	-3.593
t(sub-c)=	2.721

t(star) < t(sub-c)

Accept Ho

FOREGROUND
ARSENIC, WELL 11D

Date	Actual	x	x2	delta	delta2
20-Dec-90	6.5	6.5	42.25	0.05	0.0025
18-Mar-91	5.6	5.6	31.36	0.05	0.0025
18-Mar-91	5.4	5.4	29.16	0.05	0.0025
18-Mar-91	5.4	5.4	29.16	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	22.9000
SUM(x2)	131.9300
SUM(delta2)	0.0100
MEAN=	5.7250
LLVOM=	0.0006
VAR(x)=S2=	0.2769
s2/n=	0.0692
W=	0.0692
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	30
d.f.=	29
t=	2.462
W=	0.9563597701
MEAN=	7.28

STATISTIC:

alpha=	0.01
t(star)=	-1.535
t(sub-c)=	2.602

t(star) < t(sub-c)

Accept Ho

FOREGROUND
ARSENIC, WELL 12B

Date	Actual	x	x2	delta	delta2
20-Dec-90	7.7	7.7	59.29	0.05	0.0025
18-Mar-91	6.4	6.4	40.96	0.05	0.0025
18-Mar-91	7.0	7.0	49	0.05	0.0025
18-Mar-91	6.6	6.6	43.56	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	27.7000
SUM(x2)	192.8100
SUM(delta2)	0.0100
MEAN=	6.9250
LLVOM=	0.0006
VAR(x)=S2=	0.3303
s2/n=	0.0826
W=	0.0826
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	30
d.f.=	29
t=	2.462
W=	0.9563597701
MEAN=	7.28

STATISTIC:

alpha=	0.01
t(star)=	-0.348
t(sub-c)=	2.627

t(star) < t(sub-c)

Accept Ho

FOREGROUND
ARSENIC, WELL 13A

Date	Actual	x	x2	delta	delta2
20-Dec-90	2.7	2.7	7.29	0.05	0.0025
18-Mar-91	4.0	4.0	16	0.05	0.0025
18-Mar-91	6.0	6.0	36	0.05	0.0025
18-Mar-91	5.9	5.9	34.81	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	18.6000
SUM(x2)	94.1000
SUM(delta2)	0.0100
MEAN=	4.6500
LLVOM=	0.0006
VAR(x)=S2=	2.5378
s2/n=	0.6344
W=	0.6344
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	30
d.f.=	29
t=	2.462
W=	0.9563597701
MEAN=	7.28

STATISTIC:

alpha=	0.01
t(star)=	-2.085
t(sub-c)=	3.291

t(star) < t(sub-c)

Accept Ho

FOREGROUND
ARSENIC, WELL 13B

Date	Actual	x	x2	delta	delta2
20-Dec-90	5.7	5.7	32.49	0.05	0.0025
18-Mar-91	5.2	5.2	27.04	0.05	0.0025
18-Mar-91	4.8	4.8	23.04	0.05	0.0025
18-Mar-91	5.0	5.0	25.00	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	20.7000
SUM(x2)	107.5700
SUM(delta2)	0.0100
MEAN=	5.1750
LLVOM=	0.0006
VAR(x)=S2=	0.1503
s2/n=	0.0376
W=	0.0376
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	30
d.f.=	29
t=	2.462
W=	0.9563597701
MEAN=	7.28

STATISTIC:

alpha=	0.01
t(star)=	-2.111
t(sub-c)=	2.541

t(star) < t(sub-c)

Accept Ho

Second Quarter 1991
NEW CALCULATED MEAN BACKGROUND

ARSENIC
Wells: MW-1,MW-1B,MW-1C,MW-17A,MW-17B
BACKGROUND

	Date	Actual	x	x2	delta	delta2
MW-1	15-Aug-91	<1	0.5	0.25	0.5	0.25
	19-Sep-91	<1	0.5	0.25	0.5	0.25
	16-Oct-91	<1	0.5	0.25	0.5	0.25
	13-Nov-91	<1	0.5	0.25	0.5	0.25
	03-Dec-91	<1	0.5	0.25	0.5	0.25
	07-Jan-92	<1	0.5	0.25	0.5	0.25
MW-1B	15-Aug-91	5	5	25	0.5	0.25
	19-Sep-91	5.5	5.5	30.25	0.05	0.0025
	16-Oct-91	6.2	6.2	38.44	0.05	0.0025
	13-Nov-91	4.1	4.1	16.81	0.05	0.0025
	03-Dec-91	5.4	5.4	29.16	0.05	0.0025
	07-Jan-92	4.6	4.6	21.16	0.05	0.0025
MW-1C	15-Aug-91	7.6	7.6	57.76	0.05	0.0025
	19-Sep-91	9	9	81	0.5	0.25
	16-Oct-91	<1	0.5	0.25	0.5	0.25
	13-Nov-91	8.8	8.8	77.44	0.05	0.0025
	03-Dec-91	10	10	100	0.5	0.25
	07-Jan-92	8.0	8.0	64	0.05	0.0025
MW-17A	15-Aug-91	7.4	7.4	54.76	0.5	0.25
	19-Sep-91	8.6	8.6	73.96	0.05	0.0025
	16-Oct-91	8.5	8.5	72.25	0.05	0.0025
	13-Nov-91	7.4	7.4	54.76	0.05	0.0025
	03-Dec-91	8.3	8.3	68.89	0.05	0.0025
	07-Jan-92	5.5	5.5	30.25	0.05	0.0025
MW-17B	15-Aug-91	14	14	196	0.5	0.25
	19-Sep-91	17	17	289	0.5	0.25
	16-Oct-91	16	16	256	0.5	0.25
	13-Nov-91	15	15	225	0.5	0.25
	03-Dec-91	19	19	361	0.5	0.25
	07-Jan-92	14	14	196	0.5	0.25

n=	30
SUM(x)	218.4000
SUM(x2)	2420.6400
SUM(delta2)	4.2825
MEAN=	7.2800
LLVOM=	0.0357
VAR(x)=S2=	28.6936
s2/n=	0.9565
W=	0.9565
d.f.=	29
t=	2.4620
alpha=	0.01

FOREGROUND
ARSENIC, WELL 11A

Date	Actual	x	x2	delta	delta2
18-Mar-91	2.4	2.4	5.76	0.05	0.0025
13-Jun-91	1.7	1.7	2.89	0.05	0.0025
13-Jun-91	1.7	1.7	2.89	0.05	0.0025
13-Jun-91	1.6	1.6	2.56	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	7.4000
SUM(x2)	14.1000
SUM(delta2)	0.0100
MEAN=	1.8500
LLVOM=	0.0006
VAR(x)=S2=	0.1378
s2/n=	0.0344
W=	0.0344
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	30
d.f.=	29
t=	2.462
W=	0.9564545977
MEAN=	7.28

STATISTIC:

alpha=	0.01
t(star)=	-5.455
t(sub-c)=	2.534

t(star) < t(sub-c)

Accept Ho

FOREGROUND
ARSENIC, WELL 11B

Date	Actual	x	x2	delta	delta2
18-Mar-91	3.0	3.0	9	0.05	0.0025
13-Jun-91	2.6	2.6	6.76	0.05	0.0025
13-Jun-91	4.4	4.4	19.36	0.05	0.0025
13-Jun-91	3.5	3.5	12.25	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	13.5000
SUM(x2)	47.3700
SUM(delta2)	0.0100
MEAN=	3.3750
LLVOM=	0.0006
VAR(x)=S2=	0.6036
s2/n=	0.1509
W=	0.1509
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	30
d.f.=	29
t=	2.462
W=	0.9564545977
MEAN=	7.28

STATISTIC:

alpha=	0.01
t(star)=	-3.711
t(sub-c)=	2.745

t(star) < t(sub-c)

Accept Ho

FOREGROUND
ARSENIC, WELL 11D

Date	Actual	x	x2	delta	delta2
18-Mar-91	5.6	5.6	31.36	0.05	0.0025
13-Jun-91	5.0	5.0	25	0.05	0.0025
13-Jun-91	5.0	5.0	25	0.05	0.0025
13-Jun-91	4.5	4.5	20.25	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	20.1000
SUM(x2)	101.6100
SUM(delta2)	0.0100
MEAN=	5.0250
LLVOM=	0.0006
VAR(x)=S2=	0.2036
s2/n=	0.0509
W=	0.0509
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	30
d.f.=	29
t=	2.462
W=	0.9564545977
MEAN=	7.28

STATISTIC:

alpha=	0.01
t(star)=	-2.247
t(sub-c)=	2.567

t(star) < t(sub-c)

Accept Ho

FOREGROUND
ARSENIC, WELL 12B

Date	Actual	x	x2	delta	delta2
18-Mar-91	6.4	6.4	40.96	0.05	0.0025
13-Jun-91	6.6	6.6	43.56	0.05	0.0025
13-Jun-91	7.7	7.7	59.29	0.05	0.0025
13-Jun-91	7.9	7.9	62.41	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	28.6000
SUM(x2)	206.2200
SUM(delta2)	0.0100
MEAN=	7.1500
LLVOM=	0.0006
VAR(x)=S2=	0.5778
s2/n=	0.1444
W=	0.1444
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	30
d.f.=	29
t=	2.462
W=	0.9564545977
MEAN=	7.28

STATISTIC:

alpha=	0.01
t(star)=	-0.124
t(sub-c)=	2.735

t(star) < t(sub-c)

Accept Ho

FOREGROUND
ARSENIC, WELL 13A

Date	Actual	x	x2	delta	delta2
18-Mar-91	4.0	4.0	16	0.05	0.0025
13-Jun-91	3.0	3.0	9	0.05	0.0025
13-Jun-91	5.6	5.6	31.36	0.05	0.0025
13-Jun-91	7.0	7.0	49	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	19.6000
SUM(x2)	105.3600
SUM(delta2)	0.0100
MEAN=	4.9000
LLVOM=	0.0006
VAR(x)=S2=	3.1078
s2/n=	0.7769
W=	0.7769
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	30
d.f.=	29
t=	2.462
W=	0.9564545977
MEAN=	7.28

STATISTIC:

alpha=	0.01
t(star)=	-1.808
t(sub-c)=	3.394

t(star) < t(sub-c)

Accept Ho

FOREGROUND
ARSENIC, WELL 13B

Date	Actual	x	x2	delta	delta2
18-Mar-91	5.2	5.2	27.04	0.05	0.0025
13-Jun-91	4.6	4.6	21.16	0.05	0.0025
13-Jun-91	5.7	5.7	32.49	0.05	0.0025
13-Jun-91	5.7	5.7	32.49	0.05	0.0025

FOREGROUND:

	4
SUM(x)	21.2000
SUM(x2)	113.1800
SUM(delta2)	0.0100
MEAN=	5.3000
LLVOM=	0.0006
VAR(x)=S2=	0.2744
s2/n=	0.0686
W=	0.0686
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	30
d.f.=	29
t=	2.462
W=	0.9564545977
MEAN=	7.28

STATISTIC:

alpha=	0.01
t(star)=	-1.956
t(sub-c)=	2.601

t(star) < t(sub-c)

Accept Ho

THIRD QUARTER 1991
NEW CALCULATED MEAN BACKGROUND

ARSENIC
Wells: MW-1,MW-1B,MW-1C,MW-17A,MW-17B
BACKGROUND

	Date	Actual	x	x2	delta	delta2
MW-1	15-Aug-91	<1	0.5	0.25	0.5	0.25
	19-Sep-91	<1	0.5	0.25	0.5	0.25
	16-Oct-91	<1	0.5	0.25	0.5	0.25
	13-Nov-91	<1	0.5	0.25	0.5	0.25
	13-Dec-91	<1	0.5	0.25	0.5	0.25
	07-Jan-92	<1	0.5	0.25	0.5	0.25
MW-1B	15-Aug-91	5	5	25	0.5	0.25
	19-Sep-91	5.5	5.5	30.25	0.05	0.0025
	16-Oct-91	6.2	6.2	38.44	0.05	0.0025
	13-Nov-91	4.1	4.1	16.81	0.05	0.0025
	03-Dec-91	5.4	5.4	29.16	0.05	0.0025
	07-Jan-92	4.6	4.6	29.16	0.05	0.0025
MW-1C	15-Aug-91	7.6	7.6	57.76	0.05	0.0025
	19-Sep-91	9	9	81	0.5	0.25
	16-Oct-91	<1	0.5	0.25	0.5	0.25
	13-Nov-91	8.8	8.8	77.44	0.05	0.0025
	03-Dec-91	10	10	10	0.5	0.25
	07-Jan-92	8.0	8.0	64	0.05	0.0025
MW-17A	15-Aug-91	7.4	7.4	54.76	0.5	0.25
	19-Sep-91	8.6	8.6	73.96	0.05	0.0025
	16-Oct-91	8.5	8.5	72.25	0.05	0.0025
	13-Nov-91	7.4	7.4	54.76	0.05	0.0025
	03-Dec-91	8.3	8.3	68.89	0.05	0.0025
	07-Jan-92	5.5	5.5	30.25	0.05	0.0025
MW-17B	15-Aug-91	14	14	196	0.5	0.25
	19-Sep-91	17	17	289	0.5	0.25
	16-Oct-91	16	16	256	0.5	0.25
	13-Nov-91	15	15	225	0.5	0.25
	03-Dec-91	19	19	361	0.5	0.25
	07-Jan-92	14	14	196	0.5	0.25

BACKGROUND:	
n=	30
SUM(x)	218.4000
SUM(x2)	2338.6400
SUM(delta2)	4.2825
MEAN=	7.2800
LLVOM=	0.0357
VAR(x)=S2=	25.8661
s2/n=	0.8622
W=	0.8622
d.f.=	29
t=	2.462
alpha=	0.01

FOREGROUND
ARSENIC, WELL 11A

Date	Actual	x	x2	delta	delta2
13-Jun-91	1.7	1.7	2.89	0.05	0.0025
19-Sep-91	2.3	2.3	5.29	0.05	0.0025
19-Sep-91	1.8	1.8	3.24	0.05	0.0025
19-Sep-91	1.7	1.7	2.89	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	7.5000
SUM(x2)	14.3100
SUM(delta2)	0.0100
MEAN=	1.8750
LLVOM=	0.0006
VAR(x)=S2=	0.0836
s2/n=	0.0209
W=	0.0209
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	30
d.f.=	29
t=	2.462
W=	0.8622017241
MEAN=	7.28

STATISTIC:

alpha=	0.01
t(star)=	-5.752
t(sub-c)=	2.511

t(star) < t(sub-c)

Accept Ho

FOREGROUND
ARSENIC, WELL 11B

Date	Actual	x	x2	delta	delta2
13-Jun-91	2.6	2.6	6.76	0.05	0.0025
19-Sep-91	3.5	3.5	12.25	0.05	0.0025
19-Sep-91	1.9	1.9	3.61	0.05	0.0025
19-Sep-91	3.7	3.7	13.69	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	11.7000
SUM(x2)	36.3100
SUM(delta2)	0.0100
MEAN=	2.9250
LLVOM=	0.0006
VAR(x)=S2=	0.6969
s2/n=	0.1742
W=	0.1742
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	30
d.f.=	29
t=	2.462
W=	0.8622017241
MEAN=	7.28

STATISTIC:

alpha=	0.01
t(star)=	-4.278
t(sub-c)=	2.812

t(star) < t(sub-c)

Accept Ho

FOREGROUND
ARSENIC, WELL 11D

Date	Actual	x	x2	delta	delta2
13-Jun-91	5.0	5.0	25	0.05	0.0025
19-Sep-91	6.2	6.2	38.44	0.05	0.0025
19-Sep-91	4.3	4.3	18.49	0.05	0.0025
19-Sep-91	4.7	4.7	22.09	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	20.2000
SUM(x2)	104.0200
SUM(delta2)	0.0100
MEAN=	5.0500
LLVOM=	0.0006
VAR(x)=S2=	0.6711
s2/n=	0.1678
W=	0.1678
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	30
d.f.=	29
t=	2.462
W=	0.8622017241
MEAN=	7.28

STATISTIC:

alpha=	0.01
t(star)=	-2.197
t(sub-c)=	2.801

t(star) < t(sub-c)

Accept Ho

FOREGROUND
ARSENIC, WELL 12B

Date	Actual	x	x2	delta	delta2
13-Jun-91	6.6	6.6	43.56	0.05	0.0025
19-Sep-91	6.7	6.7	44.89	0.05	0.0025
19-Sep-91	6.6	6.6	43.56	0.05	0.0025
19-Sep-91	6.3	6.3	39.69	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	26.2000
SUM(x2)	171.7000
SUM(delta2)	0.0100
MEAN=	6.5500
LLVOM=	0.0006
VAR(x)=S2=	0.0311
s2/n=	0.0078
W=	0.0078
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	30
d.f.=	29
t=	2.462
W=	0.8622017241
MEAN=	7.28

STATISTIC:

alpha=	0.01
t(star)=	-0.783
t(sub-c)=	2.481

t(star) < t(sub-c)

Accept Ho

FOREGROUND
ARSENIC, WELL 13A

Date	Actual	x	x2	delta	delta2
13-Jun-91	3.0	3.0	9	0.05	0.0025
19-Sep-91	4.0	4.0	16	0.05	0.0025
19-Sep-91	4.1	4.1	16.81	0.05	0.0025
19-Sep-91	3.9	3.9	15.21	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	15.0000
SUM(x2)	57.0200
SUM(delta2)	0.0100
MEAN=	3.7500
LLVOM=	0.0006
VAR(x)=S2=	0.2578
s2/n=	0.0644
W=	0.0644
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	30
d.f.=	29
t=	2.462
W=	0.8622017241
MEAN=	7.28

STATISTIC:

alpha=	0.01
t(star)=	-3.667
t(sub-c)=	2.607

t(star) < t(sub-c)
Accept Ho

FOREGROUND
ARSENIC, WELL 13B

Date	Actual	x	x2	delta	delta2
13-Jun-91	4.6	4.6	21.16	0.05	0.0025
19-Sep-91	5.4	5.4	29.16	0.05	0.0025
19-Sep-91	4.8	4.8	23.04	0.05	0.0025
19-Sep-91	5.4	5.4	29.16	0.05	0.0025

FOREGROUND:

	4
SUM(x)	20.2000
SUM(x2)	102.5200
SUM(delta2)	0.0100
MEAN=	5.0500
LLVOM=	0.0006
VAR(x)=S2=	0.1711
s2/n=	0.0428
W=	0.0428
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	30
d.f.=	29
t=	2.462
W=	0.8622017241
MEAN=	7.28

STATISTIC:

alpha=	0.01
t(star)=	-2.344
t(sub-c)=	2.560

t(star) < t(sub-c)
Accept Ho

FOURTH QUARTER 1991
NEW CALCULATED MEAN BACKGROUND

ARSENIC
Wells : MW-1,MW-1B,MW-1C,MW-17A,MW-17B
BACKGROUND

	Date	Actual	x	x2	delta	delta2
MW-1	15-Aug-91	<1	0.5	0.25	0.5	0.25
	19-Sep-91	<1	0.5	0.25	0.5	0.25
	16-Oct-91	<1	0.5	0.25	0.5	0.25
	13-Nov-91	<1	0.5	0.25	0.5	0.25
	03-Dec-91	<1	0.5	0.25	0.5	0.25
	07-Jan-92	<1	0.5	0.25	0.5	0.25
MW-1B	15-Aug-91	5	5	25	0.5	0.25
	19-Sep-91	5.5	5.5	30.25	0.05	0.0025
	16-Oct-91	6.2	6.2	38.44	0.05	0.0025
	13-Nov-91	4.1	4.1	16.81	0.05	0.0025
	03-Dec-91	5.4	5.4	29.16	0.05	0.0025
	07-Jan-92	4.6	4.6	21.16	0.05	0.0025
MW-1C	15-Aug-91	7.6	7.6	57.76	0.05	0.0025
	19-Sep-91	9	9	81	0.5	0.25
	16-Oct-91	<1.0	0.5	0.25	0.5	0.25
	13-Nov-91	8.8	8.8	77.44	0.05	0.0025
	03-Dec-91	10	10	100	0.5	0.25
	07-Jan-92	8.0	8.0	64	0.05	0.0025
MW-17A	15-Aug-91	7.4	7.4	54.76	0.5	0.25
	19-Sep-91	8.6	8.6	73.96	0.05	0.0025
	16-Oct-91	8.5	8.5	72.25	0.05	0
	13-Nov-91	7.4	7.4	54.76	0.05	0.0025
	03-Dec-91	8.3	8.3	68.89	0.05	0.0025
	07-Jan-92	5.5	5.5	30.25	0.05	0.0025
MW-17B	15-Aug-91	14	14	196	0.5	0.25
	19-Sep-91	17	17	289	0.5	0.25
	16-Oct-91	16	16	256	0.5	0.25
	13-Nov-91	15	15	225	0.5	0.25
	03-Dec-91	19	19	361	0.5	0.25
	07-Jan-92	14	14	196	0.5	0.25

BACKGROUND:	
n=	30
SUM(x)	218.4000
SUM(x2)	2420.6400
SUM(delta2)	4.2800
MEAN=	7.2800
LLVOM=	0.0357
VAR(x)=S2=	28.6936
s2/n=	0.9565
W=	0.9565
d.f.=	29
t=	2.462
alpha=	0.01

FOREGROUND
ARSENIC, WELL 6A

Date	Actual	x	x2	delta	delta2
19-Sep-91	25	25	625	0.5	0.25
03-Dec-91	34	34	1156	0.5	0.25
03-Dec-91	31	31	961	0.5	0.25
03-Dec-91	34	34	1156	0.5	0.25

