⑤

PHASE I

MERCURY CONTAMINATION

TAYLOR INSTRUMENT CO.
DIVISION OF SYBRON CORPORATION
ROCHESTER, NEW YORK 14601

APRIL 1983

RECEIVED
JAN 27 1987
SOLID WASTE
D.E.C. REG. #8

LOZIER
ARCHITECTS/ENGINEERS

Red comments
by R. Young

TABLE OF CONTENTS

I. INTRODUCTION

The history of remedial activities initiated by the Taylor Instrument Company ("Taylor") at their Ames Street site has been presented through a series of Lozier Architects/ Engineers ("Lozier") Engineering Reports. The first Lozier Engineering Report was in January 1982 and further reports in March and November of 1982 addressed the initial field work and laboratory analysis on through the proposed overall site evaluation to be accomplished through both field work and laboratory testing in the fall of 1982. The aforementioned reports should be consulted for the detailed and professional endeavors by Taylor during that period. This report will deal with the efforts undertaken by Taylor through Lozier in the period from November 1982 through the present.

II. ACTIVITIES SINCE NOVEMBER 1982

The November 1982 Engineering Report by Lozier recommended an overall site analysis through borings, soil and water samplings, instrumentation installations, and laboratory analysis. This program, which was detailed in the November 1982 report, and subsequently approved by the New York State Department of Environmental Conservation (N.Y.S.D.E.C.), was performed in the fall of 1982.

The overall extent of field work performed at the Taylor Instrument site in the fall of 1982 is extensively described in Appendix A ("Thomsen Report"). In summary, the field efforts included six (6) new 2" inch I.D. observation wells (W-1 through W-6), one (1) piezometer nest (PZ-2), and four (4) lysimeters (LY-1 through LY-4). Soil samples were continuously (every two feet) withdrawn during the installation of the aforementioned observation locations. The analytical results of these mercury tested soil samplings is found in Appendix D of the Thomsen Report.

After the stabilization of each new monitoring location, all observation wells, piezometers, and lysimeters installed during the various stages of activities at the Taylor site, were purged. These purging efforts consisted of the withdrawal of at least three volumes of water from each location. This effort required at least two different site visits. Immediately after the final purging, groundwater samples were withdrawn and tested for mercury. In addition, observation well W-1 was tested for characterization parameters. Well W-1 was selected since it was believed to be upgradient of the site. The parameters selected for testing were based on known production activities used since the beginning of manufacturing activities at the Taylor Instrument site. Therefore, the results of the analysis for the characterization parameters presented in Appendix E of the Thomsen Report, should indicate whether any other contaminant, attributable to past Taylor activities, might have been introduced into the groundwater.

Additionally, in the fall of 1982 Taylor collected most all the visible glass shards which partially littered the one-half acre contaminated area in the north portion of the Taylor site. This effort culminated with the shipment of two (2) 55-gallon manifested drums, to the secured hazardous waste burial facility operated by CECOS in Niagara Falls.

Subsequent to the collection of the visible glass shards, the one-half acre contaminated site was graded and paved with a four-inch lift of asphaltic binder material. Although the 2-inch asphaltic topping was not applied in the fall of 1982, but was left until the spring of 1983, the four-inch lift of binder should have significantly reduced the introduction of any atmospheric moisture (rainfall and snow melt) to this groundwater recharge area.

III. SYNOPSIS OF FIELD PROCEDURES AND LAB TESTING

Since the analytical results of all the laboratory testing (performed by Lozier/Camo) on the soil and water samples was an integral part of the geology and hydrogeology investigations which were subcontracted to Thomsen, those results have been made a portion of the Thomsen Report and can be found in Appendices D and E of that report.

Additionally, a discussion on the procedures and methodologies employed by Empire Soils in their soil boring and instrumentation installation work at the Taylor site can also be found in the Thomsen Report. Empire Soils performed the field work for Thomsen Associates.

IV. ANALYTICAL RESULTS OF SOIL AND WATER SAMPLES

High levels of mercury in the soil were found principally in the one-half acre contaminated area. Mercury concentrations in this area were as high as 7,150 micrograms/gram at the surface. Conversely, the highest mercury levels in soil samples collected at locations W-1 and W-2 were only as high as 1 microgram/gram. Generally speaking, mercury concentrations within the soil matrix throughout the Taylor Instrument site diminished with depth and distance away from the one-half acre contaminated area. Possible geological explanations for these mercury results can be found in the Thomsen Report.

The results of the analysis of the groundwater samples withdrawn from all the installations on the Taylor site indicated most all were below detectable limits. Of the four samples which exceeded Class GA groundwater limitations (as codified in 6 N.Y.C.R.R. part 703), three of those were so marginally excessive as to be within the limits of precision and accuracy of the methods employed. The sole water sample which was in excess of those standards was from well E-180. The integrity of well E-180 is highly questionable. Ever since this well was installed in late 1981 it has yielded a turbid sample. It is now believed that this well has a defective and/or insufficient sand pack and bentonite seal. Later in this report it is recommended that well E-180 be removed from service and the casing sealed and certified as to its proper closure.

Thus it can be said with a high degree of certainty, that mercury present within the soil has not contaminated the groundwater. Asphalt paving of the one-half acre contaminated area appears to be a viable and effective means of precluding any possible future contamination of the groundwater. The testing results of the soil and water samples procured from the Taylor site during this last round of field work can be found in Appendix D and E of the Thomsen Report.

V. REMEDIAL WORK AND DRAINAGE

As indicated in Section II of this report, the proposal presented in the November 1982 report by Taylor Instrument to asphalt pave the one-half acre contaminated area was substantially accomplished during the late fall of 1982, subsequent to written approval by N.Y.S.D.E.C. The 2-inch asphalt topping was not installed at that time. However, grading, drainage and paving (binder) of the area was accomplished. These efforts accomplished two (2) very important things:

1. The adjacent areas no longer send runoff into the one-half acre contaminated area.

2. The newly paved surface is now self-draining through the use of drainage inlets and has been piped into Taylor's existing storm sewer which ties into the combined sewer network of the City of Rochester.

Sealing characteristics of the combined 4-inch binder and 2-inch topping will prevent:

1. The further introduction of atmospheric precipitation into the contaminated area.

2. The possibility of hydrolyzing any of the mercury through the aggressive efforts of low pH rainwater, and

3. The further recharge of the groundwater system through this surface area.

By examining Figure No. 4 in the Thomsen report, it can be seen that the groundwater table varies from an elevation of approximately 528.2 feet (at the southwest corner of the Taylor site) to approximately 524 feet (midway across the site proceeding in a northesterly direction). While there were no observation points in the northeast corner of the Taylor Instrument site, it can be presumed with a fair degree of confidence that the groundwater table regresses downward toward the railroad overpass on Ames Street.

Combined sewer inverts on Ames Street vary from 522.52 feet near West Avenue to 497.82 feet near the railroad overpass. Inverts such as these, coupled with the preceding groundwater elevations, would promote infiltration rather than exfiltration in the surrounding combined sewers if they suffer from joint deterioration. Under normal conditions, influent to the City sewer system is conveyed to the County's wastewater treatment facility (Frank E. VanLare Wastewater Treatment Plant) in Durand-Eastman Park.

Overall, the combination of:

1. Sealing the one-half acre contaminated area,

2. The natural hydraulic gradient of the groundwater table from the southwest to the northeast, and

3. The presence of an existing combined sewer network render the possibility extremely remote of any mercury contamination spreading within the groundwater aquifer. It is noteworthy that since at least 1965, the introduction of surface precipitation onto the one-half

acre contaminated area has resulted in little apparent groundwater contamination.

VI. PROPOSED FUTURE TESTING

Based upon the data presented in the Thomsen report using the results of actual tests performed in the field, the average horizontal groundwater velocity is approximately four (4) feet per year within the one-half acre contaminated area. Although observation well C-135 is only about thirty (30) feet away from the estimated center of mercury contamination, the mercury concentration in the groundwater sample obtained from C-135 did not exceed the 6 N.Y.C.R.R. Part 703 Class GA groundwater limitations.

This information, coupled with the asphalt paving of the one-half acre contaminated area (eliminating its future function as a groundwater recharge area) forms the basis for Taylor's proposal for further testing at the Ames Street site.

Taylor proposes to withdraw groundwater samples from the following locations on a quarterly basis: (a) W-2, (b) PZ-2A, (c) O-O, (d) D-O, (e) W-5, (f) LY-1, (g) LY-2, (h) LY-3, (i) LY-4. The water samples procured from these locations will be analyzed for total mercury. It is additionally proposed that these results be transmitted to N.Y.S.D.E.C. and that this quarterly testing program be instituted for two (2) calendar years. It is anticipated that the minute mercury concentrations presently detectable in the groundwater will remain at those levels or exhibit a decrease during the two (2) year testing program. At the end of that period a brief summary of the program possibly accompanied by a request for termination of the testing program will be prepared by Taylor, and submitted to N.Y.S.D.E.C.

VII. SECURING THE TAYLOR SITE

At this time, Taylor proposes to remove observation well E-180 from service. As stated earlier, the integrity of this well has been suspect ever since initial installation. The well has always yielded turbid water samples and there is a strong belief that the sand pack and bentonite seal are not properly in place. Since there are sufficient other testing locations in close proximity to E-180, the certified sealing of the well would not jeopardize the overall two-year testing program. Preliminary steps are presently underway to perform this aforementioned sealing operation on E-180. It is not recommended that Taylor presently pursue the certified sealing of any other observation or instrumentation locations until the end of the two-year quarterly testing program. Then, when the report summarizing the two-year testing program is written, it will address the sealing of any other locations should further testing of the groundwater not be warranted.

However, since significant capital was used to perform the field work and install the observation locations, Taylor would like to have full utilization of them for at least the next two (2) years. The New York State Department of Environmental Conservation will be contacted by Taylor prior to the sealing of any of the observation locations.

VIII. OBSERVATIONS

Taylor has used professional judgment and has taken credible environmental actions in addressing its mercury contamination problems ever since these problems were first discovered accidentally in mid-1981. With the anticipated approval of the proposed quarterly testing program, and the anticipated absence of any indication of mercury proliferation within the groundwater aquifer, Taylor expects that this remedial project will be completed in 1985.

The input and professional manner with which Taylor has been aided by New York State Department of Health and the New York State Department of Environmental Conservation has been most helpful and greatly appreciated.

THOMSEN
ASSOCIATES

HYDROGEOLOGICAL INVESTIGATION
TAYLOR INSTRUMENT SITE
ROCHESTER, NEW YORK

FOR

Lozier Architects/Engineers
Rochester, New York

Job No. GTA-82-27
January 1983

Geotechnical & Materials Engineering, Geologic & Environmental Geoscience Services

105 CORONA AVE., GROTON, NY 13073 (607) 898-5881

TABLE OF CONTENTS
PHASE I
HYDROGEOLOGICAL INVESTIGATION
TAYLOR INSTRUMENT SITE
ROCHESTER, NEW YORK

LIST OF FIGURES

1.0 INTRODUCTION

1.1 Background

Thomsen Associates was retained by Lozier Architects/ Engineers ("Lozier") to perform a hydrogeologic investigation at the Taylor Instrument Company ("Taylor") site in Rochester, New York. This investigation resulted from a previous preliminary investigation by Lozier which indicated that certain areas of the site were contaminated with elemental mercury.

The Taylor site is located at 95 Ames Street in Rochester, New York. For about 25 years (between 1940 and 1965) Taylor reclaimed mercury from their thermometer manufacturing process in a building in the northwestern part of the property. A preliminary investigation by Lozier confirmed that certain areas near the former reclamation building were contaminated with mercury. Following discussions with the New York State Department of Environmental Conservation (NYDEC) a Phase I hydrogeologic field program was agreed upon by the NYDEC and Taylor (Lozier, June 1982) to investigate the extent and concentration of any mercury contamination within the groundwater and soil matrix. This report presents the findings and conclusions from the Phase I hydrogeologic investigation.

1.2 Purpose and Scope

The purpose of this investigation is to assess the magnitude of mercury contamination within the known contaminated area, and generally assess the potential and extent of contaminant migration throughout the site.

The scope of this investigation was limited to:

- Analysis of subsurface conditions found at 11 soil borings.
- Analysis of groundwater conditions from 10 observation wells, one piezometer cluster, and two lysimeter clusters.
- Analysis of chemical results from soil samples taken from the 11 new borings.
- Analysis of results from one episode of water samples taken from 16 water sampling points.

2.0 METHODOLOGY

2.1 Borings

Seven deep borings and four shallow borings were advanced using a 3-3/4 inch I.D. hollow stem auger casing. The seven deep borings were drilled to bedrock and two foot split spoon samples were taken every two feet according to ASTM Method D-1586. Recovered soil samples were divided equally with Lozier Architects/Engineers for chemical analysis by splitting the samples longitudinally. The four shallow borings were drilled to install lysimeters. Split spoon soil samples were also taken in these borings according to ASTM Method D-1586. Boring logs for all eleven borings are found in Appendix A.

2.2 Well and Lysimeter Installation

Two-inch I.D. observation wells were installed in six borings in the glacial till (W-1 through W-6, Figure 1). Observation wells were constructed using 0.02 inch slot PVC well screen and solid PVC pipe for the riser. A bentonite seal was placed in the bottom of all the borings below the well screen to prevent the possibility of the borehole becoming a conduit to bedrock for contaminated water. Clean fine silica sand was used to backfill the annular space around the well screen and a bentonite seal placed above the well screen. A locking metal protector pipe was placed around all wells. Well construction details are found on the boring logs (Appendix A) and in Appendix B.

To investigate vertical gradients and vertical migration of mercury in groundwater one boring was converted to a piezometer nest (PZ-2). A piezometer is used to measure hydraulic head at a discrete point below the top of the water table. The piezometer nest was constructed by placing two two-inch diameter porous PVC tips in the boring at different elevations. The porous PVC tips were two feet long and connected to solid 3/4 inch I.D. PVC riser pipe. A clean sand backfill of fine silica sand was placed around the PVC porous tips which were isolated by bentonite seals. Appendices A and B give the details of the piezometer construction.

Four lysimeters were installed in two areas known to have surficial soil contamination (Figure 1). The purpose of the lysimeters was to sample pore water from the unsaturated zone. The lysimeters are porous ceramic cups which are connected to the ground surface with plastic tubing. Negative pressure is applied to the plastic tubing to withdraw pore water from the soil. A shallow and a deep lysimeter were installed at the two locations. The tips of the shallow lysimeters are at 4.1 feet and the tips of the deep lysimeters are at 6.6 feet. Lysimeters were installed in shallow borings as shown in Appendix A. The hollow stem auger was used to advance the borehole to the desired depth for the top of the lysimeter. A split spoon sample was taken from below the auger casing and the lysimeter installed in the sample hole. A slurry of soil from the split spoon sample and water was placed around the lysimeter tip to provide a good connection between the lysimeter and surrounding soils. A bentonite seal was placed in the borehole above the lysimeter. Appendices A and B show the details of lysimeter construction.

2.3 Field Permeability Tests

Field permeability tests were performed on five of the new observation wells following the methodology of Bouwer and Rice, 1976 (Appendix C). The purpose of the field permeability tests was to estimate the horizontal hydraulic conductivity of the glacial till.

2.4 Water Level Readings

Water level readings were taken at the new observation wells a week after the last well was installed on Sept. 28,1982. The wells were allowed to stabilize one month before a complete set of water level readings was taken from all wells on October 28, 1982. (Appendix B)

3.0 HYDROGEOLOGIC REGIME

3.1 Subsurface Deposits

The seven borings advanced to bedrock encountered between 14 and 28 feet of unconsolidated deposits. Bedrock elevations were highest in the southeast, sloping toward the northwest (Figure 2). The unconsolidated deposits consist of 3 to 9 feet of fill overlying glacial till. The fill consists of sand and silt with some gravel. Organic matter, cinders, and crushed stone are interspersed in the fill. The glacial till consists of dense silt and sand with some gravel and rock fragments. In some places a yellow-brown ablation till overlies a red-brown to brown basal till (Figure 3). Basal till is deposited from material that is transported upon or within a glacier as it retreats. The ablation till is generally slighlty more sandy and less dense than the underlying basal till. Bedrock, consisting of Lockport dolomite of Upper Silurian Age, is found beneath the unconsolidated deposits.

The horizontal hydraulic conductivity of the glacial till was estimated using the field permeability test method of Bouwer and Rice, 1976 (Appendix C). The horizontal hydraulic conductivity is a measure of the ease with which water passes through the soil in the horizontal direction. Five of the new observation wells were tested. Results of the tests indicate a range in horizontal hydraulic conductivity of 1.6 x 10^{-5}cm/sec to 8.8 x 10^{-5}cm/sec with a mean of 5.2 x 10^{-5}cm/sec (0.15 ft/day) (Appendix C).

3.2 Groundwater Flow

Water level measurements were taken over a period of 1 year to determine the direction of groundwater flow. The water table shown in Figure 4 was from water level measurements taken on October 28, 1982. The water table generally slopes to the northeast (Figure 4). However, a ground mound has formed beneath the area north of Building 40. The area north of Building 40 is the only unpaved area in the vicinity, and has a granular surface. Thus, this area receives more recharge than surrounding paved areas, resulting in the groundwater mound. Groundwater flows in all directions away from the high point in the northwest corner of Building 40. Water level measurements at PZ-2 also indicate this area is a groundwater recharge area. The vertical gradient in a recharge area will be downward. The vertical gradient measured at PZ-2 was 0.17 ft/ft downward indicating a strong vertical component to groundwater flow in this area due to recharge.

Water level measurements obtained by Taylor personnel indicate there is a yearly fluctuation in the water table of 4-5 feet. During the fall, the water table is six to ten feet below the ground surface in the glacial till. In the spring, when groundwater levels are higher, the water table will be withn the fill overlying the glacial till.

The horizontal average linear velocity of groundwater flow north of Building 40 can be calculated using Darcy's Law, $\bar{v} = KI/n$ where $\bar{v}$ is the average linear velocity, K is the hydraulic conductivity, I is the hydraulic gradient and n is effective porosity. Hydraulic conductivity can be estimated from the field slug tests and the hydraulic gradient can be estimated from the water table map. Effective porosity of till is estimated to be 0.1. Using $K = 5 \times 10^{-5}$cm/sec, I = .0095 ft/ft and n = .1, $\bar{v}$ = 5 ft/year. The average linear velocity of flow south of Building 49 is lower than in the area of the groundwater mound north of Building 40 because the hydraulic gradient is lower (.0074/ft/ft). The average horizontal groundwater velocity is about 4 ft/year in this area.

Since the groundwater mound north of Building 40 is caused by increased recharge through the granular surface deposits in the area, paving the area should decrease recharge and decrease the groundwater mound. Decreasing the groundwater mound should result in a change in groundwater flow direction from the current pattern to a northeasterly direction of flow which is the predominant flow pattern beneath the majority of the site.

4.0 CHEMICAL ANALYSIS

4.1 Soil Contamination

Lozier Architects/Engineers analyzed 80 soil samples from the eleven borings for total mercury concentration (Appendix D). These results show higher mercury concentrations in the soil samples from borings close to Building 40 (LY-1 , LY-2, LY-3, LY-4, PZ-2) and in soil samples from one boring south of Building 49 (W-6). Boring W-5 north of Building 40 also has some elevated mercury concentrations in soil samples. Slightly elevated concentrations of mercury were found in a few soil samples from borings W-3 and W-4. Soil samples from borings W-1 and W-2 show very little presence of mercury.

The highest mercury concentrations were in surface soil samples. In the borings close to Building 40, surface concentrations of mercury between 700 ppm and 7150 ppm were found. Mercury concentrations in soil samples from borings generally decreased with depth, with some exceptions as noted below. Soil samples from W-6 and PZ-2 show an initial drop in concentration, then concentrations of mercury in the soil samples remain high throughout the depth of the boring (greater than 250 ppm). In boring W-3, W-4, W-5, and LY-3 after an initial drop in mercury concentration with depth, mercury concentrations increase again between a depth of 12-18 feet.

The secondary peak in mercury concentration with depth found in some borings is probably due to slight changes in geologic strata resulting in slightly different hydraulic conductivities. Dissimilarities in the hydraulic conductivity of different strata could be caused by variatons in the amount of fine grained material and/or compaction of the different geologic strata. If the hydraulic conductivity of the lower deposit is lower than the hydraulic conductivity of the overlying deposit, the vertical movement of groundwater will be retarded at the interface between the two strata resulting in a concentration of mercury at the geologic interface. Examination of boring logs from the boring where the secondary peak in mercury concentrations is found, indicates that the above mechanism may be causing these peaks.

The depth of the secondary peak in mercury concentrations in W-3 is in samples from 12-14 feet and 16-18 feet. Blow counts in this boring indicate the till increases in density at 16 feet. The samples from 14-16 feet and 16-18 feet are also siltier than samples of the till above. The increase in mercury concentration of W-3 appears to correlate with a slight density and grain size change in the till resulting in a lower hydraulic conductivity at that depth. In borings W-4 and W-5 the peak in concentration at depth appears to correlate with the ablation till/basal till boundary. The basal till is generally more compact and has more silt than the ablation till so would have a slightly lower hydraulic conductivity. There is also an increase in concentration of mercury at the lowest soil samples from LY-3. This sample is close to the fill/till boundary. The till is more compact than the overlying fill which could account for the higher concentration.

The realtively high concentrations found throughout the depths of borings W-6 and PZ-2 are difficult to explain because the high concentrations of mercury were found deep in the underlying till as well as the fill. Moreover, the surficial samples tested did not have as high a concentration of mercury as other borings. LY-1 and LY-4 both had much higher surficial concentrations of mercury and show rapid attenuation of mercury with depth. In addition, previous results from borings O-O, A-45 and A-90 all show higher surficial concentrations rapidly decreasing with depth. Only results from E-180 indicate possible high concentrations with depth. The soil sample from 8 feet at E-180 has higher concentrations than the soil sample from 4 feet. However, soil samples from E-180 were only analyzed down to a depth of 8 feet while soil samples from W-6 and PZ-2 were analyzed down to depths of 15 feet and 26 feet, respectively. Thus, from the data available, it is not possible to determine if soil samples from E-180 show a similar trend to soil sample results from W-6 and PZ-2.

4.2 Water Quality

Water samples were taken from the observation wells, piezometers, and lysimeters by Lozier Architects/Engineers to assess the extent of mercury contamination in groundwater. Results from the water sample analyses are in Appendix E. Despite widespread soil contamination found in many borings, water quality results indicate only very small areas of groundwater contamination. The only wells which had concentrations of mercury above the detection limits were O-0 and E-180. Mercury concentrations in D-0 and C-135 are so close to the detection limit that these results do not indicate contamination. Only two of the four lysimeters (LY-1 and LY-4) had mercury concentrations over the detection limits of 0.0002 mg/l. Although the concentrations of mercury found in O-0, LY-1, LY-4 and E-180 exceed the NYDEC Class GA Water Quality Standards (of 0.002 mg/l) (NYDEC, 1978) only E-180 has extremely high concentrations of mercury. The concentrations of mercury found in O-0, LY-1 and LY-4 are very close to the Class GA Water Quality Standards. The results from E-180 are questionable because the annular space in the well may not be properly sealed.

The only well and lysimeter samples which show mercury contamination are from areas where the surface soil sample concentration of mercury was greater than 7000 ppm mercury. It appears that only extremely high surface concentrations of mercury in the soil will result in any effect on groundwater or porewater quality. In LY-2 the surface concentration of mercury was 1000 ppm but no detectable mercury was found in the pore water at a depth of only 6 feet; indicating a very low mobility of mercury.

4.3 Conclusions and Recommendations

Although many soil samples indicated a very high level of mercury contamination throughout the unconsolidated deposits, water quality results indicate the mercury is not very mobile and is attenuated very well by the soil. Only two wells show any mercury contamination in groundwater and the concentrations found in one of the wells (E-180) are questionable due to well construction. Reclamation began around 1940 so mercury could have been on the soil surface in the area for over 40 years. Using the calculated flow rate of 5 ft/year, groundwater would have moved over 200 feet away from the contaminated area during the past 40 years. However, well D-0 is only 55 feet downgradient of well O-0 where mercury was found in groundwater, but the water quality of D-0 has not been affected by mercury contamination. Therefore, mercury is not very mobile in the groundwater system.