FOREGROUND:

n=	4
SUM(x)	124.0000
SUM(x2)	3898.0000
SUM(delta2)	1.0000
MEAN=	31.0000
LLVOM=	0.0625
VAR(x)=S2=	18.1111
s2/n=	4.5278
W=	4.5278
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	30
d.f.=	29
t=	2.462
W=	0.9564536398
MEAN=	7.28

STATISTIC:

alpha=	0.01
t(star)=	10.129
t(sub-c)=	4.178

t(star >or= t(sub-c)

Reject Ho in favor of Hi

FOREGROUND
ARSENIC, WELL 11A

Date	Actual	x	x2	delta	delta2
19-Sep-91	2.3	2.3	5.29	0.05	0.0025
03-Dec-91	3.2	3.2	10.24	0.05	0.0025
03-Dec-91	3.0	3.0	9	0.05	0.0025
03-Dec-91	2.4	2.4	5.76	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	10.9000
SUM(x2)	30.2900
SUM(delta2)	0.0100
MEAN=	2.7250
LLVOM=	0.0006
VAR(x)=S2=	0.1969
s2/n=	0.0492
W=	0.0492
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	30
d.f.=	29
t=	2.462
W=	0.9564536398
MEAN=	7.28

STATISTIC:

alpha=	0.01
t(star)=	-4.542
t(sub-c)=	2.564

t(star) < t(sub-c)

Accept Ho

FOREGROUND
ARSENIC, WELL 11B

Date	Actual	x	x2	delta	delta2
19-Sep-91	3.5	3.5	12.25	0.05	0.0025
03-Dec-91	5.8	5.8	33.64	0.05	0.0025
03-Dec-91	6.6	6.6	43.56	0.05	0.0025
03-Dec-91	4.8	4.8	23.04	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	20.7000
SUM(x2)	112.4900
SUM(delta2)	0.0100
MEAN=	5.1750
LLVOM=	0.0006
VAR(x)=S2=	1.7903
s2/n=	0.4476
W=	0.4476
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	30
d.f.=	29
t=	2.462
W=	0.9564536398
MEAN=	7.28

STATISTIC:

alpha=	0.01
t(star)=	-1.776
t(sub-c)=	3.125

t(star) < t(sub-c)

Accept Ho

FOREGROUND
ARSENIC, WELL 11D

Date	Actual	x	x2	delta	delta2
19-Sep-91	6.2	6.2	38.44	0.05	0.0025
03-Dec-91	6.5	6.5	42.25	0.05	0.0025
03-Dec-91	7.1	7.1	50.41	0.05	0.0025
03-Dec-91	7.8	7.8	60.84	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	27.6000
SUM(x2)	191.9400
SUM(delta2)	0.0100
MEAN=	6.9000
LLVOM=	0.0006
VAR(x)=S2=	0.5011
s2/n=	0.1253
W=	0.1253
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	30
d.f.=	29
t=	2.462
W=	0.9564536398
MEAN=	7.28

STATISTIC:

alpha=	0.01
t(star)=	-0.365
t(sub-c)=	2.703

t(star) < t(sub-c)

Accept Ho

FOREGROUND
ARSENIC, WELL 12B

Date	Actual	x	x2	delta	delta2
19-Sep-91	6.7	6.7	44.89	0.05	0.0025
03-Dec-91	8.3	8.3	68.89	0.05	0.0025
03-Dec-91	11.0	11.0	121	0.05	0.0025
03-Dec-91	9.9	9.9	98.01	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	35.9000
SUM(x2)	332.7900
SUM(delta2)	0.0100
MEAN=	8.9750
LLVOM=	0.0006
VAR(x)=S2=	3.5303
s2/n=	0.8826
W=	0.8826
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	30
d.f.=	29
t=	2.462
W=	0.9564536398
MEAN=	7.28

STATISTIC:

alpha=	0.01
t(star)=	1.250
t(sub-c)=	3.460

t(star) < t(sub-c)

Accept Ho

FOREGROUND
ARSENIC, WELL 13A

Date	Actual	x	x2	delta	delta2
19-Sep-91	4.0	4.0	16	0.05	0.0025
03-Dec-91	3.3	3.3	10.89	0.05	0.0025
03-Dec-91	5.7	5.7	32.49	0.05	0.0025
03-Dec-91	5.4	5.4	29.16	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	18.4000
SUM(x2)	88.5400
SUM(delta2)	0.0100
MEAN=	4.6000
LLVOM=	0.0006
VAR(x)=S2=	1.3011
s2/n=	0.3253
W=	0.3253
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	30
d.f.=	29
t=	2.462
W=	0.9564536398
MEAN=	7.28

STATISTIC:

alpha=	0.01
t(star)=	-2.367
t(sub-c)=	2.990

t(star) < t(sub-c)

Accept Ho

FOREGROUND
ARSENIC, WELL 13B

Date	Actual	x	x2	delta	delta2
19-Sep-91	5.4	5.4	29.16	0.05	0.0025
03-Dec-91	5.4	5.4	29.16	0.05	0.0025
03-Dec-91	26.0	26.0	676	0.05	0.0025
03-Dec-91	7.1	7.1	50.41	0.05	0.0025

FOREGROUND:

n=	4
SUM(x)	43.9000
SUM(x2)	784.7300
SUM(delta2)	0.0100
MEAN=	10.9750
LLVOM=	0.0006
VAR(x)=S2=	100.9769
s2/n=	25.2442
W=	25.2442
d.f.=	3
t=	4.541
alpha=	0.01

BACKGROUND:

n=	30
d.f.=	29
t=	2.462
W=	0.9564536398
MEAN=	7.28

STATISTIC:

alpha=	0.01
t(star)=	0.722
t(sub-c)=	4.465

t(star) < t(sub-c)

Accept Ho

HYDROGEOLOGIC INVESTIGATION
AT THE MICHIGAN SEAMLESS DIVISION
SOUTH LYON, MICHIGAN

February 1, 1984

Prepared by:

Environmental Research Group, Inc.
117 North First Street
Ann Arbor, Michigan

For:

Michigan Seamless Division
Quanex Corporation
South Lyon, Michigan

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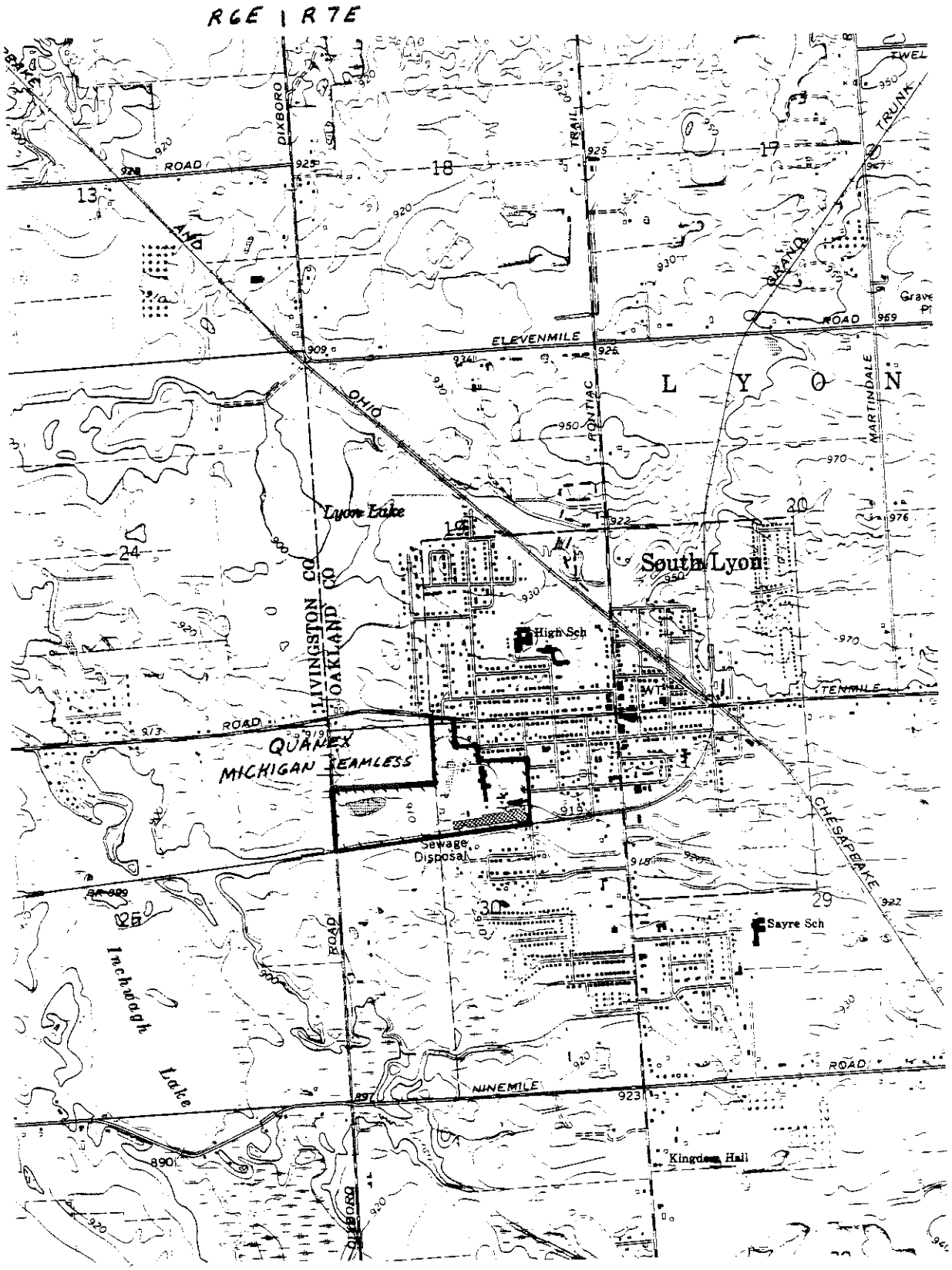
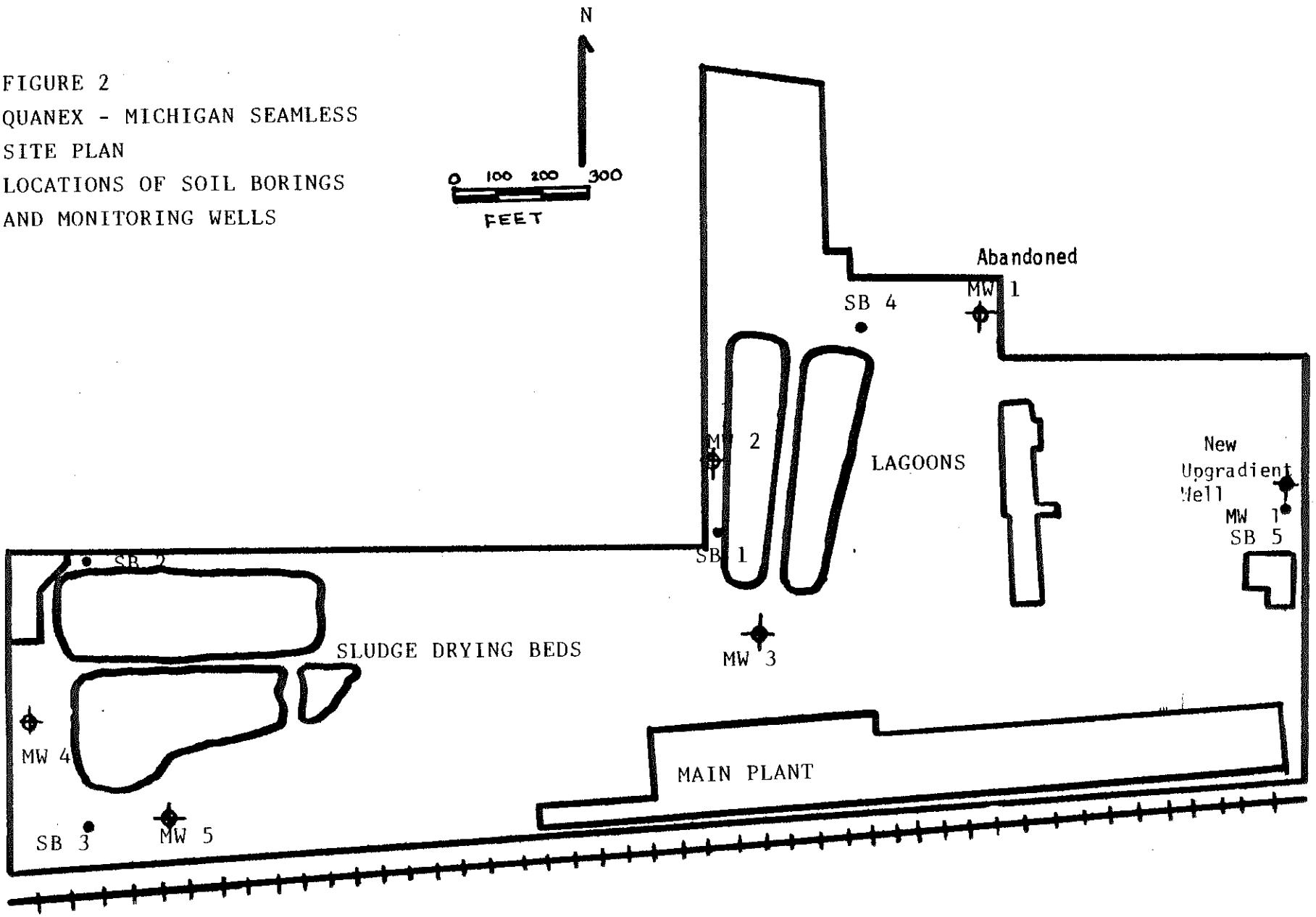


FIGURE 1
QUANEX - MICHIGAN SEAMLESS
LOCATION MAP
ADAPTED FROM USGS SOUTH LYON 7½ MINUTE QUADRANGLE

N

0 ½ 1
MILES

FIGURE 2
QUANEX - MICHIGAN SEAMLESS
SITE PLAN
LOCATIONS OF SOIL BORINGS
AND MONITORING WELLS



ENVIRONMENTAL RESEARCH GROUP, INC.

1.0 INTRODUCTION

1.1 Location

This report presents the findings of a hydrogeologic investigation at the Quanex-Michigan Seamless plant site in South Lyon, Michigan to begin implementation of a groundwater monitoring program in compliance with the federal Resource Conservation and Recovery Act (RCRA). The plant site is located on the southwest side of the city of South Lyon in the northwest quarter of the northeast quarter and the northeast quarter of the northwest quarter of Section 30 of Township 1 North, Range 7 East (Lyon Township). The site is bordered by residential areas on the north and east, by the Grand Trunk Western railroad right-of-way to the south, and wetlands and agricultural lands to the west. Surface water features in the vicinity are Yerkes Drain immediately to the south of the plant site, wetlands along the western edges of the site, and Inchwagh Lake and surrounding wetlands one-half mile west-southwest of the southwest corner of the site (Figure 1).

1.2 Process Generated Waste

In the production of seamless steel tubing, Michigan Seamless utilizes pickling liquors containing primarily sulfuric acid. Process waters from these operations are neutralized with the addition of lime at a treatment plant and then pumped to two lagoons to the north of the main plant (Figure 2). Treated water enters the east lagoon at an inlet in the southwest corner and overflows to the west lagoon from an outlet in the northwest corner. The bottom elevation of the lagoons is at 909.5' MSL. The elevation of the top of the lagoon's berms is at 919.5' MSL. Although the surface water elevation in the lagoons can theoretically fluctuate between 909.5' and 919.5', it typically ranges between 913.0' and 914.0' as it is controlled by an adjustable outlet structure. When water is discharged from the lagoons, it flows into a drainage ditch and must flow through a measuring flume before reaching Yerkes drain. This discharge is monitored and regulated under conditions of a National Pollutant Discharge Elimination system (NPDES) permit. Sludge resulting from the neutralization process is occasionally removed from the lagoons and placed in drying beds near the west end of the site. Final closure plans for the site specify removal of off-site disposal of this material.

1.3 Regulatory Requirements

Regulations established under RCRA (40 CFR Part 265, Subpart F) require implementation of a groundwater monitoring system for these hazardous waste facilities. This report presents the results of a study to determine the hydrogeological characteristics of the site, installation of monitoring wells, and plans for the first year of monitoring as stipulated under Section 265.92.

2.0 AREA GEOLOGY

The South Lyon area lies in a region of relatively complex glacial geology with surficial deposits alternating between till in ground moraine and stratified sand and gravel in outwash plains and other ice-contact features. To provide a general description of the hydrogeologic characteristics of the area, driller's logs from 43 domestic water wells

in Sections 19, 20, 29, and 30 of Lyon Township were reviewed along with logs of the South Lyon municipal wells located in the northeast quarter of the northeast quarter of Section 30 to the east of the Michigan Seamless plant site. These logs are attached as Appendix 1. Most logs show a stratigraphic pattern of a surface layer of water-bearing stratified sand and gravel underlain by a layer described by drillers as "blue clay", "hardpan", or "cemented gravel"; consisting of gray sandy clay and fine gravel. All but four logs of relatively shallow wells reported this layer. Most wells tap a second aquifier of stratified sand and gravel underlying the clay layer. The clay layer is apparently continuous throughout the area, however, it is quite possible that there are discontinuities or other hydraulic connections between the aquifers. Surface and static water level elevations for each well were estimated based on a topographic map. These elevations and the topographic contours indicate groundwater flow in an east-to-west direction, discharging to lakes and wetlands in Sections 24, 25, and 26 in Green Oak Township (T1N, R6E) to the west of South Lyon.

3.0 SITE GEOLOGY

Geologic and hydrogeologic characteristics of the site were determined by a series of soil borings, installation of monitoring wells, and measurement of groundwater elevations. A series of five soil borings was drilled on August 29, 1983 at the locations shown on Figure 2. A solid-stem auger rig was used to drill to depths ranging from 25 to 50 feet. Logs of these borings are in Table I.

Surficial materials on the site consist of stratified sand and gravel ranging from 26 feet to more than 50 feet in thickness. A cut in a bank along the north fence near the west side of the site shows these materials in place displaying cross-bedding typical of glacial outwash deposits. In borings #2, #3, #4, and #5, a layer of gray sandy clay was encountered at depths ranging from 21.3 to 28 feet. This layer was penetrated 7 feet in Boring #2; it was not fully penetrated in any of the borings. The water table was encountered at depths ranging from 3 feet in boring #3 near the west end of the site to 12.4 feet in Boring #1 at the southwest corner of the west lagoon.

4.0 WELL INSTALLATION

Monitoring wells were installed on September 29, 1983 at the locations shown on Figure 2. A new upgradient well was installed on December 22, 1983 after MDNR's review and upon their recommendation. These wells were constructed utilizing galvanized casing and stainless steel screens 3 feet in length. Casings were cleaned to remove cutting oil residues before wells were installed. The annular space (i.e., the space between the bore hole and well casing) above the sampling depth was filled with a bentonite slurry up to 6 inches from the surface. A concrete collar was poured around the casing. Locking well caps are in place on all monitoring wells and on any abandoned wells. Each well was installed with the top of the screen 5 feet below the water table. This depth was selected to intersect approximately the upper third of the saturated thickness above the clay layer. Although no clay was encountered in Boring #1 at the west edge of the west lagoon, the placement of the screen for monitoring well #2 is consistent with that of the other four wells. Given the proximity of the site to groundwater discharge areas, it is assumed that groundwater flow is relatively shallow and that the monitoring wells at the selected locations and depths will detect any contaminants transported in this flow system.

TABLE 1

LOGS OF SOIL BORINGS

HARTLEY & ASSOCIATES, P.C.

8821 KRATAGE AVENUE — UNION LAKE, MICHIGAN 48085

TEST BORING REPORT

BORING No. 1

Ground Surface Elev. ~920

Datum

Project Quanex Plant
S. Lyon, Michigan

H & A Job No. 83-085

Client Environmental Research Group
Ann Arbor, Michigan

Date Drilled 8-29-83

Driller L. Hartley

Drilling Method: 4" Auger on A.T.V.

ELEV.	DEPTH IN FEET	SAMPLE TYPE	SAMPLE No.	STRATA CHANGE	SOIL CLASSIFICATION	W.L.	
	2			2.4	Medium Compact Dry Dark Brown Medium Sand FILL		
				3.4	Compact Dry Brown Coarse Gravel		
	4	SS	5 8 9	6.0	Medium Compact Dry Brown Medium Sand, with Streaks of Dry Silt		
	6						
	8				Medium Compact Moist Brown Medium Sand and Fine Gravel with Streaks of Black Chemical Residue		
	10	SS	8 10 8				
	12				Becomes Wet	▽	Water Level 12.4' at Completion.
	14	SS	4 3 4	14.2			
	16				Loose Wet Gray Medium Sand with Some Medium Gravel		
	18			18.0			
	20	SS	4 4 3		Loose Wet Brown Coarse Sand and Medium Gravel		
	22			22.0			
	24	SS	8 8 10		Medium Compact Wet Gray Coarse Sand and Medium Gravel		
	26				(Continued on Sheet 1-A)		

SAMPLE TYPES
S.S. - 2" O.D. Split Spoon Sample
L.S.-Sectional Liner Sample
A.S.-Auger Sample
C.C.P.-Continuous Cone Penetration Test

"No"-Number of Blows Required to Drive Sampler into Soil in 6" Depth Increments, using 140 lb Hammer Dropping 30".
(12" Depth Increments during C.C.P. Tests)

W.L.-Water Level
w - Moisture Content, %
qu - Unconfined Compressive Strength in P.S.F.
nd - Natural Density in P.C.F.

HARTLEY & ASSOCIATES, P. C.

8821 KRATAGE AVENUE UNION LAKE, MICHIGAN 48085

TEST BORING REPORT

BORING No. 1 Continued

Ground Surface Elev.

Datum

Project Quanex Plant
S. Lyon, Michigan

H & A Job No. 83-085

Client Environmental Research Group
Ann Arbor, Michigan

Date Drilled 8-29-83

Driller L. Hartley

Drilling Method: 4" Auger on A.T.V.