Paving the area north of Building 40 will reduce infiltration which will have two beneficial effects. Reducing infiltration will reduce the groundwater mound beneath the area which will reduce hydraulic gradients in the area. Lower hydraulic gradients will result in lower velocity of groundwater flow which will retard any contaminant migration. Although mercury does not appear to be currently moving in the groundwater, reducing the groundwater velocity will provide a further measure of protection to groundwater downgradient of the area. Reducing infiltration will also improve water quality by reducing percolation. With a lower amount of percolation, less water will move through the soil soluabilizing mercury. Thus, less mercury should move through the soil into groundwater. Although mercury seems to be well attenuated in the soil column and relatively immobile in the groundwater regime, reducing infiltration through the site should provide further protection of groundwater quality.

Further groundwater quality monitoring is recommended to determine seasonal variations in water quality results. The wells which should be monitored are W-2 (for background), PZ-2B, O-0, D-0, and W-5. Lysimeters LY-1, LY-2, LY-3 and LY-4 should also be monitored. At the time water samples are taken water levels should be measured in all wells. In addition, we recommend that well E-180 be pulled out and the borehole grouted with a cement/bentonite slurry. Water quality results and the boring logs indicate the well may not be properly constructed and the bentonite seal may be leaking. To prevent the borehole from becoming a direct route for mercury migration into groundwater we recommend the well be removed and the borehole grouted.

Water levels should also be taken monthly at all wells to determine if seasonal fluctuations in the water table affect the direction of groundwater flow in the area.

5.0 REFERENCES

1. Bouwer, H.C. and R.C. Rice, 1976, A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells, Water Resources Research, Volume 12, No. 3, pp 423-427.

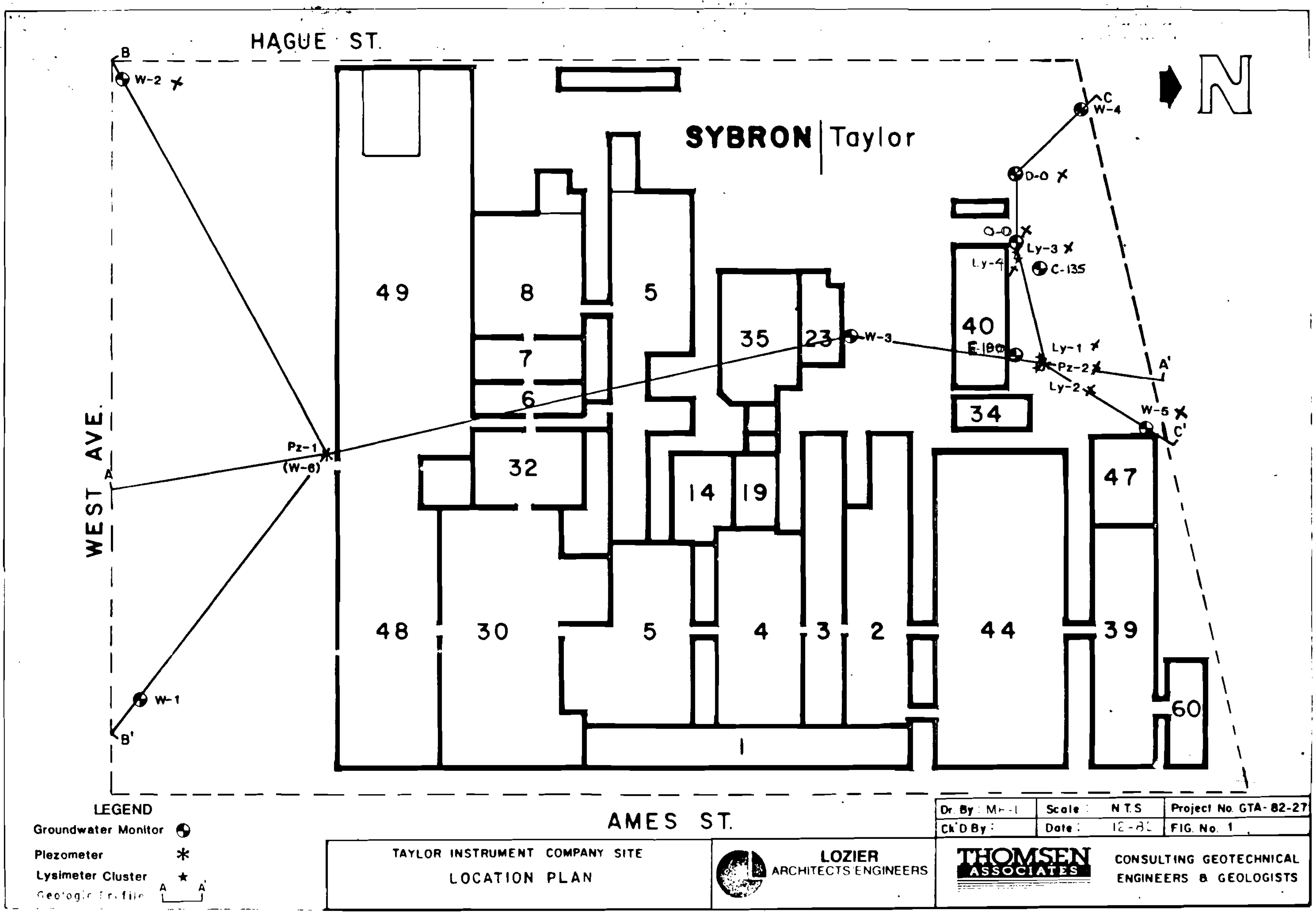
2. Lozier Architects/Engineers, June 1982, Phase I Proposed Hydrogeological Field Work and Bench Scale Testing Dealing with Mercury Contamination, Taylor Instrument Company, Division of Sybron Corporation, Rochester, New York.

3. NYDEC, 1978, Ground Water Classifications, Quality Standards and Effluent Standards and/or Limitations, Title 6, Official Compilation of Codes, Rules and Regulations, Part 703.

Respectfully submitted

THOMSEN ASSOCIATES

Marjory Rinaldo-Lee
Hydrogeologist



LEGEND

Groundwater Monitor ●

Piezometer *

Lysimeter Cluster ★

Geologic Profile A A'

Dr. By : MH-I	Scale : N.T.S.	Project No. GTA-82-27
Ck'D By :	Date : 12-82	FIG. No. 1

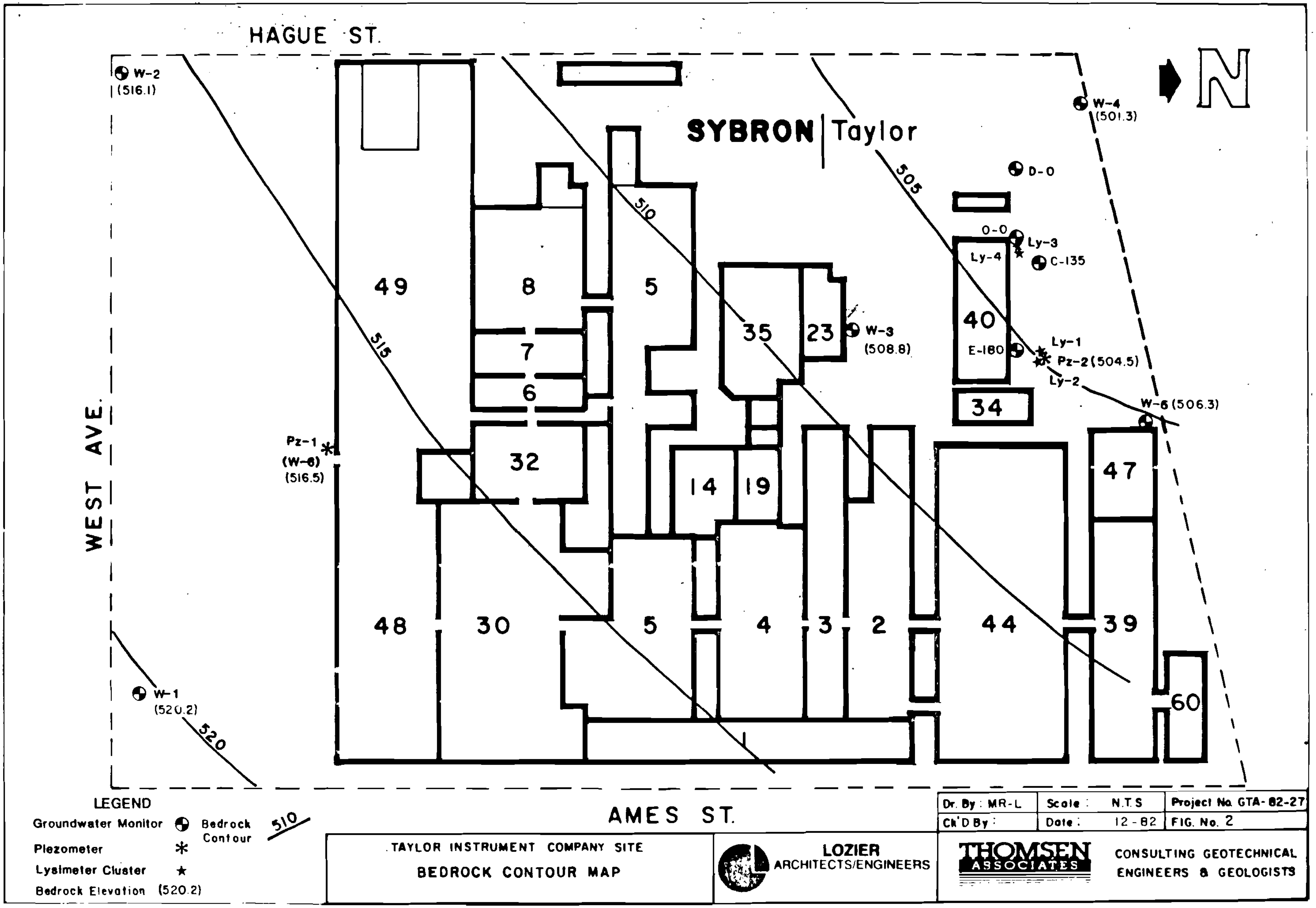
TAYLOR INSTRUMENT COMPANY SITE

LOCATION PLAN

LOZIER
ARCHITECTS ENGINEERS

THOMSEN ASSOCIATES

CONSULTING GEOTECHNICAL
ENGINEERS & GEOLOGISTS

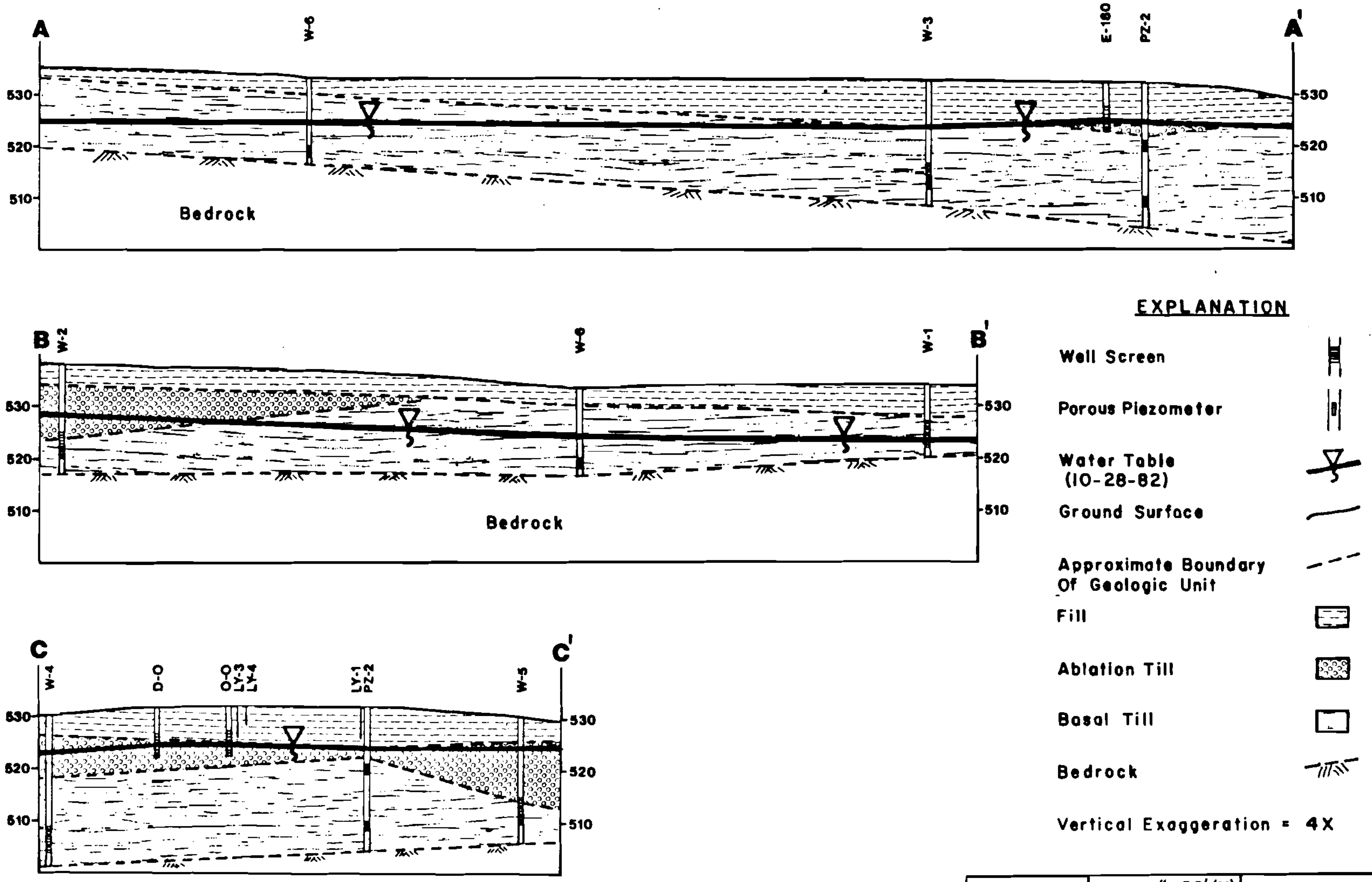


Dr. By : MR-L	Scale : N.T.S	Project No. GTA-82-27
Ch'D By :	Date : 12-82	FIG. No. 2

TAYLOR INSTRUMENT COMPANY SITE
BEDROCK CONTOUR MAP

LOZIER
ARCHITECTS/ENGINEERS

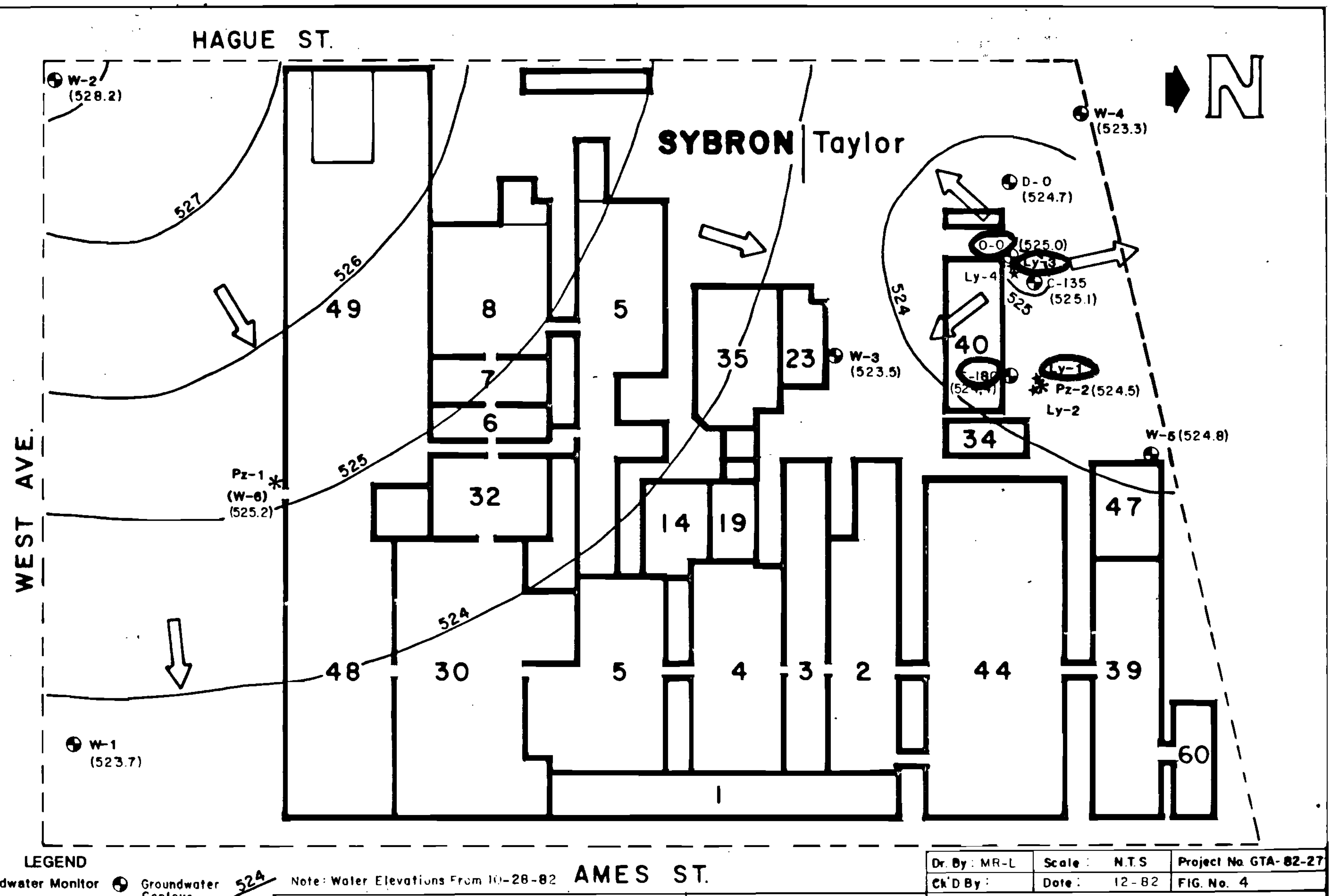
THOMSEN ASSOCIATES
CONSULTING GEOTECHNICAL ENGINEERS & GEOLOGISTS



Dr. By: MR-L	Scale: 1"=80' (H)	Project: GTA 82-27
Ck D By:	Date: 12-82	Fig. No. 3

TAYLOR INSTRUMENT COMPANY SITE

GEOLOGIC PROFILES



LEGEND

Groundwater Monitor ⊕ Groundwater Contour 524

Piezometer *

Lysimeter Cluster ★ Direction Of Flow ⇨

Groundwater Elevation (525.2)

Note: Water Elevations From 10-28-82

TAYLOR INSTRUMENT COMPANY SITE

WATER TABLE MAP

LOZIER
ARCHITECTS/ENGINEERS

THOMSEN ASSOCIATES

CONSULTING GEOTECHNICAL
ENGINEERS & GEOLOGISTS

Dr. By: MR-L	Scale:	N.T.S	Project No. GTA-82-27
Ch'D By:	Date:	12-82	FIG. No. 4

APPENDIX A

BORING LOGS

DEPTH	ELEVATION	SAMPLES	SAMPLE NO.	CHEM. SMPL	RECOVERY	N	SOIL or ROCK CLASSIFICATION	UNIFIED SOIL CLASSIF.	DENSITY (PCF)	WATER CONTENT (Percent)	PERMEABILITY (cm/sec)	MONITOR, PIEZOMETER CONSTRUCTION DETAILS						WATER PROBE READINGS Temp. (°C)	Cond. (µmho cm)	Eh (mV)	pH	NOTES
1	2	3	4	5	6	7	8	9	10	11	12	13	14					15	16	17	18	19

The figures in the Column 1 defines the scale of the Subsurface Log.

The associated elevation is shown in the second column.

The third column graphically shows the exact depth range from which a soil sample or rock core was recovered.

See Table 1 for a description of the symbols used to signify the various types of samples.

The Sample or Run No. is used for identification on sample containers and/or Laboratory Test Reports.

The Chemical Sample column graphically shows the depth range from which a sample was removed for chemical analysis.

The recovery column shows the recovery in inches for a soil sample. Rock core recovery is shown in percent.

N shows the number of blows required to drive a split spoon sampler into the soil. Unless otherwise stated, the results are for a "Standard Penetration Test", driving a two-inch diameter spoon 12 inches with a 140 pound hammer dropped 30 inches. RQD is the Rock Quality Designation for rock core. This equals the sum of the length of pieces greater than 4 inches divided by the length of the core run.

All recovered soil samples are reviewed in the laboratory. The visual descriptions are made on basis of the sample as recovered and in accordance with the Unified Classification System shown on Table VI. The Unified group symbol is shown in Column 9.

Guidelines for the terms used in descriptions are presented in Tables II and III. The description of the relative soil compactness or consistency is based upon the penetration records as defined in Table IV. The description of the soil mositure is based upon the condition of the sample as recovered. The moisture condition is described as dry, damp, moist or wet. Water used to advance the boring may have affected the in-situ moisture content of the sample. Special terms are used as required to describe materials in greater detail; several such terms are listed in Table V. When sampling gravelly soils with a standard two-inch diameter split spoon, the true percentage of gravel is often not recovered due to the relatively small sampler diameter. The presence of boulders and large gravel is sometimes, but not necessarily, detected by an evaluation of the casing and sampler blows or through the "action" of the drill rig as reported by the driller.

The results from nuclear field tests or laboratory tests for soil density and moisture are shown in Columns 11 and 12.

Soil or rock permeability, the testing method, and the depth range tested are shown in Column 12.

Column 13 is a graphic description of the monitor or piezometer installation. A Key to the description is presented on Table VII. Details of materials are noted in the NOTES column. The static water level (SWL) and date measured are noted in the adjacent column.

Columns 15 to 18 indicate the results of field tests at the depth tested. The date of the test is noted below the readings.

TABLE I

- ⧄ Split Spoon Sample
- ◨ Shelby Tube Sample
- ↕ Auger or Pit Sample
- ■ Rock Core

TABLE II

Identification of soil type is made on basis of an estimate of particle sizes, and in the case of fine grained soils also on basis of plasticity.

Soil Type	Soil Particle Size	
Boulder	>12"	
Cobble	3"-12"	
Gravel-Coarse	3"-3/4"	Coarse Grained
-Fine	#4-#10	(Granular)
Sand-Coarse	#10-#40	
-Medium	#40-#200	
-Fine		
Silt-Non Plastic (Granular) Clay-Plastic (Cohesive)	<#200	Fine Grained

TABLE III

The following terms are used in classifying soils consisting of mixtures of two or more soil types. The estimate is based on weight of total sample.

Term	Percent of Total Sample
and	35-50
some	20-35
little	10-20
trace	less than 10

(When sampling gravelly soils with a standard split spoon, the true percentage of gravel is often not recovered due to the relatively small sampler diameter.)

TABLE IV

The relative compactness or consistency is described in accordance with the following terms:

Granular Soils		Cohesive Soils	
Term	Blows per Foot, N	Term	Blows per Foot, N
Loose	<10	Very Soft	<2
Firm	11-30	Soft	3-5
Compact	31-50	Medium	6-15
Very Compact	>31	Stiff	16-25
		Hard	>25

(Large particles in the soils will often significantly influence the blows per foot recorded during the Penetration Test.)