ELEV.	DEPTH IN FEET	SAMPLE TYPE	SAMPLE No.	STRATA CHANGE	SOIL CLASSIFICATION	W. L.
	28	SS	8 12 8	30.5	Medium Compact Wet Gray Coarse Sand and Medium Gravel	
	30					
	32			32.5	Medium Compact Wet Gray Silty Medium to Coarse Sand with Streaks of Sandy Clay	
	34	AS			Medium Compact Wet Gray Medium to Coarse Sand with Some Coarse Gravel	
	36					
	38	AS				
	40					
	42					
	44	AS				
	46					
	48	AS		50.0		
	50				End of Boring	

SAMPLE TYPES
S.S. - 2" O.D. Split Spoon Sample
L.S.-Sectional Liner Sample
A.S.-Auger Sample
C.C.P.-Continuous Cone Penetration Test

"No"-Number of Blows Required to Drive Sampler into Soil in 6" Depth Increments, using 140 lb Hammer Dropping 30".
(12" Depth Increments during C.C.P. Tests)

W.L.-Water Level
w - Moisture Content, %
qu - Unconfined Compressive Strength in P.S.F.
nd - Natural Density in P.C.F.

HARTLEY & ASSOCIATES, P.C.

8821 KRATAGE AVENUE — UNION LAKE, MICHIGAN 48085

TEST BORING REPORT

BORING No. 2

Ground Surface Elev. ~910

Datum

Project Quanex Plant
S. Lyon, Michigan

H & A Job No. 83-085

Client Environmental Research Group
Ann Arbor, Michigan

Date Drilled 8-29-83

Driller L. Hartley

Drilling Method: 4" Auger on A.T.V.

ELEV.	DEPTH IN FEET	SAMPLE TYPE	SAMPLE No.	STRATA CHANGE	SOIL CLASSIFICATION	W.L.	
	5	SS	6 6 7	9.3	Medium Compact Dry Brown Medium Sand	▽	Caved-in at 6.7' Water Level 8.0' (Measued from Augers)
	10	SS	7 7 7	13.0	Medium Compact Wet Dark Gray Medium to Coarse Sand ***		***Petroleum Odor
	15	SS	10 11 10	22.0	Medium Compact Wet Gray Coarse Sand and Fine to Medium Gravel		
	20	AS		23.0	Firm Wet Gray Sandy Clay		
	25	AS		28.0	Loose Wet Gray Coarse Sand and Medium Gravel		
	30	AS		31.2	Dense Moist Gray Sandy/Gravelly Claypan		
				34.0	Hard Moist Gray Sandy/Gravelly Clay		
	35	AS		35.0	Dense Moist Gray Sandy/Gravelly Claypan		
					End of Boring		

SAMPLE TYPES
S.S. - 2" O.D. Split Spoon Sample
L.S.-Sectional Liner Sample
A.S.-Auger Sample
C.C.P.-Continuous Cone Penetration Test

"No"-Number of Blows Required to Drive Sampler into Soil in 6" Depth Increments, using 140 lb Hammer Dropping 30".
(12" Depth Increments during C.C.P. Tests)

W.L.-Water Level
w - Moisture Content, %
qu - Unconfined Compressive Strength in P.S.F.
nd - Natural Density in P.C.F.

HARTLEY & ASSOCIATES, P.C.

8821 KRATAGE AVENUE — UNION LAKE, MICHIGAN 48085

TEST BORING REPORT

BORING No. 3

Ground Surface Elev. ~905

Datum

Project Quanex Plant
S. Lyon, Michigan

H & A Job No. 83-085

Client Environmental Research Group
Ann Arbor, Michigan

Date Drilled 8-29-83

Driller L. Hartley

Drilling Method: 4" Auger on A.T.V.

ELEV.	DEPTH IN FEET	SAMPLE TYPE	SAMPLE No.	STRATA CHANGE	SOIL CLASSIFICATION	W. L.	
				1.0	Loose Dry Dark Brown Sand Topsoil		
	2			2.5	Loose Dry Brown Medium Sand		
	4	SS	2 1 3	4.0	Loose Wet Brown Silty Medium Sand	▽	Water Level 3.0' at Completion.
	6			6.2	Loose Wet Brown Fine to Medium Gravel		
	8	SS	6 7 8	12.0	Firm Moist Gray Sandy Clay		
	10						
	12						
	14	SS	2 1 1	16.0	Very Loose Wet Gray Clayey Medium Sand		
	16						
	18	SS	5 14 7	19.0	Loose Wet Gray Coarse Sand and Fine Gravel, with Some Coarse Gravel		
	20			21.3	Firm Moist Gray Sandy Clay		
	22			22.5	Hard Moist Gray Sandy Claypan		
	24	SS	6 3 3	25.0	Loose Wet Gray Coarse Sand and Medium Gravel		
	26				End of Boring		

SAMPLE TYPES
S.S. - 2" O.D. Split Spoon Sample
L.S.-Sectional Liner Sample
A.S.-Auger Sample
C.C.P.-Continuous Cone Penetration Test

"No"-Number of Blows Required to Drive Sampler into Soil in 6" Depth Increments, using 140 lb Hammer Dropping 30".
(12" Depth Increments during C.C.P. Tests)

W.L.-Water Level
w - Moisture Content, %
qu - Unconfined Compressive Strength in P.S.F.
nd - Natural Density in P.C.F.

HARTLEY & ASSOCIATES, P.C.

8621 KRATAGE AVENUE — UNION LAKE, MICHIGAN 48085

TEST BORING REPORT

BORING No. 4

Ground Surface Elev. ~915

Datum

Project Quanex Plant
S. Lyon, Michigan

H & A Job No. 83-085

Client Environmental Research Group
Ann Arbor, Michigan

Date Drilled 8-29-83

Driller L. Hartley

Drilling Method: 4" Auger on A.T.V.

ELEV.	DEPTH IN FEET	SAMPLE TYPE	SAMPLE No.	STRATA CHANGE	SOIL CLASSIFICATION	W.L.	
				0.6	Loose Dry Dark Brown Sand Topsoil		
				3.0	Loose Moist Brown Medium Sand		
	5	SS	3 3 8	4.8	Loose Moist Gray-Brown Clayey Medium Sand		
	10	SS	3 5 7		Medium Compact Wet Brown Medium to Coarse Sand and Fine Gravel	▽	Water Level 6.5' at Completion.
	15	SS	4 8 11				
	20	SS	8 9 11	19.0	Medium Compact Wet Gray Coarse Sand and Medium Gravel		
	25	SS	8 9 8	24.2	Medium Compact Wet Gray Sandy Silt, with Streaks of Sand and Fine Gravel		
	30	SS	8 9 Bounce	27.5	Stiff Moist Gray Sandy Clay		
				29.5	End of Boring-- Penetration Test Sampler Refusal on Cobble or Boulder.		

SAMPLE TYPES
S.S. - 2" O.D. Split Spoon Sample
L.S.-Sectional Liner Sample
A.S.-Auger Sample
C.C.P.-Continuous Cone Penetration Test

"No"-Number of Blows Required to Drive Sampler into Soil in 6" Depth Increments, using 140 lb Hammer Dropping 30".
(12" Depth Increments during C.C.P. Tests)

W.L.-Water Level
w - Moisture Content, %
qu - Unconfined Compressive Strength in P.S.F.
nd - Natural Density in P.C.F.

HARTLEY & ASSOCIATES, P.C.

8821 KRATAGE AVENUE — UNION LAKE, MICHIGAN 48085

TEST BORING REPORT

BORING No. 5

Ground Surface Elev. ~920

Datum

Project Quanex Plant
S. Lyon, Michigan

H & A Job No. 83-085

Client Environmental Research Group
Ann Arbor, Michigan

Date Drilled 8-29-83

Driller L. Hartley

Drilling Method: 4" Auger on A.T.V.

ELEV.	DEPTH IN FEET	SAMPLE TYPE	SAMPLE No.	STRATA CHANGE	SOIL CLASSIFICATION	W.L.	
				1.0	Loose Dry Gray Sandy Silt Topsoil FILL		
		SS	2 2 5	4.5	Loose Dry Dark Brown Silty Medium Sand FILL		
	5			9.2	Medium Compact Dry Brown Medium Sand		
	10	SS	7 6 8		Medium Compact Wet Gray Coarse Sand and Fine Gravel with Some Medium Gravel	▽	Water Level 9.7' at Completion.
	15	SS	4 6 7				
	20	SS	7 8 7	21.5			
				22.5	Firm Damp Gray Sandy Clay		
	25	SS	10 9 10	26.0	Medium Compact Wet Gray Sandy Silt		
	30	SS	4 5 6	30.0	Firm Moist Gray Very Sandy Clay		
					End of Boring		

SAMPLE TYPES
S.S. - 2" O.D. Split Spoon Sample
L.S.-Sectional Liner Sample
A.S.-Auger Sample
C.C.P.-Continuous Cone Penetration Test

"No"-Number of Blows Required to Drive Sampler into Soil in 6" Depth Increments, using 140 lb Hammer Dropping 30".
(12" Depth Increments during C.C.P. Tests)

W.L.-Water Level
w - Moisture Content, %
qu - Unconfined Compressive Strength in P.S.F.
nd - Natural Density in P.C.F.

5.0 GROUNDWATER

5.1 Existing Conditions

Top-of-casing elevations of the monitoring wells were measured by standard survey methods. Static water levels were measured by the wetted-tape method to the nearest .01 foot. These elevations are listed on Table 2. Groundwater elevation contours and direction of flow are shown on Figure 3. Groundwater flow across the site is in a westward direction, consistent with the apparent flow direction of the surrounding area, with some southward flow into Yerkes Drain.

The groundwater elevation measured in Monitoring Well #2 is significantly higher than those of the nearby wells. This is likely the result of the well's close proximity to the west settling pond. The well is, in fact, located on the berm of the pond and within 20 feet from the lagoon. MW #2 is more representative of conditions within the settling pond than of conditions occurring at the groundwater table. Although not ideal, this well is the only well which is capable of monitoring potential discharge to the west of the site and is thus included in the monitoring program.

The groundwater gradient across the site, as calculated from the differences in head between Monitoring Well #3 and Monitoring Wells #4 and #5, is .0017 ft/ft, or approximately 9 feet per mile.

5.2 Other Factors Affecting Groundwater

During late 1973 or early 1974 a fuel oil line under the main plant ruputured causing an estimated loss of 400,000 to 500,000 gallons of fuel oil. On March 19, 1974 a field investigator from the Michigan Water Resources Commission noticed an accumulation of oil in Yerkes Drain and in wetlands near the southwest corner of the site. Subsequent investigations by the Water Resources Commission, the Department of Natural Resources, and consultants retained by Michigan Seamless revealed the rupture in the fuel oil line and migration of fuel oil on the groundwater surface to Yerkes Drain. A remedial action plan was implemented involving the use of recovery pits, an interceptor drain, and recovery booms in Yerkes Drain. Fifteen monitoring wells were installed to monitor groundwater levels and the presence of fuel oil on the groundwater surface. Complete records of the recovery operations and monitoring of the fuel oil loss are in the files of the Groundwater Section of the Geological Survey Division of the DNR. The area affected by the fuel oil loss is shown on Figure 4. Water level information in the DNR files indicates groundwater flow in this area to the south-southwest directly into Yerkes Drain. Based on this information, it is unlikely that the fuel oil loss will have any effect on the monitoring program for the waste management facilities.

Table 2

Monitoring Well Elevations

Well Number	Top-of-Casing Elevation	Depth to Groundwater Below Top of Casing	Groundwater Elevation	3' Screen Elevation
1*	921.79 ft	12.14 ft	909.65 ft	903.46-900.46
2	921.39	8.71	912.68	902.14-899.14
3	915.26	9.59	905.67	902.13-899.13
4	908.21	5.38	902.83	898.21-895.21
5	909.41	5.96	903.45	898.47-895.47
1**	921.01	12.00	909.01	909.01-901.01

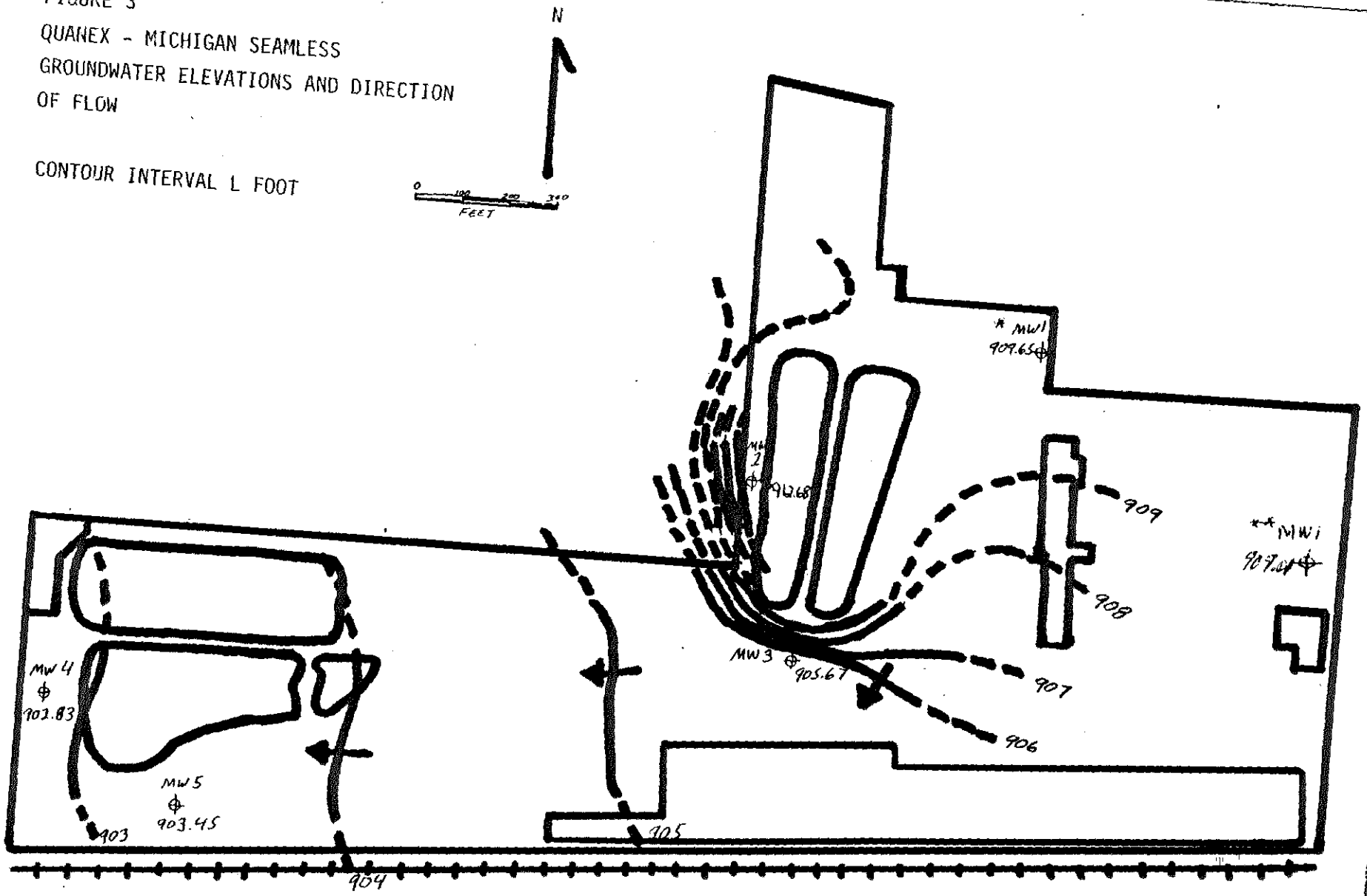
*This well was abandoned as an upgradient well because it was suspected of being affected by mounding of groundwater from the lagoons.

**This new well was installed on December 22, 1983.

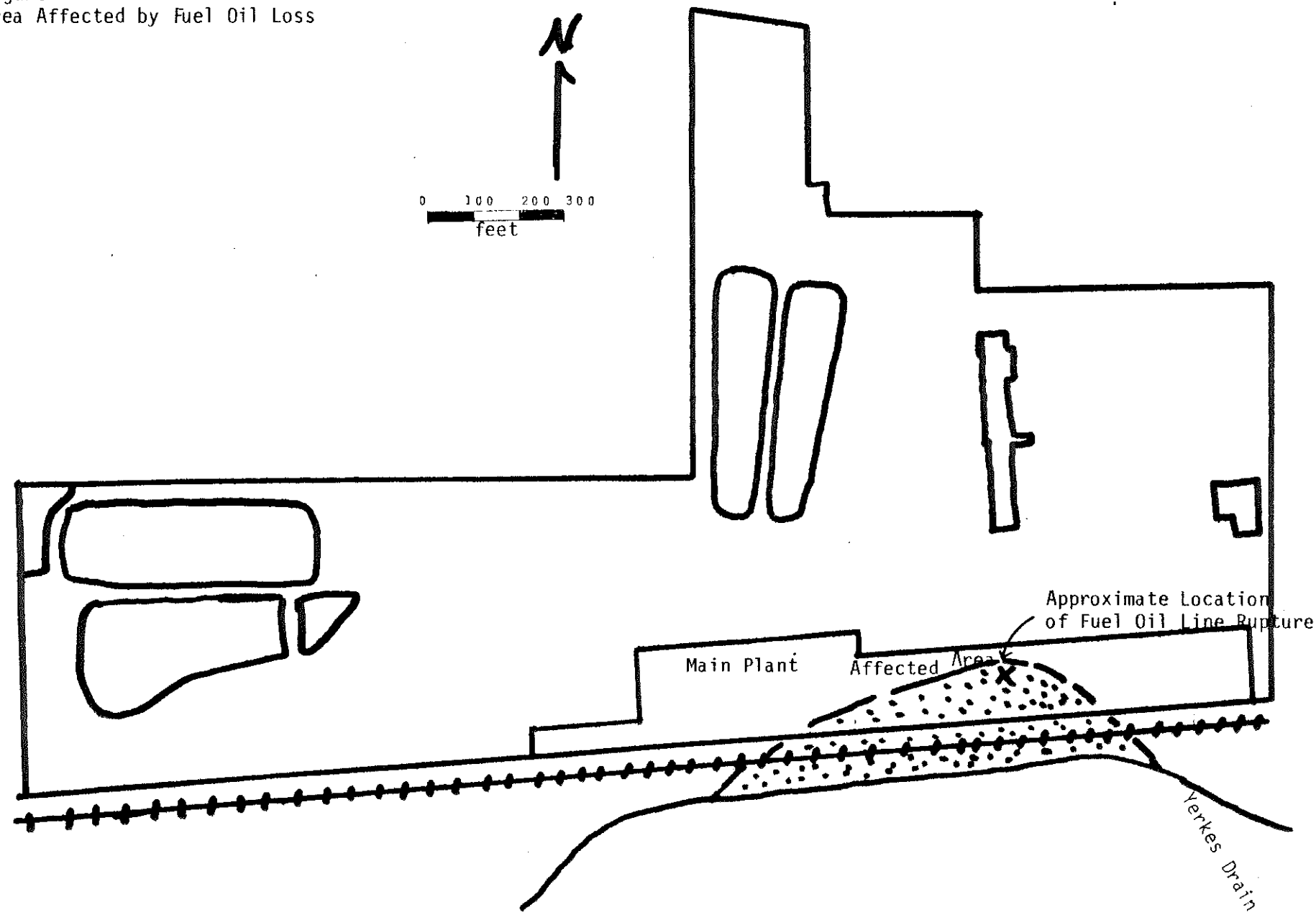
FIGURE 3

QUANEX - MICHIGAN SEAMLESS GROUNDWATER ELEVATIONS AND DIRECTION OF FLOW

CONTOUR INTERVAL 1 FOOT



Quanex - Michigan Seamless
Figure 4
Area Affected by Fuel Oil Loss



6.0 MONITORING PROGRAM

The first year monitoring program was revised upon consulting with the MDNR's Hazardous Waste Division as follows:

1. The original monitoring well #1 would be abandoned because it might possibly be affected by the lagoon's water quality.

2. A new upgradient well would be installed in the vicinity of soil boring #5 (accomplished on December 22, 1983).

3. Monitoring well #5 would be deleted from the first year program instead of the originally proposed deletion of well #2.

Thus, the wells that would be monitored are: the new upgradient well (MW #1), well #2, well #3, and well #4. These wells will be sampled quarterly in accordance with RCRA regulations for sampling of monitoring wells. Documentation of sampling methodology and chain-of-custody procedures will be strictly followed.

Samples will be analyzed for three groups of parameters: drinking water (Table 3), groundwater quality (Table 4), and indicators (Table 4). Indicator parameters will be sampled and analyzed in quadruplicate from each well during each quarter, as required by RCRA regulations. For the other parameters, a single sample will be collected and analyzed from each well during each quarter. All samples will be analyzed in accordance with EPA-approved methods.

Table 3

Drinking Water Parameters

Arsenic	Endrin
Barium	Lindane
Cadmium	Methoxychlor
Chromium	Toxaphene
Fluoride	2,4-D
Lead	2,4,5-TP Silvex
Mercury	Radium
Nitrate	Gross Alpha
Selenium	Gross Beta
Silver	Turbidity
	Total Coliform

Table 4

Annual Monitoring Parameters

Groundwater Quality:	
	Chloride
	Iron
	Manganese
	Phenol
	Sodium
	Sulfate
Indicators:	
	pH
	Specific Conductance
	Total Organic Carbon
	Total Organic Halides

APPENDIX 1

AREA WELL LOGS

GEOLOGICAL SURVEY SAMPLE No.