TABLE V

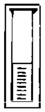
Varved	Alternating layers, seams, and partings of soils.
Layer	Soil deposit more than 6" thick.
Seam	Soil deposit less than 6" thick.
Parting	Soil deposit less than 1/8" thick.
Uniform	All grains are of about the same diameter

TABLE VI

UNIFIED SOIL CLASSIFICATION

Major Division		Group Symbol	Soil Description
Coarse-grained (over 50% by weight coarser than No. 200 sieve)	Gravelly soils (over half of coarse fraction larger than No. 4)	GW	Well-graded gravels, sandy gravels. Little or no fines.
		GP	Gap-graded or uniform gravel, sandy gravels. Little or no fines.
		GM	Silty gravels, silty sandy gravels.
		GC	Clayey gravels, clayey sandy gravels.
	Sandy soils (over half of coarse fraction finer than No. 4	SW	Well-graded sand, gravelly sands. Little or no fines.
		SP	Gap-graded or uniform sands, gravelly sands. Little or no fines.
		SM	Silty sands, silty gravelly sands.
		SC	Clayey sands, clayey gravelly sands.
Fine-grained (over 50% by weight finer than No. 200 sieve)	Low compressibility (liquid limit less than 50)	ML	Silts, very fine sands, silty or clayey fine sands, rock floor.
		CL	Low plasticity clays, sandy or silty clays.
		OL	Low plasticity organic silts and clays.
	High compressibility (liquid limit more than 50)	MH	Micaceous or diatomaceous silts.
		CH	Highly plastic clays and sandy clays.
		OH	Organic silts and highly plastic clays.
Organic Soils			

TABLE VII


Curb [illegible]

Riser

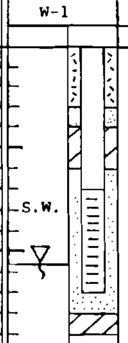
Well Screen


Point Piezometer

- ⬚ Sand Pack
- ▨ Bentonite Seal
- ⬚ Concrete Seal
- ⬚ Granular Fill

DEPTH	ELEVATION	SAMPLES	SAMPLE NO.	CHEM SMPL	RECOVERY (Inches)	N	SOIL or ROCK CLASSIFICATION	UNIFIED SOIL CLASSIF.	DENSITY (PCF)	WATER CONTENT (Percent)	PERMEABILITY (cm/sec)	WATER PROBE READINGS Temp. (°C)	Cond. (µmho/cm)	Eh (mV)	pH	NOTES
			1			5	TOPSOIL									
			2			4	Yellow-Brown fine SAND & SILT, little fine gravel and fibrous (Damp-Loose)									
5			3			23	Grades, Some medium-coarse Sand, trace cinders									Fill
			4			32	Red-Brown fine SAND & SILT, little medium-coarse sand and fine gravel (Moist-Compact)									Basal Till
			5			25										
10			6			33	Grades, Some medium-coarse Sand and fine Gravel (Saturated Compact)									
			7			110	Gray fine SAND & SILT, Some medium-coarse Sand and fine Gravel (Saturated-Compact)									
15							Grades little medium-coarse sand, trace rock fragments									
							Spoon & Auger Refusal @ 14.0'									

MONITOR/PIEZOMETER CONSTRUCTION DETAILS



Well constructed using 2 inch I.D. PVC riser and well screen. Screen length = 5 ft. Screen opening = 0.01 inches.

Water Level Measured 10/28/82

NOTE: See reverse side for key and explanation to log

RUN NO.	RECOVERY (Percent)	RQD

Surface Elevation 534.2
Date Started 9/16/82
Date Completed 9/16/82
Number of Installations in Boring 1
Method of installation Hollow Stem Auger

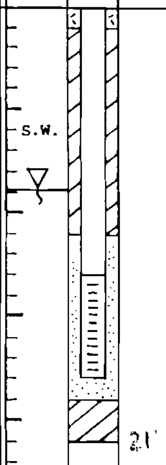
Project No. GTA-82-27
Project Title Taylor Instrument Site
Location Rochester, NY
Classified By RW Checked MR-L

HYDROGEOLOGIC LOG

THOMSEN ASSOCIATES

MONITOR NO. W-1

Sheet 1 of 1



DEPTH	ELEVATION	SAMPLES	SAMPLE NO.	CHEM. SMPL	RECOVERY (Inches)	N	SOIL or ROCK CLASSIFICATION	UNIFIED SOIL CLASSIF.	DENSITY (PCF)	WATER CONTENT (Percent)	PERMEABILITY (cm/sec)	MONITOR/PIEZOMETER CONSTRUCTION DETAILS	WATER PROBE READINGS Temp. (°C)	Cond. (µmho/cm)	Eh (mV)	pH	NOTES
			1			8	Brown, fine SAND & SILT, little medium coarse sand and fibrous material (Moist-Loose)					W-2					Fill, 8" Topsoil
			2			13	Grades, trace clay 4.0'										
5			3			60	Yellow-Brown, fine-medium SAND & SILT, Some coarse Sand and fine Gravel (Moist-Very Compact)										Ablation Till
			4			55											
			5			58											
10			6			78											
			7			137	Grades Some coarse Sand, fine Gravel and Rock Fragments, little medium sand 14.0'										
15			8			194	Red-Brown fine-coarse SAND & SILT, Some fine-coarse Gravel (Wet-Very Compact)										Basal Till
			9														
			10			100/.3'	Grades, Some medium-coarse Sand and fine Gravel										
20			11			100/.2'											
			12			100/0'	Spoon and Auger Refusal @ 21.0'										Well constructed using 2 inch I.D. PVC riser and well screen. Well screen = 5 ft. Screen opening = 0.01 inches. Water Level Measured 10/28/82

NOTE:
See reverse side for key and explanation to log.

RUN NO.		RECOVERY (Percent)	RQD

Surface Elevation 537.1
Date Started 9/15/82
Date Completed 9/15/82
Number of Installations in Boring 1
Method of installation Hollow Stem Auger

Project No. GTA-82-27
Project Title Taylor Instrument Site
Location Rochester, NY
Classified By RW Checked MR-L

HYDROGEOLOGIC LOG

THOMSEN ASSOCIATES

MONITOR NO.
W-2
Sheet 1 of 1

DEPTH	SAMPLE NO.	N
	1	7
	2	7
5	3	5
	4	16
	5	26
10	6	38
	7	100/.5
15	8	62
	9	91
	10	100/.5
20	11	100/.3
	12	100/.3
25		

SOIL or ROCK CLASSIFICATION

Crushed STONE, medium-coarse SAND & fine GRAVEL, Some fine Sand and Silt (Damp-Loose)

SILT & SAND, Some Cinders and Crushed Stone

Brown fine SAND & SILT, Some medium-coarse Sand and fine Gravel (Moist-Firm) 9.0'

Red-Brown fine SAND & SILT, Some medium-coarse Sand and fine Gravel (Wet-Compact)

Grades, medium-coarse SAND & SILT, Some fine Gravel and Rock Fragments

Grades, fine SAND & SILT, Some coarse Sand, trace clay (Saturated-Very Compact)

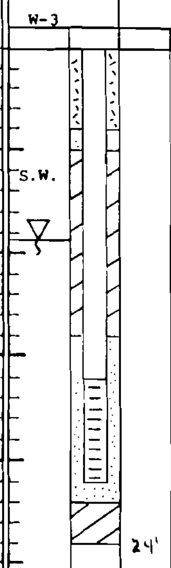
Brown fine SAND & SILT, Some Silt, trace clay (Saturated-Very Compact)

Grades, little medium-coarse sand and fine gravel

Grades, trace weathered rock fragments

Spoon and Auger Refusal @ 24.0'

MONITOR/PIEZOMETER CONSTRUCTION DETAILS



NOTES

Fill

Basal Till

Well constructed using 2 inch I.D. P.V.C. riser and well screen. Well screen = 5 ft. Screen opening = 0.01 inches.

Water Level Measured 10/28/82

NOTE: See reverse side for key and explanation to log.

Surface Elevation 532.8
Date Started 9/16/82
Date Completed 9/17/82
Number of Installations in Boring 1
Method of Installation Hollow Stem Auger

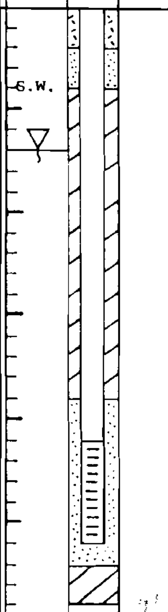
Project No. GTA-82-27
Project Title Taylor Instrument Site
Location Rochester, NY
Classified By RW
Checked MR-L

HYDROGEOLOGIC LOG

THOMSEN ASSOCIATES

MONITOR NO. W-3
Sheet 1 of 1

DEPTH	ELEVATION	SAMPLES	SAMPLE NO.	CHEM. SMPL	RECOVERY (Inches)	N	SOIL or ROCK CLASSIFICATION	UNIFIED SOIL CLASSIF.	DENSITY (PCF)	WATER CONTENT (Percent)	PERMEABILITY (cm/sec)	MONITOR/PIEZOMETER CONSTRUCTION DETAILS	WATER PROBE READINGS Temp. (°C)	Cond. (µmho/cm)	Eh (mV)	pH	NOTES
			1			13	Black CINDERS & CRUSHED STONE, Some fine-coarse Sand and fine Gravel, little silt and fibrous (Moist-Firm)					W-4					Fill
			2			22	Grades, fine SAND & SILT, Some medium-coarse Sand, little fine gravel, trace cinders 4.0'					S.W.					
5			3			63											
			4			40	Yellow-Brown medium-coarse SAND & fine GRAVEL, little fine sand and silt (Moist-Very Compact)										Ablation Till
			5			82	Grades, SILT & fine SAND, little medium-coarse sand & gravel, trace clay										
10			6			34											
			7			153	grades, fine-coarse GRAVEL, Some medium-coarse Sand, little fine sand & silt (Wet-Very Compact)										Basal Till
15			8			100/.3'											
			9			100/.4'	grades, Brown SILT & fine SAND, little coarse sand & fine gravel (Wet-Cmpt) 12.0'										
			10			100/.3'	Red-Brown SILT & fine SAND, Some coarse Sand and fine Gravel (Moist-Very Compact)										
20			11			100/.2'	Brown SILT & fine SAND, little fine gravel and rock fragments (Moist-Very Compact)										
			12			100/.4'	Grades, Some Weathered Rock Fragments										
25			13			100/.3'											
			14			100/.2'	No Recovery										
			15				No Recovery										
30							Spoon and Auger Refusal @ 29.0'										Well constructed using 2 inch I.D. PVC riser and well screen. Screen Length = 5 ft. screen opening = 0.01 inches. Water Level Measured 10/28/82



NOTE: See reverse side for key and explanation to log.

RUN NO. | RECOVERY (Percent) | RQD

Surface Elevation 530.3
Date Started 9/22/82
Date Completed 9/22/82
Number of Installations in Boring 1
Method of installation Hollow Stem Auger

Project No. GTA-28-27
Project Title Taylor Instrument Site
Location Rochester, NY
Classified By RW Checked MR-L

HYDROGEOLOGIC LOG

THOMSEN ASSOCIATES

MONITOR NO. W-4

Sheet 1 of 1

DEPTH	ELEVATION	SAMPLES	SAMPLE NO.	CHEM. SMPL	RECOVERY (Inches)	N
			1			21
			2			27
5			3			79
			4			63
			5			71
10						
			6			31
			7			100/.4
15			8			58
			9			81
			10			100/.3
20						
			11			100/.4
			12			100/.4

SOIL or ROCK CLASSIFICATION

Brown-Black CINDERS, medium-coarse SAND and GRAVEL, Some fine Sand and Silt (Damp-Firm)
grades, fine SAND & SILT, Some coarse Sand and fine Gravel, trace cinders

Yellow-Brown fine SAND & SILT, Some medium coarse Sand and fine Gravel
(Wet-Very Compact)

Grades, little coarse sand and fine gravel
Grades, Some fine Gravel and Rock Fragments
Grades, little medium-coarse sand and fine gravel 16.0'

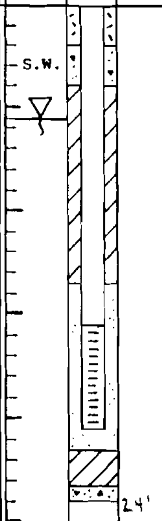
Brown fine SAND & SILT, Some medium-coarse Sand & fine Gravel
(Saturated-Very Compact) 20.0'

Red-Brown SILT & fine SAND, little medium-coarse sand and fine gravel
(Saturated-Very Compact)
Grades, Some fine Gravel and Weathered Rock Fragments
Spoon and Auger Refusal @ 24.0'

UNIFIED SOIL CLASSIF.	DENSITY (PCF)	WATER CONTENT (Percent)	PERMEABILITY (cm/sec)

MONITOR/PIEZOMETER CONSTRUCTION DETAILS

W-5



WATER PROBE READINGS

Temp. (°C)	Cond. (µmho/cm)	Eh (mV)	pH

NOTES

Miscellaneous Fill

Ablation Till

Basal Till

Well constructed using 2 inch I.D. PVC riser and well screen. Screen length = 5 ft. Screen opening = 0.01 inches.

Water Level Measured 10/28/82

NOTE: See reverse side for key and explanation to log.

RUN NO.	RECOVERY (Percent)	RQD

Surface Elevation 530.3
Date Started 9/15/82
Date Completed 9/15/82
Number of Installations in Boring 1
Method of installation Hollow Stem Auger

Project No. GTA-82-27
Project Title Taylor Instrument Site
Location Rochester, NY
Classified By RW Checked MR-L

HYDROGEOLOGIC LOG

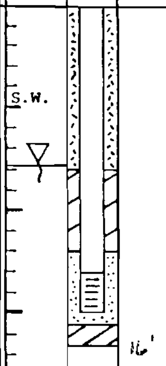
THOMSEN ASSOCIATES

MONITOR NO.
W-5
Sheet 1 of 1

DEPTH	ELEVATION	SAMPLES	SAMPLE NO.	CHEM. SMPL	RECOVERY (Inches)	N	SOIL or ROCK CLASSIFICATION	UNIFIED SOIL CLASSIF.	DENSITY (PCF)	WATER CONTENT (Percent)	PERMEABILITY (cm/sec)	Temp. (°C)	Cond. (µmho/cm)	Eh (mV)	pH	NOTES
							No Recovery									
			1			19	Brown SILT & fine SAND, Some coarse Sand and fine Gravel, trace clay (Wet-Firm) 3.0'									Fill
			2			16										
5			3			100/.2	Brown SILT & ROCK FRAGMENTS Boulder 6.0' - 11.0'									Basal Till
10							11.0'									
			4			210	Red-Brown SILT & fine SAND, Some coarse Sand, fine Gravel and Rock Fragments (Wet-Very Compact)									
			5			209										
15			6				No Recovery									
							Spoon and Auger Refusal @ 16.5'									
20																

MONITOR/PIEZOMETER CONSTRUCTION DETAILS

W-6



Well constructed using 2 inch I.D. PVC riser and well screen. Screen length = 2 ft. Screen opening = 0.01 inches.

Water Level Measured 10/28/82

NOTE:
See reverse side for key and explanation to log.

RUN NO.	RECOVERY (Percent)	RQD

Surface Elevation 533.0
Date Started 9/20/82
Date Completed 9/20/82
Number of Installations in Boring 1
Method of installation Hollow Stem Auger

Project No. GTA-82-27
Project Title Taylor Instrument Site
Location Rochester, NY

Classified By RW Checked MR-L

HYDROGEOLOGIC LOG

THOMSEN ASSOCIATES

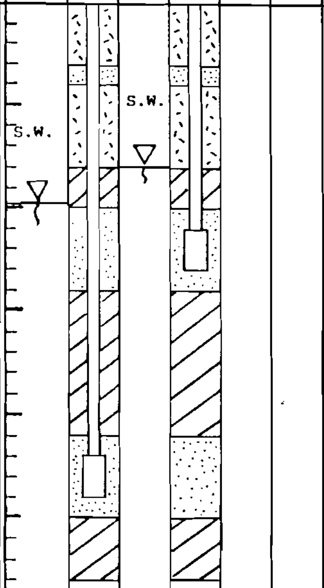
MONITOR NO. W-6

Sheet 1 of 1

DEPTH	ELEVATION	SAMPLES	SAMPLE NO.	CHEM. SMPL	RECOVERY (Inches)	N	SOIL or ROCK CLASSIFICATION	UNIFIED SOIL CLASSIF.	DENSITY (PCF)	WATER CONTENT (Percent)	PERMEABILITY (cm/sec)	Temp. (°C)	Cond. (µmho/cm)	Eh (mV)	pH	NOTES
		/	1			46	Black CINDERS & fine GRAVEL, Some medium-coarse Sand and Silt (Damp-Compact) 1.5'									Miscellaneous Fill
		/	2			24	Brown fine-medium SAND & SILT, little fine gravel (Moist-Firm)									Fill
5		/	3			25										
		/	4			100/.2	Brown medium-coarse SAND and fine GRAVEL, Some fine Sand & Silt (Moist-Very Compact) 8.0'									
		/	5			100/.1										Ablation Till
10		/	6			202	Yellow-Brown fine SAND & SILT, little medium-coarse sand and fine gravel (Moist-Very Compact) 10.0'									Basal Till
		/	7			100/.2	Red-Brown fine SAND & SILT, Some medium-coarse Sand and fine Gravel (Moist-Very Compact)									
15		/	8			100/.3										
		/	9			100/.4										
		/	10			100/.4										
20		/	11			136	Grades, little medium-coarse sand and fine gravel									
		/	12			100/.3	No Recovery									
25		/	13			100/.2	Grades, Some medium-coarse Sand and fine Gravel									
		/	14			100/.4	No Recovery									
						100/.0	Spoon & Auger Refusal @ 28.0'									Piezometers constructed of 2 inch diameter porous PVC tips 2 feet long. Risers are 3/4 inch I.D. PVC.
30																
																Water Level Measured 10/28/82

MONITOR/PIEZOMETER CONSTRUCTION DETAILS

PZ-2A PZ-2B



NOTE: See reverse side for key and explanation to log.

RUN NO.		RECOVERY (Percent)	RQD

Surface Elevation 532.5
Date Started 9/20/82
Date Completed 9/20/82
Number of Installations in Boring 2
Method of Installation Hollow Stem Auger

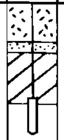
Project No. GTA-82-27
Project Title Taylor Instrument Site
Location Rochester, NY
Classified By RW Checked MR-L

HYDROGEOLOGIC LOG

THOMSEN ASSOCIATES

MONITOR NO. PZ-2

Sheet 1 of 1

DEPTH	ELEVATION	SAMPLES	SAMPLE NO.	CHEM. SMPL	RECOVERY (Inches)	N	SOIL or ROCK CLASSIFICATION	UNIFIED SOIL CLASSIF.	DENSITY (PCF)	WATER CONTENT (Percent)	PERMEABILITY (cm/sec)	MONITOR/PIEZOMETER CONSTRUCTION DETAILS LY-1	WATER PROBE READINGS Temp. (°C)	Cond. (µmho/cm)	Eh (mV)	pH	NOTES
			1			18	Black CINDERS & CRUSHED STONE, Some Miscellaneous Debris										Fill
			2			17	CONCRETE & DEBRIS, little fine sand and silt (Damp-Firm) 4.0'										
5			3			13	Brown SILT & fine SAND, little coarse sand and gravel (Moist-Firm)										
							Boring Terminated @ 6.6'										Augured to 5.0 ft. Split spoon sample driven to 6.6 ft. Lysimeter installed in sample hole.

NOTE: See reverse side for key and explanation to log.

RUN NO.	RECOVERY (Percent)	RQD

Surface Elevation 532.4
Date Started 9/21/82
Date Completed 9/21/82
Number of Installations in Boring 1
Method of installation Hollow Stem Auger

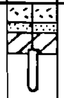
Project No. GTA-82-27
Project Title Taylor Instrument Site
Location Rochester, NY

Classified By RW Checked MR-L

HYDROGEOLOGIC LOG

THOMSEN ASSOCIATES

MONITOR NO.
LY-1
Sheet 1 of 1

DEPTH	ELEVATION	SAMPLES	SAMPLE NO.	CHEM. SMPL	RECOVERY (Inches)	N	SOIL or ROCK CLASSIFICATION	UNIFIED SOIL CLASSIF.	DENSITY (PCF)	WATER CONTENT (Percent)	PERMEABILITY (cm/sec)	MONITOR/PIEZOMETER CONSTRUCTION DETAILS LY-2	WATER PROBE READINGS Temp. (°C)	Cond. (μmho/cm)	Eh (mV)	pH	NOTES
			1			22	Black CINDERS & CRUSHED STONE, Some fine-coarse Sand and fine Gravel, trace fibrous (Moist-Firm)										Miscellaneous Fill
			2			14	SILT & fine SAND, Some medium-coarse Sand and fine Gravel (Moist-Firm)										
5							Boring Terminated @ 4.1'										Augered to 2.5 ft. Split spoon sample from 2.5 ft - 4.1 ft. Lysimeter installed in sample hole.

NOTE:
See reverse side for key and explanation to log.

RUN NO.		RECOVERY (Percent)	ROD

Surface Elevation 532.6
Date Started 9/21/82
Date Completed 9/21/82
Number of Installations in Boring 1
Method of Installation Hollow Stem Auger

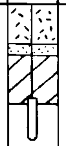
Project No. GTA-82-27
Project Title Taylor Instrument Site
Location Rochester, NY

Classified By RW Checked MR-L

HYDROGEOLOGIC LOG

THOMSEN ASSOCIATES

MONITOR NO.
LY-2
Sheet 1 of 1

DEPTH	ELEVATION	SAMPLES	SAMPLE NO.	CHEM. SMPL	RECOVERY (Inches)	N	SOIL or ROCK CLASSIFICATION	UNIFIED SOIL CLASSIF.	DENSITY (PCF)	WATER CONTENT (Percent)	PERMEABILITY (cm/sec)	MONITOR/PIEZOMETER CONSTRUCTION DETAILS LY-3	WATER PROBE READINGS Temp. (°C)	Cond. (µmho/cm)	Eh (mV)	pH	NOTES
		/	1			25	Brown SILT & fine SAND, Some medium-coarse Sand and fine Gravel, trace fibrous and glass debris (Moist-Firm)										Fill
		/	2			24	Brown SILT & fine SAND, little medium-coarse sand and fine gravel, trace clay (Moist-Firm)										
5		/	3			13											Augered to 5.0 ft. Split spoon sample from 5.0 ft - 6.6 ft. Lysimeter installed in sample hole.
							Boring Terminated @ 6.6'										

NOTE:
See reverse side for key and explanation to log.

RUN NO.	RECOVERY (Percent)	RQD

Surface Elevation 532.5
Date Started 9/21/82
Date Completed 9/21/82
Number of Installations in Boring 1
Method of Installation Hollow Stem Auger

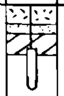
Project No. GTA-82-27
Project Title Taylor Instrument Site
Location Rochester, NY

Classified By RW Checked MR-L

HYDROGEOLOGIC LOG

THOMSEN ASSOCIATES

MONITOR NO.
LY-3
Sheet 1 of 1

DEPTH	ELEVATION	SAMPLES	SAMPLE NO.	CHEM SMPL	RECOVERY (Inches)	N	SOIL or ROCK CLASSIFICATION	UNIFIED SOIL CLASSIF.	DENSITY (PCF)	WATER CONTENT (Percent)	PERMEABILITY (cm/sec)	MONITOR/PIEZOMETER CONSTRUCTION DETAILS LY-4			WATER PROBE READINGS Temp. (°C)	Cond. (µmho/cm)	Eh (mV)	pH	NOTES
			1			13	Dark Brown CINDERS & CRUSHED STONE, Some fine-coarse Sand and fine Gravel, little clay, fibrous, and miscellaneous debris												Fill
			2			20													
5							Brown SILT & fine SAND, little medium-coarse sand (Moist-Firm)												
							Boring Terminated @ 4.1'												Augered to 2.5 ft. Split spoon sample from 2.5' to 4.1 ft. Lysimer installed in sample hole.

NOTE:
See reverse side for key and explanation to log

RUN NO.	RECOVERY (Percent)	ROD

Surface Elevation 532.2
Date Started 9/21/82
Date Completed 9/21/82
Number of Installations in Boring 1
Method of Installation Hollow Stem Auger

Project No. GTA-82-27
Project Title Taylor Instrument Site
Location Rochester, NY
Classified By RW Checked MR-L

HYDROGEOLOGIC LOG

THOMSEN ASSOCIATES

MONITOR NO. LY-4
Sheet 1 of 1

APPENDIX B

WATER LEVELS AND WELL CONSTRUCTION DATA

WATER LEVELS

	Ground	Reference	Date			
Monitor	Elevation	Elevation	9-8-82	9-20-82	9-28-82	10-28-82
W-1	534.2	536.14		524.56	524.72	523.66
W-2	537.1	539.32		528.65	530.11	528.18
W-3	532.8	534.79		523.87	524.00	523.50
W-4	530.4	532.98			525.31	523.30
W-5	530.3	532.24		524.49	526.32	524.78
W-6	533.0	534.95			526.87	525.17
PZ-2A (Deep)	532.5	534.28				522.65
PZ-2B	532.5	534.28				524.50
O-O	532.3	534.78	524.03	525.11		525.03
C-135	532.1	534.43	524.01	524.56		525.12
D-O	532.4	534.92	523.84	525.67		524.68
E-180	532.8	534.57	523.49	525.24		524.43