20-1

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

DEC 06 1972

SE/SW/SE

1 LOCATION OF WELL

County	Twp.	Fraction	Section No.	Town	Range
OAKLAND	LYON	SOUTH EAST ¼ ¼ ¼	20	South LYON N/S.	7 EAST E/W.

Distance And Direction from Road Intersections: 100 yds. E. MARTINDALE

OWNER No.

Street address & City of Well Location

3 OWNER OF WELL: JACK HOLLON

Address: 59380 Ten Mile Rd.

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
0 - 42' clay		
Sand mixed	42	42
42-49' gravel		
clay mixed	7	49
49-62 clay	13	62
62-81 clay		
gravel mixed	19	81
81-100 mixed		
clay gravel	19	100
100-119 clay	19	119
119-123 Water	4	123

ADDED INFO. BY DRILLER, ITEM No.

CORRECTED BY

LOCATION BY

4 WELL DEPTH: (completed) ft. Date of Completion

5 ☑ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Jetted ☐ Bored ☐

6 USE: ☑ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐

7 CASING: Diam. Threaded ☑ Welded ☐ Height: Above/Below surface ft. Weight lbs/ft. Drive Shoe? Yes ☐ No ☐

in. to ft. Depth

in. to ft. Depth

8 SCREEN: Type: Stainless steel Dia.: 4x4

Slot/Gauze 75 Length 4

Set between 119 ft. and 123 ft.

Fittings: K Packer screw fittings

9 STATIC WATER LEVEL 75 ft. below land surface

10 PUMPING LEVEL below land surface

ft. after 4 hrs. pumping 7 g.p.m.

ft. after hrs. pumping g.p.m.

11 WATER QUALITY in Parts Per Million:

Iron (Fe) Chlorides (Cl)

Hardness

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☐ Pitless Adapter ☐ 12" Above Grade

13 GROUTING: Well Grouted? ☐ Yes ☐ No

Material: ☐ Neat Cement ☐

Depth: From ft. to ft.

14 SANITARY: Nearest Source of possible contamination

60 feet NW Direction Septic Type

Well disinfected upon completion ☐ Yes ☐ No

15 PUMP: Manufacturer's Name

Model Number HP

Length of Drop Pipe ft. capacity G.P.M.

Type: ☐ Submersible ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

Well only replacement ~950 GW 875

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Huron Valley well del — REGISTERED BUSINESS NAME

0132 — REGISTRATION NO.

Address 605 Hickory ST Milford Mich

Signed [signature] — AUTHORIZED REPRESENTATIVE

Date 11-15-72

D67D 100M 6-66

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No.

MAR 31 1977

20-2

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

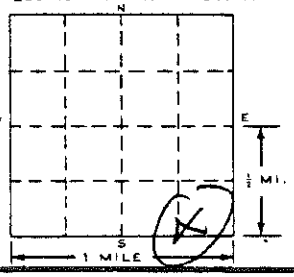
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town. Number	Range Number
Oakland	Lyon	SW ¼ SE ¼ SE ¼	20	1 N N/S.	7 E E/W.

Distance And Direction from Road Intersections

Street address & City of Well Location: Same

Locate with "X" in section below — Sketch Map:



Part of the S½ of the SE¼ of Sec. 20

3 OWNER OF WELL: Anthony J. VanOyen Jr.

Address: 59200 Ten Mile Rd. South Lyon, Mich.

4 WELL DEPTH: (completed) 161 ft. Date of Completion: Aug. 7, 1975

5 [X] Cable tool [ ] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Jetted [ ] Bored [ ]

6 USE: [X] Domestic [ ] Public Supply [ ] Industry [ ] Irrigation [ ] Air Conditioning [ ] Commercial [ ] Test Well [ ]

7 CASING: Threaded [X] Welded [ ] Diam. 4 in. to 157 ft. Depth; ___ in. to ___ ft. Depth

Height: Above/Below Surface ___ ft. Weight ___ lbs./ft. Drive Shoe? Yes [X] No [ ]

8 SCREEN: Johnson

Type: Stainless Dia.: 3 in.

Slot/Gauze 20 slot Length 4 ft.

Set between 157 ft. and 161 ft.

Fittings: nipple - k-pac - plug

9 STATIC WATER LEVEL 65 ft. below land surface

10 PUMPING LEVEL below land surface

___ ft. after ___ hrs. pumping ___ g.p.m.

___ ft. after ___ hrs. pumping ___ g.p.m.

11 WATER QUALITY in Parts Per Million:

Iron (Fe) ___ Chlorides (Cl) ___

Hardness ___ Other ___

12 WELL HEAD COMPLETION: [ ] In Approved Pit [ ] Pitless Adapter [X] 12" Above Grade

13 Well Grouted? [ ] Yes [X] No [ ] Neat Cement [ ] Bentonite [ ]

Depth: From ___ ft. to ___ ft.

14 Nearest Source of possible contamination

___ feet ___ Direction ___ Type

Well disinfected upon completion [X] Yes [ ] No

15 PUMP: [X] Not installed

Manufacturer's Name ___

Model Number ___ HP ___ Volts ___

Length of Drop Pipe ___ ft. capacity ___ G.P.M.

Type: [ ] Submersible [ ] Jet [ ] Reciprocating

2 FORMATION

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Brown clay	26	26
Blue clay/stoney	66	92
Gravel/little brown clay	48	140
Blue clay/stones	17	157
Sand/water	4	161
Pumped 45 gpm with		
4 in. plunger		

USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.

ADDED INFO BY DRILLER, ITEM NO. ~940

*CORRECTED BY E

**ADDITION BY GW 875

ELEVATION

DEPTH TO ROCK

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Lloyd L. Wyckoff — REGISTERED BUSINESS NAME

0705 — REGISTRATION NO.

Address 160 Polvadera - Union Lake, Mich. 48085

Signed [signature] AUTHORIZED REPRESENTATIVE

Date 3-3-76

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. [ ]

3 SEP 28 1979

20-3

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

NE 20

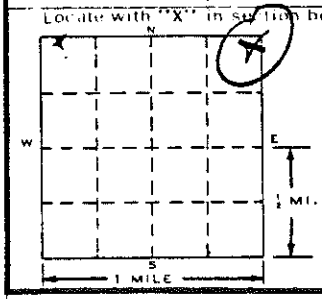
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Oakland	Lyon	~~NW 1/4 NW 1/4~~	29	1 N.~~S.~~	7 E.~~W.~~

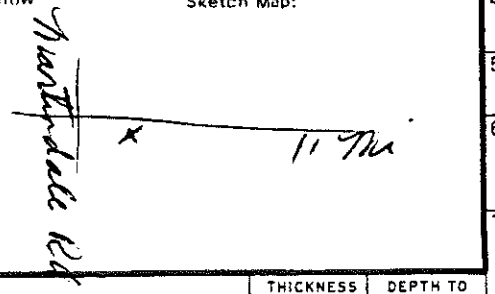
Distance And Direction from Road Intersections: 325' E. of Martindale Rd 125' S. of 11 Mile Rd

Street address & City of Well Location

Locate with "X" in section below



Sketch Map:



3 OWNER OF WELL: Vincent Stephenelli

Address: 3157 Merrill, Royal Oak, Mi 48073

4 WELL DEPTH: (completed) 84 ft. Date of Completion 8-25-78

5 ☒ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Jetted ☐ Bored ☐ ____

6 USE: ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐ ____

7 CASING: Threaded ☐ Welded ☐ Height: Above/~~Below~~ Surface 1 ft.

Diam. 4 in. to 84 ft. Depth; ____ in. to ____ ft. Depth. Weight 11 lbs./ft. Drive Shoe? Yes ☒ No ☐

8 SCREEN: Type Stainless Steel Dia.: 4"

Slot/~~Gauze~~ 15 Length 4'

Set between 80 ft. and 84 ft. 3x18" nipple

Fittings: K. packer & plug

9 STATIC WATER LEVEL 33 ft. below land surface

10 PUMPING LEVEL below land surface 33 ft. after 2 hrs. pumping 60 g.p.m.

____ ft. after ____ hrs. pumping ____ g.p.m.

11 WATER QUALITY in Parts Per Million:

Iron (Fe) ____ Chlorides (Cl) ____

Hardness ____ Other ____

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☒ Pitless Adapter ☒ 12" Above Grade

13 Well Grouted? ☐ Yes ☒ No ☐ Neat Cement ☐ Bentonite ☐ ____

Depth: From ____ ft. to ____ ft.

14 Nearest Source of possible contamination 75 feet N. Direction Septic Type

Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: ☐ Not installed

Manufacturer's Name Flint & Walling

Model Number 1BK7 HP 1/4 Volts 230

Length of Drop Pipe 42 ft. capacity 14 G.P.M.

Type: ☒ Submersible ☐ Jet ☐ Reciprocating

2 FORMATION

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Yellow Clay	6'	6'
Sandy yellow Clay	8'	14'
Blue Clay	56'	70'
Fine Sand	10'	80'
Coarse Sand	4'	84'

USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.

ADDED INFO BY DRILLER, ITEM NO. ~ 964

*CORRECTED BY

**ADDITION BY GW 931

ELEVATION

DEPTH TO ROCK

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Ray Harrison 0108

REGISTERED BUSINESS NAME REGISTRATION NO.

Address 1325 E. Lake Dr. Walled Lake Mi

Signed Ray D. Harrison Date 9-10-78

AUTHORIZED REPRESENTATIVE

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. 20-4

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

County	Twp.	Fraction	Section No.	Town	Range
Oakland	Lyon	~~SE~~ ¼ SE ¼ SE ¼	20	1 N/S.	R7E E/W.

Distance And Direction from Road Intersections: 200' north 59050-10 mi Rd. So. Lyon.

OWNER No.

Street address & City of Well Location

3 OWNER OF WELL: Wm. Peters.
Address 58620-10 mi Rd. So. Lyon. Mich 48178.

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Red Clay	30	30
sand W/ water	7	37
Blue clay	137	184
Water Gravel	6	190

4 WELL DEPTH: (completed) 190 ft. Date of Completion

5 [X] Cable tool [ ] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Jetted [ ] Bored [ ]

6 USE: [X] Domestic [ ] Public Supply [ ] Industry [ ] Irrigation [ ] Air Conditioning [ ] Commercial [ ] Test Well [ ]

7 CASING: Diam. 4 in. to ___ ft. Depth; Threaded [X] Welded [ ]; Height: Above/Below surface 12" above ft.; Weight 11 lbs/ft.; Drive Shoe? Yes [X] No [ ]

8 SCREEN: Type: Johnson Dia.: 4"
Slot/Gauze 18 Length 4'
Set between 190 ft. and 186 ft.
Fittings: Screwed W/ K.P.

9 STATIC WATER LEVEL 35 ft. below land surface

10 PUMPING LEVEL below land surface
80 ft. after 3 hrs. pumping 18 g.p.m.
35 ft. after 6 hrs. pumping ___ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) ___ Chlorides (Cl) ___
Hardness ___

12 WELL HEAD COMPLETION: [ ] In Approved Pit [X] Pitless Adapter [X] 12" Above Grade

13 GROUTING:
Well Grouted? [ ] Yes [X] No
Material: [ ] Neat Cement [ ]
Depth: From ___ ft. to ___ ft.

14 SANITARY:
Nearest Source of possible contamination 75 feet E Direction Septic Type
Well disinfected upon completion [X] Yes [ ] No

15 PUMP:
Manufacturer's Name Goulds
Model Number UEH05412 HP ½
Length of Drop Pipe 84 ft. capacity 10 G.P.M.
Type: [X] Submersible [ ] Jet [ ] Reciprocating

16 Remarks, elevation, source of data, etc.
ADDED INFO. BY DRILLER, ITEM NO. ~940 GW 905

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Arthur H Vradenburg — REGISTERED BUSINESS NAME
0398 — REGISTRATION NO.
Address 59550-9-mi rd South Lyon, Mich
Signed Arthur H Vradenburg Date May 17th
AUTHORIZED REPRESENTATIVE

7D 100M 6-66

FEB 2 [illegible] GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. [ ]

APR 2 8 1972

20-5

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

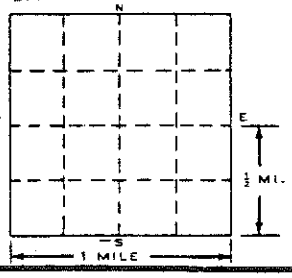
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
OAKLAND	LYON	S½ SW¼ SE¼	20	1 N/S X	7 E/W X

Distance And Direction from Road Intersections: 600' E. MARTINDALE ROAD ON N. SIDE OF 10 MILE ROAD

Street address & City of Well Location: SAME AS OWNER

Locate with "X" in section below — Sketch Map:



3 OWNER OF WELL: JOE SAWYER

Address: 59550 10 MILE ROAD SOUTH LYONS, MICHIGAN

4 WELL DEPTH: (completed) 53' ft. Date of Completion 4-12-72

5 [X] Cable tool [ ] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Jetted [ ] Bored [ ]

6 USE: [X] Domestic [ ] Public Supply [ ] Industry [ ] Irrigation [ ] Air Conditioning [ ] Commercial [ ] Test Well [ ]

7 CASING: Threaded [X] Welded [ ] Diam. 4 in. to 53 ft. Depth; ___ in. to ___ ft. Depth. Height: Above/Below Surface 1 ft. Weight 11 lbs./ft. Drive Shoe? Yes [X] No [ ]

8 SCREEN: Type: POLYETHELENE Dia.: 4" Slot/Gauze 10 Length 4' Set between 48 ft. and 53 ft. Fittings: PACKER BOTTOM AND MISC. FITTINGS

9 STATIC WATER LEVEL 40 ft. below land surface

10 PUMPING LEVEL below land surface 46 ft. after 4 hrs. pumping 15 g.p.m.; ___ ft. after ___ hrs. pumping ___ g.p.m.

11 WATER QUALITY in Parts Per Million: Iron (Fe) ___ Chlorides (Cl) ___ Hardness ___ Other ___

12 WELL HEAD COMPLETION: [ ] In Approved Pit [ ] Pitless Adapter [X] 12" Above Grade

13 Well Grouted? [ ] Yes [ ] No [ ] Neat Cement [ ] Bentonite [ ] ___ Depth: From ___ ft. to ___ ft.

14 Nearest Source of possible contamination 75 feet ___ Direction S. Tank Type. Well disinfected upon completion [X] Yes [ ] No

15 PUMP: [ ] Not installed NEW PUMP NOT INSTALLED. Manufacturer's Name ___ Model Number ___ HP ___ Volts ___ Length of Drop Pipe ___ ft. capacity ___ G.P.M. Type: [ ] Submersible [ ] Jet [ ] Reciprocating

2 FORMATION

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
TOP SOIL	1	1
SANDY CLAY	11	12
MIXED SAND AND GRAVEL DRY	33	45
WATER SAND	8	53

USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.

[illegible] DRILLER [illegible]

[illegible] BY

[illegible] BY

~950

GW910

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

ROBERTS DRILLING CO. — REGISTERED BUSINESS NAME

#0248 — REGISTRATION NO.

Address: 4730 E. M. 36 Pinckney 48169

Signed: [signature] — AUTHORIZED REPRESENTATIVE

Date: 4-15-72

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. SEP 28 1979

3

SEP 28 1979

20-6

WATER WELL RECORD

ACT 294 PA 1965

NE 20

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

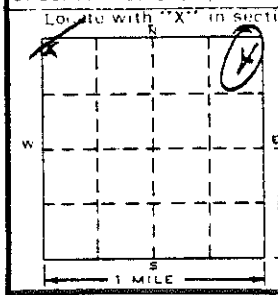
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Oakland	Lyon Twp	NW ¼ NW ¼ NW ¼	[illegible]	1 N/S	7 E/W

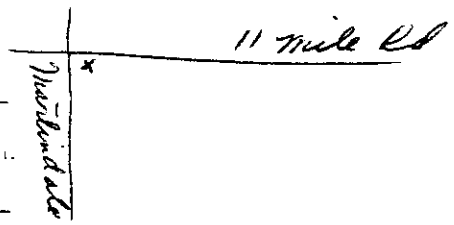
Distance And Direction from Road Intersections: 150' E. of Martindale Rd; 125 S. of 11 Mile Rd

Street address & City of Well Location

Locate with "X" in section below



Sketch Map:



3 OWNER OF WELL: Anthony Gellasario

Address: 3163 Merrill, Royal Oak Mi 48072

4 WELL DEPTH: (completed) 84 ft. Date of Completion 7-21-79

5 [X] Cable tool [ ] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Jetted [ ] Bored [ ]

6 USE: [X] Domestic [ ] Public Supply [ ] Industry [ ] Irrigation [ ] Air Conditioning [ ] Commercial [ ] Test Well [ ]

7 CASING: Threaded [X] Welded [ ] Diam. 4" in. to 84' ft. Depth; ___ in. to ___ ft. Depth

Height: Above/~~Below~~ Surface 1 ft. Weight 11 lbs./ft. Drive Shoe? Yes [X] No [ ]

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
yellow Clay	6'	6'
Sandy yellow Clay	8'	14'
Blue Clay	56'	70'
fine sand -	6'	76'
Sharp water sand	8'	84'

USE A 2ND SHEET IF NEEDED

8 SCREEN: Type: Stainless Steel Dia.: 4" Slot/~~Gauze~~ 15 Length 4' Set between 80 ft. and 84 ft. 3"x18" nipple Fittings: K. Packer + plug

9 STATIC WATER LEVEL 30 ft. below land surface

10 PUMPING LEVEL below land surface 30 ft. after 2 hrs. pumping 60 g.p.m. ___ ft. after ___ hrs. pumping ___ g.p.m.

11 WATER QUALITY in Parts Per Million: Iron (Fe) ___ Chlorides (Cl) ___ Hardness ___ Other ___

12 WELL HEAD COMPLETION: [ ] In Approved Pit [X] Pitless Adapter [X] 12" Above Grade

13 Well Grouted? [ ] Yes [X] No [ ] Neat Cement [ ] Bentonite [ ] ___ Depth: From ___ ft. to ___ ft.

14 Nearest Source of possible contamination 90 feet S.E. Direction Septic Type. Well disinfected upon completion [X] Yes [ ] No

15 PUMP: [ ] Not installed. Manufacturer's Name Flint Walling. Model Number 7BK7 HP ¾ Volts 230. Length of Drop Pipe 42 ft. capacity 19 G.P.M. Type: [X] Submersible [ ] Jet [ ] Reciprocating

16 Remarks, elevation, source of data, etc.

ADDED INFO BY DRILLER, ITEM NO. ~960 GW930

CORRECTED BY

ADDITION BY

ELEVATION

DEPTH TO ROCK

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Ray Harrison — REGISTERED BUSINESS NAME; 0108 — REGISTRATION NO.

Address 1225 E. Lake Dr. Walled Lake Mi

Signed Ray D. Harrison — AUTHORIZED REPRESENTATIVE; Date 8-2-78

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. 29-1

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

S

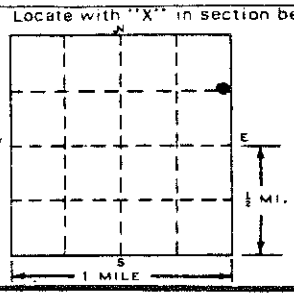
1 LOCATION OF WELL

County	Township/Name	Fraction	Section Number	Town Number	Range Number
Oakland	Lyon	NE¼ SE¼ NE¼	29	1 N/S	7 E/W

Distance And Direction from Road Intersections: 1/4 mile south of 10 mile Rd

Street address & City of Well Location: 23825 Griswold Rd South Lyon

Locate with "X" in section below — Sketch Map



3 OWNER OF WELL:

Will Gains

Address 23825 Griswold Rd South Lyon, Mich.

4 WELL DEPTH: (completed) 78 ft. Date of Completion 7-17-69

5

☒ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Jetted ☐ Bored ☐ ____

6 USE:

☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐ ____

7 CASING:

Threaded ☒ Welded ☐

Diam. 4 in. to 74 ft. Depth

____ in. to ____ ft. Depth

Height: Above/~~Below~~ Surface 1 ft.

Weight 11 lbs./ft.

Drive Shoe? Yes ☒ No ☐

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand	32	32
Blue Clay	42	74
Sand	4	78

USE A 2ND SHEET IF NEEDED

8 SCREEN:

Type: W W Cook Dia.: 3 3/4

Slot/~~Gauze~~ 60 Length 4

Set between 74 ft. and 78 ft.

Fittings: packer & plug

9 STATIC WATER LEVEL

15 ft. below land surface

10 PUMPING LEVEL below land surface

70 ft. after 2 hrs. pumping 6 g.p.m.

____ ft. after ____ hrs. pumping ____ g.p.m.

11 WATER QUALITY in Parts Per Million:

Iron (Fe) ____ Chlorides (Cl) ____

Hardness ____ Other ____

12 WELL HEAD COMPLETION:

☐ In Approved Pit ☒ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted?

☒ Yes ☐ No

☐ Neat Cement ☒ Bentonite ☐ ____

Depth: From ____ ft. to ____ ft.

14 Nearest Source of possible contamination

75 feet ____ Direction Septic Type

Well disinfected upon completion ☒ Yes ☐ No

15 PUMP:

☐ Not installed

Manufacturer's Name Reda

Model Number 314X4050 HP 1/2 Volts 115

Length of Drop Pipe 22 ft. capacity 5 G.P.M.

Type: ☒ Submersible ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

~930

GW 915

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Cribley Drilling Co. Inc. 524

REGISTERED BUSINESS NAME — REGISTRATION NO.

Address Dexter Mich.

Signed J. A. Clark Date 9-1-69

AUTHORIZED REPRESENTATIVE

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. [ ] 29-2

WATER WELL RECORD
ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

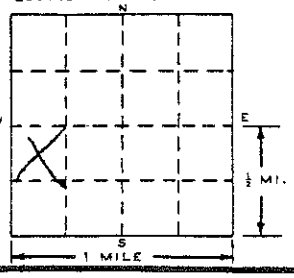
JUL 20 1971

1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Oakland	Lyon	NE¼ SW¼	29	1 N/S.	7 E/W.