SUMMARY OF WELL CONSTRUCTION DETAILS

Well	Reference Point	Reference Elevation	Ground Elevation	Bottom of Concrete Seal	Top of Upper Bentonite Seal	Top of Sand Pack/Bottom of Bentonite Seal	Top of Well Screen	Bottom of Well Screen	Top of Lower Bentonite Seal/Base of Sand Pack	Bottom of Borehole
W-1	Top of PVC Pipe	536.14	534.2	533.2	530.2	528.2	527.2	522.2	521.2	520.2
W-2	Top of PVC Pipe	539.32	537.1	536.1	536.1	526.1	524.1	519.1	518.1	516.1
W-3	Top of PVC Pipe	534.79	532.8	528.8	527.8	518.8	516.8	511.8	510.8	508.8
W-4	Top of PVC Pipe	532.98	530.4	528.4	526.4	511.4	509.4	504.4	503.4	501.4
W-5	Top of PVC Pipe	532.24	530.3	528.3	526.3	516.8	514.8	509.8	508.8	506.3
W-6	Top of PVC Pipe	534.95	533.0	525.0	525.0	521.0	520.0	518.0	517.5	516.5
PZ-2A	Top of PVC Pipe	534.28	532.5	529.5	518.5	511.5	510.5	508.5	507.5	504.5
PZ-2B	Top of PVC Pipe	534.28	532.5	529.5	524.5	522.5	521.5	519.5	518.5	504.5

APPENDIX C

HYDRAULIC CONDUCTIVITY TESTS

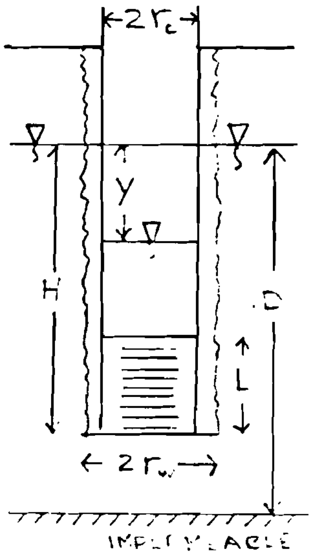
SUMMARY OF HYDRAULIC CONDUCTIVITY TEST RESULTS

Well		Hydraulic Conductivity (cm/sec)
W-2		$8.8x10^{-5}$
W-3		$3.8x10^{-5}$
W-4		$1.6x10^{-5}$
W-5		$8.3x10^{-5}$
W-6		$3.6x10^{-5}$
	Mean	$5.2x10^{-5}$
	Range	$1.6x10^{-5}$-$8.8x10^{-5}$

THOMSEN ASSOCIATES CONSULTING GEOTECHNICAL ENGINEERS & GEOLOGISTS

SUBJECT FIELD SLUG TESTS PROJECT NUMBER GTA-82-27

BY MR:L DATE 12-6-82 CHECKED BY .... DATE .... SHEET NUMBER 1 OF 1



$$K = \frac{r_c^2 \ln(R_e/r_w)}{2L} \frac{1}{t} \ln\left(\frac{Y_0}{Y_t}\right)$$

$$\ln\left(\frac{R_e}{r_w}\right) = \left[\frac{1.1}{\ln(H/r_w)} + \frac{A + B\ln(D-H)/r_w}{L/r_w}\right]^{-1}$$

t = time

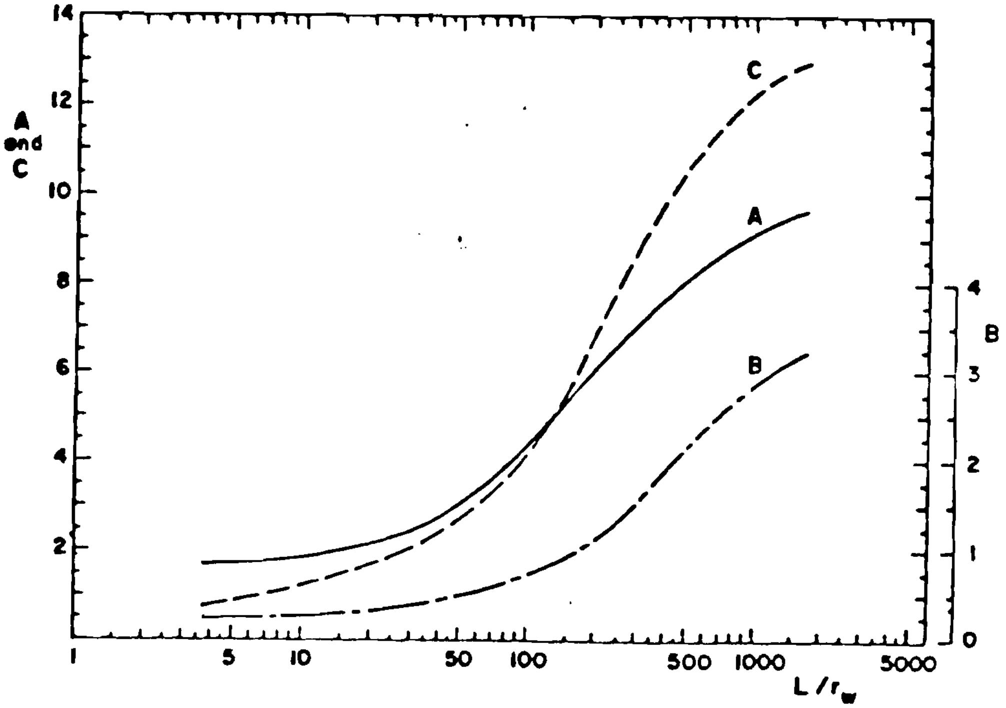


Fig. 3 Curves relating coefficients A, B, and C to L/r_w

FROM: Bower and Rice (1976)

SLUG TESTS FOR HYDRAULIC CONDUCTIVITY

Well	H	D	r_w	r_c	L	A	B	L/r_w	$\ln R_e/r_w$	t	y_o	y_t	K(ft/sec)	K(cm/sec)
W-2	9.6	12.1	0.33	0.083	8	2.5	.35	24	2.2	242	2.63	1.25	$2.9\text{x}10^{-6}$	$8.8\text{x}10^{-5}$
W-3	11.65	14.7	0.33	0.083	8	2.5	.35	24	2.2	299	2.80	1.91	$1.2\text{x}10^{-6}$	$3.8\text{x}10^{-5}$
W-4	19.1	21.9	0.33	0.083	8	2.5	.35	24	2.5	184	2.82	2.57	$5.4\text{x}10^{-7}$	$1.6\text{x}10^{-5}$
W-5	15.1	18.5	0.33	0.083	8	2.5	.35	24	2.3	114	2.80	2.06	$2.7\text{x}10^{-6}$	$1.2\text{x}10^{-5}$
W-6	7.4	8.7	0.33	0.083	3.5	1.9	.25	10.5	1.8	431	2.80	2.08	$1.2\text{x}10^{-6}$	$3.6\text{x}10^{-5}$

APPENDIX D

SOILS ANALYSES

LOZIER
CAMO
LABORATORIES
23 N. MAIN STREET • FAIRPORT, NEW YORK 14450 • 716-425-2210

CONFIDENTIAL

PRIVILEGED

82-9-149
November 10, 1982

Mr. Kevin Hilton
Environmental Engineer
Taylor Instrument Company
Division of Sybron Corporation
95 Ames Street
Rochester, New York 14601

Dear Kevin:

Enclosed with this letter you will find the results of Total Mercury Analyses performed on stratified boring samples. These borings were collected by Oscar Ernst of Thomsen Associates picked up by Lozier/Camo personnel and transported to our facility.

Please note that the "W" series refer to Wells while those of "PZ" and "LY" refer to Piezometers and Lysimeters, respectively.

If you have any question please feel free to call.

Very truly yours,

David Nelson

David Nelson
Director, Analytical Services

DN/kz
Encl: As Noted

Affiliated with
LOZIER ARCHITECTS ENGINEERS • 600 PERINTON HILLS • FAIRPORT, NEW YORK 14450 • 716-223-7610
CAMO LABORATORIES • 367 VIOLET AVENUE • POUGHKEEPSIE, NEW YORK 12601 • 914-473-9200

Introduction

Lozier/CAMO personnel received soil samples from Oscar Ernst of Thomsen Associates collected on the following dates: 9/15/82 - 9/16/82 and 9/17/82 - 9/22/82. After being transported to the laboratory these samples were each split into two sections. One of these was sent to CAMO Pollution Control for analysis. The other is being kept at Lozier/CAMO in storage.

Methodology

All analyses were performed according to methods outlined in EPA manual, "Methods of Chemical Analysis of Water & Wastes," 1979. Method 245.5. Each sample was analyzed in duplicate. The data is listed in Table 2.

Results and Discussion

A summary is listed in Table 1 which shows the significantly high areas of Total Mercury concentration for each well/boring.

The wells exhibiting higher concentrations are the following:

Well/Boring	Depth
W-3	0'-2'
W-3	12'-14'
W-5	0'-2'
W-5	14'-16'
PZ-1	0'-15'
PZ-2	0'-26'
LY-1	0'-4'
LY-2	0'-4.1'
LY-3	0'-6.6'
LY-4	0'-2'

It is interesting to note that the PZ-1 (W-6) location has a substantially higher Total Mercury concentration than the other wells on the south end of the building complex (Figure 1).

The north end still exhibits high concentrations, especially in the Piezometer/Lysimeter clusters and well 5 area (Figure 1).

TABLE 1

TAYLOR INSTRUMENT COMPANY

Summary of Areas With Highest Concentration of Total Mercury

ell #/Total Well Depth		Depth of Highest Concentration	Duplicate $\overline{X}$ (μg/g)
W-1/14'		0'-2'	1.0
W-2/22'		0'-2'	0.4
W-3/24'		0'-2'	3.15
		16'-18'	3.15
W-4/26'		0'-2'	1.8
		12'-14'	1.7
W-5/24'		0'-2'	~275.0
		14'-16'	3.5
PZ-1(W-6)/15'	Note: Overall very high (≥300.0)		
		3'-5'	700.0
		13'-15'	360.0
PZ-2/26'	Note: Overall very high (≥250.0)		
		0'-2'	≥1,375.0
LY-1/5.6'	Note: Overall very high above a depth of ~4'		
		0'-2'	7,150.0
LY-2/4.1'	Note: Overall very high (≥550.0)		
		0'-2'	925.0
LY-3/6.6'	Note: Overall very high (≥300.0)		
		0'-2'	700.0
LY-4/4.1'	Note: Overall very high above a depth of ~2'		
		0'-2'	~4,000.0

Figure 1

Taylor Instrument Company

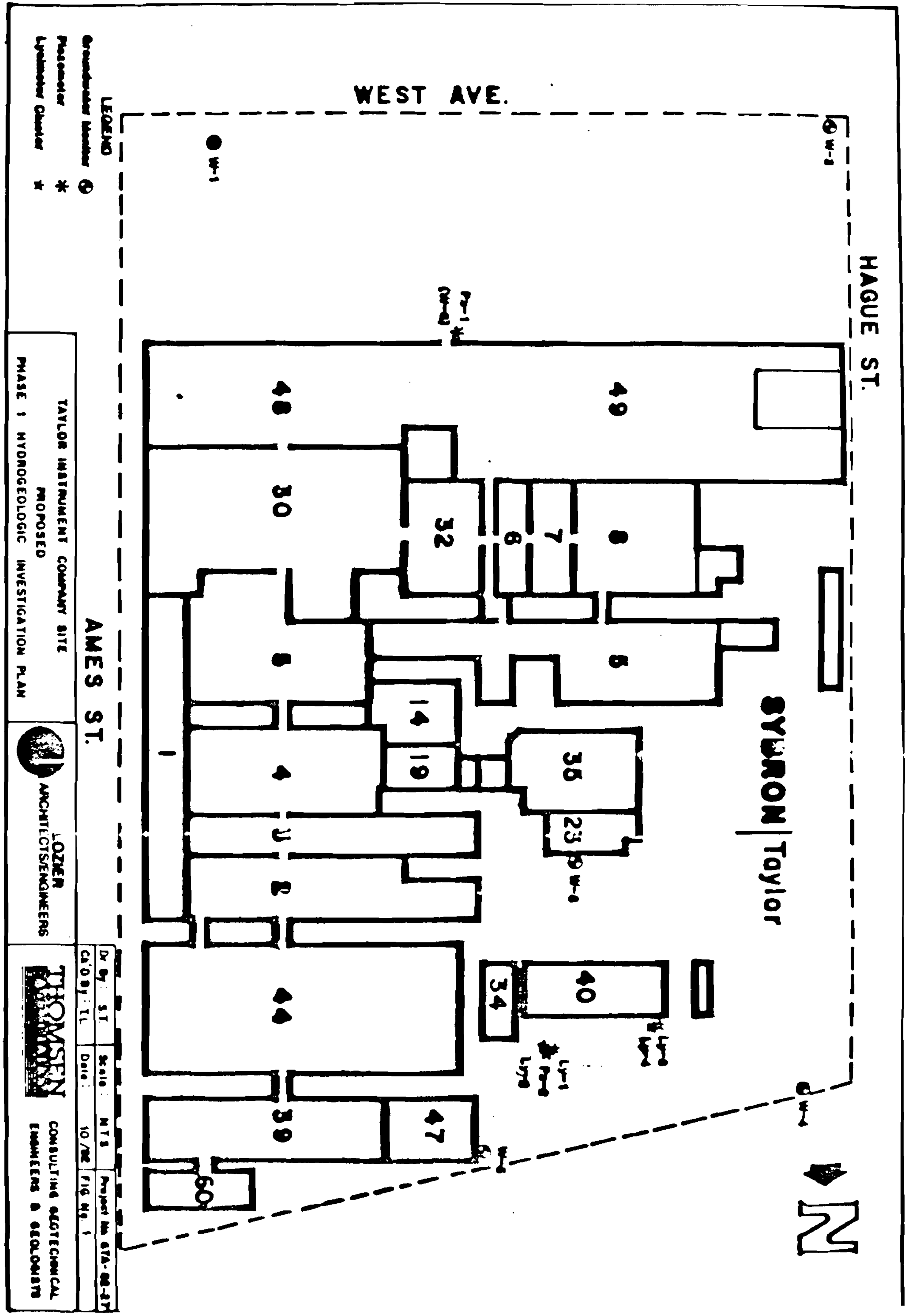


Table 2
Taylor Instrument Company
Total Mercury Analysis of Soil Samples
CAMO No: 82-9-11185