Distance And Direction from Road Intersections
Lot No. 102 - Woodside Acres Sub.
22914 Sandra St.
Street address & City of Well Location

Locate with "X" in section below — Sketch Map:



3 OWNER OF WELL: Guido Kiefer,
Address 37021 Bristol, Livonia, Mich.

4 WELL DEPTH: (completed) 58 ft. Date of Completion 8-1-70

5 [X] Cable tool [ ] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Jetted [ ] Bored [ ]

6 USE: [X] Domestic [ ] Public Supply [ ] Industry [ ] Irrigation [ ] Air Conditioning [ ] Commercial [ ] Test Well [ ]

7 CASING: Threaded [X] Welded [ ]
Diam. 4 in. to ___ ft. Depth
___ in. to ___ ft. Depth
Height: Above/Below Surface ___ ft.
Weight 11 lbs./ft.
Drive Shoe? Yes [X] No [ ]

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Yellow sand	16	16
Sand, gravel and water	10	26
Yellow clay	2	28
Gravel, clayey	23	51
Sand and gravel		58

PUMP INSTALLED ___ BY
KREZEL PUMP SERVICE
22000 Meadowbrook Rd. Northville, Mich.
REG. NO. 0699

8 SCREEN:
Type: Wire would Dia.: 4
Slot/Gauze 18 Length 4
Set between ___ ft. and ___ ft.
Fittings:

9 STATIC WATER LEVEL 11 ft. below land surface

10 PUMPING LEVEL below land surface
___ ft. after ___ hrs. pumping 60 g.p.m.
___ ft. after ___ hrs. pumping ___ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) ___ Chlorides (Cl) ___
Hardness ___ Other ___

12 WELL HEAD COMPLETION: [ ] In Approved Pit [X] Pitless Adapter [X] 12" Above Grade

13 Well Grouted? [X] Yes [ ] No
[ ] Neat Cement [ ] Bentonite [ ] AquaGel
Depth: From ___ ft. to ___ ft.

14 Nearest Source of possible contamination
___ feet ___ Direction ___ Type
Well disinfected upon completion [X] Yes [ ] No

15 PUMP: [ ] Not installed
Manufacturer's Name Red Jacket
Model Number 90 9BV HP ½ Volts 230
Length of Drop Pipe 42 ft. capacity 10 G.P.M.
Type: [X] Submersible [ ] Jet [ ] Reciprocating

USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.
~ 924
GW 913

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Wayne W. Claypool — REGISTERED BUSINESS NAME
0111 — REGISTRATION NO.
Address Northville, Mich.
Signed ___ AUTHORIZED REPRESENTATIVE Date 9-4-70

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. 29-3

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

5

1 LOCATION OF WELL

County	Twp.	Fraction	Section No.	Town	Range
Oakland	Lyon Township	NE¼NW¼SW¼	29	1 N/A	7 E/A

Distance And Direction from Road Intersections: 60725 Marjorie Ann South Lyon

OWNER No.

Street address & City of Well Location

3 OWNER OF WELL: Lenville Rose

Address: 60725 Marjorie Ann South Lyon, Mi

2 FORMATION

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
0 to 15' Sand	0	15'
15' to 25' Water sand	15	10
25 to 50 Sand & clay	25	15
50 to 55' Water gravel	10	10
	5'	5

4 WELL DEPTH: (completed) 55 ft. Date of Completion 10-28-69

5 ☑ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Jetted ☐ Bored ☐

6 USE: ☑ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐

7 CASING: Diam. 4 in. to ___ ft. Depth; Threaded ☑ Welded ☐; Height: Above/Below surface 1 ft.; Weight ___ lbs/ft.; Drive Shoe? Yes ☐ No ☐

8 SCREEN: Type: Stainless steel Dia.: 4 x 4; Slot/Gauze 20 Length ___; Set between 51 ft. and 55 ft.; Fittings: Kpacher screw fittings

9 STATIC WATER LEVEL 10 ft. below land surface

10 PUMPING LEVEL below land surface: 20 ft. after 1 hrs. pumping 40 g.p.m.; ___ ft. after ___ hrs. pumping ___ g.p.m.

11 WATER QUALITY in Parts Per Million: Iron (Fe) ___ Chlorides (Cl) ___ Hardness ___

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☑ Pitless Adapter ☐ 12" Above Grade

13 GROUTING: Well Grouted? ☐ Yes ☐ No; Material: ☐ Neat Cement ☐ ___; Depth: From ___ ft. to ___ ft.

14 SANITARY: Nearest Source of possible contamination ___ feet ___ Direction ___ Type; Well disinfected upon completion ☑ Yes ☐ No

15 PUMP: Manufacturer's Name Goulds; Model Number UFH 5412 HP X2; Length of Drop Pipe 42 ft. capacity 10 G.P.M.; Type: ☑ Submersible ☐ ___ ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

ADDED INFO. BY DRILLER. ITEM NO.

CORRECTED BY: 922 GW 910

ADDITION BY:

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Alfred Vradenburg — REGISTERED BUSINESS NAME; 1047 — REGISTRATION NO.

Address 12927 - Nine Mile Rd.

Signed Alfred Vradenburg — AUTHORIZED REPRESENTATIVE; Date 11-4-69

D67D 100M 6-66

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. [ ]

29-4

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

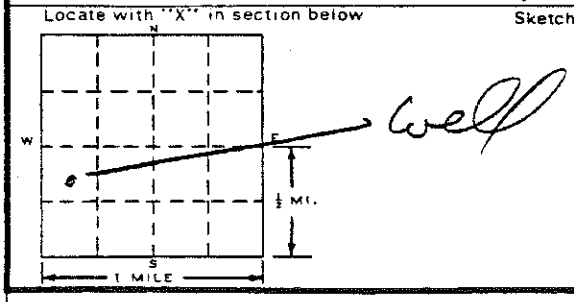
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Oakland	Lyon	NE¼ SW¼ SW.	29	1 N/S.	7 E/W.

Distance And Direction from Road Intersections: 22715 Kay Dr.

Street address & City of Well Location: South Lyon

Locate with "X" in section below — Sketch Map:



3 OWNER OF WELL: Kenneth Byington

Address: 22715 Kay Dr. South Lyon

4 WELL DEPTH: (completed) 40 ft. Date of Completion 3-25-71

5 [X] Cable tool [ ] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Jetted [ ] Bored [ ] ____

6 USE: [X] Domestic [ ] Public Supply [ ] Industry [ ] Irrigation [ ] Air Conditioning [ ] Commercial [ ] Test Well [ ] ____

7 CASING: Threaded [X] Welded [ ] Diam. 4 in. to 36 ft. Depth; ____ in. to ____ ft. Depth

Height: Above/~~Below~~ Surface 1 ft. Weight 11 lbs./ft. Drive Shoe? Yes [X] No [ ]

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand	40	40

RECEIVED APR 5 1971 [illegible] CES

8 SCREEN: Type: WW Cook Dia.: 3 3/4 Slot/~~Gauge~~ 18 Length 4 Set between 36 ft. and 40 ft. Fittings: packer & plug

9 STATIC WATER LEVEL: 10 ft. below land surface

10 PUMPING LEVEL below land surface: 14 ft. after 2 hrs. pumping 12 g.p.m.; ____ ft. after ____ hrs. pumping ____ g.p.m.

11 WATER QUALITY in Parts Per Million: Iron (Fe) ____ Chlorides (Cl) ____ Hardness ____ Other ____

12 WELL HEAD COMPLETION: [ ] In Approved Pit [X] Pitless Adapter [ ] 12" Above Grade

13 Well Grouted? [X] Yes [ ] No [ ] Neat Cement [ ] Bentonite [ ] ____ Depth: From ____ ft. to ____ ft.

14 Nearest Source of possible contamination: 80 feet S Direction Septic Type. Well disinfected upon completion [X] Yes [ ] No

15 PUMP: [ ] Not installed. Manufacturer's Name Reda. Model Number 2D4 P031 HP 1/3 Volts 220. Length of Drop Pipe 25 ft. capacity 11 G.P.M. Type: [X] Submersible [ ] Jet [ ] Reciprocating

USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.

~922
GW 912

ADDITION BY:

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Cribley Drilling Co. Inc. — REGISTERED BUSINESS NAME — 524 — REGISTRATION NO.

Address: Dexter Mich.

Signed: J. A. Clark — AUTHORIZED REPRESENTATIVE — Date 3-26-71

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. [ ]

29-5

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

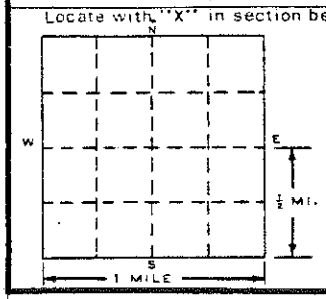
County	Township Name	Fraction	Section Number	Town Number	Range Number
Oakland	Lyon	SE¼ NW¼ SW¼	29	1 N.	7 E.

Distance And Direction from Road Intersections: 23200 Sandra ST. SOUTH LYON, MICH

Street address & City of Well Location: LOT # 19

Locate with "X" in section below

Sketch Map:



3 OWNER OF WELL: RIEFER-VIGOLA-CABINET CO

Address 37021 BRISTOL

LIVONIA, MICH 48154

4 WELL DEPTH: (completed) 68 ft. Date of Completion 3-12-71

5 ☑ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Jetted ☐ Bored ☐ ____

6 USE: ☑ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐

7 CASING: Threaded ☑ Welded ☐ Diam. 4 in. to 68 ft. Depth; ____ in. to ____ ft. Depth

Height: Above/Below Surface ____ ft. Weight 11 lbs./ft. Drive Shoe? Yes ☑ No ☐

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Br. Sand.	21'	21'
Blue Clay & sand.	36'	57'
Water Bearing Sand	11'	68'

USE A 2ND SHEET IF NEEDED

8 SCREEN: Type: Stainless Steel Dia.: 4" Slot/Gauze 35 Length 3' Set between 65 ft. and 68 ft.

Fittings: 12' Nipple & K. Packer

9 STATIC WATER LEVEL 18 ft. below land surface

10 PUMPING LEVEL below land surface 7 ft. after 3 hrs. pumping 50 g.p.m.; ____ ft. after ____ hrs. pumping ____ g.p.m.

11 WATER QUALITY in Parts Per Million: Iron (Fe) ____ Chlorides (Cl) ____ Hardness ____ Other UNKNOWN

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☑ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☑ No ☐ Neat Cement ☐ Bentonite ☐ ____ Depth: From ____ ft. to ____ ft.

14 Nearest Source of possible contamination ____ feet ____ Direction UNKNOWN Type

Well disinfected upon completion ☑ Yes ☐ No

15 PUMP: ☐ Not installed

Manufacturer's Name DEMING

Model Number 6700 HP ½ Volts 230

Length of Drop Pipe 42 ft. capacity 10 G.P.M.

Type: ☑ Submersible ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

~924

GW 906

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Whitmore Lake Well Drilling — REGISTERED BUSINESS NAME — 657 REGISTRATION NO.

Address Box 227 Whitmore Lake Mich

Signed Charles Gill Jr. — AUTHORIZED REPRESENTATIVE — Date 4-28-71

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

2 GEOLOGICAL SURVEY SAMPLE No. 29-6

OCT 27 1975

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

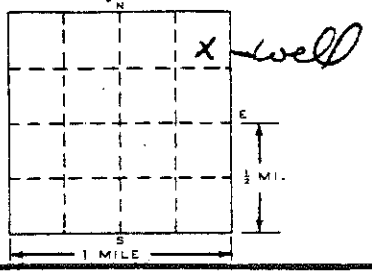
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Oakland	LYON	¼ NE ¼ NE ¼	29	1 N	7 E

Distance And Direction from Road Intersections: 23809 Griswold

Street address & City of Well Location: South Lyon Mich

Locate with "X" in section below — Sketch Map:



3 OWNER OF WELL: Bryon Daves

Address: Same

4 WELL DEPTH: (completed) 109 ft. Date of Completion 10-2-75

5 [X] Cable tool [ ] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Jetted [ ] Bored [ ]

6 USE: [X] Domestic [ ] Public Supply [ ] Industry [ ] Irrigation [ ] Air Conditioning [ ] Commercial [ ] Test Well [ ]

7 CASING: Threaded [X] Welded [ ] Height: Above/Below Surface 1 ft.

Diam. 4 in. to 109 ft. Depth — Weight 11 lbs./ft.

___ in. to ___ ft. Depth — Drive Shoe? Yes [X] No [ ]

8 SCREEN:

Type: WW Stain Dia.: 3 3/4

Slot/Gauze 35 Length 4

Set between 105 ft. and 109 ft.

Fittings: Packer & plug

9 STATIC WATER LEVEL

16 ft. below land surface

10 PUMPING LEVEL below land surface

54 ft. after 3 hrs. pumping 9 g.p.m.

___ ft. after ___ hrs. pumping ___ g.p.m.

11 WATER QUALITY in Parts Per Million:

Iron (Fe) ___ Chlorides (Cl) ___

Hardness ___ Other ___

12 WELL HEAD COMPLETION: [ ] In Approved Pit [X] Pitless Adapter [ ] 12" Above Grade

13 Well Grouted [X] Yes [ ] No

[ ] Neat Cement [X] Bentonite [ ]

Depth: From ___ ft. to ___ ft.

14 Nearest Source of possible contamination

100 feet ___ Direction Septic Type

Well disinfected upon completion [X] Yes [ ] No

15 PUMP: [ ] Not installed

Manufacturer's Name Reda

Model Number 9D9 P051 HP ½ Volts 220

Length of Drop Pipe 84 ft. capacity 9 G.P.M.

Type: [X] Submersible [ ] Jet [ ] Reciprocating

2 FORMATION

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Clay	33	33
Sand	7	40
Clay	65	105
Sand	4	109

USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.

ADDED INFO BY DRILLER, ITEM NO.
*CORRECTED BY
**ADDITION BY
ELEVATION ~938
DEPTH TO ROCK GW 922

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Cribley Drilling Co. Inc. — REGISTERED BUSINESS NAME — 524 — REGISTRATION NO.

Address: Dexter

Signed: Jack Clark — AUTHORIZED REPRESENTATIVE — Date 10-10-75

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. 29-7

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

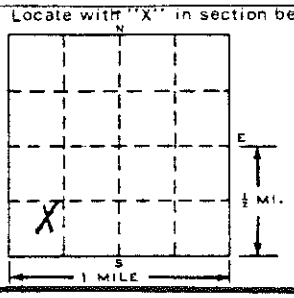
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
OAKLAND	LYON	NE¼ SW¼ SW¼	29	1 N/S.	7 E/W.

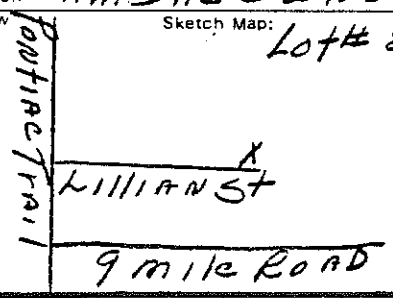
Distance And Direction from Road Intersections: 1/4 mile N. of 9 mile rd 1 Block E. of Pontiac Trail

Street address & City of Well Location: Same as Owner

Locate with "X" in section below



Sketch Map: Lot# 83



3 OWNER OF WELL: William Miller
Address 60687 Lillian St South Lyons, Mich 48178

4 WELL DEPTH: (completed) 69 ft. Date of Completion 8-22-70

5 ☑ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Jetted ☐ Bored ☐ ____

6 USE: ☑ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐ ____

7 CASING: Threaded ☑ Welded ☐ Diam. 4 in. to 69 ft. Depth ____ in. to ____ ft. Depth
Height: Above/Below Surface 1 ft. Weight 11 lbs./ft. Drive Shoe? Yes ☑ No ☐

8 SCREEN: Type: Slotted Dia.: 4" Slot/Gauze 12 Length 4' Set between 65 ft. and 69 ft. Fittings: Packer Bottom & misc. Fittings.

9 STATIC WATER LEVEL 23 ft. below land surface

10 PUMPING LEVEL below land surface 63 ft. after 6 hrs. pumping 17 g.p.m. ____ ft. after ____ hrs. pumping ____ g.p.m.

11 WATER QUALITY in Parts Per Million: Iron (Fe) ____ Chlorides (Cl) ____ Hardness ____ Other ____

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☑ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☐ No ☐ Neat Cement ☐ Bentonite ☐ ____ Depth: From ____ ft. to ____ ft.

14 Nearest Source of possible contamination 85 feet ____ Direction S. Tank Type
Well disinfected upon completion ☑ Yes ☐ No

15 PUMP: ☐ Not installed
Manufacturer's Name Jacuzzi
Model Number 554B HP 1/2 Volts 230
Length of Drop Pipe 63 ft. capacity 17 G.P.M.
Type: ☑ Submersible ☐ Jet ☐ Reciprocating

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Top Soil	1	1
Dry Sand + Gravel	17	18
Clay + Gravel	34	52
Sand + Gravel	13	65
Water Sand	4	69

USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.

DRILLER, ITEM NO. ~922
GW 899

**ADDITION BY

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Roberts Drilling Co #0248
REGISTERED BUSINESS NAME REGISTRATION NO.

Address 4730 E. M. 36 Pinckney 48169

Signed George J Roberts Date 5-28-71
AUTHORIZED REPRESENTATIVE

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. [ ]

29-8

WATER WELL RECORD
ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

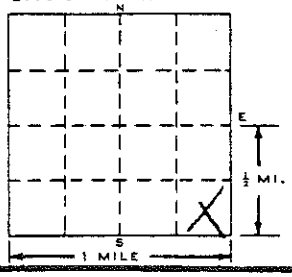
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Oakland	Lyon	~~NE~~ ¼S ~~W~~ ¼SE ¼	29	1 N/S.	7 E/W.

Distance And Direction from Road Intersections
59684 Nine Mile Rd.

Street address & City of Well Location

Locate with "X" in section below — Sketch Map:



3 OWNER OF WELL: Ed. Lyman

Address 20264 Rensellor
Livonia, Mich. 48152

4 WELL DEPTH: (completed) 56 ft. Date of Completion 6-13-70

5 [X] Cable tool [ ] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Jetted [ ] Bored [ ] ____

6 USE: [X] Domestic [ ] Public Supply [ ] Industry [ ] Irrigation [ ] Air Conditioning [ ] Commercial [ ] Test Well [ ]

7 CASING: Threaded [X] Welded [ ]
Diam. 4 in. to ____ ft. Depth
____ in. to ____ ft. Depth
Height: Above/Below Surface ____ ft.
Weight 11 lbs./ft.
Drive Shoe? Yes [X] No [ ]

2 FORMATION

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Yellow clay		6
Soft blue clay, gravelly		52
Sand and gravel		56

USE A 2ND SHEET IF NEEDED

8 SCREEN:
Type: Wire wound Dia.: 4
Slot/Gauze 30 Length 4
Set between ____ ft. and ____ ft.
Fittings:

9 STATIC WATER LEVEL
16'6" ft. below land surface

10 PUMPING LEVEL below land surface
____ ft. after ____ hrs. pumping 60 g.p.m.
____ ft. after ____ hrs. pumping ____ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) ____ Chlorides (Cl) ____
Hardness ____ Other ____

12 WELL HEAD COMPLETION: [ ] In Approved Pit [X] Pitless Adapter [X] 12" Above Grade

13 Well Grouted? [X] Yes [ ] No
[ ] Neat Cement [ ] Bentonite [ ] AquaGel
Depth: From ____ ft. to ____ ft.

14 Nearest Source of possible contamination
____ feet ____ Direction ____ Type
Well disinfected upon completion [X] Yes [ ] No

15 PUMP: [ ] Not installed
Manufacturer's Name Red Jacket
Model Number 50 913C HP ½ Volts 230
Length of Drop Pipe 42 ft. capacity 10 G.P.M.
Type: [X] Submersible [ ] Jet [ ] Reciprocating

PUMP INSTALLED BY
KREZEL PUMP SERVICE
22000 Meadowbrook Rd. Northville, Mich.
REG. NO. 0699

16 Remarks, elevation, source of data, etc.
~932
GW 916

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
WAYNE W. CLAYPOOL — REGISTERED BUSINESS NAME
0111 — REGISTRATION NO.
Address Northville, Mich.
Signed ____ AUTHORIZED REPRESENTATIVE Date 9-4-70

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. 29-9

WATER WELL RECORD

ACT 294 PA 1965

1971

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

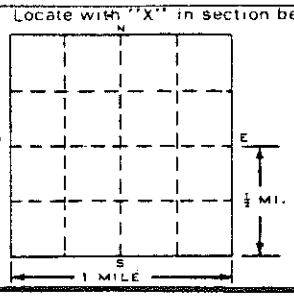
County	Township Name	Fraction	Section Number	Town Number	Range Number
Oakland	Lyon	SE ¼ NW ¼ SW ¼	29	1 N/S	7 E/W

Distance And Direction from Road Intersections: 23210 Sandra St. South Lyon, Mich LOT #18

Street address & City of Well Location

Locate with "X" in section below

Sketch Map:



3 OWNER OF WELL: Kiefer-Vigoka-Cabinet Co.

Address 37021 Bristol Livonia, Mich. 48154

4 WELL DEPTH: (completed) 56½ ft. Date of Completion 4-14-71

5 ☑ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Jetted ☐ Bored ☐

6 USE: ☑ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐

7 CASING: Threaded ☑ Welded ☐ Diam. 4 in. to 56½ ft. Depth; ___ in. to ___ ft. Depth

Height: Above/Below Surface ___ ft. Weight 11 lbs./ft. Drive Shoe? Yes ☑ No ☐

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Br. Sand	18'	18'
Blue Clay & Sand.	30'	48'
Water Bearing Sand.	8½	56½

USE A 2ND SHEET IF NEEDED

8 SCREEN: Type: Stainless Steel Dia.: 4" Slot/~~Gauge~~ 25 Length 3' Set between 53½ ft. and 56½ ft.

Fittings: 12" Nipple & K packer.