Log # 11185

SAMPLE W	 S	DEPTH IN FEET	Hg CONC ug/g	REMARKS
1	1	0-2	0.6	
1	1	0-2	1.4	*
1	2	2-4	<0.1	
1	2	2-4	0.2	*
1	3	4-6	<0.1	
1	3	4-6	<0.1	*
1	4	6-8	<0.1	
1	4	6-8	<0.1	*
1	5	8-10	<0.1	
1	5	8-10	<0.1	*
1	6	10-12	<0.1	
1	6	10-12	<0.1	*
1	7	12-14	<0.1	
1	7	12-14	0.6	*
2	1	0-2	0.4	
2	1	0-2	0.4	*
2	2	2-4	0.2	
2	2	2-4	0.3	*
2	3	4-6	<0.1	
2	3	4-6	<0.1	*
2	4	6-8	0.2	
2	4	6-8	0.1	*
2	5	8-10	0.4	
2	5	8-10	<0.1	*
2	6	10-12	0.2	
2	6	10-12	0.2	*

* Duplicate Values

Table 2

Taylor Instrument Company

Total Mercury Analysis of Soil Samples

CAMO No: 82-9-11185

Log # 11185

SAMPLE W	SAMPLE S	DEPTH IN FEET	Hg CONC ug/g	REMARKS
2	7	12-14	<0.1	
2	7	12-14	<0.1	*
2	8	14-16	<0.1	
2	8	14-16	0.3	*
2	9	16-18	<0.1	
2	9	16-18	<0.1	*
2	10	18-20	0.1	
2	10	18-20	<0.1	*
2	11	20-22	<0.1	
2	11	20-22	<0.1	*
3	1	0-2	2.8	
3	1	0-2	3.5	*
3	3	4-6	1.6	
3	3	4-6	1.3	*
3	4	6-8	0.4	
3	4	6-8	0.4	*
3	5	8-10	<0.1	
3	5	8-10	<0.1	*
3	6	10-12	<0.1	
3	6	10-12	<0.1	*
3	7	12-14	1.9	
3	7	12-14	2.4	*
3	8	14-16	<0.1	
3	8	14-16	0.5	*
3	9	16-18	3.8	
3	9	16-18	2.5	*

* Duplicate Values

Table 2

Taylor Instrument Company

Total Mercury Analysis of Soil Samples

CAMO No: 82-9-11185

Log # 11185

SAMPLE W	SAMPLE S	DEPTH IN FEET	Hg CONC ug/g	REMARKS
3	10	18-20	<0.1	
3	10	18-20	<0.1	*
3	11	20-22	0.2	
3	11	20-22	<0.1	*
3	12	22-24	<0.1	
3	12	22-24	<0.1	*
4	1	0-2	1.6	
4	1	0-2	2.0	*
4	2	2-4	0.1	
4	2	2-4	0.1	*
4	3	4-6	0.3	
4	3	4-6	0.3	*
4	4	6-8	0.5	
4	4	6-8	0.5	*
4	5	8-10	<0.1	
4	5	8-10	0.1	*
4	6	10-12	<0.1	
4	6	10-12	0.1	*
4	7	12-14	2.8	
4	7	12-14	0.6	*
4	8	14-16	0.2	
4	8	14-16	0.2	*
4	9	16-18	0.1	
4	9	16-18	<0.1	*
4	10	18-20	0.1	
4	10	18-20	0.1	*

* Duplicate Values

Table 2

Taylor Instrument Company

Total Mercury Analysis of Soil Samples

CAMO No: 82-9-11185

Log # 11185

SAMPLE		DEPTH IN FEET	Hg CONC ug/g	REMARKS
W	S			
4	11	20-22	<0.1	
4	11	20-22	0.2	*
4	12	22-24	0.3	
4	12	22-24	0.3	*
4	13	24-26	<0.1	
4	13	24-26	<0.1	*
5	1	0-2	<250	
5	1	0-2	300	*
5	2	2-4	1.7	
5	2	2-4	1.7	*
5	3	4-6	1.4	
5	3	4-6	1.3	*
5	4	6-8	1.7	
5	4	6-8	1.2	*
5	5	8-10	<0.1	
5	5	8-10	<0.1	*
5	6	10-12	1.3	
5	6	10-12	1.6	*
5	7	12-14	1.8	
5	7	12-14	1.1	*
5	8	14-16	3.6	
5	8	14-16	3.4	*
5	9	16-18	0.3	
5	9	16-18	1.1	*
5	10	18-20	0.3	
5	10	18-20	0.2	*

* Duplicate Values

Table 2
Taylor Instrument Company
Total Mercury Analysis of Soil Samples
CAMO No: 82-9-11185

Log # 11185

SAMPLE		DEPTH IN FEET	Hg CONC ug/g	REMARKS
W	S			
5	11	20-22	<0.1	
5	11	20-22	<0.1	*
5	12	22-24	1.3	
5	12	22-24	1.4	*

* Duplicate Values

Table 2
Taylor Instrument Company
Total Mercury Analysis of Soil Samples
CAMO No: 82-9-11185

Log # 11185

SAMPLE PZ	SAMPLE S	DEPTH IN FEET	Hg CONC ug/g	REMARKS
1	2	3-5	650	
1	2	3-5	750	*
1	3	5-7	300	
1	3	5-7	300	*
1	4	11-13	300	
1	4	11-13	300	*
1	5	13-15	400	
1	5	13-15	320	*
2	1	0-2	<250	
2	1	0-2	2500	*
2	2	2-4	300	
2	2	2-4	300	*
2	3	4-6	<250	
2	3	4-6	250	*
2	4	6-8	300	
2	4	6-8	<250	*
2	5	8-10	300	
2	5	8-10	350	*
2	6	10-12	300	
2	6	10-12	250	*
2	7	12-14	380	
2	7	12-14	400	*
2	8	14-16	300	
2	8	14-16	250	*
2	9	16-18	300	
2	9	16-18	300	*

* Duplicate Values

Table 2
Taylor Instrument Company
Total Mercury Analysis of Soil Samples
CAMO No: 82-9-11185

Log # 11185

SAMPLE PZ	 S	DEPTH IN FEET	Hg CONC ug/g	REMARKS
2	10	18-20	320	
2	10	18-20	300	*
2	11	20-22	300	
2	11	20-22	<250	*
2	13	24-26	400	
2	13	24-26	400	*

* Duplicate Values

Table 2

Taylor Instrument Company

Total Mercury Analysis of Soil Samples

CAMO No: 82-9-11185

Log # 11185

SAMPLE Ly	SAMPLE S	DEPTH IN FEET	Hg CONC ug/g	REMARKS
1	1	0-2	7150	
1	1	0-2	7150	*
1	2	2-4	1100	
1	2	2-4	12.5	*
1	3	4-5.6	<0.1	
1	3	4-5.6	<0.1	*
2	1	0-2	1000	
2	1	0-2	850	*
2	2	2.5-4.1	550	
2	2	2.5-4.1	650	*
3	1	0-2	500	
3	1	0-2	900	*
3	2	2-4	300	
3	2	2-4	300	*
3	3	5-6.6	500	
3	3	5-6.6	480	*
4	1	0-2	7750.	Elemental Hg visible
4	1	0-2	>250.	*
4	2	2.5-4.1	0.2	
4	2	2.5-4.1	>0.1	*

* Duplicate Values

APPENDIX E

GROUNDWATER ANALYSES

LOZIER
CAMO
LABORATORIES
23 N. MAIN STREET • FAIRPORT, NEW YORK 14450 • 716-425-2210

82-9-171
November 30, 1982

CONFIDENTIAL

PRIVILEGED

Mr. Kevin Hylton
Environmental Engineer
Taylor Instrument Company
Division of Sybron Corporation
95 Ames Street
Rochester, New York 14601

Dear Kevin:

Enclosed with this letter you will find results for the water analyses on samples collected from Taylor Instruments on October 20, 1982.

Please note that the "W" series refer to Wells, while those of "PZ" and "LY" refer to Piezometers and Lysimeters, respectively. Samples were also collected from the wells initially drilled (O-O, D-O, C-135, E-180). The results are listed in Table 1.

When it was established that there was no high mercury content in theorized "background wells", one was selected for additional analyses. The well chosen was W-1. The sample from this well was collected November 22, 1982. The results are listed in Table 2.

It should be noted that all wells/borings were purged three (3) times prior to sample collection.

All analyses were performed in accordance with guidelines stipulated in EPA Manual, "Methods for Chemical Analysis of Water and Wastes", March 1979.

Very truly yours,

David Nelson
Director, Analytical Services

DN/kz

Affiliated with:
LOZIER ARCHITECTS ENGINEERS • 600 PERINTON HILLS • FAIRPORT, NEW YORK 14450 • 716-223-7610
CAMO LABORATORIES • 367 VIOLET AVENUE • POUGHKEEPSIE, NEW YORK 12601 • 914-473-9200

TABLE 1

Taylor Instrument Company

Total Mercury Concentrations of Well/Boring Water Samples

October 20, 1982

Sample Identification	Hg Conc. (mg/l)	[1]Limitations (mg/l)	Remarks
Wells:			
W-1	<0.0002	.002	
W-2	<0.0002	.002	
W-3	<0.0002	.002	
W-4A	<0.0002	.002	
W-4B	<0.0002	.002	
W-5A	<0.0002	.002	
W-5B	<0.0002	.002	
W-6	<0.0002	.002	
0-0	0.0025	.002	2
D-0	0.0004	.002	
C-135	0.0002	.002	
E-180	0.1400	.002	2
Piezometer:			
PZ-2A	<0.0002	.002	
PZ-2B	<0.0002	.002	
Lysimeters:			
LY-1	0.0024	.002	2
LY-2	0.0002	.002	
LY-3	<0.0002	.002	
LY-4	0.0025	.002	2
Field Blank:	<0.0002	.002	

1 - Class GA Water Limitations as defined in "Groundwater Classification Quality Standards and Effluent Standards and/or Limitations," NYSDEC, Part 703.

2 - Limitations exceeded

TABLE 2

Taylor Instrument Company

Groundwater Characterization on Well W-1

Parmeters	Concentrations		[1]Limitations (mg/l)	Remarks
Miscellaneous Inorganic:				
pH	7.4	range	6.5-8.5	
Chloride	130.0	mg/l	250.0	
Cyanide	<0.01	mg/l	0.20	
NO_3-N	<0.10	mg/l	10.0	
SO_4	90.0	mg/l	250.0	
Metals:				
Cd	<0.01	mg/l	0.01	
Cr^{+6}	<0.01	mg/l	0.05	
Cu	0.02	mg/l	1.0	
Fe	1.3	mg/l	0.3	2
Ni	0.05	mg/l	not listed	
Zn	0.06	mg/l	5.0	
Organics:				
Trichloroethylene	<2.0	μg/l	10 μg/l	
Methyl Chloroform	<2.0	μg/l	not listed	

1 - Class GA Water Limitations as defined in "Groundwater Classification Quality Standards and Effluent Standards and/or Limitations", NYSDEC, Part 703.

2 - Limitations exceeded