9 STATIC WATER LEVEL 18 ft. below land surface

10 PUMPING LEVEL below land surface ? ft. after 3 hrs. pumping 50 g.p.m.

___ ft. after ___ hrs. pumping ___ g.p.m.

11 WATER QUALITY in Parts Per Million: Iron (Fe) ___ Chlorides (Cl) ___ Hardness ___ Other Unknown

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☑ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☑ No ☐ Neat Cement ☐ Bentonite ☐ ___ Depth: From ___ ft. to ___ ft.

14 Nearest Source of possible contamination ___ feet ___ Direction Unknown Type

Well disinfected upon completion ☑ Yes ☐ No

15 PUMP: ☐ Not installed

Manufacturer's Name Deming

Model Number 6700 HP ½ Volts 230

Length of Drop Pipe 42 ft. capacity 10 G.P.M.

Type: ☑ Submersible ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

~924

GW 906

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Whitmore Lake Well Drilling 657

REGISTERED BUSINESS NAME REGISTRATION NO.

Address Box 227 Whitmore Lake, Mich.

Signed Charles Griff Jr. Date 4-28-71

AUTHORIZED REPRESENTATIVE

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. [ ]

29-10

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

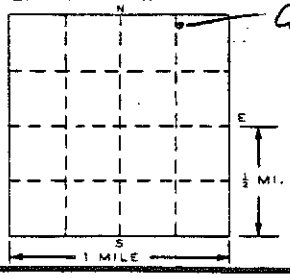
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Oakland	Lyon	NW ¼ NE ¼ NE ¼	29	1 N.S.	7 E.W.

Distance And Direction from Road Intersections: 59425 Ten Mile Rd.

Street address & City of Well Location: South Lyon

Locate with "X" in section below — Sketon Map:



3 OWNER OF WELL: John Stick & Jack Harrison

Address: 26400 Springfield, Farmington Mich.

4 WELL DEPTH: (completed) 65 ft. Date of Completion 11-29-69

5 ☒ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Jetted ☐ Bored ☐ ____

6 USE: ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐ ____

7 CASING: Threaded ☒ Welded ☐ Diam. 4 in. to 52 ft. Depth; ____ in. to ____ ft. Depth

Height: Above/~~Below~~ Surface 1 ft. Weight 11 lbs./ft. Drive Shoe? Yes ☒ No ☐

8 SCREEN: Type: WW Cook Dia.: 3 3/4

Slot/~~Gauze~~ 4' 20 & 4'-16 Length 8

Set between 57 ft. and 65 ft.

Fittings: packer & plug

9 STATIC WATER LEVEL 22 ft. below land surface

10 PUMPING LEVEL below land surface 26 ft. after 2 hrs. pumping 35 g.p.m.

____ ft. after ____ hrs. pumping ____ g.p.m.

11 WATER QUALITY in Parts Per Million: Iron (Fe) ____ Chlorides (Cl) ____ Hardness ____ Other ____

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☒ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☒ Yes ☐ No ☐ Neat Cement ☒ Bentonite ☐ ____ Depth: From ____ ft. to ____ ft.

14 Nearest Source of possible contamination 100 feet 5 Direction septic tank Type

Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: ☐ Not installed

Manufacturer's Name Peerless

Model Number 8035P201 HP 2 Volts 230

Length of Drop Pipe 42 ft. capacity 35 G.P.M.

Type: ☒ Submersible ☐ Jet ☐ Reciprocating

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Yellow Clay	15	15
Gravel	55	65
Bottomed on Blue Clay at 65'		

USE A 2ND SHEET IF NEEDED

RECEIVED — WATER RESOURCES COMMISSION

16 Remarks, elevation, source of data, etc. ~945 GW 923

17 WATER WELL CONTRACTOR'S CERTIFICATION: This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Cubley Drilling Co. Inc. — REGISTERED BUSINESS NAME — 524 REGISTRATION NO.

Address: Chesterfield, Mich.

Signed: J. A. Clark — AUTHORIZED REPRESENTATIVE — Date 3-6-70

D67d 100M (Rev. 12-68)

APR 1 - 1970 GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. 29-11

JAN 15 1971

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

County	Twp.	Fraction	Section No.	Town	Range
OAKLAND	LYON	(¼) ¼ ¼	29	1 (N)/S.	1 (E)/W.

Distance And Direction from Road Intersections: ¼ MILE WEST OF GRISWOLD RD. NEXT TO C & O RAILROAD

OWNER No.

Street address & City of Well Location

3 OWNER OF WELL: EUGENE RANDALL

Address: 59450 NINE MILE Rd.

4 WELL DEPTH: (completed) 57 ft. Date of Completion 11-29-70

5 ☑ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Jetted ☐ Bored ☐ ___

6 USE: ☑ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐ ___

7 CASING: Diam. 4 in. to 54 ft. Depth; Threaded ☐ Welded ☐; Height: Above/Below surface 1 ft.; Weight ___ lbs/ft.; Drive Shoe? Yes ☑ No ☐

___ in. to ___ ft. Depth

8 SCREEN:
Type: JOHNSON Dia.: 4"
Slot/Gauze 18 Length 4'
Set between 57 ft. and 53 ft.
Fittings: K packer & nipple

9 STATIC WATER LEVEL
30 ft. below land surface

10 PUMPING LEVEL below land surface
30 ft. after ___ hrs. pumping 40 g.p.m.
___ ft. after ___ hrs. pumping ___ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) ___ Chlorides (Cl) ___
Hardness ___

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☐ Pitless Adapter ☐ 12" Above Grade

13 GROUTING:
Well Grouted? ☐ Yes ☐ No
Material: ☐ Neat Cement ☐ ___
Depth: From ___ ft. to ___ ft.

14 SANITARY:
Nearest Source of possible contamination
___ feet ___ Direction ___ Type
Well disinfected upon completion ☑ Yes ☐ No

15 PUMP:
Manufacturer's Name ___
Model Number ___ HP ___
Length of Drop Pipe ___ ft. capacity ___ G.P.M.
Type: ☐ Submersible ☐ ___ ☐ Jet ☐ Reciprocating

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
0 to 53 Clay	53	53
53 to 57 Waterland	4	4

MODEL INFO. BY DRILLER ITEM NO.

CORRECTED BY:

ADDITION BY:

16 Remarks, elevation, source of data, etc.

Well only

~940
GW 910

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

[signature] REGISTERED BUSINESS NAME — 1047 REGISTRATION NO.

Address 12927 Nine Mile South Lyon

Signed [signature] AUTHORIZED REPRESENTATIVE Date 1-4-70

D67D 100M 6-66

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. 29-12

WATER WELL RECORD

ACT 294 PA 1965

PROBABLY SEC. 32 29*

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

County	Twp.	Fraction	Section No.	Town	Range
Oakland	Lyons	NW¼ NW¼ NE¼	[illegible]	1 N/S.	7 E/W.

Distance And Direction from Road Intersections: 57945 - 10 Mile South Lyons S.

Street address & City of Well Location

OWNER No.

3 OWNER OF WELL: William Ray Duncan

Address: 57945 10 Mile South Lyons Mich

2. FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Rock - Clay	30'	30'
Hard Pan	38'	68'
Gravel	10'	78'
Sand (Muddy)	12'	90'
Sand (Water)	13	103

4 WELL DEPTH: (completed) 103 ft. Date of Completion 9/11/67

5 ☑ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Jetted ☐ Bored ☐ ___

6 USE: ☑ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐ ___

7 CASING: Diam. 4 in. to 103 ft. Depth; Threaded ☑ Welded ☐; ___ in. to ___ ft. Depth; Height: Above/Below surface ___ ft.; Weight 11.00 lbs/ft.; Drive Shoe? Yes ☑ No ☐

8 SCREEN: Type: Red Brass Dia.: 3½ O.D.; Slot/~~Gauze~~ 12 Length 6'-8"; Set between 98 ft. and 103 ft.; Fittings: 2' Packer Plug & Coup

9 STATIC WATER LEVEL 50 ft. below land surface

10 PUMPING LEVEL below land surface: 60 ft. after 8 hrs. pumping 12 g.p.m.; ___ ft. after ___ hrs. pumping ___ g.p.m.

11 WATER QUALITY in Parts Per Million: Iron (Fe) ___ Chlorides (Cl) ___ Hardness ___

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☑ Pitless Adapter ☐ 12" Above Grade

13 GROUTING: Well Grouted? ☐ Yes ☑ No; Material: ☐ Neat Cement ☐ ___; Depth: From ___ ft. to ___ ft.

14 SANITARY: Nearest Source of possible contamination: 100 feet E Direction Septic Type; Well disinfected upon completion ☑ Yes ☐ No

15 PUMP: Manufacturer's Name Fairbanks Mfg Co.; Model Number SL 5029 HP ½; Length of Drop Pipe 84 ft. capacity 12 G.P.M.; Type: ☑ Submersible ☐ ___ ☐ Jet ☐ Reciprocating

ADDED INFO. BY DRILLER ITEM NO.

*CORRECTED BY: [signature]

**ADDITION BY:

16 Remarks, elevation, source of data, etc. ~940 GW810

Drillers Log Geo. Gant

17 WATER WELL CONTRACTOR'S CERTIFICATION: This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

J. H. Roberts W.D. — REGISTERED BUSINESS NAME; 0027 — REGISTRATION NO.

Address 22033 Springrock

Signed J. H. Roberts — AUTHORIZED REPRESENTATIVE; Date 9/19/67

D67D 100M 6-66

NOV 7 1967

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. 29-13

WATER WELL RECORD
ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

NOV 15 1971

1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
OAKLAND	LYON	SE NW SW	29	1 N	7E

Distance And Direction from Road Intersections: SOUTH LYON MICH 22606 SANDRA ST

Street address & City of Well Location

Locate with "X" in section below

Sketch Map: PONTIAC-TR. NINE-MILE

3 OWNER OF WELL:
Address: Harley Smith 22606 Sandra St.

4 WELL DEPTH: (completed) Date of Completion
102 ft. 8-19-71

5
☒ Cable tool ☐ Rotary ☐ Driven ☐ Dug
☐ Hollow rod ☐ Jetted ☐ Bored ☐

6 USE:
☒ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☐

7 CASING:
Threaded ☒ Welded ☐
Diam. 4 in. to 99 ft. Depth
___ in. to ___ ft. Depth
Height: Above/Below Surface 1 ft.
Weight 12 lbs./ft.
Drive Shoe? Yes ☒ No ☐

2 FORMATION

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
0 to 98 Clay	0	98
0 gravel	98	4 102
98 to 102 W gravel	4	102

ADDED INFO BY DRILLER, ITEM NO.

CORRECTED BY:

ADDITION BY:

USE A 2ND SHEET IF NEEDED

8 SCREEN:
Type: S-S Johnson Dia.: 4"
Slot/Gauze 18 Length 3
Set between 99 ft. and 102 ft.
Fittings: T Packer O Nipple

9 STATIC WATER LEVEL
15 ft. below land surface

10 PUMPING LEVEL below land surface
___ ft. after 2 hrs. pumping 30 g.p.m.
___ ft. after ___ hrs. pumping ___ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) ___ Chlorides (Cl) ___
Hardness ___ Other ___

12 WELL HEAD COMPLETION:
☐ In Approved Pit
☒ Pitless Adapter ☒ 12" Above Grade

13 Well Grouted?
☐ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☐ ___
Depth: From ___ ft. to ___ ft.

14 Nearest Source of possible contamination
___ feet ___ Direction ___ Type
Well disinfected upon completion ☒ Yes ☐ No

15 PUMP:
☐ Not installed
Manufacturer's Name Goulds
Model Number 5-412 HP 1/2 Volts 230
Length of Drop Pipe 38 ft. capacity 10 G.P.M.
Type: ☒ Submersible
☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.
Replacement ~925 GW 910

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Alfred Vradenburg 1047
REGISTERED BUSINESS NAME REGISTRATION NO.

Address 13927 - W Nine Mile South Lyon

Signed Alfred Vradenburg Date 8-23-71
AUTHORIZED REPRESENTATIVE

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. 29-14

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

County	Twp.	Fraction	Section No.	Town	Range
Oakland	Lyon	NW ¼ NE ¼ NE ¼	28	1 N/S.	7 E/W.

Distance And Direction from Road Intersections: Corner Martindale & 10 mile

OWNER No.

59425 Ten Mile Rd. South Lyon
Street address & City of Well Location

3 OWNER OF WELL: John Heck

Address 30411 Twelve Mile Rd. Farmington Mich.

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Yellow Sandy Clay	20	20
Sand water	45	65
Blue Clay	1	66

4 WELL DEPTH: (completed) 66 ft. Date of Completion 3-18-68

5 ☒ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Jetted ☐ Bored ☐ ___

6 USE: ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐ ___

7 CASING: Threaded ☒ Welded ☐
Diam. 4 in. to 57½ ft. Depth
___ in. to ___ ft. Depth
Height: Above/~~Below~~ surface 1 ft.
Weight 11 lbs/ft.
Drive Shoe? Yes ☒ No ☐

8 SCREEN:
Type: Wa Cook Dia.: 3¾
Slot/~~Gauge~~ 20 Length 7'
Set between 57½ ft. and 64½ ft.
Fittings: packer & 18" anchor

9 STATIC WATER LEVEL
26 ft. below land surface

10 PUMPING LEVEL below land surface
26 ft. after 2 hrs. pumping 38 g.p.m.
___ ft. after ___ hrs. pumping ___ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) ___ Chlorides (Cl) ___
Hardness ___

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☒ Pitless Adapter ☐ 12" Above Grade

13 GROUTING:
Well Grouted? ☐ Yes ☒ No
Material: ☐ Neat Cement ☐ ___
Depth: From ___ ft. to ___ ft.

14 SANITARY:
Nearest Source of possible contamination ~~Septic~~
300 feet S Direction ~~Septic~~ Type
Well disinfected upon completion ☒ Yes ☐ No

15 PUMP:
Manufacturer's Name Reda
Model Number 8D35 P201 HP 2
Length of Drop Pipe 42 ft. capacity 35 G.P.M.
Type: ☒ Submersible ☐ ___ ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

ADDED INFO. BY DRILLER, ITEM NO. ~948 GW 922

RECORDED BY

ENTERED BY

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Culley Drilling Co. — REGISTERED BUSINESS NAME
524 — REGISTRATION NO.

Address Dexter Mich.

Signed J. A. Clark — AUTHORIZED REPRESENTATIVE
Date 4-1-68

D67D 100M 6-66

MAY 17 1968

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. 29-15

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

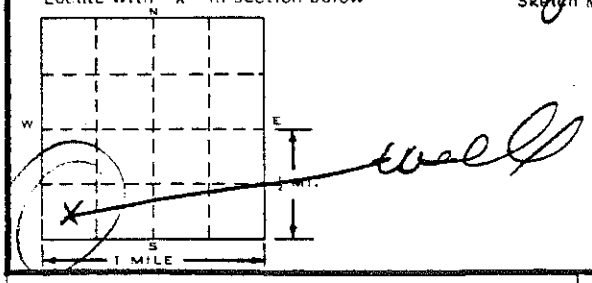
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Oakland	Lyon	¼ SW ¼ SW ¼	29	1 S.	7 W.

Distance And Direction from Road Intersections: 22630 Sandra Dr.

Street address & City of Well Location: South Lyon Mich

Locate with "X" in section below — Sketch Map:



3 OWNER OF WELL: South Lyon Community Schools

Address: South Lyon Mich.

4 WELL DEPTH: (completed) 78 ft. Date of Completion 2-22-78

5 [X] Cable tool [ ] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Jetted [ ] Bored [ ]

6 USE: [X] Domestic [ ] Public Supply [ ] Industry [ ] Irrigation [ ] Air Conditioning [ ] Commercial [ ] Test Well [ ]

7 CASING: Threaded [X] Welded [ ] Diam. 4 in. to 74 ft. Depth; ___ in. to ___ ft. Depth

Height: Above/~~Below~~ Surface 1 ft. Weight 11 lbs./ft. Drive Shoe? Yes [X] No [ ]

8 SCREEN: Type: WW Stain Dia.: 4 Slot/~~Gauze~~ 25 Length 4 Set between 74 ft. and 78 ft. Fittings: Parker & plug.

9 STATIC WATER LEVEL 10 ft. below land surface

10 PUMPING LEVEL below land surface 41 ft. after 2 hrs. pumping 12 g.p.m.; ___ ft. after ___ hrs. pumping ___ g.p.m.

11 WATER QUALITY in Parts Per Million: Iron (Fe) ___ Chlorides (Cl) ___ Hardness ___ Other ___

12 WELL HEAD COMPLETION: [ ] In Approved Pit [X] Pitless Adapter [ ] 12" Above Grade

13 Well Grouted? [X] Yes [ ] No [ ] Neat Cement [X] Bentonite [ ] ___ Depth: From ___ ft. to ___ ft.

14 Nearest Source of possible contamination 75 feet ___ Direction Septic System Type. Well disinfected upon completion [X] Yes [ ] No

15 PUMP. [ ] Not installed. Manufacturer's Name Reda. Model Number 9D9P051 HP ½ Volts 220. Length of Drop Pipe 63 ft. capacity 12 G.P.M. Type: [ ] Submersible [ ] Jet [ ] Reciprocating

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand	28	28
Clay	27	55
Gravel, Clay sand mix	14	69
Gritty Clay	4	73
Gravel	5	78

USE A 2ND SHEET IF NEEDED

OAKLAND COUNTY DEPT. OF HEALTH — 1978 — E.H. NO.

16 Remarks, elevation, source of data, etc.

ADDED INFO BY DRILLER, ITEM NO.
COORDINATED BY
ADDITION BY
ELEVATION
DEPTH TO ROCK

~920
GW 900

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Cribley Drilling Co Inc — REGISTERED BUSINESS NAME — 524 — REGISTRATION NO.

Address: Dexter Mich

Signed: [signature] — AUTHORIZED REPRESENTATIVE — Date 3-3-78

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. [ ] 29-16

OCT 30 1979

WATER WELL RECORD
ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

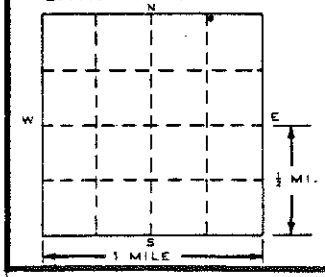
County	Township Name	Fraction	Section Number	Town Number	Range Number
Oakland	Lyon	¼ ¼ ¼	39	1 N.S.	7 E.W.

Distance And Direction from Road Intersections

~~55922~~ 55920 Nine Mile Road at Pontiac Trail

Street address & City of Well Location

Locate with "X" in section below — Sketch Map:



3 OWNER OF WELL:
Detroit Edison
Address P.O. Box 1659
Detroit, Michigan 48239

4 WELL DEPTH: (completed) 44 ft. Date of Completion 9-5-79

5 [X] Cable tool [ ] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Jetted [ ] Bored [ ]

6 USE: [ ] Domestic [ ] Public Supply [ ] Industry [ ] Irrigation [ ] Air Conditioning [ ] Commercial [ ] Test Well [ ] Sub Station

7 CASING: Threaded [X] Welded [ ]
Diam. 4 in. to 40' 3½" ft. Depth
___ in. to ___ ft. Depth
Height: Above ~~Below~~ Surface 1 ft.
Weight 11 lbs./ft.
Drive Shoe? Yes [X] No [ ]

8 SCREEN: Johnson Stainless Steel
Type: ___ Dia.: 4"
Slot/~~Gauze~~ 18 Length 5'
Set between 39' 3½" ft. and 44 ft.
Fittings: 3" x 17" Nipple

9 STATIC WATER LEVEL 28 ft. below land surface

10 PUMPING LEVEL below land surface
36 ft. after 2 hrs. pumping 15 g.p.m.
___ ft. after ___ hrs. pumping ___ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) 6.6 Chlorides (Cl) 34
Hardness 306 Other ___

12 WELL HEAD COMPLETION: [ ] In Approved Pit [X] Pitless Adapter [ ] 12" Above Grade

13 Well Grouted? [ ] Yes [X] No
[ ] Neat Cement [ ] Bentonite [ ] ___
Depth: From ___ ft. to ___ ft.

14 Nearest Source of possible contamination Unknown
___ feet ___ Direction ___ Type
Well disinfected upon completion [X] Yes [ ] No

15 PUMP: [ ] Not installed
Manufacturer's Name Red Jacket
Model Number R50N1-9BC HP 1/2 Volts 230
Length of Drop Pipe 28 ft. capacity 12 G.P.M.
Type: [X] Submersible [ ] Jet [ ] Reciprocating

2 FORMATION

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Crushed stone	6"	6"
Blue Clay	1'	1½'
Red Sand	8½'	10'
Red Clay	10'	~~9220~~'
Blue Clay	13'	33'
Med. Sand	11'	44'

ADDED INFO BY DRILLER, ITEM NO.
*CORRECTED BY
**ADDITION BY
ELEVATION
DEPTH TO ROCK
USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.
CODY STATION
~923
GW 895

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
O. OL Corsaut, Inc. — REGISTERED BUSINESS NAME
0025 — REGISTRATION NO.
Address 15101 W. 11 Mile Road, Oak Park 48237
Signed Owen Corsaut — AUTHORIZED REPRESENTATIVE
Date Oct. 15, 1979

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. [ ]

29-17

MAY 1 8 1979

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

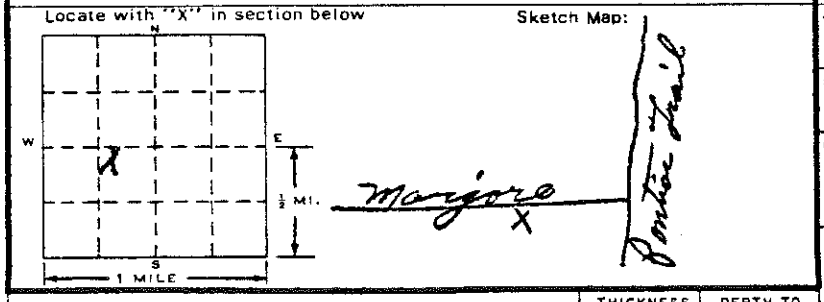
County	Township Name	Fraction	Section Number	Town Number	Range Number
Oakland	Lyon	SW ¼ NW ¼ NW ¼	29	1 N/S	7 E/W

Distance And Direction from Road Intersections: 0.1 mi E of Pontiac Trail; 40' N. of Marjore

Street address & City of Well Location

Locate with "X" in section below

Sketch Map:



3 OWNER OF WELL:

Address: First Baptist Church South Lyon, L0820 Marjore Ann, South Lyon

4 WELL DEPTH: (completed) Date of Completion

79 ft. April 79

5

[X] Cable tool [ ] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Jetted [ ] Bored [ ] ____

6 USE:

[X] Domestic [ ] Public Supply [ ] Industry [ ] Irrigation [ ] Air Conditioning [ ] Commercial [ ] Test Well [ ] ____

7 CASING:

Threaded [ ] Welded [X]

Diam. 4 in. to 79 ft. Depth

____ in. to ____ ft. Depth

Height: Above/Below Surface ____ ft.

Weight 11 lbs./ft.

Drive Shoe? Yes [X] No [ ]

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Brown sandy Clay	35	35
blue Clay	10	45
~~gray sand~~ hardpan	27	72
gray sand (WB)	7	79

USE A 2ND SHEET IF NEEDED

8 SCREEN:

Type: stainless Dia.: 4"

Slot/~~Gauze~~ 12 Length 4'

Set between 74 ft. and 79 ft.

Fittings: burlap packer

9 STATIC WATER LEVEL

14 ft. below land surface

10 PUMPING LEVEL below land surface

42 ft. after 2 hrs. pumping 20 g.p.m.

____ ft. after ____ hrs. pumping ____ g.p.m.

11 WATER QUALITY in Parts Per Million:

Iron (Fe) ____ Chlorides (Cl) ____

Hardness ____ Other ____

12 WELL HEAD COMPLETION:

[ ] In Approved Pit

[X] Pitless Adapter [X] 12" Above Grade

13 Well Grouted?

[ ] Yes [X] No

[ ] Neat Cement [ ] Bentonite [ ] ____

Depth: From ____ ft. to ____ ft.

14 Nearest Source of possible contamination

____ feet ____ Direction ____ Type

Well disinfected upon completion [X] Yes [ ] No

15 PUMP:

[ ] Not installed

Manufacturer's Name Valley

Model Number ____ HP ¼ Volts 230

Length of Drop Pipe ____ ft. capacity 20 G.P.M.

Type: [X] Submersible [ ] Jet [ ] Reciprocating

16 Remarks, elevation, source of data, etc.

ADDED INFO BY DRILLER, ITEM NO. ~920

*CORRECTED BY GW 906

**ADDITION BY

ELEVATION

DEPTH TO ROCK

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Smith Well Drilling 1133

REGISTERED BUSINESS NAME REGISTRATION NO.

Address 21210 Waldron

Signed O D Smith Date 4-11-79

AUTHORIZED REPRESENTATIVE

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. [ ]

29-18

MAY 1 8 1979

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

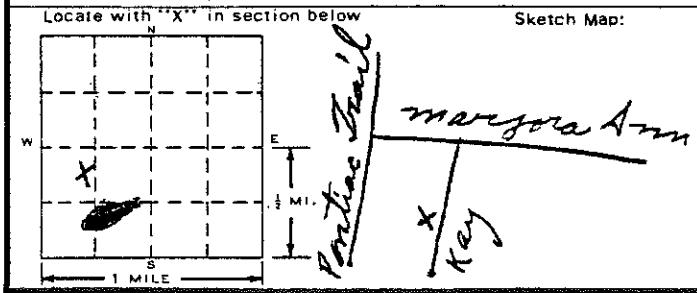
County	Township Name	Fraction	Section Number	Town Number	Range Number
Oakland	Lyon	SW ¼ NW ¼ SW ¼	29	1 N/S.	7 E/W.

Distance And Direction from Road Intersections: 011 Mile E of Pontiac Trail 300' W of of Kay

Street address* & City of Well Location

Locate with "X" in section below

Sketch Map:



3 OWNER OF WELL: James Turner

Address 27901 Kay South Lyon

4 WELL DEPTH: (completed) 40 ft. Date of Completion Oct 79

5 [X] Cable tool [ ] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Jetted [ ] Bored [ ]

6 USE: [X] Domestic [ ] Public Supply [ ] Industry [ ] Irrigation [ ] Air Conditioning [ ] Commercial [ ] Test Well [ ]

7 CASING: Threaded [ ] Welded [X] Diam. 4 in. to 40 ft. Depth; ___ in. to ___ ft. Depth. Height: Above/Below Surface ___ ft. Weight 11 lbs./ft. Drive Shoe? Yes [X] No [ ]

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Brown sandy Clay	24	24
hardpan	8	32
Gray sand (WB)	8	40

USE A 2ND SHEET IF NEEDED

8 SCREEN: Type: Stainless Dia.: 4" Slot ~~Gauze~~ 12 Length 4' Set between 36 ft. and 40 ft. Fittings: burlap packer

9 STATIC WATER LEVEL 16 ft. below land surface

10 PUMPING LEVEL below land surface 26 ft. after 2 hrs. pumping 20 g.p.m. ___ ft. after ___ hrs. pumping ___ g.p.m.

11 WATER QUALITY in Parts Per Million: Iron (Fe) ___ Chlorides (Cl) ___ Hardness ___ Other ___

12 WELL HEAD COMPLETION: [ ] In Approved Pit [X] Pitless Adapter [X] 12" Above Grade

13 Well Grouted? [ ] Yes [X] No [ ] Neat Cement [ ] Bentonite [ ] ___ Depth: From ___ ft. to ___ ft.

14 Nearest Source of possible contamination ___ feet ___ Direction ___ Type Well disinfected upon completion [X] Yes [ ] No

15 PUMP: [ ] Not installed Manufacturer's Name Valley Model Number ___ HP ½ Volts 230 Length of Drop Pipe 26 ft. capacity 20 G.P.M. Type: [X] Submersible [ ] Jet [ ] Reciprocating

16 Remarks, elevation, source of data, etc.

Remco draw down seal

ADDED INFO BY DRILLER, ITEM NO.

*CORRECTED BY

**ADDITION BY B

ELEVATION

DEPTH TO ROCK

~922 GW 906

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Smith Well Drilling 1133

REGISTERED BUSINESS NAME REGISTRATION NO.

Address 21210 Waldron

Signed O D Smith Date 4-13-79

AUTHORIZED REPRESENTATIVE

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. [ ]

SEP 22 1978

29-19

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
OAKLAND	LYON	SE ¼ ¼ ¼	29	1 N/S.	7 E/W.

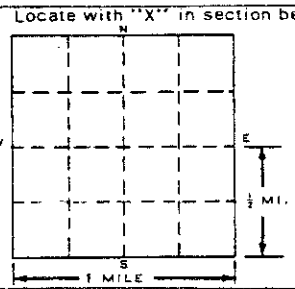
Distance And Direction from Road Intersections

23009 VALERIE — SOUTH LYON

Street address & City of Well Location

Locate with "X" in section below

Sketch Map:



3 OWNER OF WELL: TOM KLUCK

Address 23009 VALERIE SOUTH LYON

4 WELL DEPTH: (completed) Date of Completion 63½ ft. 8-30-78

5 ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Jetted ☐ Bored ☐ ____

6 USE: ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐ ____

7 CASING: Threaded ☒ Welded ☐ Diam. 4 in. to 59½ ft. Depth; ____ in. to ____ ft. Depth

Height: Above/Below Surface ____ ft.; Weight 11 lbs./ft.; Drive Shoe? Yes ☒ No ☐

2 FORMATION

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
YELLOW SAND	7	7
COARSE GRAVEL	15	22
HARD BLUE CLAY	22	44
FINE SAND & GRAVEL	19½	63½

USE A 2ND SHEET IF NEEDED

8 SCREEN: Type: SLOTTED Dia.: 3" Slot/Gauze 15 Length 4' Set between 59½ ft. and 63½ ft.

Fittings: HEMP PACKER PLUG

9 STATIC WATER LEVEL 25 ft. below land surface

10 PUMPING LEVEL below land surface 42 ft. after 2 hrs. pumping 15 g.p.m.; ____ ft. after ____ hrs. pumping ____ g.p.m.

11 WATER QUALITY in Parts Per Million: Iron (Fe) ____ Chlorides (Cl) ____ Hardness ____ Other ____

12 WELL HEAD COMPLETION: ☐ in Approved Pit ☒ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☒ Yes ☐ No ☐ Neat Cement ☒ Bentonite ☐ ____ Depth: From ____ ft. to ____ ft.

14 Nearest Source of possible contamination 100 feet N Direction DRAINFIELD Type

Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: ☐ Not installed

Manufacturer's Name ____ Model Number ____ HP ____ Volts ____ Length of Drop Pipe ____ ft. capacity ____ G.P.M.

Type: ☐ Submersible ☐ Jet ☐ Reciprocating

RECEIVED SEP 8 1978

16 Remarks, elevation, source of data, etc.

ADDED INFO BY DRILLER, ITEM NO.

*CORRECTED BY

**ADDITION BY

ELEVATION ~920

DEPTH TO ROCK GW 895

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

DLUSSER DRILLING CO. INC — REGISTERED BUSINESS NAME; 0388 — REGISTRATION NO.

Address 1701 W. MICHIGAN — YPSILANTI

Signed Richard A. Dlusser — AUTHORIZED REPRESENTATIVE; Date 8-31-78

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No.

MAY - 5 1976

29-20

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

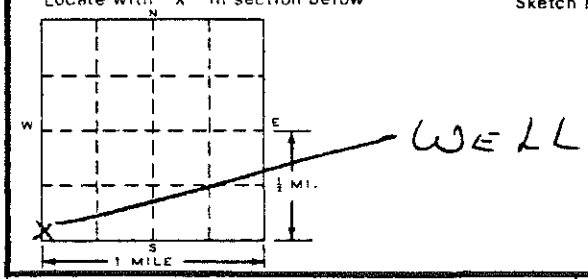
County	Township Name	Fraction	Section Number	Town Number	Range Number
Oakland	Lyon	¼ ¼ ¼	29	1 N/S.	7 E/W.

Distance And Direction from Road Intersections: 22450 Pontiac Tr

Street address & City of Well Location: South Lyon

Locate with "X" in section below

Sketch Map:



3 OWNER OF WELL: T&T Building & Develop.

Address: South Lyon Mich.

4 WELL DEPTH: (completed) 58 ft. Date of Completion 2-12-76

5 [X] Cable tool [ ] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Jetted [ ] Bored [ ]

6 USE: [X] Domestic [ ] Public Supply [ ] Industry [ ] Irrigation [ ] Air Conditioning [ ] Commercial [ ] Test Well [ ]

7 CASING: Threaded [X] Welded [ ] Diam. 4 in. to 58 ft. Depth; ___ in. to ___ ft. Depth

Height: Above/~~Below~~ Surface 1 ft. Weight 11 lbs./ft. Drive Shoe? Yes [X] No [ ]

8 SCREEN: Type: WW Stain Dia.: 3 3/4 Slot/~~Gauze~~ 12 Length 4 Set between 54 ft. and 58 ft. Fittings: Packer & plug

9 STATIC WATER LEVEL 10 ft. below land surface

10 PUMPING LEVEL below land surface 34 ft. after 2 hrs. pumping 10 g.p.m.; ___ ft. after ___ hrs. pumping ___ g.p.m.

11 WATER QUALITY in Parts Per Million: Iron (Fe) ___ Chlorides (Cl) ___ Hardness ___ Other ___

12 WELL HEAD COMPLETION: [ ] In Approved Pit [X] Pitless Adapter [ ] 12" Above Grade

13 Well Grouted? [X] Yes [ ] No [ ] Neat Cement [X] Bentonite [ ] ___ Depth: From ___ ft. to ___ ft.

14 Nearest Source of possible contamination 75 feet ___ Direction Septic Type. Well disinfected upon completion [X] Yes [ ] No

15 PUMP: [X] Not installed. Manufacturer's Name ___ Model Number 4D9P051 HP 1/2 Volts 220 Length of Drop Pipe 47 ft. capacity 10 G.P.M. Type: [X] Submersible [ ] Jet [ ] Reciprocating

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Clay	9	9
Sand	27	36
Clay	16	52
Sand	6	58

USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.

ADDITIONAL BY DRILLER, ITEM NO.
CORRECTED BY
STANDARDIZED BY
ELEVATION ~922
DEPTH TO ROCK GW 912

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Cribley Drilling Co. Inc 524

REGISTERED BUSINESS NAME REGISTRATION NO.

Address Dexter Mich

Signed Jack Clark Date 4-9-76

AUTHORIZED REPRESENTATIVE

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. 29-21

APR 25 1978

WATER WELL RECORD

ACT 294 PA 1965

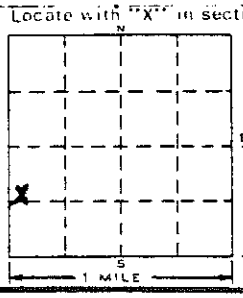
MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

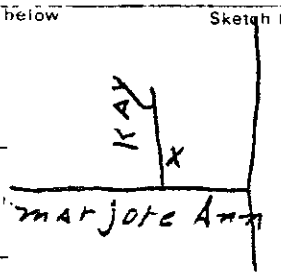
County	Township Name	Fraction	Section Number	Town Number	Range Number
Oakland	Lyon	SW NW SW	29	1 N/S.	7 E/W.

Distance And Direction from Road Intersections
0.1 mi E of Pontiac Trail
0.6 mi S of 10 mi Rd
Street address & City of Well Location

Locate with "X" in section below



Sketch Map:



3 OWNER OF WELL: FRED Campbell
Address 22935 KAY
South Lyon

4 WELL DEPTH: (completed) 72 ft. Date of Completion 8-4-77

5 ☒ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Jetted ☐ Bored ☐ ____

6 USE: ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐

7 CASING: Threaded ☐ Welded ☒
Diam. 4 in. to 72 ft. Depth
____ in. to ____ ft. Depth
Height: Above/Below Surface ____ ft.
Weight 11 lbs./ft.
Drive Shoe? Yes ☒ No ☐

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Brown sandy clay	16	16
Brown sand water	10	26
Hard pan	5	31
Streaks of sand in hard pan	31	62
Gray sand	10	72

USE A 2ND SHEET IF NEEDED

8 SCREEN:
Type: Stainless Dia.: 4"
Slot ~~Gauge~~ 15 slot Length 4'
Set between 68 ft. and 72 ft.
Fittings: 1"X3" nip
K-packer

9 STATIC WATER LEVEL 15 ft. below land surface

10 PUMPING LEVEL below land surface
____ ft. after 2 hrs. pumping 20 g.p.m.
____ ft. after ____ hrs. pumping ____ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) ____ Chlorides (Cl) ____
Hardness ____ Other ____

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☒ Pitless Adapter ☒ 12" Above Grade

13 Well Grouted? ☐ Yes ☒ No
☐ Neat Cement ☐ Bentonite ☐ ____
Depth: From ____ ft. to ____ ft.

14 Nearest Source of possible contamination
____ feet ____ Direction ____ Type
Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: ☐ Not installed
Manufacturer's Name Valley Subm. Pump
Model Number ____ HP ½ Volts 230
Length of Drop Pipe 54 ft. capacity 15 G.P.M.
Type: ☒ Submersible ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.
~922
GW 908
ITEM NO.
ELEVATION
BELOW TOP OF BOX

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
South Well Drilling 1133
REGISTERED BUSINESS NAME REGISTRATION NO.
Address 21210 Walkers
Signed O. D. Smith Date 3-23-78
AUTHORIZED REPRESENTATIVE

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. SEP 20 1976 29-22

WATER WELL RECORD
ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

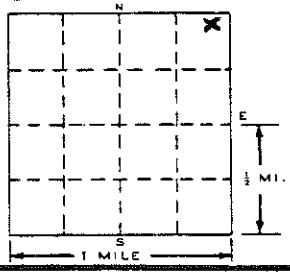
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
OAKLAND	LYON	NE ¼ NE ¼ NE ¼	29	1 N ~~S~~	7 E ~~W~~

Distance And Direction from Road Intersections: S.W. CORNER OF 10 MILE ROAD AND GRISWOLD ROAD

Street address & City of Well Location

Locate with "X" in section below — Sketch Map:



3 OWNER OF WELL: CROSS OF CHRIST LUTHERAN CHURCH

Address SOUTH LYON MICHIGAN

4 WELL DEPTH: (completed) 78 ft. Date of Completion 7-6-1976

5 [X] Cable tool [ ] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Jetted [ ] Bored [ ] ____

6 USE: [ ] Domestic [X] Public Supply [ ] Industry [ ] Irrigation [ ] Air Conditioning [ ] Commercial [ ] Test Well [ ] ____

7 CASING: Threaded [X] Welded [ ] Diam. 4 in. to 73 ft. Depth; ____ in. to ____ ft. Depth

Height: Above/Below Surface 12" ft. Weight 11 lbs./ft. Drive Shoe? Yes [X] No [ ]

8 SCREEN: STAINLESS STEEL
Type: JOHNSON Dia.: 4"
Slot/~~Gauze~~ 15 Length 5'
Set between 73 ft. and 78 ft.
Fittings: 3" X 18" NIPPLE, JOHNSON SEAL

9 STATIC WATER LEVEL 20 ft. below land surface

10 PUMPING LEVEL below land surface 50 ft. after 2 hrs. pumping 20 g.p.m.
DRAW DOWN 12' ft. after ____ hrs. pumping ____ g.p.m.

11 WATER QUALITY in Parts Per Million: Iron (Fe) ____ Chlorides (Cl) ____ Hardness ____ Other ____

12 WELL HEAD COMPLETION: [ ] In Approved Pit [ ] Pitless Adapter [ ] 12" Above Grade

13 Well Grouted? [ ] Yes [X] No [ ] Neat Cement [ ] Bentonite [ ] ____ Depth: From ____ ft. to ____ ft.

14 Nearest Source of possible contamination 150 feet NORTH Direction TILE FIELD Type
Well disinfected upon completion [X] Yes [ ] No

15 PUMP: [X] Not installed
Manufacturer's Name ____
Model Number ____ HP ____ Volts ____
Length of Drop Pipe ____ ft. capacity ____ G.P.M.
Type: [ ] Submersible [ ] Jet [ ] Reciprocating

2 FORMATION

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
CLAY SANDY YELLOW	12'	12'
SILT SAND & GRAVEL	26	38
CLAY WITH GRAVEL		
GRAY	31	69
SAND MEDIUM		
WATER BEARING	9	78

USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.

ADDED INFO BY DRILLER, ITEM NO.
*CORRECTED BY
**ADDITION BY C ~938
ELEVATION
DEPTH TO ROCK GW918

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Caulfield Well & Drainage Co. 0110
REGISTERED BUSINESS NAME — REGISTRATION NO.

Address 29093 LIST ST Farmington Michigan

Signature Joseph A. Caulfield — AUTHORIZED REPRESENTATIVE — Date ____

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. 29-23

JUN 28 1978

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

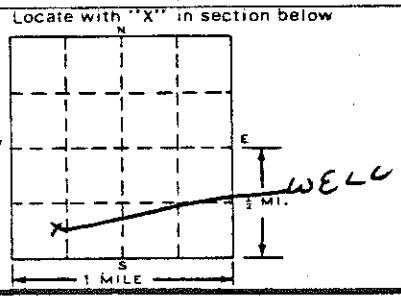
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
OAKLAND	LYON	¼ ¼ ¼	29	1 N/S.	7 E/W.

Distance And Direction from Road Intersections: 22623 VALERIE

Street address & City of Well Location: SOUTH LYON

Locate with "X" in section below — Sketch Map:



3 OWNER OF WELL: RALPH TEEPLES

Address: 22460 PONTIAC TR SOUTH LYON

4 WELL DEPTH: (completed) 55 ft. Date of Completion 5-15-78

5 [X] Cable tool [ ] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Jetted [ ] Bored [ ]

6 USE: [X] Domestic [ ] Public Supply [ ] Industry [ ] Irrigation [ ] Air Conditioning [ ] Commercial [ ] Test Well [ ]

7 CASING: Threaded [X] Welded [ ] Diam. 4 in. to 51 ft. Depth; ___ in. to ___ ft. Depth

Height: Above/~~Below~~ Surface 1 ft. Weight 11 lbs./ft. Drive Shoe? Yes [X] No [ ]

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
CLAY	3	3
SAND	19	22
SAND, GRAVEL, CLAY MIX	27	49
GRAVEL	6	55
BOTTOMED OUT		

USE A 2ND SHEET IF NEEDED

8 SCREEN: Type: WW STAINLESS Dia.: 3 3/4

Slot/~~Gauze~~ 40 Length 4

Set between 51 ft. and 55 ft.

Fittings: PACKER + PLUG

9 STATIC WATER LEVEL 10 ft. below land surface

10 PUMPING LEVEL below land surface: 35 ft. after 2 hrs. pumping 9 g.p.m.

___ ft. after ___ hrs. pumping ___ g.p.m.

11 WATER QUALITY in Parts Per Million: Iron (Fe) ___ Chlorides (Cl) ___ Hardness ___ Other ___

12 WELL HEAD COMPLETION: [ ] In Approved Pit [X] Pitless Adapter [ ] 12" Above Grade

13 Well Grouted? [X] Yes [ ] No [ ] Neat Cement [X] Bentonite [ ] ___ Depth: From ___ ft. to ___ ft.

14 Nearest Source of possible contamination ___ feet ___ Direction NOT IN ___ Type

Well disinfected upon completion [X] Yes [ ] No

15 PUMP: [ ] Not installed

Manufacturer's Name REDA

Model Number 909051 HP 1/2 Volts 220

Length of Drop Pipe 44 ft. capacity 9 G.P.M.

Type: [X] Submersible [ ] Jet [ ] Reciprocating

JUN 6 1978 Health

16 Remarks, elevation, source of data, etc.

ADDED INFO BY DRILLER, ITEM NO. ___

*CORRECTED BY ___

**ADDITION BY ___

ELEVATION

DEPTH TO ROCK

~921

GW 911

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

CRILLEY DRILLING INC — REGISTERED BUSINESS NAME — 1586 — REGISTRATION NO.

Address DEXTER MICH

Signed Charles Crill — AUTHORIZED REPRESENTATIVE — Date 5-19-78

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. [ ] 29-24

OCT 30 1973

WATER WELL RECORD
ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

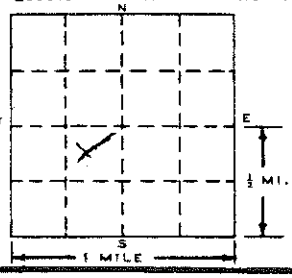
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Oakland	Novi	NE ¼ ¼ ¼	29	1 N/S	7 E/W

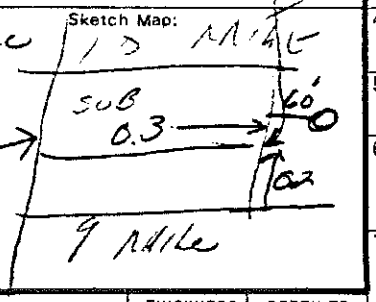
Distance And Direction from Road Intersections: 1/4 S/W Cor Sec 29

Street address & City of Well Location

Locate with "X" in section below



Sketch Map:



3 OWNER OF WELL: Chas. Smith

Address: 10 mile Rd S. Lyon

4 WELL DEPTH: (completed) 64 ft. Date of Completion: March 73

5 ☒ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Jetted ☐ Bored ☐ ____

6 USE: ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐

7 CASING: Threaded ☒ Welded ☐ Height: Above/Below Surface ____ ft.

Diam. 4 in. to 61 ft. Depth; Weight ____ lbs./ft.

____ in. to ____ ft. Depth; Drive Shoe? Yes ☐ No ☐

8 SCREEN: Type: SS Dia.: 4

Slot/Gauze 40 Length 3

Set between 61 ft. and 64 ft.

Fittings: L-Packer

9 STATIC WATER LEVEL 10 ft. below land surface

10 PUMPING LEVEL below land surface 17 ft. after 2 hrs. pumping 12 g.p.m.

____ ft. after ____ hrs. pumping ____ g.p.m.

11 WATER QUALITY in Parts Per Million:

Iron (Fe) ____ Chlorides (Cl) ____

Hardness ____ Other ____

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☒ Pitless Adapter ☒ 12" Above Grade

13 Well Grouted? ☐ Yes ☐ No ☐ Neat Cement ☐ Bentonite ☐ ____

Depth: From ____ ft. to ____ ft.

14 Nearest Source of possible contamination ____ feet ____ Direction NOT-14 Type

Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: ☐ Not installed

Manufacturer's Name Red Jacket

Model Number 430 HP ½ Volts 230

Length of Drop Pipe 30 ft. capacity ____ G.P.M.

Type: ☒ Submersible ☐ Jet ☐ Reciprocating

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand	14	14
Gray-B-Clay	45	59
Gray Net	5	64

ACCEPTED BY: BATTER, ITEM NO.

*CORRECTED BY:

**ADDITION BY: R

ELEVATION

DEPTH TO ROCK

USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.: unlisted ~922 Gr 912

OCT 30 1973 Bureau of Environmental and Occupational Health

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Pearson — REGISTERED BUSINESS NAME; 1199 — REGISTRATION NO.

Address 18241 Mahon Livonia

Signed Albert Clark — AUTHORIZED REPRESENTATIVE; Date March 73

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. 2 AUG - 9 1976

30-1

WATER WELL RECORD
ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

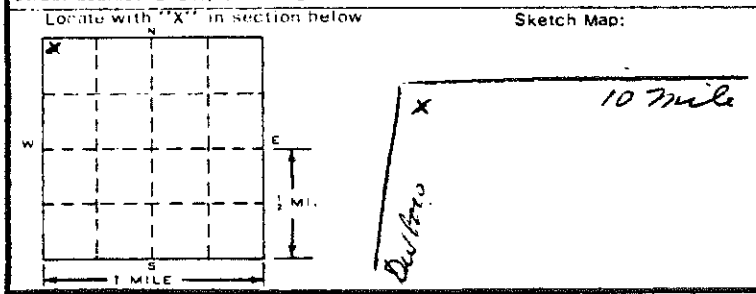
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Oakland	Lyon	NW ¼ NW ¼ NW ¼	30	1 N	7 E

Distance And Direction from Road Intersections: 250' E of Dixboro Rd 200' So of 10 Mile Rd.

Street address & City of Well Location

Locate with "X" in section below — Sketch Map:



3 OWNER OF WELL: Millarch Nurseries
Address: 19913 Hardwell, Livonia

4 WELL DEPTH: (completed) 60 ft. Date of Completion 10-4-75

5 ☒ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Jetted ☐ Bored ☐

6 USE: ☒ Domestic ☐ Public Supply ☐ Industry ~~☐ Irrigation~~ ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐

7 CASING: Threaded ☒ Welded ☐
Diam. 4" in. to 56 ft. Depth; ___ in. to ___ ft. Depth
Height: Above/~~Below~~ Surface 1 ft.
Weight 11 lbs./ft.
Drive Shoe? Yes ☒ No ☐

8 SCREEN:
Type: Stainless Steel Dia.: 4"
Slot/~~Gauge~~ 15 Length 4'
Set between 56 ft. and 60 ft.
Fittings: 3 x 18" nipple & packer

9 STATIC WATER LEVEL 23 ft. below land surface

10 PUMPING LEVEL below land surface
23 ft. after 1 hrs. pumping 60 g.p.m.
___ ft. after ___ hrs. pumping ___ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) ___ Chlorides (Cl) ___
Hardness ___ Other ___

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☒ Pitless Adapter ☒ 12" Above Grade

13 Well Grouted? ☐ Yes ☒ No
☐ Neat Cement ☐ Bentonite ☐
Depth: From ___ ft. to ___ ft.

14 Nearest Source of possible contamination
120 feet E Direction Septic Type
Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: ☐ Not installed
Manufacturer's Name
Model Number 7BK7 HP ¾ Volts 230
Length of Drop Pipe 42 ft. capacity 19 G.P.M.
Type: ☒ Submersible ☐ Jet ☐ Reciprocating

2 FORMATION

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Top soil - black	3'	3'
Sandy Clay -	5'	8'
Yellow Clay	4'	12'
Blue Clay	27'	39'
Cemented gravel	2'	41'
Blue Clay	11'	52'
fine grey sand	2'	54'
Sharp water sand	6'	60'

USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.

ADDED INFO BY DRILLER, ITEM NO.
*CORRECTED BY ~920
**ADDITION BY
ELEVATION GW 897
DEPTH TO ROCK

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Ray Harrison — REGISTERED BUSINESS NAME; 108 — REGISTRATION NO.
Address 1225 E. Lake Dr Walled Lake
Signed Ray S Harrison — AUTHORIZED REPRESENTATIVE; Date 10-4-75

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. [ ]

OCT 24 1980

24-1

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

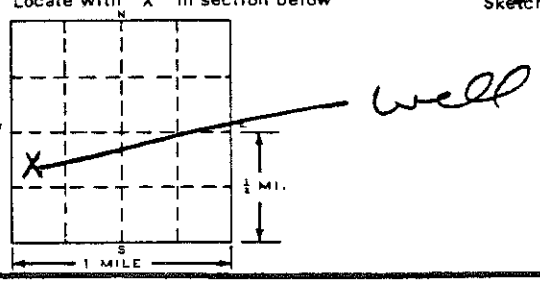
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Livingston	Green Oak	¼ ¼ ¼	24	1 N/S	6 E/W

Distance And Direction from Road Intersections: 13063 Michaels Lane

Street address & City of Well Location: South Lyon

Locate with "X" in section below — Sketch Map:



3 OWNER OF WELL: Daniel Hackett

Address: South Lyon Mi

4 WELL DEPTH: (completed) 57 ft. Date of Completion 8-27-80

5 [X] Cable tool [ ] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Jetted [ ] Bored [ ] ____

6 USE: [X] Domestic [ ] Public Supply [ ] Industry [ ] Irrigation [ ] Air Conditioning [ ] Commercial [ ] Test Well [ ] ____

7 CASING: Threaded [X] Welded [ ]

Diam. 4 in. to 53 ft. Depth

____ in. to ____ ft. Depth

Height: Above/~~Below~~ Surface 1 ft.

Weight 11 lbs./ft.

Drive Shoe? Yes [X] No [ ]

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
SAND	15	15
CLAY	17	32
GRAVEL	7	39
CLAY	2	41
SAND	16	57

USE A 2ND SHEET IF NEEDED. FILLED BY DRILLER, ITEM NO.

8 SCREEN:

Type: WW STAINLESS Dia.: 3 3/4

Slot/~~Gauze~~ 16 Length 4

Set between 53 ft. and 57 ft.

Fittings: PACKER & PLUG

9 STATIC WATER LEVEL 18 ft. below land surface

10 PUMPING LEVEL below land surface

22 ft. after 2 hrs. pumping 1080 g.p.m.

____ ft. after ____ hrs. pumping ____ g.p.m.

11 WATER QUALITY in Parts Per Million:

Iron (Fe) ____ Chlorides (Cl) ____

Hardness ____ Other ____

12 WELL HEAD COMPLETION: [ ] In Approved Pit [X] Pitless Adapter [ ] 12" Above Grade

13 Well Grouted? [X] Yes [ ] No

[ ] Neat Cement [X] Bentonite [ ] ____

Depth: From ____ ft. to ____ ft.

14 Nearest Source of possible contamination

____ feet ____ Direction LOT 14 ____ Type

Well disinfected upon completion [X] Yes [ ] No

15 PUMP: [ ] Not ~~installed~~

Manufacturer's Name RED JACKET

Model Number 50GWI-CE9BC HP 1/2 Volts 230

Length of Drop Pipe 42 ft. capacity 12 G.P.M.

Type: [X] Submersible [ ] Jet [ ] Reciprocating

16 Remarks, elevation, source of data, etc.

ELEVATION

DEPTH TO ROCK

GW 898

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

CRIBLEY DRILLING — REGISTERED BUSINESS NAME

21-1576 — REGISTRATION NO.

Address DEXTER MI.

Signed Charles Crewe — AUTHORIZED REPRESENTATIVE

Date 9-19-80

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. [ ]

24-2

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

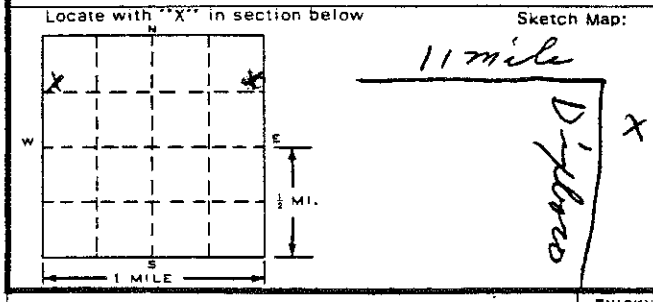
County	Township Name	Fraction	Section Number	Town Number	Range Number
G Livingston	Green Oaks	SW Sw Sw Ex	24	1 N/S	6 E/W

Distance And Direction from Road Intersections: 0.1 Miles S. of Dixboro; 0.2 mile N. of 11 mile Rd

Street address & City of Well Location

Locate with "X" in section below

Sketch Map: 11 mile; Dixboro; X



3 OWNER OF WELL: Vel Starr

Address: 26391 Dixboro, South Lyons, Mich.

4 WELL DEPTH: (completed) 94 ft. Date of Completion 1-10-79

5 [X] Cable tool [ ] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Jetted [ ] Bored [ ]

6 USE: [X] Domestic [ ] Public Supply [ ] Industry [ ] Irrigation [ ] Air Conditioning [ ] Commercial [ ] Test Well [ ]

7 CASING: Threaded [ ] Welded [X]

Diam. 4 in. to 94 ft. Depth; ___ in. to ___ ft. Depth

Height: Above/Below Surface ___ ft.; Weight 11 lbs./ft.; Drive Shoe? Yes [X] No [ ]

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Brown Clay	18	18
Brown Sand Streaks of Blue Clay	57	75
Blue Clay	9	84
Gray Water Sand	10	94

USE A 2ND SHEET IF NEEDED

8 SCREEN: Type: Stainless Steel Dia.: 4"; Slot/Gauze 15 Length 4'; Set between 90 ft. and 94 ft.; Fittings: Burlap Packer.

9 STATIC WATER LEVEL 25 ft. below land surface

10 PUMPING LEVEL below land surface: 63 ft. after 2 hrs. pumping 15 g.p.m.; ___ ft. after ___ hrs. pumping ___ g.p.m.

11 WATER QUALITY in Parts Per Million: Iron (Fe) ___ Chlorides (Cl) ___ Hardness ___ Other ___

12 WELL HEAD COMPLETION: [ ] In Approved Pit [X] Pitless Adapter [X] 12" Above Grade

13 Well Grouted? [ ] Yes [ ] No [ ] Neat Cement [ ] Bentonite [ ] ___ Depth: From ___ ft. to ___ ft.

14 Nearest Source of possible contamination: ___ feet ___ Direction ___ Type; Well disinfected upon completion [X] Yes [ ] No

15 PUMP: [ ] Not installed; Manufacturer's Name F & W; Model Number ___ HP 1/2 Volts 230; Length of Drop Pipe 63 ft. capacity 15 G.P.M.; Type: [X] Submersible [ ] Jet [ ] Reciprocating

16 Remarks, elevation, source of data, etc.

ADDED INFO BY DRILLER, ITEM NO.
*CORRECTED BY
**ADDITION BY
ELEVATION
DEPTH TO ROCK

~ 905
GW 880

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Smith Well Drilling — REGISTERED BUSINESS NAME; 1133 — REGISTRATION NO.

Address 21210 Waldron-Fr. Rd.

Signed O. D. Smith — AUTHORIZED REPRESENTATIVE; Date 4-10-81

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. _____ 24-3

AUG 16 1982

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

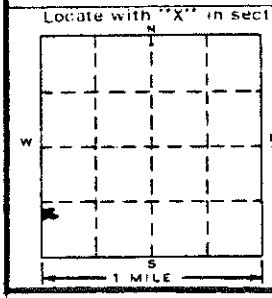
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Livingston	Green Oaks	NW SW SW	24	1 N/S	6 E/W

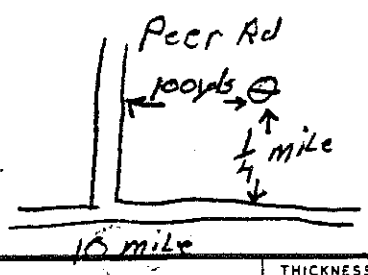
Distance And Direction from Road Intersections: 1/4 mile North of 10 mile 100yds East of Peer

Street address & City of Well Location: 9683 Peer Rd South Lyons

Locate with "X" in section below



Sketch Map:



3 OWNER OF WELL:

Larry Thueme

Address 393 University South Lyons Mich

4 WELL DEPTH: (completed) Date of Completion

79 ft. Oct 1, 1981

5

☒ Cable tool ☐ Rotary ☒ Driven ☐ Dug
☐ Hollow rod ☐ Jetted ☐ Bored ☐ ____

6 USE:

☒ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☐ ____

7 CASING:

Threaded ☐ Welded ☒

Diam. 4 in. to 75 ft. Depth
____ in. to ____ ft. Depth

Height: Above/~~Below~~ Surface 1 ft.
Weight 10.79 lbs./ft.
Drive Shoe? Yes ☒ No ☐

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Yellow Sand	4	4
Yellow Sand + Gravel	18	22
Gray Sand + Gravel	16	38
Blue Clay + Gravel	12	50
Blue Clay	15	65
Blue Clay + Gravel	9	74
Gray Sand + Gravel	5	79

8 SCREEN:

Type: Johnson SS Dia.: 3"
Slot/~~Gauze~~ 10 Length 4'
Set between 75 ft. and 79 ft.
Fittings: Knocker 1' of Blank

9 STATIC WATER LEVEL

21 ft. below land surface

10 PUMPING LEVEL below land surface

____ ft. after 1 hrs. pumping 30 g.p.m.
____ ft. after ____ hrs. pumping ____ g.p.m.

11 WATER QUALITY in Parts Per Million:

Iron (Fe) ____ Chlorides (Cl) ____
Hardness ____ Other ____

12 WELL HEAD COMPLETION:

☐ In Approved Pit
☒ Pitless Adapter ☒ 12" Above Grade

13 Well Grouted?

☒ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☐ ____
Depth: From 0 ft. to 20 ft.

14 Nearest Source of possible contamination

75 feet S Direction Septic Type
Well disinfected upon completion ☒ Yes ☐ No

15 PUMP:

☐ Not installed
Manufacturer's Name Myers
Model Number 52K52 HP 1/2 Volts 220
Length of Drop Pipe 42 ft. capacity 30 G.P.M.
Type: ☒ Submersible
☐ Jet ☐ Reciprocating

USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.

~~ADDED INFO BY DRILLER, ITEM NO.~~
*CORRECTED BY
**ADDITION BY
ELEVATION
DEPTH TO ROCK

~710
GW 889

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Leo Adams Well Drilling 47-1002
REGISTERED BUSINESS NAME REGISTRATION NO.

Address 9639 McClements Brighton

Signed Beverly Adams Date 11-10-81
AUTHORIZED REPRESENTATIVE

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

LAYNE-NORTHERN COMPANY
Incorporated

MISHAWAKA, INDIANA

☐ TEST
☒ PERMANENT

Job No. [illegible]

WELL LOG No. 1 CITY South Lyon County [illegible]

Owner City of South Lyon Township [illegible]

Section 30 [illegible]

Location State Michigan

From Land Description Approx. 3250 ft. East and 3400 ft. North of SW Corner of Section

From Street or Road 400' E. of West Street and 200' South of North property line and about 7' North of Layne Test Well No. 1.

FORMATION FOUND — DESCRIBE FULLY	FROM NATURAL GROUND LEVEL			
	Depth to Top of Stratum	Depth to Bottom of Stratum	Thickness of Stratum	Static Water Level
Sand	0	16	16	
Coarse gravel	16	32	16	
White clay	32	46	14	
Sandy clay	46	69	23	
Sand & gravel	69	110	41	1' 6"

12 inch diameter hole drilled by ☒ Cable Tool ☐ Rotary ☐ Jetting

Pipe left in hole 88' 2"

Date Started 8/4/54 Finished 8/26/54 A. Turner

DRILLER

LAYNE-NORTHERN COMPANY
Incorporated

MISHAWAKA, INDIANA

☐ TEST

☒ PERMANENT

Job No. [illegible]

WELL LOG No. 2 CITY South Lyon County [illegible]

Owner City of South Lyon Township Lyon

Section [illegible]

Location 110' N. W. of permanent Well 1. State Michigan

From Land Description Approx. 3150 ft. East and 3500 ft. North of SW Corner of Section.

From Street or Road 300' E. of West St. 100' S. of property line and 100' E. of West property line.

FORMATION FOUND — DESCRIBE FULLY	FROM NATURAL GROUND LEVEL			
	Depth to Top of Stratum	Depth to Bottom of Stratum	Thickness of Stratum	Static Water Level
Top soil	0	1	1	
Sand	1	10	9	
Gravel	10	32	22	
Blue sandy clay	32	70	38	
Soft gray clay	70	84	14	
Gravel	84	85	1	6'
Gray muddy sand	85	90	5	
Fine gravel, muddy	90	98	8	
Coarse sand & gravel, clean	98	118	20	

12 inch diameter hole drilled by ☒ Cable Tool ☐ Rotary ☐ Jetting

Pipe left in hole 100' 9"

Date Started 9/8/54 Finished 10/15/54 A. Turner

DRILLER

WELL #4

DESCRIPTION	DEPTH	THICKNESS
SANDY YELLOW CLAY	0-18'	18'
COARSE SAND & GRAVEL	18'-28'	10'
CEMENTED GRAVEL	28'-54'	26'
FINE TO COARSE GRAVEL	54'-127'	73'
FINE DIRTY SILTY SAND	127'- ?	?

WELL #3

DESCRIPTION	DEPTH	THICKNESS
MUCK	0-2'	2'
SAND	2'-4'	2'
SANDY MUCK	4'-20'	16'
DIRTY GRAVE	20'-35'	15'
GRAY GRAVEL	35'-45'	10'
CEMENTED GRAVEL	45'-50'	5'
SANDY, GRAY CLAY	50'-57'	7'
COARSE WATER BEARING GRAVEL	57'-85'	28'
CLEAN COARSE SAND	85'-94'	9'
CLEAN FINE GRAVEL	94'-107'	13'
DIRTY SAND & GRAVEL	107'-120'	13'
FINE GRAVEL	120'-130'	10'
FINE SILTY SAND	130'-?	?